

THE PAPUA NEW GUINEA
UNIVERSITY OF TECHNOLOGY



2012
COURSES HANDBOOK





**THE PAPUA NEW GUINEA
UNIVERSITY OF TECHNOLOGY**

HANDBOOK 2012

Published March, 2012 by Academic & Student Administration Division
Printed by Unitech Printing Services (lp04/12)

The Papua New Guinea University of Technology
Private Mail Bag, Lae 411, Morobe Province
Papua New Guinea

General enquiries should be addressed to:

The Registrar

The Papua New Guinea University of Technology
Private Mail Bag
LAE
Papua New Guinea

Enquiries concerning courses and student matters should be addressed to:

The Admissions Officer

The Papua New Guinea University of Technology
Private Mail Bag
LAE
Papua New Guinea

Telephone: (675) 473 4999 / 473 4445

Facsimile : (675) 475 7667

E-mail : lfugre@admin.unitech.ac.pg or
: skendorop@admin.unitech.ac.pg

This book is accurate at the date of publication. The University reserves the right to vary the content of its courses and syllabi or to cancel courses and syllabi previously announced.

CONTENTS**PAGES**

How to find your way in this Handbook	i
Officers of the University	ii
General Information	ii
Courses of Study	ii - iii
Admission	iii - iv
Matheson Library	iv - v
Department of Agriculture	1 - 39
Department of Applied Physics	40 - 94
Department of Applied Sciences	95 - 133
Department of Architecture and Building	134 - 172
Department of Business Studies	173 - 238
Department of Civil Engineering	239 - 265
Department of Electrical & Communication Engineering	266 - 302
Department of Mechanical Engineering	303 - 346
Department of Mining Engineering	347 - 374
Department of Mathematics and Computer Science	375 - 438
Department of Communication and Development Studies	439 - 491
Department of Forestry	492 - 536
Department of Surveying and Land Studies	537 - 620

HOW TO FIND YOUR WAY IN THIS HANDBOOK

The subjects which make up the various courses taught at the Papua New Guinea University of Technology are listed under COURSE Structure near the beginning of each departmental section of the book. This is followed by an outline of all the subjects taught by the department using the relevant code and title. Many courses include subjects taught by another department. For example, all first year courses include one subject taught by the staff of the Department of Mathematics and one subject taught by the staff of the Department of Language and Communication Studies. You will find an outline of the courses taught by other departments in the sections for those departments. Below is an alphabetical list of codes used by the various departments.

CODE	DEPARTMENT
AG	Agriculture
AGP	Agriculture
AP	Applied Physics
AR	Architecture and Building
AS	Applied Science
BA	Business Studies
BL	Architecture and Building
CE	Civil Engineering
CH	Applied Science
CM	Electrical Engineering
CS	Mathematics and Computer Science
ED	Electrical Engineering
EE	Electrical Engineering
EF	Foundation Year Engineering
EL	Electrical Engineering
FR	Forestry
FT	Applied Science
IS	Business
LA	Communication and Development Studies
LC	Communication and Development Studies
LMC	Surveying and Land Studies
MA	Mathematics and Computer Science
MAP	Mathematics and Computer Science
ME	Mechanical Engineering
MEP	Mechanical Engineering
MN	Mining Engineering
MP	Mining Engineering
PH	Applied Physics
SV	Surveying and Land Studies
SL	Surveying and Land Studies
SLP	Surveying and Land Studies
PS	Surveying and Land Studies

OFFICERS OF THE UNIVERSITY

Chancellor

Stagg P., OL, MBE, FIEPNG, Registered Engineer

Vice-Chancellor

Dr. Schram A., Ph.D, Eco.Poli (EUI), Assoc. Deg. Inter. Relatn, MA, Poli.Hist (Nether.), BA, Poli. Sci. RL (Nether)

Acting Deputy Vice Chancellor

Professor Gonduan. C. K, PhD Arch (AITA) James Cook Uni, M. Infra. Plan.& Eng. Stuttgart Uni), PG Cert. MLF Eng. US ETI, (Washington), PGDipl. T&CP (Sydney Uni), BArch(PNGUT), PNGIA, Reg. Architect

Pro Vice-Chancellor (Academic)

Professor M. A. Satter, B.Tech, Ph.D(Loughborough), MBA (Heriot-Watt), CEng, FIMech.E, FIEPNG, FIEB, MBAAS, MemASME

(Administration)

Vacant

Registrar

Sako J. Q. Allan, MPP (VUW-NZ), BA Pub Admin (UPNG)

Bursar

Imbok Jimmy Y.U., BA Commerce (UPNG) ATPNG

Acting University Librarian

Acting Deputy University Librarian:

Isikel, Ismael, BASW (UPNG), PGDEd (UPNG), MLIS (UHM, US).

GENERAL INFORMATION

LOCATION OF THE UNIVERSITY

Originally envisaged as occupying a site adjacent to the University of Papua New Guinea in Port Moresby, the then Institute in its first year shared temporary premises with the Idubada Technical and Trade School in Port Moresby. The House of

Assembly investigated other possible sites and decided to establish the Institute at Lae, primarily because of the benefits that would result from a location in industrial and manufacturing centre of Papua New Guinea. In June 1967 the present 500 acre campus area was obtained. It is located approximately 9 kilometres from the centre of Lae City.

UNIVERSITY PUBLICATIONS

Courses Handbook is published at the beginning of each academic year and gives details of the courses and subjects offered in each department. It thus provides day-to-day information required by all students.

The Calendar contains the University's Act, Statutes, Rules, Regulations and By-Laws, Rules and Regulations that affect the students, and they will thus need to consult the Calendar. Copies of the calendar are held in the Library and in the Academic and Student Administration Office.

In addition, the University produces annually the following publications:

- * Vice-Chancellor's Annual Report
- * Research Report
- * Information for Intending Students
- * Students' Information Handbook
- * Student Rules

Copies of these Reports can be obtained from the Public Relations Unit, and copies of the other booklets from the Academic and Student Administration Office.

COURSES OF STUDY

DEPARTMENT OF AGRICULTURE

Bachelor of Science in Agriculture
Post-Graduate Diploma in Agriculture

DEPARTMENT OF APPLIED SCIENCE

Bachelor of Science in Applied Chemistry
Bachelor of Science in Food Technology
Bachelor of Science in Human Nutrition

DEPARTMENT OF APPLIED PHYSICS

Bachelor of Science in Applied Physics with Electronics & Instrumentation
Bachelor of Science in Radiation Therapy
Post Graduate Diploma in Applied Physics

DEPARTMENT OF ARCHITECTURE AND BUILDING

Diploma of Architecture (DARC)
Diploma of Building (DBLD)
Bachelor of Architecture (BARC)
Bachelor of Building (BBLD)
Postgraduate Diploma in Physical Planning (PGPP)

DEPARTMENT OF BUSINESS STUDIES

Diploma in Commerce (Accountancy)
Diploma in Commerce (Management)
Diploma in Commerce (Information Technology)
Bachelor of Commerce (Accountancy)
Bachelor of Commerce (Management)
Bachelor of Commerce (Information Technology)
Bachelor of Commerce in Business Economics

DEPARTMENT OF CIVIL ENGINEERING

Bachelor in Engineering in Civil Engineering
Post-Graduate Diploma in Civil Engineering

DEPARTMENT OF ELECTRICAL & COMMUNICATION ENGINEERING

Diploma in Electrical Engineering
Bachelor of Engineering in Electrical Engineering
Post-Graduate MPhil

DEPARTMENT OF MECHANICAL ENGINEERING

Bachelor of Engineering in Mechanical Engineering.
Postgraduate Diploma in Energy Engineering.
Master of Philosophy (MPhil)
Master of Technology (MTech)

DEPARTMENT OF MINING ENGINEERING

Bachelor of Engineering in Mining Engineering
Bachelor of Engineering in Mineral Process Engineering
Master of Philosophy (MPhil)

DEPARTMENT OF FORESTRY

Bachelor in Science in Forestry
Bachelor in Forest Management

DEPARTMENT OF COMMUNICATION AND DEVELOPMENT STUDIES

Diploma of Technology in Communication for Development
Bachelor of Technology in Communication for Development

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

Diploma in Computer Science
Bachelor in Computer Science
Post-Graduate Diploma in Engineering Mathematics
Post-Graduate Diploma in Computer Science
Post-Graduate Diploma in Mathematics

DEPARTMENT OF SURVEYING AND LAND STUDIES

Diploma in Cartography
Diploma in Surveying
Bachelor of Cartography
Bachelor of Surveying
Bachelor of Land Studies
Diploma in Land Administration
Certificate in Land Administration
Post-Graduate Diploma in Land Studies

TIMBER AND FORESTRY TRAINING COLLEGE

Short courses as listed under Department

ADMISSION PROCEDURES

The following procedures should be followed by candidates seeking admission to a course of study.

UNDERGRADUATE

- (a) School Leavers
School Leavers should apply using the School Leaver Form.
- (b) Non School Leavers
Non School Leavers should write to the University for an application form. The application form should be completed and submitted, together with documented evidence of qualifications. Candidates applying for TESAS sponsorship should submit the completed form to the

scholarship branch of the Commission for Higher Education. All other candidates should submit the form direct to the University. In either case, the completed form must be returned by the 31st August. Applications received after the closing date will not normally be considered.

POST GRADUATE

Candidate seeking admission to a post-graduate course should write to the Registrar for an application form. There is no deadline for submission of these applications.

ENTRY REQUIREMENTS

Entry requirements vary from course to course. Details can be found in the appropriate sections of this Handbook dealing with each course or in the Information for Intending Students booklet, a copy of which can be obtained from the Academic and Student Administration Office.

ADVANCED STANDING AND EXEMPTIONS

Non school leaver applicants may be eligible for advanced standing and/or exemptions, that is, may be exempted from taking one or more years and/or subjects of a course, according to the qualifications obtained since leaving school. Applicants who consider they may be eligible for advanced standing/or exemptions, should indicate this on their application forms.

ADMISSION QUOTAS

While the University endeavors to admit all qualified applicants, it has been found necessary to impose admission quotas on courses. Entry to some courses is highly competitive and it may not be possible for all candidates who are formally qualified to be admitted.

REGISTRATION

Before the start of each semester, all students are required to register for the subjects they wish to study.

Students are registered as full-time, part-time or external students.

COURSE REQUIREMENTS

Course requirements are given in the General By-Laws Governing Candidates for Undergraduate

Degree, Diploma and Certificates (contained in the Calendar).

ATTENDANCE AT CLASSES

Attendance at classes is an integral part of a student's course work. A student who is often absent from classes may be excluded from enrolment.

CHANGES OF COURSES

Changes of courses are approved only under exceptional circumstances and only where the student's sponsor and the appropriate Heads of Departments have given their approval.

COREQUISITES AND PREREQUISITES

When one subject is a co-requisite for another subject, both must be taken in the same semester or year. When one subject is a prerequisite for another subject, the first subject must be satisfactorily completed before the second subject can be taken.

REPEATED SUBJECTS

A student who fails a particular subject, and who is not given a conceded pass in the subject, is required to repeat and pass the subject before they are eligible to graduate.

WITHDRAWALS

Students who wish to withdraw from a particular subject must do so not later than five weeks before the commencement of the pre-examination study break in the semester in which the subject ends, otherwise the student will be recorded as having failed that subject. Students who wish to withdraw from their course of study should complete a Withdrawal Form and return this to the Academic and Student Administration.

THE MATHESON LIBRARY

Acting University Librarian:

Isikel, Ismael, BASW (UPNG), PGDEd (UPNG), MLIS (UHM, US).

Librarian:

Aimo, Rosa, BA (UPNG), Dip.Lib.Sci. (ADCOL)

Yamega, Mary, BA (UPNG), Dip.Lib.Sci (ADCOL)

Gonduan, Rena, BA (JCU QLD), Dip.Lib.Sci (ADCOL/UPNG)

Assistant Librarians:

Matiwat, Gabriel, BA Arts, (UPNG), Dip. Lib. Sci (UPNG), Dip. Theology (Bomana),

Kaumba, Abraham, Dip. Land Mgmt. (Unitech)

David, Decka, B.Elect.Eng (Comm) (Unitech)

Senior Library Officer:

Pasanai, Wilfred, Dip. Ed. (UOG)

Kumal, Jennifer, Dip. Lib. Sci. (ADCOL/UPNG)

Library Officers:

Maha, Hitolo, PSH Cert., Lib. Off. Cert. (IPM)

Wom, Timothy, Cert. Lib. Tech. (UPNG)

Digara, Linda, Cert. Lib. Asst. (ADCOL)

Ali, Darusila, Secretarial Cert. Rabaul Business College

Library Assistants:

Kallon, Davis Annie, Dip. Lib. Infor. Services Cert. (UPNG).

Tum, Julie, Cert. Computing, (CDO) Madang, Cert. Info. Tech, ITC, Lae

Ginsua, H. Ovaraka, Secretarial Cert. Lae Technical College

Richard, Basada, Cert. Project Planning & Proposal, Mapex Consultancy, Lae

The Library services in the University are provided at a central library. The building is 3,344 square metres in area, of which 2,137 square metres where completed in 1977. It is air conditioned and the public areas are carpeted. There are seats, reading desks and tables for 400 students, staff and other readers. The Library holds 132,000 books available for loan, a 3,000 volume reference collection. The Library has a collection of 996 periodicals titles. The Library is no longer subscribing to some of these titles. In addition to books and periodicals the Library maintains complete sets of Australian, British and New Zealand standards. In addition to its lending service, the Library provides individual assistance to readers in locating information or answering

queries. CD-ROM and online searches of major overseas bibliographic databases are available to staff, senior students and others. When necessary the Library obtains photocopies of articles in periodicals not held and books through its inter-library loans service. It offers classes and tutorials on the use of the collections' arrangement, the use of its catalogues and of reference works. Effective internet searching, critical thinking and information literacy. Facilities include photocopying printing and binding.

Enquiries to the Library may be made by:

Phone : 473 4351

Fax : 473 4363

Email : infor@lib.unitech.ac.pg

All residents and visitors to Papua New Guinea University of Technology may read in the Library, and residents have been granted permission to borrow as well as read. A small collection of recreational and fiction books is maintained for University staff and their families but this is also available to off-campus readers. A copy of the "Library Rules" may be obtained on request.

OPENING HOURS:

The hours of opening are determined by the Library Committee. At present they are:

During Semester:

Monday to Friday 8.00 am - 10:00 pm

Saturday 1:00 pm - 5:00 pm

Sunday 1:00 pm - 5:00 pm

During Vacation:

Monday to Friday 8:00 am - 4:00 pm

Saturday CLOSED

Sunday CLOSED

Public Holidays CLOSED

DEPARTMENT OF AGRICULTURE

DEPARTMENT OF AGRICULTURE

Head of Department and Professor:

Prof. Abdul Halim, B.Ag (Bangladesh Agric. Univ), MSc. (Bangladesh Agric. Univ) PhD. (UPLB, Philippines)

Deputy Head of Department and Senior Lecturer:

Dr. Peter A. Manus, MSc (Ag.Econ, Readings), BScAg- Hons (UPNG), PhD (UOT)

Associate Professor & Acting Director of University Biotechnology Centre:

Dr. Gariba Danbaro, B.Sc(Hons), Dip.Ed., MPhil (Ghana), PhD (Kobe, Japan)

Associate Professor:

Dr. Akanda Shamsul, B.Sc. (Bangladesh), MSc (Bangladesh), PhD (Oregon)

Senior Lecturers:

Dr Jayaprakash , BVSc, MVSc, PhD (Poland)

Dr Rao Rajashekhar, MSc(Agr), PhD

Lecturers:

Dr. Maia Wamala, M. Ag (UQ, Aust), PGD Ag (UQ), B. Ag. Sci. Hons (UPNG), B. Ag. Sci. (UPNG), Cert. Ag. Educ. (UOV), PhD (UOT)

Mr. Maino Maquin, K Dip. Trop. Agric.(Vudal), Dip. in Secondary Teaching (UPNG-GTC), BScAg (UOT) MSc (QUT, Aust)

Mr. William Kerua, MSc-RSM (UQ. Aust), BScAg (UOT), Advanced Dip in Teaching (UPNG-GTC), Cert Trop Fish (NFC)

Mr. Tom Okpul, MPhil; BScAg (UOT), Dip.Ag (Vudal). (On study leave (PhD) in UQ, Aust)

Mr. Patrick Michael, MSc (UK), MSc. Prelim (Nottingham, UK, BSc (UOT)

Mr. Nick Kewa MPhil (UOT)

Mrs Veronica Bue, MPhil (UOT), BSc Ag (UOT) On study leave , Curtin University of Technology, Perth, Australia)

Mr. Ronnie Dotaona . MPhil; BScAg (UOT)

Ms Betty Tiko, PGD, BScAg (UOT)

SPISARD (Outreach Extension Program)

Senior Technical Instructor:

Mr. William Nano, PGDip-AgSci (UNE), BScAg-Hons; BScAg (UPNG)

In-charge of South Pacific Institute for Sustainable Agriculture Development (SPISARD)

Scientific Officer:

Mr. Tata Telawika, BAppl Sci (UOT)

Ms. Lena Yual. BSAG (UOT)

Chief Technical Officer:

Mr. Luke Wangi, Cert.High Tech Ed (Lae Tech), 2nd Yr Chem Tech (UOT)

Principal Technical Officer:

Mr. Kairi, Amos, Cert.TropAgr(PopondettaAgric) ip.TropAgr(Vudal)

Senior Technical Officers:

Mr. Kila, A, Cert.TropAgr (Vudal), PGCert (HATI)

Mr. Arapi, D, Cert.MedLabTech (CAHS)

Technical Officers:

Mr. Yauwo, J, Cert.TropAgr (Vudal)

Mr. Gindo, H, Cert.HighTechEd(LaeTech)

Mrs. Etric, K, Cert.TropAgr(PopondettaAgric). On study leave, TAFE, Australia

Mr. Akiris, L, BSc BioChem (UPNG)

DEPARTMENT OF AGRICULTURE

Degree Program

The Department of Agriculture offers a four-year course, which leads to the Degree of Bachelor of Science in Agriculture. Entry to the course is at the Grade 12 School Certificate (or equivalent) level only. The program prepares the student for a wide variety of agricultural and agriculturally related occupations in PNG. These include teaching, research, advisory and technical positions both in government and private industry as well as in numerous other areas for which basic preparation in agriculture and related sciences is valuable.

About one-third of the instructional time is devoted to study in the biological, physical and social sciences, including rural sociology and two-thirds

to the study of agriculture and agricultural sciences. The interaction between agricultural activity and the quality of environment is emphasised throughout the course.

Industrial Training

All students enrolled in the degree program are required to undertake field training during second and third years. Industrial training in second year involves working on the University Farm one day each week in both semesters; field work in third year is undertaken for a full semester.

Research

The Department has concentrated research on selected food crops and small animals in the past. This is in line with the national government's shift in emphasis from plantation crops to food crops and livestock. For the last few years a research team representing different disciplines has been doing research on Rice. For the coming years, the emphasis of research will be on rice and other crops and small animals. With the expanded and coordinated research work on food crops and livestock proposed under the National Agricultural Research Institute (NARI), there is room for collaborative research between our staff and those of NARI and the agricultural industries.

Objectives of the research program are:

1. to understand existing systems of production in the subsistence or traditional sector and to come up with viable production technologies that will improve the traditional production system in PNG. Such an approach entails inter-disciplinary teams.
2. identifying problems of production and aiming for goal-orientated research for specific sites with on-farm adaptive trials. Since the Department is located in the lowlands, the Department will contribute to lowland systems in the first instance.
3. to look at intensification potential with a view to commercial production.

Outreach Extension Activities in the Rural Community:

Since 2003 activities have been initiated by this

Department for the mutual benefits of the rural people, students and the staff. Some villages have already been selected in the Markham valley to start with. The pilot project will focus on villages such as Tumua and Situm representing different agro-ecological conditions. These activities are being conducted under the umbrella of a newly established centre named South Pacific Institute of Sustainable Agriculture and Rural Development (SPISARD) attached to the Department of Agriculture. The goal of this project is to improve the quality of teaching and research of the University through active participation with realities of PNG rural areas. Students are required to stay in the villages, write report; conduct demonstration and training and share experiences with the farmers in the rural settings.

Linkages

The Department has established links with farmers, agricultural institutes, plantations, agribusiness and the Department of Primary Industry in the following provinces: Central, Morobe, Madang, Eastern Highlands, Western Highlands, Enga, East New Britain and West New Britain. MOUs have also been signed with NARI and DAL to do collaborative works.

Teaching and Research Farm

The Department has one farm of 39 ha located on the University campus and a larger farm of about 300 hectares still to be purchased and developed.

Main functions of the farm are to provide:

- 1.1 physical and financial data from a known and reliable source for teaching, demonstration and research,
- 1.2 materials (e.g. land, crops, livestock, machinery) for demonstration and practical training in agricultural techniques,
- 1.3 facilities for research and development work by the University staff and students, and for outside bodies,
- 1.4 the opportunity for the students to have an active and intimate association over a period of time with a farming situation,
- 1.5 produce food for sale,
- 1.6 land for staff and student gardens.
- 1.7 provide an annual physical and financial

report to the Agriculture Department.

27

Postgraduate Program

The Department also offers courses leading to a Post Graduate Diploma in Agriculture in which students can further their knowledge in professional areas like Crop Production, Animal Production, Crop Protection, Agricultural Economics, Soil Science and Agricultural Engineering.

The Department accepts postgraduate students for M.Sc, M.Phil and Ph.D by research provided they meet the requirements prescribed by the PNG University of Technology.

COURSE STRUCTURE

Progression from one year to the next will depend upon the successful completion of all of the current year's subjects. Only in exceptional situations, and at the discretion of the Head of Department, will a student be allowed to progress from one year to the next without the successful completion of the current year's subjects.

BACHELOR OF SCIENCE IN AGRICULTURE

First Year First Semester

	Contact hours
AS 111 Chemistry I	6
MA 181 Mathematics I AF (A)	4
AG 101 Agriculture & the Economy	2
FR 111 Plant Biology	5
CS145 Introduction to Information Technology I	2
LA 101 Study Skills	<u>3</u>
	<u>22</u>

First Year Second Semester

AG112 Animal Biology	5
AG 102 Agric. Extension & Rural Sociology	4
LA 102 Reading and Writing Skills	3
CS 146 Introduction to Information Technology II	2
AG 104 Crop Botany & Ecology	6
PH 176 Physics for Agriculture	5
AG 106 Morobe Field Trip	<u>2</u>

Second Year First Semester

AG 201 Agricultural Biochemistry	5
AG 205 Agricultural Experimentation	4
AG 211 Agricultural Economics I	3
AG 208 Introduction to crop pests & weeds	5
AG 207 Genetics & Breeding	5
AG 209 Agricultural Mechanisation	5
	<u>27</u>

Second Year Second Semester

AG 202 Crop Physiology	5
AG 204 Introduction to Soil Science	5
AG 206 Animal Management	5
AG 208 Introduction to crop pests & Weeds	<u>5</u>
AG 213 Lowland Field Trip (2 weeks)	<u>2</u>
	<u>22</u>

Third Year First Semester

AG 301 Crop Diseases I	5
AG 303 Animal Health & Diseases	4
AG 305 Animal Nutrition	5
AG 307 Field Crops & Vegetable Production	6
AG 309 Agricultural Economics II	3
AG 311 Principles of Aquaculture	<u>4</u>
LA301 Writing research paper	3
	<u>30</u>

Third Year Second Semester

AG 302 Industrial Attachment	<u>22</u>
	<u>22</u>

Fourth Year First Semester

AG 401 Plant Breeding (Track I&II)	3
AG 403 Special Project I (Track I, II&III)	4
AG 405 Introduction to Research Methodology (Track I & II)	3
AG 407 Perennial Crop Production (Track I, II&III)	5
AG 409 Soil Fertility and Soil Management (Track I & II)	5
AG 411 Animal Breeding (Track I&II)	4
AG 413 Agricultural Field Engineering (Track II&III)	5
AG 417 Agricultural Finance (Track III)	4
AG 419 Agricultural Project Planning and Management (Track III)	4
AG 421 Agricultural Marketing (Track III)	<u>3</u>

		40
Fourth Year Second Semester		
AG 402	Agricultural Biotechnology (Track I)	4
AG 404	Special Project II (Track I, II&III)	2
AG 406	Crop Pest and Weed Management (Track I &II)	5
AG 408	Farm Management (Track I, II&III)	5
AG 410	Agriculture, the Environment and Sustainability (Track I&III)	3
AG 412	Crop Diseases II (Track I&II)	3
AG 414	Pasture Management (Track II&III)	3
AG 415	Highlands Field Trip (Track I, II&III)	2
AG 416	Agricultural Production Economics and Pricing (Track II&III)	4
AG 418	Agricultural Extension (Track III)	3
AG 420	Post Harvest Technology (Track I, II, III)	

33

SUBJECTS TAUGHT BY THE DEPARTMENT (current)

AG 101	Agriculture & the Economy
AG 112	Animal Biology
AG 102	Agricultural Extension & Rural Sociology
AG104	Crop Botany and Ecology
AG 106	Morobe Field Trip
AG122	Rural Sociology
AG 201	Agricultural Biochemistry
AG 202	Crop Physiology
AG203	Anatomy & Physiology of Farm Animals
AG 204	Introduction to Soil Science
AG 205	Agricultural Experimentation
AG 206	Animal Management
AG 207	Genetics and Breeding
AG 208	Introduction to Crop Pests and Weeds
AG209	Agricultural Mechanisation
AG 211	Agricultural Economics I
AG 213	Lowland Field Trip
AG 301	Crop Diseases I
AG 302	Industrial Attachment
AG 303	Animal Health and Diseases
AG 305	Animal Nutrition
AG 307	Field Crops and Vegetable Production
AG 309	Agricultural Economics II

AG 311	Principles of Aquaculture
AG 401	Plant Breeding (Track I&II)
AG 402	Agricultural Biotechnology (Track I)
AG 403	Special Project I (Track I, II&III)
AG 404	Special Project II (Track I, II&III)
AG 405	Introduction to Research Methodology (Track I & II)
AG 406	Crop Pest and Weed Management (Track I &II)
AG 407	Perennial Crop Production (Track I, II&III)
AG 408	Farm Management (Track I, II&III)
AG 409	Soil Fertility and Soil Management (Track I&II)
AG 410	Agriculture, the Environment and Sustainability (Track I&III)
AG 411	Animal Breeding (Track I&II)
AG 412	Crop Diseases II (Track I&II)
AG 413	Agricultural Field Engineering (Track II&III)
AG 414	Pasture Management (Track II&III)
AG 415	Highlands Field Trip (Track I, II&III)
AG 416	Agricultural Production Economics and Pricing (Track II&III)
AG 417	Agricultural Finance (Track III)
AG 418	Agricultural Extension (Track III)
AG 419	Agricultural Project Planning and Management (Track III)
AG 420	Post Harvest Technology (Track I, II, III)
AG 421	Agricultural Marketing (Track III)

AG 101: Agriculture & The Economy

Objectives:

1. To understand the main features of the PNG economy and the role of agriculture in it;
2. To describe the topography, climate, population distribution, employment and income patterns, transport and communication systems of PNG as they affect agricultural production and development;
3. To describe subsistence, semi-commercial, commercial, smallholder and larger holder farming systems;
4. To understand the concepts of sustainability of resource utilisation, soil fertility, soil conservation, and watershed management in relation to agricultural production and

development.

Syllabus:

Role and contributions of agriculture to the economy, Agricultural production practices and effect on sustainability, biodiversity, and land degradation. Land tenure and land use for agricultural production. Ecological and socio-economic factors affecting distribution and production of crops and livestock. Issues of population growth and impact on land use, cash cropping and food security. The importance of farming systems practiced in PNG. Post harvest activities with relevance to the economy.

Textbook:

Wrigley, G. 1981. Principles of Agriculture. Tropical Agricultural Series (4th Edition). Longmans, London.

Reference:

1. Ruthenberg, H., 1980. Farming Systems in the Tropics (3rd Edition). Clarendon Press, Oxford.
2. Papua New Guinea Journal of Agriculture, Forestry and Fisheries
3. Harvest

Assessments:

Continuous Assessments - 50%
Written Examination - 50%

AG 112: ANIMAL BIOLOGY

Pre-requisite:

Grade 12 Biology or equivalent

Objectives:

1. To explain the extent of Biology as a theoretical and applied discipline;
2. To emphasize the scientific methods in its development in PNG.

Syllabus:

Basic theories on origins, evolution and taxonomic classification. Phylogeny and diversity of animals. Outline of animal chemistry, cell, tissues and organs. Introduction to animal physiological systems; digestion, circulation, nervous, endocrine, locomotion, skeletal, respiratory, excretion and

reproduction. Introduction to genetics; mitosis and meiosis, inheritance, pattern and chemistry of inheritance. Introduction to ecology including ecosystem and communities. Application of animal biology in agriculture.

Textbook:

Roberts, M.B.V. 1986. Biology: A Functional Approach (4th Edn). ELBS.

Reference:

Biology Study Guide. Revised by D. Hector and J.C. Reid

Assessments:

Continuous Assessments - 50%
Written Examination - 50%

**AG 102: AGRICULTURAL EXTENSION
AND RURAL SOCIOLOGY**

Objectives:

1. To understand the concept of agriculture extension and its various definitions.
2. To understand the philosophies, principles and objectives of agriculture extension and their application in the context of PNG.
3. To understand communication process and teaching methods in extension.
4. To understand fundamental duties and responsibilities of agriculture extension workers in the context of PNG.

Syllabus:

Definition of agricultural extension, difference between agricultural extension, agricultural education, community development and social welfare. Discussion on the various philosophies, principles and objectives of agricultural extension with examples of PNG situation. Communication process in extension, its elements and their application to disseminate innovations in rural areas of PNG. Adoption and diffusion process of innovations in the farming community of PNG. Different types of extension teaching methods to educate the farmers in rural PNG. The types of professionals required to run an extension organisation. The duties and responsibilities of different types of extension professionals,

especially those agriculture extension workers.

Textbooks:

Ray, G.L. (1996). Extension Communication and Management, R. Publishing Corporate, Delhi.
Rogers, E.M. and Shoemakers, F.F. (1971). Communication of Innovations, New York. The Free Press.

Reference:

Halim, A. and Kaida, Y. 2001. Agricultural Extension in Southeast Asia: Historical Review, Bangladesh Agricultural University.
Lerner, D. and Schramm, W. (Eds.) (1967). Communication and Changes in the Developing Countries. East West Centre Press, Honolulu.
Lionberger, H.F. 1978. Adoption of New Ideas and Practices. Iowa State University, Press, Iowa.
Swanson, B.E. 1984. Agricultural Extension Manual, FAO, Rome.

Assessment:

Continuous Assessment - 40%
Written Exam - 60%

AG 122: RURAL SOCIOLOGY

Objectives:

1. To gain insight of the rural communities in Papua New Guinea: their relationship with land and other groups of the society
2. To gain knowledge of the fundamental social processes
3. To have an understanding of the diffusion of innovation in a social system
4. To gain preliminary knowledge of conducting social survey and their methods

Syllabus:

Papua New Guinea agricultural community, characteristics and role in economic development. Social, cultural, economic and political factors affecting agriculture in PNG. The changing pattern of agriculture: organization of labour, systems of land holdings, the dynamics of farm management. The peasant model: characteristics of peasants and small holders. The spread of agricultural innovation.

Textbooks:

1. Rogers E.M. Diffusion of Innovations, The Free Press of Glencoe, New York, 1995
2. Long, N. An Introduction to the Sociology of Rural Development, Tavistock Publication, London, 1980
3. Lionberger, Herbert F. Adoption of New Ideas and Practices. The Iowa State University Press, USA, 1978

References:

1. FAO Reference Manual on Agricultural Extension – FAO, Rome, 1995
2. Roucek, J.S. & Warren, R.L. Sociology: An Introduction. Littlefield, Adams & Co. 1971
3. Mosher, A. T., Getting Agriculture Moving. Praeger, New York, 1966

Assessment:

Continuous Assessment - 40%
Written Examination - 60%

AG 104: CROP BOTANY AND ECOLOGY

Pre-requisite: FR 111

Objectives:

1. To understand the influence of environment on crops;
2. To know and appreciate the historical and broad climatic factors which determine the distribution of agricultural plants in PNG;
3. To describe the botanical and chemical features of agricultural plants important in PNG;
4. To understand the morphology and life cycles of agricultural plants in PNG;
5. To be able to identify unknown species with keys using the above characters;
6. To understand the above relationships and how these can be manipulated to improve production and sustainability and avoid harm to the agro-ecosystem.

Syllabus:

The botanical and chemical features of agricultural crop plants important in the tropics and PNG. Training in the use of botanical and agricultural methods of classification. Major ecosystems of the

world and PNG, Climate and microclimate and other abiotic factors. Ecology of farming systems. Energy and minerals and their cycles. Trends and effects in intensification. Contrasts arising from diversity and simplicity in agro-ecosystems. Biotic factors. Use of fertiliser and pesticides. Environmental effects of agriculture. Crop environment management for sustainability.

Textbook:

Purseglove, J. W. 1974. Tropical Crops: Monocotyledons. Vols. 1 and 2
Purseglove, J. W. 1974. Tropical Crops: Dicotyledon. Longman. London
Lecture Notes compiled by L.C. Dempster & A.E. Hartemink

Reference:

Jackson, D.L. & Jacobs, S.W. 1985. Australian Agricultural Botany. Sydney Uni. Press
Tivy, J. 1990 Agricultural Ecology. Longman Scientific & Technical. Harlow Essex & John Wiley & Sons Inc. New York
Hillary, E. 1984. Ecology 2000. Joseph. London
Mariner, J.L. 1968. Understanding Ecology. The Independent School Press. Wellesby Hills Mass

Assessments:

Continuous assessments - 40%
Written examinations - 60%

AG 106: MOROBE FIELD TRIP

Objectives:

1. To expose students to various agricultural activities in and around Morobe Province;
2. To appreciate the transportation activities of agricultural products in and around Morobe Province;
3. To appreciate the handling and shipping of agricultural export and import commodities, at the nations main port as well as the quarantine process and procedures;
4. To appreciate the importance of this activities to the economy of the nation.

Syllabus:

Field visits made to both large and small-scale agricultural industries and institutions involved in

research, production, extension, economic, transportation, shipping and quarantine activities.

Assessments:

Continuous assessments - 50%
Written examinations - 50%

AG 202: CROP PHYSIOLOGY

Pre-requisite: FR 111

Objectives:

1. To understand the scope and coverage of the discipline of crop physiology and its place in the overall practice of crop production;
2. To have an understanding of the functioning of the crop plant, the derivation of dry matter and its partitioning in the plant;
3. To know and understand the physiological basis of crop yield and crop quality.

Syllabus:

Review of basic plant functions. Transpiration and water movement in plants. Phloem transport, Photosynthesis, dry matter accumulation and yield formation. Plant growth regulators; their functions in plants and their uses in agriculture. Photoperiodism. Plant reproductive physiology: flowering, fruiting, and fruit ripening. Senescence and abscission. Responses of crop plants to environmental stress. Crop maturity and storage physiology.

Textbook:

Salisbury, F.B. and Ross, C.W. 1992. Plant Physiology (4th Edn). Wadsworth Publishing Co.Inc., California.

Reference:

Milthorpe, F.L. and Mooby, J. 1979. An Introduction to Crop Physiology (2nd Edn). Cambridge University Press.
Luckwill, L.C. 1981. Growth Regulators in Crop production. Studies in Biology No. 129 (1st Edn), Edward Arnold Ltd. London.
Johnson C.B. 1981. Physiological processes Limiting Plant production (1st Edn), Butterworth, London.
Evans, L.T. 1976. Crop Physiology (Some case

histories). (1st Edn). University printing House, Cambridge.

Assessment:

Continuous Assessment - 40%

Written Examination - 60%

AG 203: ANATOMY AND PHYSIOLOGY OF FARM ANIMALS

Pre-requisite: AG 112

Objectives:

1. To gain an understanding of the structure and function of the various organ systems in farm animals;
2. To appreciate how these organ systems function to keep the animal alive and productive.

Syllabus:

Introduction to anatomy and physiology of farm animals- skeletal system (classification of bones and their functions), physiology of various organs and body systems with special emphasis on the following: nervous, endocrine, respiratory, circulatory, digestive, urinary and reproductive systems. Anatomy and histology of various systems to be covered in practical sessions.

Textbook:

Heath, E. and Olusanya, S. 1985. Anatomy and Physiology of Tropical Livestock. Longman, London.

Reference:

Frandsen, R.D. 1986. Anatomy and Physiology of Farm Animals (4th Edn). Lea and Febiger, Philadelphia.
Simpkins, J. and Williams, J.J. 1985. Advanced Biology. Bell and Hyman, London.
Svendsen, P. and Carter, A.M. 1984. An Introduction to Animal Physiology (2nd Edn), MTP Press Ltd., Lancaster, Boston and The Hague.

Assessments:

Continuous Assessments - 40%

Written Examinations - 60%

AG 205: AGRICULTURAL EXPERIMENTATION

Pre-requisite: MA 181

Objectives:

1. To use numerical techniques to calculate areas under curves;
2. To construct and apply frequency tables, histograms, and calculate descriptive statistics for centre and spread of data;
3. To calculate probabilities associated with simple experiments;
4. To detail the steps involved in planning and executing basic agricultural experiments;
5. To explain the importance of basic experimental design in crops and livestock;
6. To identify and implement the method of analysis and tests of significance for each design;
7. To correctly interpret the results and draw appropriate conclusions.
8. To use a hand calculator efficiently, including using scientific notation, function keys, and the statistical keys;
9. To use computer programs to investigate graphs of the standard mathematical functions, and to use spreadsheets.

Syllabus:

Probability; Statistics (frequency tables, histograms, descriptive statistics); Distribution of outcomes and events for simple experiments. General principles of field and laboratory experiments. Experimental design including randomised block layout, Latin square, Split plot, Factorial and confounded. Basic differentiation and integration; Orthogonality. Incomplete records. Handling of data and use of calculating machines and computers. Applications of variance, co-variance and correlation analysis to data obtained from field and laboratory experiments. The interpretation of results from agricultural experiments.

Textbook:

Clarke, G.M. 1981. Statistics and Experimental designs (2nd Edn). Arnold, London.

Assessments:

Continuous assessments	- 40%
Written Examinations	- 60%

AG 207: GENETICS AND BREEDING

Objectives:

1. To describe different patterns of inheritance and interconnect the characteristics of plants and animals to their genetic basis;
2. To evaluate and predict the change in gene frequency from generation to generation in inter-breeding populations of plants and animals and to discuss and debate the use of evolution;
3. To determine the degree of inheritance of characters of plants and animals and initiate basic selection and breeding programs.

Syllabus:

Principles of genetics, genetic basis of variation continuous and discontinuous variation. Mendelian Inheritance Patterns of inheritance in qualitative and quantitative characters of plants and animals. Physical basis of inheritance and principles of cytogenetics and molecular genetics. Principles of gene mapping. Population genetics and behavior of genes in populations and the process of evolution. Foundations of quantitative inheritance, basic breeding and selection systems.

Textbook:

Jones, R.N. and Karp, A. 1986. *Introducing Genetics*, John Murray, London.

Reference:

Falconer, D.S. 1981. *Introduction to quantitative Genetics*, Longman. London

Assessment:

Continuous Assessment	- 40%
Written Examination	- 60%

AG 209: AGRICULTURAL MECHANISATION

Pre-requisite: PH 172

Objectives:

1. To understand and appreciate the various power sources available for agricultural operations;
2. To understand the concepts of agricultural mechanization in developing countries;
3. To know and appreciate the basis of agricultural workshop;
4. To know and appreciate the mechanization requirements of each operation in agricultural production;
5. To know and differentiate between the different types of machinery and labour saving devices used in agricultural production;
6. To perform basic operations and maintenance of these machines and techniques;
7. To know the design principles of these machines;
8. To understand the concepts of agricultural structure and farm electricity.

Syllabus:

Mechanization in a developing country, its concept and impact; Principles of mechanics and properties of materials; sources of power on a farm, the tractor as the basic power source, implements and machines used for tillage, planting, spraying, and harvesting operations; field efficiency and machines; processing and storage of agricultural crops. Farm structures, electricity and water supply.

Textbook:

Kaul, R.N. and Egbo, C.O. 1985. *Introduction to Agricultural Mechanisation*. Macmillan, London.

Reference:

Nath, S. 1988. *Manual of Practicals in Farm Mechanisation*. Unitech Printery.
 Crossley, C.P. and Kilgour, J. 1983. *Small Farm Mechanisation for Developing Countries*, Wiley, London.
 Culpin, C. 1986. *Farm Machinery* (11th Edn), Collins, London.
 Phipps, I.J. and Reynolds, C.L. 1990. *Mechanica in Agriculture* (4th Edn), Interstate publishing Inc. Illinois.
 FAO 1977. *Elements of Agricultural Machinery* (Vol 1 and 11). *Agricultural Service Bulletin* No. 12.

Assessment:

Continuous Assessments	- 40%
Written Examination	- 60%

AG 211: AGRICULTURAL ECONOMICS I

Objectives:

1. To understand the basic economic framework;
2. To understand the behaviour of firms under perfect and imperfect market structures;
3. To understand the equilibrium price and output under different market structures;
4. To know and appreciate the nature of cyclical variation of prices and output in farming.

Syllabus:

The nature and scope of economics, scarcity and choice, choice in the subsistence economy. Economic systems and resource allocation. Demand, supply and equilibrium price. Elasticity of demand and supply. Supply and demand in agriculture. Seasonal and cyclical variation of farm products. Consumer behaviour and market demand. Costs of production and economics of scale. The taxonomy of markets. Costs and pricing under perfect and imperfect structures.

Textbook:

Livingstone I and Ord HW 1981. Agricultural Economics for Africa. Heinemann, London.
Lecture Notes

Assessment:

Continuous Assessments	- 40%
Written Examination	- 60%

AG 213: LOWLANDS FIELD TRIP

Objectives:

1. To learn various agricultural activities such as production, research, extension packaging/handling, activities as well as their economic importance to the nation;
2. To be familiar with the agro-ecology peculiar to the main coastal regions including the lowlands and the highlands;
3. To be familiar with the procedures and processes associated with the agricultural

based financial loaning institutions both large and small scale.

Syllabus:

Field trip to small and large scale agricultural based institutions and industries in the PNG lowlands to familiarize with agricultural operations such as production, processing, packaging/storage and transportation, extension, and research.

Assessments:

Written Report - 100%

AG 201: AGRICULTURAL BIOCHEMISTRY

Pre-requisite: AS 111

Objectives:

1. To understand cell structure and cell chemistry;
2. To know the structure of the major macromolecules and their role within the cell;
3. To understand the pathways and cycles involved in the cellular metabolism of the nutrient macromolecules;
4. To know and appreciate the role of enzymes in cellular function and the factors which affect enzyme activity;
5. To understand the photosynthetic pathway and the relationship between respiration and photosynthesis;
6. To understand the structure and role of the cell membranes in metabolism and the way in which molecules are moved through membranes.

Syllabus:

General principles of organic chemistry; Concepts of acids, salts base and buffers; Cell structure and cell chemistry. Chemistry, properties and biosynthesis of carbohydrates, lipids, amino acids, nucleic acids and their metabolisms. Properties of enzymes and mechanism of enzyme action. Biochemistry of photosynthesis in plants and respiration in plants and animals. Basic concepts of metabolism and metabolic pathways with reference to agriculture.

Textbook:

Sheeler, P. and Bianahi, D. E. 1983. Cell Biology: Structure, Biochemistry and Function, John Wiley.

Reference:

Stryer, L. 1981. Biochemistry (2nd Edn). W.H. Freeman, San Francisco.
Conn, E. E. and Stumpf, P. K. 1976. Outline of Biochemistry (4th Edn). John Wiley.

Assessments:

Continuous assessments - 40%
Written examination - 60%

AG 204: INTRODUCTION TO SOIL SCIENCE

Pre-requisite: AS 111

Objectives:

1. To define and describe the meaning of the term "a soil";
2. To describe the basic processes of soil formation including weathering;
3. To understand the process of the development of soil profile, soil horizons and their identification;
4. To identify the soil physical, chemical, and biological processes occurring in soil;
5. To describe the terms; soil pH, soil acidity and identify their effects on soil properties;
6. To understand the importance of soil as a medium for plant growth.

Syllabus:

The concept of soil; components of the soil; soil forming processes; factors of soil formation; soil forming rocks and minerals; soil profile and soil horizons; soil classification; soil texture, soil structure, soil density and their effect on plant growth; soil color; managing soil air and soil temperature. Soil cation exchange and cation exchange capacity; soil acidity and alkalinity; soil moisture and soil degradation; soil organisms; soil organic matter; soil as a medium for plant growth; plant nutrients and their importance in crop production; diffusion, mass flow, and oxidation-reduction potentials; soils of PNG

Textbook:

Foth, H.D. 1990. Fundamentals of Soil Science. John Wiley and Sons, New York.

Reference:

Bleeker, P. 1983. Soils of Papua New Guinea. ANU Press. Canberra
Brady, N.C. and Weil, R.R. The Nature and Properties of Soils. 12th Edn., Prentice Hall

Assessments:

Continuous Assessments - 40%
Written examination - 60%

AG 206: ANIMAL MANAGEMENT

Pre-requisite: AG 112

Objectives:

1. To discuss the factors that affect productivity and efficiency in the main species of animals;
2. To learn the husbandry of these species;
3. To impart practical knowledge of how a commercial animal enterprise is planned and operated;
4. To outline the main animal products, the processes and factors involved in producing good quality products and by-products from animals;
5. To outline the important role of animals in agriculture and how animals can be integrated into a sustainable system involving crops and other land use practices.

Syllabus:

Components of animal production systems and their influence on productivity and efficiency in animals. Aspects of the growth, development and productive processes in domestic animals with special reference to the efficiency of production and adaptation to the environment. The husbandry of cattle, pigs, poultry, sheep, goats, rabbits and buffaloes, mating behaviour, dam-offspring relationships and the care of the neonates. Product harvesting and quality aspects. A brief discussion on the husbandry of work animals. Emphasis will be given to the role of livestock in the present and future development of PNG and to the integration of animals into mixed farming systems.

Textbook:

Payne, W.J.A. 1990. An Introduction to Animal Husbandry in the Tropics (4th Edn). ELBS.
Danbaro G. 2002 Management of Pigs and Poultry Study Notes

Assessments:

Continuous Assessments - 40%
Written Examination - 60%

AG 208: INTRODUCTION TO CROP PESTS AND WEEDS

Pre-requisite: AG 201

Objectives:

1. To understand the importance of crop pests and weeds on agricultural crops;
2. To know the reasons relating to crop pests and weed problems on agricultural crops;
3. To know the basic biology and ecology of crop pests and weeds in agriculture;
4. To inter-relate the biological information of crop pests and weeds;
5. To introduce control measures for crop pests and weeds on agricultural crops.

Syllabus:

The distribution, significance and characteristics of crop pests and weeds; anatomy, morphology and physiology of crop pests and weeds. Effects of crop pests and weeds through ecosystem simplification; (diversity abundance, and interactions). Growth curves, spatial distribution and sampling of crop pests and weeds. Preservation methods of crop pests and weeds. Application of biological and ecological information for crop pests, and weed management; Principles of crop pest and weed control: biological, cultural, chemical and Quarantine. Taxonomic studies of crop pests and weeds in PNG.

Textbook:

Henty, E.E. and Pritchard, G.H. 1975 Papua New Guinea weeds and their control. Botany Bulletin No. 7 2nd Edn. Department of Forest. Division of Botany. Lae.
Lavabre, E.M. 1991 Weed control. The tropical agriculturalist. CTA/Macmillan.

Gullan, P.J and Cranston, P.S 1994 An outline of entomology. Chapman and Hall. London.

Reference:

Zimdahl, R.L. 1993 Fundamentals of Weed Science. Academic Press. New York
Chapman, R.F 1969. The insect: Structure & Functions. ELBS Hodder & Stoughton, UK

Assessments:

Continuous Assessments - 40%
Written Examination - 60%

AG 301: CROP DISEASES I

Pre-requisite: None

Objectives:

1. To examine various agents causing plant diseases, symptomatology, etiology, disease cycle and pathogenesis;
2. To isolate plant pathogens, identify them and determine methods of inoculation;
3. To monitor spread of diseases in population and assess disease and associated crop losses, prescribe epidemiological measures to limit disease spread suitable to PNG;
4. To determine host-pathogen relationships and prescribe measures for disease control suitable to PNG.

Syllabus:

Plant diseases caused by biotic agents, covering symptomatology, etiology, disease cycles and pathogens. Disease physiology, epidemiology, population pathology and environment, assessment of diseases and crop losses. Diagnosis of diseases, isolation and identification of pathogens, inoculation techniques, host-parasite relationships and measures of diseases control in the tropics.

Textbook:

Agrios, G. N. 1978. Plant Pathology (4th Edn). Academic Press. London.

Reference:

Shaw, D. E. 1984. Microorganisms in Papua New Guinea. DPI Research Bulletin No. 33. Port Moresby.

Pearson, M. 1982. A Student Guide to the Plant Diseases of Papua New Guinea. UPNG Printery.
CMI. 1983. Plant Pathologist's Pocket Book, (2nd Edn). CMI, Surrey.

Assessment:

Continuous Assessment - 40%
Written Examination - 60%

AG 303: ANIMAL HEALTH AND DISEASES

Pre-requisite: AG 203

Objectives:

1. To understand the physiological basis of diseases;
2. To appreciate how management can influence the balance between an animal and agents which cause diseases to ensure animals remain healthy and productive;
3. To gain skills in the examination of living and dead (autopsy) animals in order to determine causes of diseases/death.

Syllabus:

Importance of animal health in animal production and rural development; definition of diseases and methodology used in making a diagnosis; epidemiology, general classification of diseases of different livestock in PNG (infectious and non-infectious). Major exotic diseases and possible methods of entry into the country; Preventive measures including Quarantine.

Textbook:

Hall, H. T. B. 1988. Diseases and Parasites of Livestock in the Tropics. Intermediate tropical Agriculture Series. London.
DPI (1976, 1977, 1980) Rural Development Series Handbooks No. 4, 5, 16.
Sainsbury, D. 1983. Animal Health. Granada.

Assessment:

Continuous Assessment - 40%
Written Examination - 60%

AG 305: ANIMAL NUTRITION

Pre-requisite: AG 102

Objectives:

1. To have an understanding of the nutrients that are required by different classes of farm animals;
2. To have an understanding of the way in which these nutrients are utilised by animals for production;
3. To be able to describe deficiency and toxicity symptoms for critical nutrients;
4. To be able to calculate nutrient content of diets using feed composition tables;
5. To be able to predict animal performance from given diets.

Syllabus:

Definition and description of major nutrients in animal nutrition. Digestive systems in mono-gastrics and ruminants - functions and functional differences. Metabolism of nutrients by mono-gastrics and ruminants. Requirements of nutrients. Deficiency symptoms. Evaluation of feeds for nutrient content and nutritive value and anti-nutrients. Use of feed standards and requirement tables for estimation of performance. Introduction to feed formulation.

Textbook:

McDonald, P., Edwards, R.A. and Greenhalgh, J.F.D. 1988. Animal Nutrition (4th Edn), Longman Group, London.

Reference:

CAB. 1980. The Nutrient Requirements of Ruminant Livestock.
Hecter, J.B. and Termouth, J.H. (eds) 1987. The Nutrition of herbivores. Academic Press.

Assessment:

Continuous Assessment - 40%
Written Examination - 60%

AG 307: FIELD CROPS AND VEGETABLE PRODUCTION

Prerequisite: FR 111

Objectives:

1. To understand the principles involved in the practice of field crop production;
2. To understand the production practices and importance of the major field crops of PNG and the world generally.

Syllabus:

Principles involved in the production of field crops and vegetables. Land preparation, tillage, spacing, seeding rates and fertiliser requirement. Cropping systems: shifting cultivation, sole cropping, intercropping, crop rotation. General characteristics of the major groups of field crops (namely root/tuber crops, cereals, grain legumes, and vegetables). Specific coverage of each of the major crops in each group, with particular emphasis on botany, ecology, cultivation, crop protection harvesting, storage, marketing and economic importance of each crop. Integrated crop and animal production systems.

Assessment:

Continuous Assessment - 40%
Written Examination - 60%

AG 309: AGRICULTURAL ECONOMICS II

Pre-requisite: AG 211

Objectives:

1. To be able to calculate the equilibrium interest rate, consumption level, national income and investment level in open and closed economies;
2. To be able to estimate the level of government expenditure or taxation that are needed to increase the level of national income;
3. To be able to calculate the balance of payment deficit in PNG and identify appropriate strategies that are needed to recover deficits.

Syllabus:

National income accounting, Savings, Investment and consumption, IS-LM framework, Aggregate demand and supply, Money and banking, Inflation, Employment and unemployment, International trade, Balance of payments. Exchange rate system. Trade policies, economic growth and development.

AG 302: INDUSTRIAL ATTACHMENT

Pre-requisite: None

Objectives:

1. To gain and consolidate field experience in an area of interest and possible employment;
2. To appreciate the field application of the theoretical learning in the agricultural field;
3. To be able to gain hands on experience in the agricultural based areas which they are not familiar with.
4. To participate in and appreciate the procedures and techniques applied in research institutes;
5. To learn and appreciate the level of management skills practiced at different levels of work/labour category;
6. To be exposed to new technology in the field of agricultural engineering.

Syllabus:

Six months of field work in the second half of the third year program. The students will be placed with various agricultural based institutions and industries either in extension, research, production or processing based areas.

The students activities will be monitored under the industries training program which will be monitored by the department.

Assessment:

Continuous Assessment - 100%

AG 311: PRINCIPLES OF AQUACULTURE

Hours per week: 4

Prerequisite: AG 112 Animal Biology
AG 203 Anatomy Physiology
of Farm Animals

Objectives:

At the end of the course, students should be able to:-

1. Appreciate the significance and contribution of aquaculture to food security as one of the fast growing food producing sectors, its history, status and trends in Papua New Guinea and in

the world.

2. Understand the fundamentals and concepts of aquaculture and principles of fish production, and
3. Identify the different characteristics of cultivable species (fresh, brackish and marine waters), rearing media (ponds, cages, pens and tanks), types of culture systems (operation and management), water parameters and feeds and feeding and harvesting, processing and marketing techniques.

Syllabus:

Significance and contribution of aquaculture, history, status and trends in PNG and in the world, fundamentals and concepts of aquaculture and principles of fish production, characteristics of different cultivable species (fresh, brackish and marine waters), rearing media for aquaculture systems (such as ponds, cages, pens and tanks) types, operations and management of culture systems, water parameters, feeds and feeding, harvesting, processing and marketing techniques.

Textbooks:

Avault, J.W. (1996). Fundamentals of Aquaculture
Stickney, R.R. (2000). Principles of Aquaculture

Reference:

Bardach, J.W. J.H. Ryther and W.Q. Mc Larney. (1972). Aquaculture: The Farming and Husbandry of Freshwater and Marine Organisms.
Landau, M. (1992). Introduction to Aquaculture. John Wiley and Sons, Inc. NY.
FAO Fisheries Dept. (2006). State of World Aquaculture. FAO Fisheries Technical Paper No. 500. Rome, FAO.
SEAFDEC AQD. (1980). Fish Farming Handbook. Tigbauan, Iloilo, Philippines.
Visser, P.M. (2005). Fish Farming in the Tropics. The Liklik Book Information Center, ATCDI, Unitech, Private Mail Bag, Lae, Morobe Province, PNG.

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3 hrs)

AG 401: PLANT BREEDING

Pre-requisite: AG 207

Objectives:

1. To design, conduct and analyse basic breeding and selection programs for crop improvement;
2. To appreciate the importance of the diversity of crops and to realise the need for conservation and know alternative means of conservation of important crops of PNG.

Syllabus:

The evolution of crop plants; centres of diversity; exploration collection and conservation of plant genetic resources; genetic principles in plant breeding; classification of breeding methods; breeding procedures for representative self-pollinated cross-pollinated and clonal crops; Special techniques in plant breeding - mutation, polyploidy, inter specific hybridisation and in vitro techniques; breeding for disease resistance; trial, multiplication and release of improved varieties. Current breeding programs in important crops of PNG.

Reference:

Wagih, M.E. 1996. Plant Breeding: A course Manual (2nd edn). PNG Uni. Of Technology printery.
Simmonds, N.W. 1979. Principles of Crop Improvement. Longman, london.

Assessment:

Continuous Assessment - 40%
Written Examination - 60%

AG 403 & 404: SPECIAL PROJECT I & II

Objectives:

1. Undertake supervised original research through field and/or laboratory practice;
2. Adequately review the literature related to the area of research;
3. Present a well documented written scientific report;
4. Present a verbal summary presentation of the project;
5. Practice desirable work habits such as good

management of resources, communication skills with supervisors and colleagues, carry out instructions, planning and timely execution of tasks;

6. Undertake project job with minimum supervision.

Syllabus:

The special project would embrace one of the study disciplines in agriculture through research, development and applications as appropriate to the need of the country within the time frame and the resources available. The project could be in any area of agriculture such as, soil science, crop science, animal science, agricultural economics, agricultural extension, crop diseases, crop pest and weeds, agricultural machinery/engineering, post harvest technology, soil/water management, biotechnology and other areas of relevance.

Assessment:

Continuous Assessment - 100%

AG 405: INTRODUCTION TO RESEARCH METHODOLOGY

Pre-requisite: AG 205, LA 202

Objectives:

1. To outline the difference between basic and applied research;
2. To recognize that experimentation varies in each discipline of agriculture;
3. To enable students to use computers for data analysis and interpretation;
4. To communicate the research result to the end user.

Syllabus:

Basic and applied research in agricultural research and development. Word Processing, spreadsheets and statistical packages in agriculture. Principles of experimentation. Experimental designs appropriate for various disciplines of agriculture. Field data handling and constraints. Use of computers for field data processing. Data Exploration, data analysis and test of significance. Appropriate interpretation and discussion of results. Principles of communicating research results.

Assessment:

Continuous Assessment - 40%
Written Examination - 60%

AG 407: FARM MANAGEMENT

Pre-requisite: AG 211, AG 309

Objectives:

1. To understand the principles of decision making in farming;
2. To understand farm planning and control methods and their applications to achieve farmer goals;
3. To understand farm records and their use in farm planning.

Syllabus:

Functions of farm management, types of decisions and the decision making process in farming. Economic principles of farm management. Farm planning and control methods: Budgeting techniques (whole farm, partial, gross margin and cash flow), linear programming and sensitivity analysis. Farm records: production, financial and inventory records. Valuation of inventory and depreciation calculations.

Textbook:

Yang, W.Y. 1965. Methods of Farm Management Investigation. FAO Development Paper No. 80, Rome.
C. S. Barnard, J. S. Nix. 1990 Farm Planning and Control, Cambridge University Press.

Assessments:

Continuous assessments - 40%
Written examination - 60%

AG 409: SOIL FERTILITY AND SOIL MANAGEMENT

Pre-requisite: AG 204

Objectives:

1. To able to name the types, source, and available forms of nutrients required for plant growth;

2. To list different types of soils and plant tissue tests to identify the nutrient status in soil;
3. To understand the properties and characteristics of water; forces that govern the retention and movement of water in soils, plant and air; and the soil hydrologic cycle;
4. To be able to differentiate between saline, alkaline, and sodic soils;
5. To understand the meaning of soil erosion by types and processes;
6. To identify the different systems of soil classification including World and Australian soil classification systems;
7. To understand the concepts of soil and crop management, including soil management in PNG;
8. To state the sources and types of several contaminants, both organic and inorganic, affecting the soil and the environment.

Syllabus:

Introduction to plant nutrients; mechanics of nutrient uptake; managing plant nutrients in soil. Soil fertility evaluation and the implications for plant growth and nutrition; soil testing and fertiliser recommendations. Ion exchange in soil; soil acidity and liming. Characteristics of soil water; soil water potential and their importance in crop production. Methods of water measurements. Soil factors affecting water movement; water retention and water availability to plants. Principles of irrigation and drainage. Management of soil physical condition including soil aeration. Soil erosion processes and erosion control measures. Soil management under different cropping systems. Consequence of land use on agricultural productivity and the environment. Soil identification and classification.

Textbook:

Brady, N.C. and Weil, R.R. The Nature and Properties of Soils, 12th Edn. Prentice Hall

Assessments:

Continuous assessments - 40%
Written examination - 60%

References:

Tisdale, S.L., Nelson, W.L. and Beaton, J.D. Soil Fertility and Fertilisers, 6th Edn. MacMillan

International.

Foth, H.D. Fundamentals of Soil Science, 10th Edn. John Wiley and Sons.

White, R.E. Introduction to the Principles and Practices of Soil Science, 2nd Edn. Blackwell Science, Oxford.

Wild, A. Russell's Soil Conditions and Plant Growth, 12th Edn. Longmans Scientific and Technical, Harlow, Essex.

AG 411: ANIMAL BREEDING

Pre-requisite: MA 181, AG 207

Objectives:

1. To discuss variation, its causes and components, and heritability;
2. To learn and apply selection theory and use it to calculate genetic response;
3. To calculate repeatability use it for ranking and selection of animals with repeated records;
4. To be able to calculate breeding values and use it for ranking animals;
5. To discuss the different methods of selection and be able to compare their efficiency;
6. To learn and evaluate different breeding programs and mating systems.

Syllabus:

Cause, magnitude and nature of genetic variation in animal populations. Manipulation of variation in animal breeding programs to improve production from livestock. Selection and mating systems. Performance recording, its purpose and use in breeding programs. Breeding objectives and practical breeding plans for different livestock species. Reproductive technologies and molecular genetics in animal breeding. Possible roles of animal breeding in the livestock industries of PNG.

Textbook:

Falconer, D.S. 1981. Introduction to Quantitative Genetics (2nd Edn). Lonman.

Assessments:

Continuous assessments - 40%
Written examination - 60%

Reference:

Pattie, W.A. and James, J.W. 1985. Principles of Applied Animal Breeding (Lecture Notes). Department of Animal Production, University of Queensland.

Bowman, J.C. 1974. An Introduction to Animal Breeding. Edward Arnold.

Dalton, D. C. 1960. An Introduction to Practical Animal breeding, Granada.

AG 415: HIGHLANDS FIELD TRIP

Pre-requisite: None

Objectives:

1. To learn various agricultural activities such as production, research, extension, process-ing, packaging/handling, activities as well as their economic importance to the nation;
2. To be familiar with the agro-ecology peculiar to the main highlands, both at higher and lower altitudes;
3. To be familiar with the procedures and processes associated with the agriculture based financial loaning institutions both large and small scale in the region.

Syllabus:

Field trip to small and large scale agricultural based institutions and industries into the PNG highlands to familiarize with operations such as production, processing, packaging/storage and transportation, extension, and research.

Assessment:

Continuous Assessment - 100%

AG 402: AGRICULTURAL BIOTECHNOLOGY

Pre-requisite: AG 207, AG 102

Objectives:

1. To understand major concepts and potential benefits of tissue culture and molecular genetics in plant and animal production in PNG;
2. To understand the principles of some common

- techniques used in agriculture biotechnology and learn to use different equipment involved;
3. To gain basic skills in artificial insemination and embryo transfer in domestic animals and appreciate the role of this technology in improving animal production in PNG;
 4. To determine the appropriate biotechnology approach for solving classical problems in crop and animal production in PNG.

Syllabus:

Introduction to the principles and concepts of agricultural biotechnology for both plants and animals. Definition and scope of appropriate agricultural biotechnology in developing countries and technology transfer. Introduction to major biotechnological techniques and equipment used in crop and animal improvement, breeding and disease diagnosis. DNA sequencing, recombinant DNA technology, polymerase chain reaction, ELISA, nucleic acid hybridisation assays etc., will be covered.

Textbook:

Wagih, M.E. 1996. AgBiotechnolohy: Phytotechnology approach to crop improvement. A Course Manual (2nd Edn). Unitech Printery.

Assessments:

Continuous assessments	- 40%
Written examination	- 60%

AG 406: CROP PEST & WEED MANAGEMENT

Pre-requisite: AG 208

Objectives:

1. To know the major crop pests and weeds of PNG, their identification; symptoms of damage and control.
2. To develop theoretical and practical skills to recognise a pest problem;
3. To be able to assess the economic thresholds of pest and weeds;
4. To appreciate the methods for managing crop pests and weeds using ecological and economic principles.

Syllabus:

Classification of crop insect pests; Insects as vectors of viral, bacterial and fungal diseases. Applied anatomy, morphology and physiology of crop pests and weeds. Crop pest and weeds in PNG and their interaction with their biotic & abiotic factors; Population ecology and decision tools for crop pest and weed management; damage assessment, cultural, biological, chemical and integrated pest management methods. Quarantine. Pesticides, their chemistry, toxicity, methods of application and their ecological implications. Introduction to potential use of genetically modified organisms and Information technology for crop pest and weed management.

Textbook:

Hicks, S. and Perry, K. (1982). Insects and Nematode Pests of crops. DPI Rural Series Handbook No 17.

Thistleton, B.M. 1987. Recommendations for control of pests. DPI Technical Report 87/1

Sutherland, J.A 1986 The manual for the safe and efficient use of pesticides. DPI Development Series handbook No18

Assessments:

Continuous assessments	- 40%
Written examination	- 60%

Reference:

Schenieder, M. 1999. Entomology. A textbook for students, Agriculturists & Foresters in Papua New Guinea. Bulolo University College

Muzik, T.J. 1970. Weed biology and Control. McGraw Hill Book Company

AG 408: PERENNIAL CROP PRODUCTION

Pre-requisite: FR 111, AG 201

Objectives:

1. To gain a thorough knowledge of the cultural and management principles used in the production of perennial crops.
2. To gain experience in the current methods of production of the major and some of the minor perennial crops in PNG.

Syllabus:

Origin, distribution and importance of perennial crops in PNG. Climatic and soil requirements, cultural operation, methods of propagation, nursery practices, plantation management, harvesting, processing and storage of major plantation crops in PNG such as coffee, oil palm, cocoa, coconut, rubber, tea, mango, banana, pineapple, citrus etc.. Outline of crops of minor potential value. Integration of animals in perennial crop management.

Textbook:

Williams, C.N. 1980 Tree and Field Crops of the Wetter Regions of the Tropics, Chew, W.Y., Longmans.

Assessments:

Continuous assessments	- 40%
Written examination	- 60%

Reference:

De Alvin Paulo, T. and Kozloski, T.T. 1977. Ecophysiology of Tropical Crops (1st Edn). Academic Press, London.

AG 410: AGRICULTURE, THE ENVIRONMENT & SUSTAINABILITY

Objectives:

1. To understand the concept of environment and agricultural sustainability;
2. To appreciate the major global and regional environmental problems;
3. To understand the sources and types of several contaminants, both organic and inorganic, affecting the soil and the environment;
4. To understand the impact of mining, logging and industrial activities on the environment;
5. To understand the importance and principles of managing ecosystems.

Syllabus:

The concept of environment and agricultural sustainability. An understanding of the causes and complexity of major global and regional environmental problems. Sources of pollutants and their effect on plant, soil, water and organisms.

The consequence of agricultural activities on the environment. Chemistry of agricultural chemicals and their transformation in soil, plant and animals. Agricultural waste and their management including bioremediation. The impact of mining, forestry and industrial activities on the natural environment. Rehabilitation of eroded and degraded soil. Ecosystem management with particular examples in the tropics.

Textbook:

Ellis, S. and Mellor, A., Soils and Environment. Routledge

Assessments:

Continuous assessments - 40%
Written examination - 60%

References:

Locher, R.C., Jewell, W.J., Novak, J.D., Clarkson, W.W., and Friedman, G.S. land Application of Wastes, Vol II. Van Nostrand Reinhold Company.
Miller, R.E., and Gardiner, D.T. Soils in our Environment. 8th Edn. Prentice Hall.

AG 412: CROP DISEASES II

Pre-requisite: AG 301

Objectives:

1. To have a better understanding of disease development in plant population and relate the epidemiological principles to disease control;
2. To understand the biology and ecology of soil borne pathogens to formulate sustainable disease management strategies;
3. To have knowledge about seed health and basic strategies to produce pathogen free seeds.

Syllabus:

Disease Epidemiology: Disease development in population, crop loss assessment, disease forecasting, disease management strategies, major principles of disease control and the relationship of epidemiological parameters to disease control, host resistance mechanisms, gene deployment strategies, designing experiments and sampling,

Integrated disease management, diseases of major crops of PNG and their control.

Seed Pathology: Economic significance of seed-borne diseases, mechanisms of seed transmission, seed storage problems and hazards caused by mycotoxins, seed health testing, control of seed-borne diseases, quarantine for seed.

Soil Microbiology: The soil population, methods of studying the ecology of soil microorganisms, symptomatology and epidemiology of soil borne diseases, principles of soil borne disease control.

Assessment:

Continuous Assessment - 40%
Written Examination - 60%

AG 413: AGRICULTURAL FIELD ENGINEERING

Pre-requisite: AG 209

Objectives:

1. To understand the concepts of land surveying and its use in land measurement and management;
2. To carry out chain survey and leveling of an agricultural land;
3. To understand the fundamentals in soil and water conservation as applicable to agriculture;
4. To know and understand the design principles and maintenance requirements of soil management systems, equipment and structures;
5. To understand the principles and methods of irrigation and its system and equipment.

Syllabus:

Introduction to land surveying methods: map reading, chain survey, leveling, compass survey, GPS and photogrammetry. Soil erosion, its cause, and prevention. Runoff estimate and drainage channel design. Irrigation methods, and irrigation systems. Farm structures such as farm buildings, roads etc.

Textbook:

Lecture notes.

Assessments:

Continuous assessments	- 40%
Written examination	- 60%

Reference:

Schwab, G.O., Fervert, R.K. Barnes, K.K. and Edminster, T.W. 1971. Elementary Soil and Water Engereering (2n^d edn). John Wiley, New York.
Clancey, J. 1991. Site Surveying and Levelling, Edward Arnold, London.
Hudson, N.W. 1975. Field Engeering for Agricultural Development. Oxford Uni. Press.
Nath, S. 1988. Manuals of Practicals in Field Engineering. Unitech Printery.

AG 414: PASTURE MANAGEMENT

Pre-requisite: AG 305

Objectives:

1. To understand the principles of pasture growth and the factors affecting pasture growth;
2. To learn the factors affecting pasture productivity;
3. To understand the factors affecting animal production from pasture systems and the inter-relationships between pasture production and animal production.

Syllabus:

Components of pasture systems. Classification of PNG grasslands. Structure of pasture plants. Establishment, management, and rehabilitation of pastures. Fodder conservation and utilisation. Integrated management of pastures/animals interaction. Integration of animals with pastures and crops.

Textbook:

Humphreys, L.R. 1978. Tropical Pastures and Fodder Crops. Longman Group Ltd. London.

Assessments:

Continuous assessments	- 40%
Written examination	- 60%

Reference:

Crowder, L. V. and Cheda, H.R. 1982. Tropical Grassland Husbandry. Longman Group Ltd.

London.

AG 416: AGRICULTURAL PRODUCTION ECONOMICS & PRICING

Pre-requisite: AG 211, AG 309

Objectives:

1. To understand the concepts of production function and economic optimization in agriculture;
2. To appreciate the efficiency of resource use in agricultural production;
3. To understand the role of risk and uncertainty in agriculture and risk reducing strategies;
4. To understand the reasons for government intervention in pricing farm products.

Syllabus:

Productive resources and their classification. The production function and profit maximisation: factor-product, factor-factor, and product-product relationships. The theory of costs of production. Types of farming, types and location of farming and size of farm business. Uncertainty in agricultural production. Supply and demand of agricultural products and the determinants and behaviour of agricultural product prices. Price variation of agricultural commodities through time and government intervention in pricing farm products.

Reference:

Heady, E.O. and Dillon, J.L. 1961. Agricultural production Functions. Iowa Sate Univ. Press.
Dillon, J.L. 1986. The Analysis of Response in Crop and Livestock Production. Pergamon Press.
Tomek, W.G. and Robinson, K.L. 1981. Agricultural Product Prices. Cornell Univ. Press.

Assessment:

Continuous Assessment	- 40%
Written Examination	- 60%

AG 417: AGRICULTURAL FINANCE

Pre-requisite: AG 211, AG 309

Objectives:

1. To understand the role of financial institutions and credit in agriculture;
2. To know and understand the methods for identifying financial strengths and weakness;
3. To understand financial planning and management of assets.

Syllabus:

Resources acquisition and control in financing. Credit: role of and classification of credit and evaluation of credit capacity. Bank and other credit institutions, farm loans, interest rates and repayment terms. The balance sheet: its structure, ratio and comparative analysis. The income statement: its organization, inventory adjustments and financial tests/ratios. The cash flow statement: its uses, advantages and organization. Debt servicing capacity and asset replacement decisions. Risk and risk management including agricultural insurance.

Assessment:

Continuous Assessment - 40%
Written Examination - 60%

**AG 419: AGRICULTURAL PROJECT
PLANNING & MANAGEMENT**

Pre-requisite: AG 211, AG 309

Objectives:

1. To understand the reasons for undertaking agricultural projects and their failures in Less Developed Countries;
2. To know and understand the stages of project conception to project completion;
3. To understand the valuation of costs and benefits and adjustments of financial prices to economic values;
4. To learn the procedures for financial and economic analysis.

Syllabus:

Types of projects; nature, scope and dimensions. Reasons for undertaking agricultural projects and causes for project failures in Developing Countries. Stages of project planning, appraisal, implementation and evaluation. Identifi-

cation and valuation of costs and benefits and adjustments of financial prices to economic prices or values. Discounted and un-discounted measures of project worth.

Reference:

Gittinger, J.P. 1982. Economic Analysis of Agricultural Projects, 2nd ed. EDI series of economic development, The John Hopkins University Press, Baltimore.
Selvavinayagam, K. 1991. Financial Analysis in Agricultural Project Preparation, FAO, Rome.

Assessments:

Continuous Assessment - 40%
Written Examination - 60%

AG 420: POST HARVEST TECHNOLOGY

Hours per week: 4

Pre requisite: Agricultural Mechanization
(AG 209)

Objectives:

At the end of the course, students should be able to:

1. To acquaint the students with problems related to post-harvest handling of farm produce.
2. To learn about appropriate drying and storage methods of agricultural produce.
3. To learn about on-farm processing of some crop produce.
4. To learn about cost analysis and to analyse cost benefit for an operation.

Syllabus:

Importance of post harvest technology aspects in developing countries, defining harvest & post harvest losses, losses and damage-assessment, measurement, estimation and waste in relation to the food pipe line.

Moisture content and moisture meters, harvest maturity and its determination, harvesting of perishable and durable crops.

Drying theory: Thin and deep bed drying of crop, air-flow through porous media, psychrometry and its use in crop drying, heat and mass balance, fans

and motors used in handling crop products, crop dryers and their maintenance.

Principles and practices of crop storage, preparing grain for storage, storage structures including evaporative cooling and their maintenance. Enemies of stored grain, control of insects and rodents, management of insecticides and helping someone poisoned by the insecticides.

Crop handling, cleaning, grading, grinding, roasting and puffing of agricultural products, fineness modulus and estimation of uniformity index of ground material.

Textbook:

Brooker, D.B., Bakker – Arkema, F.W., and Hall, C.W. (1992) Drying and Storage of Grains and Oilseeds. AVI. Publication, USA.

References:

1. F.A.O. (1985). Prevention of Post Harvest food losses.
2. F.A.O. (1982). Aeration of Grains in subtropical climates.
3. F.A.O. (1970). Handling and Storage of Food Grains in Tropical and subtropical areas.
4. Kader, A.A. (1992). Post Harvest Technology of Horticultural Crops. ANR Publications. University of California, USA.
5. Tindall, H.D. (1983). Vegetables in the Tropics. The Macmillan Press, U.K.
6. Nath, Surya. (1983). Decade of Post Harvest Technology. Indian Institute of Technology Press, Kharagpur, India.

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1 x 2 hrs)

AG 421: AGRICULTURAL MARKETING

Pre-requisite: AG 211, AG 309

Objectives:

1. To understand the economic principles as they are applied to agricultural marketing;
2. To understand performance under different market structures;
3. To understand the market functions under-

taken to have the products in the form required by the consumer;

4. To understand the value of market information and advertising.

Syllabus:

Application of economic principles to agricultural product marketing. Characteristics of supply, demand, price and elasticity of agricultural products. Market structure, conduct and performance. Marketing boards and co-operatives. Marketing margins and institutions. Storage and future trading, Promotion, market development and advertising. Grading, standardisation and packaging. Market information.

Assessment:

Continuous Assessment - 40%
Written Examination - 60%

AG 418: AGRICULTURAL EXTENSION

Objectives:

1. To understand learning theories and practices,
2. To understand decision making process in the adoption of innovations,
3. To understand extension approaches around the world.
4. To develop programme and plans for rural development,
5. To understand the management system of an extension organisation,
6. To understand monitoring and evaluation process in extension, and
7. To review the problems and prospects of agricultural development in PNG.

Syllabus:

Principles and theory relating to adult learning, design learning activities that are appropriate to adults and their learning process. Decision-making and the model of decision-making process in the adoption of innovations by the farmers. Agricultural Extension Approaches in the developing countries. History of agriculture extension in PNG and its present status. Approaches to designing programmes, principles of extension planning. The concept of extension organisation,

planning, organisation, staffing, leading, controlling, and problems of an organisation. Develop an understanding of monitoring and evaluation system, participatory rural appraisal, process and techniques in evaluating agriculture extension programmes and projects.

Textbook:

Ray, G.L. (1996). *Extension Communication and Management*, R. Publishing Corporation, Delhi.

Halim, A. and Kaida, Y. (2001). *Agricultural Extension in Southeast Asia: Historical Review*, Bangladesh Agricultural University.

References:

Swanson, B.E. (1984). *Agricultural Extension Manual.*, RAO, Rome .
Lerner, D. and Schramm, W. (Eds.) (1967). *Communication and Changes in the Developing Countries.* East West Centre Press, Honolulu, Own

Assessment:

Continuous Assessment	- 40%
Written Exam	- 60%

MA 181: MATHEMATICS 1 AF (A)

Pre-requisite: Grade 12 or equivalent

Objectives:

1. To apply mathematical concepts to agricultural related studies;
2. To solve practical problems involving lengths, areas and volumes;
3. To manipulate algebraic expressions and solve algebraic equations;
4. To use traditional function notation; use the properties of the standard mathematical functions, and their graphs;

Syllabus:

Measurement: Use of standard area and volume formulae, trigonometry, ratio and proportion, effect of errors in calculations. Numerical methods of estimating irregular areas and volumes.
Algebra: Simplification of expressions, the solution of linear and quadratic equations.

Functions: Properties and graphs of linear, quadratic exponential, logarithmic and trigonometric functions. Trigonometric relations.

PH 176: PHYSICS FOR AGRICULTURE

Objectives:

After successfully completing this course the students shall be able to:

1. Understand basic physical quantities, units, errors and apply them in experimentation.
2. Analyse motion of particles using simple examples.
3. Understand the concepts of force, mass, momentum, motion, work, energy power and be able to solve simple problems applying basic principles of mechanics.
4. Understand the principle and operation of electrical machines like motors, dynamo and basic electrical circuitry applicable in household facilities and installations on the farm.

Syllabus:

Units, quantities, standards of mass, length, time, precision in measurements and error calculations. Scalar and vectors, vector addition, vector components. Linear motion, speed, velocity, acceleration, free fall motion, Equations of uniformly accelerating bodies. Force and motion, Newton's laws of motion, circular motion, Centrifuge, moment of inertia, torque. Work, energy & power, work energy theorem, conservation of energy. Source and types of energy, energy conversion, renewable and non-renewable energy. Elasticity, Hooke's law, tensile, bulk and shear modulus. Density, pressure, surface tension and capillary action. Flow of fluids, Archimedes principle and Pascal's law. Laws of viscosity and applications. Osmosis and diffusion. Waves and energy in waves. Reflection and refraction of plane and curved surfaces. Concave and convex lenses (Application: slide projector and microscope). Thermometry, expansion of solids and liquids, heat energy. Calorimetry and latent heat. Gas laws,. Heat transfer, conduction, convection and radiation. Charge, Emf., Ohm's law, Kirchoff's law, series and parallel circuits, residential electrical system, general hazards and

safety. Magnets and magnetism, magnetic field due to a current, Electromagnetic induction, electric motors and transformers with applications and examples.

Textbook:

H.D. Young. University Physics, Addison Wesley.

AS 111: CHEMISTRY 1 (A)

Pre-requisite: Grade 12 or equivalent

Objectives:

1. To be able to name and write the formulae of elements and compounds;
2. To be able to write balanced chemical, ionic and net ionic equations for chemical reactions, including oxidations-reduction reactions;
3. To understand the properties of elements and compounds in terms of their position in the periodic table and Lewis structure;
4. To understand chemical bonding and draw Lewis diagrams for different types of bonding;
5. To do calculations involving moles, molarity concentration, dilution, limiting reagent and empirical formulae;
6. To apply the Gas Laws including the Ideal gas Equation.

Syllabus:

Naming, Formulae, Equations - chemical, ionic and net ionic. Atomic Structure, isotopes, calculation of average atomic mass. Electronic Configuration, Stoichiometry, Avogadro's number, moles, molarity, dilution, empirical formula, limiting reagent. Oxidation-Reduction reaction: Oxidation number and electron transfer, half-reactions, balancing redox equations. Chemical bonding, ionic, covalent, polar covalent, metallic. Lewis diagrams, shapes of molecules. Periodicity; size, electro-negativity, ionisation energy, metals, non-metals, metalloids. Gas Laws; Boyle's Law, Charles Law and Ideal gas Equation.

FR 111: PLANT BIOLOGY

Pre-requisite: Grade 12 or equivalent

Objectives:

1. To appreciate the extent of plant biology as a theoretical and applied discipline;
2. To know and use the scientific methods in its development in PNG.

Syllabus:

Plant structures and function. Classification of plants. Plant ecology, environment and evolution. Introduction to cell biology; structure and function, cell chemistry. Various metabolic and anabolic processes in plants. Micro-organisms: bacteria, virus, fungi, algae.

Textbook:

Biology Study Guide. Revised by Debra Hector. Laboratory Manual
Roberts M.B.V. 1986 Biology. A Functional Approach, 4th Edn. ELBS
Berrie G.L, A Berrie, and Eze, J.M.O. Tropical Plant Science. ELBS

Assessments:

Continuous assessments	- 40%
Written examination	- 60%

C. POSTGRADUATE DIPLOMA IN AGRICULTURE

Introduction

The Postgraduate Diploma in Agriculture is a full time programme of studies extending over one academic year. The programme aims to provide advanced training in tropical agricultural production in the areas of crop and animal management and offers specialization in four major areas of agricultural science: crop production; animal production; agricultural economics/extension, and agricultural engineering. The course is designed to meet the needs of graduates with a general degree in employed in various parts of the agricultural sector in the country.

Contact Hours

The Postgraduate Diploma consists of course work for 14 and 12 contact Hours per week for semesters 1 and 2, respectively, and a research project in the area of specialization for 10 and 12 contact Hours per week for semesters 1 and 2,

respectively. Each candidate is required to pass the Research Methodology course in semester 1 and the Project course in each semester. In addition, the candidate must pass at least five courses chosen from Schedule I below; a minimum of three of such courses must be from the candidate's intended area of specialization. Candidates will be guided by their supervisors in the choice of their subjects and project topics. Details on the structure are given in the special Rules set out in the handbook on "Procedures for Higher Degree Candidates" and in the "University Calendar".

Examinations

All subjects will be examined by regular assignments, tests and final examinations. Two or three examiners recommended by the Head of Department and approved by Higher Degrees Committee will examine the dissertation based on project work.

COURSE STRUCTURE

Average Code	Subject	Weekly hours

First Semester

AGP10	Research Methodology	6
	Choice of two courses from Schedule 1 (2x4)	8
AGP11	Project	<u>10</u>
		24

Second Semester

	Choice of three courses from Schedule 1 (3x4)	12
AGP11	Project (continues from Sem.I)	<u>12</u>
		24

Schedule 1 courses: (All courses marked with an asterisk * are taught in the first semester. All other courses are taught in the second semester).

Animal Production

AGP20	Advanced Animal Production	4*
AGP21	Animal Breeding	4
AGP22	Applied Animal Nutrition	4*
AGP23	Animal Health and Diseases	4
AGP24	Molecular Biology in Agriculture	4

Crop Production

AGP30	Advanced Crop Production	4*
AGP31	Advanced Crop Breeding	4
AGP32	Soil Fertility and Plant Nutrition	4*
AGP33	Soil Management	4
AGP34	Crop Physiology	4
AGP35	Plant Pathology	4*
AGP36	Agricultural Pests	4
AGP37	Weed Science and management	4*
AGP38	Seed Technology	4
AGP39	Taxonomy of Crop insect Pests	4

Agricultural Economics / Extension

AGP40	Advanced Farm Management	4*
AGP41	Agricultural Production, Price and Marketing	4
AGP42	Agric. Project Planning, Analysis & Management	4
AGP43	Advanced Agricultural Extension	4*

Agricultural Engineering

AGP60	Crop Processing and Storage	4*
AGP61	Technology of Farm Machinery	4
AGP62	Irrigation and Agricultural Water Supply	4
AGP63	Soil and Water Conservation Engineering	4

SUBJECT DETAILS

AGP 10: RESEARCH METHODOLOGY

Hours per week: 6

Prerequisite: AG 221 or recognized equivalent.

Objective:

At the end of the course, students should be able to:

1. determine the best experimental design for various types of agricultural experiments,
2. analyze and critically interpret different results from different experimental designs,
3. analyze various types of field and information surveys,
4. be able to use computers as a tool in agricultural planning, management and experimentation

Syllabus:

The course is designed to give a general approach to research, analysis and evaluation procedures used in agricultural experimentation. Coverage will include the planning and executive of experiments; the design of controlled experiments with major crops and livestock of PNG; selection of treatments; demonstration of laying out of designs at the farm; on-farm collection of experimental data; interpretation of the experimental results and discussion of problems experienced in carrying out research; the use of computers in agricultural operations and experimentation; the planning and implementation of field socioeconomic surveys.

Throughout the course material will be illustrated with examples from animal and crop experiments. Students will become familiar with use of computers for data analysis during the course.

Textbook:

Little, T.M and Hills, F.J. 1972. Agricultural Experimentation. John Wiley and Sons, New York.

Reference:

Finney, D.J. 1972. An Introduction to Statistical Science in Agriculture. Blackwell Scientific Publications, London.

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3hrs)

AGP 11: PROJECT

Objective:

On the completion of this subject, students should be able to:

1. Identify the main activities of a typical agricultural project involving investigation, research, and / or execution.
2. Plan a detailed schedule of activities (from beginning to the end) to complete and meet the project deadline.
3. Apply the agricultural and engineering principles learnt in other subjects in the development of the project work.

4. Write a dissertation, in standard format, on the project work.

Syllabus:

Topics of the research project will be chosen in consultation with the Supervisor in the area of interest / specialization. Students are expected to prepare objectives, carry out a literature survey on the topic, and propose the methodology of research during the first semester; these will form the basis of a seminar presentation by the student during the semester. The project work itself will be executed by the student following the standard procedure. The student is expected to present results of the work in the form of a dissertation which must be submitted at least one month before the 2nd semester examinations. The dissertation will be examined by two or three examiners recommended by the Head of Department and approved by the Higher Degrees Committee.

Assessment:

Continuous assessment, seminar,
Dissertation - 100%

AGP 20: ADVANCED ANIMAL PRODUCTION

Hours per week: 4

Prerequisite: AG 242, AG 351, AG 471 or equivalents.

Objective:

1. Understand the principles involved in the production of animals in the tropics.
2. Manage the production of the various animal species of importance in PNG.

Syllabus:

Systems of pig, poultry, fish and rabbit production for the tropics. The importance of management, housing, climate, nutrition and disease on the efficiency of production. Integration of animal production with gardening systems. Systems of large and small ruminant production in PNG. Effects of season on pasture production, availability of nutrients and animal parasites and common diseases of grazing animals in the tropics.

Visits to selected farms, villages and factories.

Textbook:

Ewer, T.K. 1982. Practical Animal Husbandry. Wright Sciencetchnica, London.
Williamson, G., Payne, W.J.A. 1984. An Introduction to Animal Husbandry in the Tropics (3rd Edn.). Longman, London and New York.

Reference:

Blood, D.C., Radostits, O.M. and Henderson, J.A. 1983. Veterinary Medicine Bailliere Tindall, London.

Assessment:

Continuous Assessment - 50%
Written Examination - 50%(1x3hrs)

AGP 21:ANIMAL BREEDING

Hours per week: 4

Prerequisite: AG 372

Objective:

At the end of the course, students should be able to:

1. Understand the principles involved in the breeding of animals,
2. Design and execute breeding programmes for the major livestock species in PNG.

Syllabus:

Genetic variation and inheritance of quantitative characters. Animal breeding plans for exploiting Additive and non-additive genetic variation. Heritability and response to selection. Sire evaluation and progeny testing. Selection index principles and their application to livestock improvement. Research methodology used in animal breeding.

Textbook:

Falconer, D.S. 1981. Introduction to Quantitative Genetics (2nd Edn.). Longman, London.

Reference:

Johansson, I. And Rendel, J. 1972. Genetics and

Animal Breeding. Oliver and Boyd, Edinburgh.
Pattie, W.A. and James, J.W. 1985. Principles of Applied Animal Breeding. Department of Animal Production, University of Queensland.

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3 hrs)

AGP 22: APPLIED ANIMAL NUTRITION

Hours per week: 4

Prerequisite: AG 362,AG 431 or recognized equivalents.

Objective:

1. Appreciate the principles involved in animal nutrition,
2. Understand the various methods for assessment of nutritive value, and animal nutritional requirements.

Syllabus:

Advanced studies on the digestion, absorption and utilization of nutrients. Development of an understanding of feedstuffs (including pasture) available in PNG and their limitations for use. Development of a working knowledge of current methods for assessment of nutritive value and animal requirements. Manipulation of feed resources from pasture.

Textbook:

Preston, T.R. and Leng, R.A. 1985. Matching Ruminant Production Systems with Available Resources in the Tropics and Subtropics. Penambul Booka, Armidale.

Reference:

Feeding Standard for Australian Livestock Poultry (1987), Pigs (1990) and Ruminants (1991). CSIRO (Australia), Australian Agricultural Council Publications.

McDonald, P., Edwards, R.A. and Greenhalgh, J.F.D. 1988. Animal Nutrition (4th Edn). Longman Scientific.

Assessment:

Continuous Assessment - 50%
Written Examination - 50%(1x3hrs)

AGP 23: ANIMAL HEALTH AND DISEASES

Hours per week: 4

Prerequisite: AG 471, or a recognized equivalent.

Objective:

At the end of the course, students should be able to:

1. Appreciate the major diseases and pests afflicting livestock in the tropics,
2. Understand the control and management systems for coping with these diseases and pests.

Syllabus:

The course is intended to give appreciation at an advanced level of major infections, parasitic and metabolic diseases of animals used for food and fibre production. Relationship between diseases of domesticated livestock and agricultural economy. Control and management systems including herd health programmes, vaccination, endo- and ectoparasite control will be dealt with in detail.

Reference:

Radostits, O.M., Blood, D.C. and Gay, C.C. 1994. Veterinary Medicine (8th Edn.). Bailliere Tindall, London.

Assessment:

Continuous Assessment - 50%
Written Examination - 50%(1x3hrs)

AGP 24: MOLECULAR BIOLOGY IN AGRICULTURE

Hours per week: 4 (2/2)

Objectives:

1. To understand the basic concepts and principles of molecular biology at the cellular level.

2. To gain basic laboratory skills in DNA manipulation and purification, Polymerase Chain Reaction, electrophoresis and sequencing.
3. To understand the principles of gene discovery and use in animal agriculture.
4. To understand and gain appreciation for the role of molecular biology in agriculture especially in developing countries.
5. To discuss recent developments in the use of molecular biology in human health and agricultural research including evolution, biodiversity and conservation of genetic resources.

Syllabus:

Overview of prokaryotic and eukaryotic cell structure, function and metabolism; gene structure and regulation; cell cycle, membrane transport, signaling pathways, hormones and second messengers; cloning, restriction enzymes, plasmid vectors, electrophoresis, genomic and DNA libraries, screening and genome walking; DNA sequencing, Northern and Southern, in-situ hybridization; Polymerase Chain Reaction, expression vectors, in-vitro mutagenesis, Transgenic plants and animals, the immune system and HIV/AIDS, DNA forensics, scope of biotechnology with special emphasis on developing countries, bio-safety, legal and ethical issues in biotechnology.

Textbooks:

Alberts, B., Johnson A., Lewis J., Raff M., Roberts K., Walter P. 2002: Molecular Biology of the Cell. 4th Edition. Garland Science.
Brown T.A. 2006. Gene Cloning and DNA Analysis: an introduction. 5th Ed., Blackwell Publishing.

References:

Sambrook, J., Peter MacCallum. David Russell 2000. Molecular Cloning: a Laboratory Manual, 3rd Ed. Cold Spring Harbor Laboratory Press Ltd., Cold Spring Harbor, NY.

Assessment:

Continuous - 50%
Final - 50%

AGP 30: ADVANCED CROP PRODUCTION

Hours per week: 4

Prerequisite: AG 431, AG 332, or recognized equivalents.

Objective:

At the end of the course, students should be able to:

1. Understand the principles in the production of tropical crops,
2. Manage the production of each major crop in PNG, from planting to harvesting, including farm-gate processing,
3. To integrate the knowledge gained in undergraduate studies into farming systems.

Syllabus:

Detailed studies of crop distribution in relation to agro-ecology of PNG farming and cropping systems, plant competition – density and inter-cropping, agro-forestry systems, feasibility studies with an introduction to the PNGRIS system, weeds and weeding, seeds and seed technology, post-harvest technology.

Textbook:

Pratley, J.E. 1994. Principles of Field Crop Production (3rd Edn.). Oxford University Press, Melbourne.

Reference:

Burton, W.G. 1982. Post Harvest Physiology of Food Crops. Longman, London.
Paulo, de T. Alvim and Kozlowski, T.Y. 1977. Ecophysiology of Food Crops. Academic Press, London.
Milloslav, Recheigl Jr. 1982. Handbook of Agricultural Productivity, Vol. 1. CRC Press Inc., Florida.
Onwueme, I.C. 1978. The Tropical Tuber Crops. Wiley, Chichester.

Assessment:

Continuous Assessment - 50%
Written Examination - 50%(1x3hrs)

AGP 31: ADVANCED CROP BREEDING

Hours per week: 4

Prerequisite: AG 381 or recognized equivalent.

Objective:

At the end of the course, students should be able to:

1. Understand the genetic and biotechnology principles underlying modern crop breeding.
2. Design and carry out breeding programmes for the improvement of the major crops in PNG.

Syllabus:

Advanced topics on the principles, procedures, and the problems in the breeding of crop plants considering conventional and biotechnological breeding systems. Models for quantitative genetic theory and analysis. Analysis of mating designs. Assumptions and implication. Estimation and interpretation of heritability and combining ability. Biometrical analysis and partitioning of phenotypic variance. Covariance among relatives. Selection theories. Adaption and GxE interaction analysis. Scope and applications of in vitro technology to breeding. Somatic hybridization. Somaclonal variation in vitro fertilization and embryo rescue. Production of useful breeding materials including haploids, polyploids and disease-free. Recombinant DNA technology to breeding. Development of disease-resistant varieties. Use of genetic engineering in crop breeding and improvement. Biodiversity and germplasm preservation. Inspection of plant breeding and improvement programs in PNG.

Reference:

Simmonds, N.W. 1979. Principles of Crop Improvement. Longman, London.
Vose, P.B. and Blixt, S.G. 1983. Crop Breeding. Pergamon Press, Oxford.
Wagih, M.E. 1996. Phyto-technology: A Course Manual. PNG Uni. Of Technology Prtnery.

Assessment:

Continuous Assessment - 50%
Written Examination - 50%(1x3hrs)

AGP 32: SOIL FERTILITY AND PLANT NUTRITION

Hours per week: 4

Objective:

1. To develop and strengthen experience in assessing soil fertility and the implications for plant growth and nutrition.

Syllabus:

The course comprises lectures, practical exercises and a field trip. Topics include: the soil as a source of plant nutrients; diagnosis of nutrient disorders of plants; soil testing and fertilizer recommendations; soil acidity and liming; soil biology.

Textbook:

Mengel, K. and Kirkby, E.A. 1987. Principles of Plant Nutrition (4th Edn.). International Potash Institute, Bern, Switzerland.

Reference:

Wild, A. 1988 (Ed.). Russel's Soil Conditions and Plant Growth (11th Edn.). Longman Scientific and Technical, Harlow, Essex.
Tisdale, S.L., Nelson, W.L., Beaton, J.D. 1990. Soil Fertility and Fertilizers (4th Edn.). MacMillan international Editions, New York. Brady, N.C. 1990. The Nature and Properties of Soils (10th Edn.). MacMillan International Editions, New York.
Foth, H.D. 1990. Fundamentals of Soil Science (8th Edn.). John Wiley and Sons, New York.
Bleeker, P. 1983. Soils of Papua New Guinea. CSIRO and MacArthur Press, ANU, Canberra.
Grundon, N.J. 1987. Hungry Crops A course to nutrient deficiencies. Queensland Department of Primary Industries DI 87002, Brisbane, Australia.

Assessment:

Continuous Assessment - 60%
Written Examination - 40% (1x3hr)

AGP 33: SOIL MANAGEMENT

Hours per week: 4

Objective:

1. To develop and strengthen experience in describing and assessing morphological and physical properties of soils in the natural environment.

Syllabus:

The course comprises lectures, practical exercises and a field trip. Topics include soil identification and classification (Soil profile description; soil classification; techniques for reloading and interpreting soil and relationships, and soil physics and water movement (soil factors affecting soil physical properties; water movement, retention and availability in soil, soil aeration and mechanical impedance; soil acidity; soil salinity and sodicity).

Textbook:

Brady, N.C. 1990. The Nature and Properties of Soils (10th Edn.). MacMillan International Editions, New York.

Reference:

Wild, A. 1988 (Ed.). Russel's Soil Conditions and Plant Growth (11th Edn.). Longman Scientific and Technical, Harlow, Essex.
Bleeker, P. 1983. Soils of Papua New Guinea. CSIRO and MacArthur Press, ANU, Canberra.
Foth, H.D. 1990. Fundamentals of Soil Science (8th Edn.). John Wiley and Sons, New York.

Assessment:

Continuous Assessment - 60%
Written Examination - 40% (1x3hrs)

AGP 34: CROP PHYSIOLOGY

Hours per week: 4

Prerequisite: AG 252 or recognized equivalent

Objective:

At the end of the course, students should be able to:

1. Understand how various plant and environmental factors interact in the process of crop growth and productivity,
2. Appreciate the physiology of how various agronomic interventions affect crop perform-

ance and quality.

Syllabus:

The crop environment. Radiation, heat and momentum transfer. Plant water relations. Energy balance and evapotranspiration. Stomata. Photosynthesis and respiration in crops. Environmental control of morphogenesis. Temperature and its effects on crops. Drought and drought tolerance. Effect of wind, altitude and CO² concentration on crops. Physiology of yield improvement.

Textbook:

Jones, H.G. 1983. Plants and Microclimate. Cambridge University Press.

Reference:

Evans, L.T. 1975 (Ed.). Crop Physiology. Cambridge University Press.
Goldsworthy, P.R. and Fisher, N.M. 1984. The Physiology of Tropical Field Crops. John Wiley, New York.
Norman, M.J.T., Pearson, C.J. and Searle, P.G.E. 1984. The Ecology of Tropical Food Crops. Cambridge University Press.
Paulo, de T. Alvim and Kozłowski, T.T. 1977. Ecophysiology of Food Crops. Academic Press, London.

Assessment:

Continuous Assessment - 50%
Written Examination - 50%(1x3hrs)

AGP 35: PLANT PATHOLOGY

Hours per week: 4

Prerequisite: AG 422, AG 462 or equivalents.

Objective:

Upon completion of the subject students should understand:

1. Methods for identification and loss assessment of pathogenic crop diseases,
2. The ecology and management of plant pathogen-vector relationships,
3. Means of pathogen avoidance and control.

Syllabus:

Advanced techniques in identification of plant pathogens including: selective media and structural studies for bacteria and fungi, serological tests for all pathogens. Symptomatology and herbaceous indexing for plant viruses. Nature, host, vectors and environmental effects and relationships of plant pathogens. Strategies and techniques of pathogen control.

Textbook:

Kranz, J., Schmuttere, H. and Koch, W. 1977. Diseases, Pests and Weeds in Tropical Crops. John Wiley, New York.

Reference:

Fry, W.E. 1981. Principles of Plant Disease Management. Academic Press, New York.
Hughes, I.K. 1982. Principles of Crop Protection. DPI, Queensland.
Pimental, D. 1981. Handbook of Pest Management in Agriculture (Vols. 1, 2 and 3). CRC Press Inc., Florida.

Assessment:

Continuous Assessment - 50%
Written Examination - 50%(1x3hrs)

AGP 36: PLANT PATHOLOGY

Hours per week: 4

Prerequisite: AG 422 or equivalent

Objective:

Upon completion of the subject students should understand:

1. Methods for identification and loss assessment of agricultural pests,
2. The ecology and management of agricultural pests,
3. Means of agricultural pest avoidance and control.

Syllabus:

Types of pests. Recognition and identification of major groups. Important PNG species. Anatomical and physiological characters important in control. Life cycles and stages. Ecology of crop

pests and reasons for losses. Types and recognition of damage. Economic aspects. Assessment of losses, estimates of pest density and damage. Pest management, methods and applications of control.

Reference:

Dent, D. 1991. Insect Pest Management, CAB International, Wallingford, Oxon.
Hughes, I.K. 1982. Principles of Crop Protection. DPI, Queensland.
Pimental, D. 1981. Handbook of Pest Management in Agriculture (Vols. 1, 2 and 3). CRC Press Inc., Florida.

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3hrs)

AGP 37: WEED SCIENCE AND MANAGEMENT

Hours per week: 4

Objective:

Upon completion of the subject students should understand:

1. Methods for identification and loss assessment of weeds,
2. The ecology and management of weeds,
3. Means of weeds avoidance and control.

Syllabus:

Types of weeds. Recognition and identification of major groups. Important PNG species. Growth, morphological, ecological and physiological characters important in control. Life cycle strategies. Ecology of crop-weed interactions. Economic aspects. Weed management. Methods and applications of control.

Textbook:

Kranz, J., Schmutterer, H. and Koch, W. 1977. Diseases, Pests and Weeds in Tropical Crops. John Wiley, New York.
Muzik, T.J. 1970. Weed Biology and Control. McGraw Hill.

Reference:

Labrada, R., Casely, J.C. and Parker, C. 1994.

Weed Management for Developing Countries. FAO Plant Production and Protection Paper No. 120. FAO, Rome.

Zimdahl, R.L. 1993. Fundamentals of Weed Science. Academic Press, London.

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3hrs)

AGP 38: SEED TECHNOLOGY

Hours per Week: 4 (2/2)

Objectives:

Upon the completion of subject, students will be able to:

1. Understand seed biology of different crops
2. Utilize the knowledge to produce quality seeds of different crops.
3. Manage the seed production and seed certification agency/organization

Syllabus:

Seed - Development, physiology, structure, health and chemical composition of different crops, seed production in cross pollinated, self pollinated and clonal crops – isolation distance, husbandry, field inspection, seed processing & treatment, certification, distribution/ marketing with particular emphasis on pure line, hybrid and synthetic varieties production; micro-propagation techniques for clonal seed production in horticultural crops; International and national (PNG) bylaws of seed production and seed certification; organization of seed testing laboratory, Seed testing – sampling, purity analysis, moisture content, health, viability and germinability, Recent technology in production of true seeds in tuber crops.

Textbook:

Agrawal, PK and M. Dadlani. 1987. Techniques in Seed Science and Technology. South Asian Publishers, New Delhi.
ICAR. 2005. Improved Seed – Agriculture Production Manual, ICAR, New Delhi.

References:

Hayward, MD, Romagosa, I and Bosenmark, NO. 1993. Plant Breeding: Principle and Prospects. Chapman and Hall Publ.

Mantell, SH, JA Mathew and RA McKee. 1985. Principles of Plant Biotechnology: An Introduction to Geneic Engineerin in Plants Blackwell Sci. Publ. Oxford.

Pierik, RLM. 1987. *In vitro* Culture of Higher Plants. Martinus Nijhoff Publ. , Dordecht.

Singh, BD. 2005. Plant Breeding: Principle and Methods. VII Edn, Kalyani Publishers, Ludhiana, New Delhi.

Singh, BD. 2006. Plant Biotechnology. Kalyani Publishers, New Delhi.

Stockoph, NC, Tomes, Dwite T and Christie, BR. 1993. . Plant Breeding: Theory and Practice. Westview Press.

Assessment:

Continuous - 50%

Final - 50%

AGP 39: TAXONOMY OF CROP INSECT PESTS

Hours per week: 4(2/2)

Objectives:

1. Appreciate the importance of co-evolutionary process in evolution
2. Comprehend the importance and use of Carl Linneaus classification system on main crop insect taxons.
3. Classify crop insects into respective taxon levels.
4. Identify crop insect variation using conventional and advance taxonomy as an important tool in Agriculture.
5. Assess the condition of the environment using insect variation.

Syllabus:

Evolutionary Science and its importance. Carl Linnaeus classification system and contemporary taxonomy. Taxonomy of insect orders Isoptera. Orthoptera, Hemiptera, Diptera, Hymenoptera, Lepidoptera and Coleoptera to family and genus level. Taxonomic studies of crop insect pest such

as rice, sugarcane, coffee, oil palm. DNA finger printing and information Technology such as CABPEST, CXBIKEY and others in Taxonomy. Environmental assessment using insect variation

Textbook:

Kumar, R. (2001) Insect Pests of Agriculture in Papua New Guinea, Part 1. Principles and Practice, Pest of tree Crops & Stored Products. Science in New Guinea,

References:

Chapman, RE. (1969) The Insect: Sturcture and Function ELBS Hodder & Stoughton. UK

CSIRO (1991). The insects of Australia, Melbourne University Press.

Assessment:

Continuous - 50%

Final - 50%

AGP 40: ADVANCED FARM MANAGEMENT

Hours per week: 4

Objective:

The objective of this course is to enable the students to

1. evaluate farm decisions within their institutional context using the principles and techniques of farm management and to device appropriate programmes for the operation and development of a farm business given socio-economic constraints.
2. Construct whole farm and partial budgets, Construct and use comparative analysis ratios, Identify risk and understand application of risk-reducing strategies.

Syllabus:

Management objectives. Decision making. The application of economic and other principles to the problem of combining the farm components: land, labour, machines, farm improvements, services, materials, finance and markets. The impact of uncertainty and dynamic nature of farming. Budgeting and record keeping as management techniques. Linear programming as a tool of farm

planning.

Reference:

Rae, A.N. 1977. Crop Management Economics. St Martin's Press, New York.

Barnard, C.S. and Nix, J.S. 1979. Farm Planning and control. Cambridge University Press.

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3hrs)

AGP 41: AGRICULTURAL PRODUCTION, PRICE AND MARKETING

Hours per week: 4

Objective:

The students will be able to:

1. Identify the main physical relationships, namely, factor-factor, factor-product and product-product relationship,
2. Examine some of these relationships in an agricultural context,
3. Calculate profit maximizing level of output and price for a particular farm,
4. Determine product combinations for maximum profit,
5. To understand the process by which market prices are formed and the functions they fulfil,
6. To overview the types of market structure and some of their properties,
- 7 Undertake demand forecasting and product planning.

Syllabus:

Response analysis and optimization, farm-firm production function and allocative efficiency. Cost analysis, productivity and technical change in agriculture. The analysis of supply and demand for agricultural products and analysis of price determination in agriculture. Price variation through time and space. Behaviour of aggregate farm prices. Agricultural systems and price formation, identification and analysis of marketing problems including assessment of market performance, market institutions and policy intervention. Food marketing systems; methods of

demand forecasting; marketing research as a management tool.

Reference:

Heady, E.O. and Dillon, J.L. 1961. Agricultural Production Functions. Iowa State Univ. Press.

Dillon, J.L. 1968. The Analysis of Response in Crop and Livestock Production. Pergamon Press.

Tomek, W.G. and Robinson, K.L. 1981. Agricultural Product Prices. Cornell Univ. Press.

Assessment:

Continuous Assessment - 50%
Written Examination - 50%(1x3hrs)

AGP 42: AGRICULTURAL PROJECT PLANNING, ANALYSIS AND MANAGEMENT

Hours per week: 4 (4/0)

Prerequisites: AG 419

Objectives:

Students will be able to:

1. describe and analyze different models of project planning, management and their application
2. determine the different process in defining, planning, implementing and evaluating of a project.
3. use analytical tools and techniques in defining, planning, implementing and evaluating agricultural project
4. identify cost and benefits in agricultural project
5. do case studies in project planning and management

Syllabus:

Defining the project, information gathering tools and techniques, project proposal and feasibility studies, Identify and define objectives of a project. Project planning methods and planning tools and techniques. Project implementation, monitoring and management tools and techniques, Team leader roles, time and resource management, Cost and benefit analysis, evaluation procedures and use of evaluation tools and techniques, Case study on

agricultural projects and project presentations.

Textbook:

Gittinger, J.P. 1982. *Economic Analysis of Agricultural Project*
Haynes, M.E. 1996, *Project Management - a practical guide for success*
John Hopkins.1990, *Agricultural Projects* (Revised Ed.), University Press, Baltimore.

References:

Chamala, S., Mortiss, P.D. 1990. *Working Together for Land Care: Group Management Skills and Strategies*, p.190. Australia: Australian Academic Press Pty. Ltd.
Jones, Q. 1990. *Planning Tools for successful Project Management*
REC, 2004. *Readings: Project Planning and Management*, University of Queensland, Gatton.
REC, 2002. *Readings: Project Evaluation*, University of Queensland, Gatton.

Assessment:

Continuous Assessment - 50%
Final - 50%

AGP 43: ADVANCED AGRICULTURAL EXTENSION

Hours per week: 4

Objective:

The general objective of this course is to enable the student to understand the state of affairs in agricultural extension and the current issues and concerns that affect how extension might be organised in future for better results.

The students will be able to:

1. Know about the different approaches of extension,
2. Identify the social factors that influence adoption of innovation,
3. Select and use the method(s) of extension teaching with the help of various teaching aids,
4. Develop plans and programmes jointly with farmers for rural development,
5. Communicate effectively with farmers and maintain a close working relationship with

agricultural research,

- 6 Identify problems, alternative solutions and implementation of feasible solution.

Syllabus:

The history and development of agricultural extension. The frame work of agricultural extension - organizational setting, its role in adoption. Basic theory of adoption Environmental and human factors affecting adoption or rejection of innovation. Social and individual behaviour and their impact on change; the role of pressure and inducement mechanism; the role of change agents in the adoption process. Theory of communication Principles of interaction between change agents and farmers. The role of local opinion leaders; individual and group contact. The personality of extension agent. Extension methodology choice of the approach programme planning the identification of constraints; conversion of facts into an extension programmes; assessment of priority; the choice of the right package programme; assessment of manpower requirements; timing of programmes. Administration of extension; performance of extension service; education, training and career. Evaluation, of extension Appraisal of success and failure; economic and social cost benefit consideration.

Extension Research: Research design and data collection methods for extension research. Interview and questionnaire techniques; application of statistical methods.

Reference:

Rogers, E. and Shoemaker, F. 1971. *Communications of Innovations: A Cross-Cultural Approach* (2nd Edn.). The Free Press and London-Collier-Macmillan.
Hunter, G. 1978. *Modernising Peasant Societies A Comparative study in Asia and Africa*. Oxford Univ. Press.
Maunder, A.H. 1972 (Ed.). *Agricultural Extension A Reference Manual*. FAO, Rome.
Johnston, B.F. and Clark, W.C. 1982. *Redesigning Rural Development*. John Hopkins Univ. Press, Baltimore.
Rogers, E. 1983. *Diffusion of Innovations*. Free Press, New York.
Swanson, B.E. 1984. *Agricultural Extension: A*

Reference Manual (2nd Edn.). FAO, Rome.

Assessment:

Continuous Assessment - 50%
Written Examination - 50%

AGP 60: CROP PROCESSING AND STORAGE

Hours per week: 4

Prerequisite: AG 392, FT 201, FT 311

Objective:

On the completion of this subject, students will be able to:

1. Understand the fundamental principles in product processing and storage,
2. Understand the physical properties of agricultural products and the role they play in processing and storage,
3. Understand various processes for product value addition and storage,
4. Select appropriate processing and storage methods, equipment and systems.

Syllabus:

Main characteristics and properties of tree, industrial and food crops at maturity, methods of harvesting and transportation prior to processing, mechanical treatments use in processing (drying, curing, washing, decortication, crushing, expression, milling and separation), Post-harvest treatments of crops of major economic importance including (oil-producing crops, sugar cane, root and crops, and selected fruit and vegetable crops), purpose of produce storage, store design considerations, air flow processes, storage structures, selection of storage systems.

Textbook:

Mohsenin, N.N. 1986. Physical Properties of Plant and Animal Materials. Gordon and Breach, New York.

Assessment:

Continuous Assessment - 50%
Written Examination - 50%

AGP 61: TECHNOLOGY OF FARM MACHINERY

Hours per week: 4

Prerequisite: AG 392

Objective:

On the completion of this subject, students should be able to:

1. Understand the performance and design characteristic of crop establishment, protection, harvesting and handling machinery.
2. Select and match machine to meet the performance requirements of various agricultural systems,
3. Consider safety and other ergonomic factors in using farm machinery.

Syllabus:

Power/implement force relationship and analysis, machinery power measurement, human ergonomic and safety considerations in using agricultural machinery, agricultural production machinery design, operation and performance characteristics, choosing appropriate machinery matched to operational requirement.

Textbook:

Culpin, C. 1992. Farm Machinery. Collins, London.
F.A.O. Agricultural Service Bulletin, Elements of Agricultural Machinery (I and II). FAO, Rome.

Assessment:

Continuous Assessment - 50%
Written Examination - 50%

AGP 62: IRRIGATION AND AGRICULTURAL WATER SUPPLY

Hours per week: 4

Prerequisite: AG 411

Objective:

On the completion of this subject, students should be able to:

1. Understand the engineering fundamentals of water management for agricultural production,
2. Understand the design and operational principles associated with irrigation and rural water supply systems,
3. Consider human and environmental safety and other ergonomic factors associated with water engineering system for agriculture,
4. Understand and consider standards related to agricultural water use systems.

Syllabus:

Land surveying, hydrologic cycle, precipitation and depression water storage, underground water hydrology, irrigation need, design of surface, sprinkler and trickle irrigation systems, irrigation scheduling and operation, assessment and maintenance of irrigation systems, water requirement and conveyance, rural water supply design, water supply system component selection, installation and maintenance.

Textbook:

Michael, A.M. 1978. Irrigation: Theory and Practice. Vikas Publishing House, PVT Ltd, New Delhi.

Morgan, P. 1988. Rural Water Supplies and Sanitation. Macmillan.

Assessment:

Continuous Assessment - 50%
Written Examination - 50%

**AGP 63: SOIL AND WATER
CONSERVATION ENGINEERING**

Hours per week: 4

Prerequisite: AG 411

Objective:

On the completion of this subject, students should be able to:

1. Understand the principles of land management for sustainable agricultural development,
2. Review, select and design an appropriate drainage system for an area,
3. Assess the causes and extent of hazard posed

- be water erosion for an area,
4. Design, install and maintain erosion control structures.

Syllabus:

Principles of land management, soil erosion process and problems, soil conservation and erosion control measures, drainage needs, design, installation and maintenance of drainage systems, traditional soil conservation structures, installation, maintenance and assessment of soil conservation systems.

Textbook:

Hudson, N.W. 1992. Soil Conservation Engineering. Cornell University Press.

Assessment:

Continuous Assessment - 50%
Written Examination - 50%

**SPECIAL RULES FOR THE
POSTGRADUATE DIPLOMA IN
AGRICULTURE**

In these rules, unless specified otherwise, the 'Department' means the 'Department of Agriculture' and the 'Diploma' means the 'Postgraduate Diploma in Agriculture'.

The course of study leading to the Postgraduate Diploma in Agriculture is a full time programme of one academic year.

Only under exceptional circumstances will an extension beyond an academic year be granted by the Head of Department.

An applicant for admission to candidature for the Diploma shall have:

1. either a Bachelor's degree in Agriculture from the University of Papua New Guinea or a Bachelor's Degree in Agricultural Science from the PNG University of Technology or equivalent. Only students with a good academic record (average 65% or better) and / or with industry experience and sponsorship will be admitted to the course.
2. an applicant with a degree other than an

agricultural one may be admitted after attending and passing qualifying courses in agriculture. These courses will be decided by the Department and approved by the High Degrees Committee.

3. a candidate shall follow and obtain a minimum of 192 credit points (four credit points being equivalent to one hour per week of lecture, tutorial, practical or project classes for one semester) in the course of study set out below:

First Semester

Average

Code	Subject	Weekly hours
AGP 10	Research Methodology	6
	Choice of two courses from Schedule 1 (2x4)	8
AGP 11	Project	10

Second Semester

	Choice of three courses from Schedule 1 (3x4)	12
AGP 11	Project	12

Such subjects and project topic and supervisor(s) to be selected by the candidates subject to the advice of the Head of the Department and approved by the Higher Degrees Committee. The Higher Degrees Committee on the advice of the Head of Department may substitute a subject or subjects for those prescribed.

Topics of the research project will be chosen in consultation with the Supervisor in the area of interest / specialization. Students are expected to prepare objectives, carry out a literature survey on the topic, and propose the methodology of research during the first semester; these will form the basis of seminar presentation by the student during the semester. The project work itself will be executed by the student following the standard procedure.

The student is expected to present results of the work in the form of a dissertation which must be submitted at least one month before the 2nd semester examinations. The dissertation will be examined by two or three examiners recommended by the Head of Department and approved by the Higher Degrees Committee.

The diploma is awarded on the basis of assessment which takes into account the overall performance of the candidate in assessments, tests, final examination and the project.

DEPARTMENT OF APPLIED PHYSICS

Acting Head of Department:

Renagi O. Ph.D. (James Cook), M.Sc. (James Cook), B.Sc. (UPNG)

Deputy Head of Department:

Anduwan G.A. Ph.D. (Ball State – USA) EdD and M.Sc (Ball State-USA), B.Eng(PNGUT), Dip CERT(PNGUT)

Associate Professor:

Dey S.C. Ph.D. (ANU), M.Sc. (Chittagong), M.AppSc (UNSW), B.Sc (Hons.) (Chittagong), MAGU (USA), FRAS. (UK)

Senior Lecturers:

Pal, S. Ph.D. (IIT, Kharagpur), M.Sc. , B.Sc. (Cal. Univ., India), Post Doc. (IIT-KGP), IPTA (India).

Lakshman, A. Ph.D., M.Sc., B.Sc. (Andhra), B.Ed. (Annamalai)

Lecturers:

Soto, R. MSEE (Univ. of Houston), BSEE, ITESM, DIPT

Rawali, M. . M.Sc.Tech (UNSW), Dip(ICTP) P.G.Dip (PNGUT), B.Sc (PNGUT)

Senior Technical Instructor:

Kolkoma D. B.Eng and Dip (PNGUT)

Principal Technical Officer:

Positions Vacant

Senior Technical Officers:

Koddy,FM. B.Sc. (PNGUT)

Technical Officers:

Deckson, B. Cert. Lab. Tech. (Lae Tech.), Dip. Tech. Services (ICS)

Bomi, K. Cert. Lab. Tech. (Lae Tech.)

Executive Secretary:

Doe, F. SecCert. (Goroka Tech.)

Yapai, N SecCert(Lae Tech)

The Department now offers two 4-year degree course. The first is entitled "**Bachelor of Science in Applied Physics with Electronics and Instrumentation**" (BSAP) and the second is

entitled "**Bachelor of Science in Radiation Therapy**" (BSRT).

Bachelor of Science in Applied Physics with Electronics and Instrumentation (BSAP)

The BSAP program is designed to produce graduates with technical skills in electronics and instrumentation, together with a good understanding of the underlying physical principles.

In the first year the student is introduced to the basic concepts and methodology of physics, chemistry and mathematics. Over the next three years, the student is introduced to the major areas of physics and electrical engineering and also supplied with the mathematical techniques required for the understanding of advanced physical concepts. The final year syllabus includes a project heavily involved with some aspect of instrumentation. During the course the students undergo a period of at least 5 weeks industrial training which is designed to equip them for their future careers.

The minimum requirements for entry to the course are; B grades in Grade 12 Physics and Mathematics, and C grades in Grade 12 Chemistry and English.

Bachelor of Science in Radiation Therapy (BSRT)

Radiation therapy (also called radiotherapy) is the medical use of ionizing radiation as part of treatment of deadly cancer diseases to control malignant cells. Cancers are caused by genetic abnormalities in the material of the transformed cells that may occur due to various reasons.

The use of radiation therapy may be for curative or adjuvant cancer treatment as well as palliative treatment or as therapeutic treatment. Radiotherapy has several applications in non-malignant conditions as well. It is also common to combine radiation therapy with surgery, chemotherapy, hormone therapy or some mixture of the three. As research develops, the treatments of cancer are becoming more specific for different varieties of cancer.

In view of the fact that there is a great need of expanding the radiation therapy facilities in the country to combat the cancer diseases, the Department of Applied Physics undertakes the

initiative to introduce a degree program entitled “Bachelor of Science in Radiation Therapy (BSRT)” of 4-years duration (full-time).

The course structure for this program has been carefully designed with the objectives of producing appropriately trained graduates with sufficient command of the basic disciplines (radiation physics, chemistry, biology, anatomy, pathology, physiology, diagnostic imaging, clinical practices, etc) so as to be able to work safely and competently as practicing Radiotherapists.

The Radiotherapy & Oncology Unit of the Angau Memorial Hospital, Lae with modern machines required for cancer treatment being installed is in a position for making significant contribution to BSRT program by extending training facilities to produce professionally confident Radiation Therapists thereby ensuring long-term sustainability of radiation oncology services in Papua New Guinea.

The Department is also responsible for the teaching of Physics to first year students in all 11 science-based departments of the University.

The level is essentially that of matriculation physics. The lectures are intended to equip the student with the basic physical concepts required for his or her professional studies. The laboratory classes impart skill in making physical measurements and estimating the errors in observations. The

STRUCTURE OF COURSES

BACHELOR OF SCIENCE IN APPLIED PHYSICS WITH ELECTRONICS AND INSTRUMENTATION

Code	Subject	Weekly Hours

Year 1

First Semester

EE101	Introduction to Computing and Problem Solving	2
AP121	Introduction to Mathematical Physics I	2
AP131	Introductory Physics I	6

AS131	Chemistry for Physics I	4
MA167	Engineering Mathematics I	5
LA101	Study Skills	3
		22

Year 1

Second Semester

EE102	Introduction to Computing and Problem Solving	2
AP122	Introduction to Mathematical Physics I	2
AP132	Introductory Physics II	8
AS132	Chemistry for Physics II	4
MA168	Engineering Mathematics II	5
LA102	Reading and Writing	3
		24

Year 2

First Semester

AP251	Mathematical Physics	4
AP231	Circuit Theory	4
AP271	Thermodynamics	4
MA235	Engineering Mathematics II(A)	4
EE241	Introduction to Computers	3
EE233	Linear Electronics	4
EE251	Introduction to Digital Systems	3
		26

Year 2

Second Semester

AP242	Atomic and Nuclear Physics	4
AP274	Classical Mechanics	4
AP262	Physics of Materials	4
MA236	Engineering Mathematics II(B)	4
EE234	Non-Linear Electronics	3
EE242	Software Engineering	3
EE262	Digital Electronics and Systems	4
		26

Year 3

First Semester

AP311	Electromagnetic Fields	4
AP373	Quantum Physics	4
AP345	Instrumentation I	4
MA333	Engineering Mathematics III EE (A)	4
EE311	Signals & Systems	3
EE341	Computer Architecture	4
		23

Year 3

Second Semester

AP342	Electromagnetic Waves	4
AP346	Instrumentation II	4
AP352	Solid State Physics	4
AP382	Physical Electronics	4

EE342 Interfacing Techniques	5	AP211 Introduction to Quantum Theory and Atomic Spectra	
MA334 Engineering Mathematics III EE (B)	4	AP231 Circuit Theory	
	25	AP241 Physical Transducers	
Year 4		AP242 Atomic and Nuclear Physics	
First Semester		AP262 Physics of Materials	
AP401 Project	6	AP272 Thermodynamics	
AP422 Modern Optics & Lasers.	4	AP311 Electromagnetic Fields	
AP442 Radiation Physics	4	AP321 Quantum Mechanics	
AP443 Global Geophysics	4	AP342 Electromagnetic Waves	
EE411 Instrumentation Systems and Process Control	3	AP352 Solid State Physics	
	21	AP353 Feedback Instrumentation	
Year 4		AP372 Rigid Body Dynamics	
Second Semester		AP382 Physical Electronics	
AP402 Project	6	AP401/2 Project	
AP412 Electromagnetic & Noise Suppression	4	AP411 Advanced Solid State Physics	
AP432 Physics of Environment	4	AP412 Electromagnetic Shielding and Noise Suppression	
AP462 Energy Sources	4	AP422 Modern Optics and Lasers	
AP484 Exploration Geophysics	4	AP432 Physics of the Environment	
	22	AP442 Radiation Physics	
AP471 Industrial Training 5 weeks		AP461 Computer Simulation	
Electives:		AP462 Energy Sources	
AP411 Advanced Solid State Physics	4	AP471 Industrial Training	
AP412 Electromagnetic Shielding & Noise Suppression	4	AP472 Polymer Physics	
AP422 Modern Optics and Lasers	4	AP492 Physics of Non-Destructive Testing	
AP432 Physics of Environment	4	PH101 Physics for Architects and Builders	
AP441 Introductory Geophysics	4	PH103 Physics for Surveyors I	
AP442 Radiation Physics	4	PH104 Physics for Surveyors II	
AP443 Global Geophysics	4	PH113 Physics for Computer Science I	
AP461 Computer Simulation	4	PH114 Physics for Computer Science II	
AP462 Energy Sources	4	PH141 Principles of Physics I	
AP472 Polymer Physics	4	PH142 Principles of Physics II	
AP484 Exploration Geophysics	4	PH173 Physics for Surveyors and Natural Resources I	
AP492 Physics of Non-Destructive Testing	4	PH174 Physics for Surveyors and Natural Resources II	
EE411 Instrumentation Systems and Process Control	3	PH176 Physics for Agriculture	
		PH183 Physics for Applied Sciences I	
SUBJECTS TAUGHT BY THE DEPARTMENT		PH184 Physics for Applied Sciences II	
AP111 Introduction to Computing		PH251 Physics of Engineering Materials I	
AP112 Programming with Fortran		PH252 Physics of Engineering Materials II	
AP121 Introduction to Mathematical Physics I			
AP122 Introduction to Mathematical Physics II			
AP131 Introductory Physics I			
AP132 Introductory Physics II			

SUBJECT DETAILS

AP 111: INTRODUCTION TO COMPUTING

Hours per week: 2

Objectives:

On completion of this subject, the student should be able to:-

1. Discuss computer systems and computer technology;
2. Describe hardware and software and how they work together;
3. Use utilities, word-processing, spreadsheets and graphics packages.

Syllabus:

Introduction to computers, history of computers, computer systems, computer technology. Processing hardware: microcomputers and mainframes, computer operations, information processing, disk operating system, DOS commands, storage devices and file organisations, input-output operations. Introduction to utilities, word-processing, spreadsheets and graphics software packages.

Textbook:

Norton, P, Inside the IBM PC (Prentice-Hall, 1990).

Reference:

Stern, N & Stern, R, Computing with end-User Applications (John Wiley, 1988-99)

Assessment:

Continuous assessment - 100%

AP 112: PROGRAMMING WITH FORTRAN

Hours per week: 2

Prerequisite: AP 111

Objectives:

On completion of this subject the student should be able to:-

1. Distinguish between different programming languages;
2. Write FORTRAN programmes, compile and execute them;
3. Use FORTRAN programming to solve problems in Physics;
4. Use computer for simulation and modeling.

Syllabus:

Programming languages; Importance of FORTRAN in solving problems in science and engineering; Dialects of FORTRAN; FORTRAN standard; Problem analysis and algorithm development; Data types, operations and functions; Program coding, execution, testing and debugging; Control structures; Input/output; File processing; Arrays and subscripted variables; Processing of multidimensional arrays; Functions and subroutines; Double precision and complex data types; Character data; COMMON and BLOCK DATA subprogrammes; EQUIVALENCE; Computer simulation and modeling.

Textbook:

Nyoff, Larry and Leestma, Stanford, FORTRAN 77 for Engineers and Scientists, Macmillan Publishing Co., New York, 1985

Assessment:

Continuous Assessment - 100%

AP 121: INTRODUCTION TO MATHEMATICAL PHYSICS I

Hours per week: 2

Objectives:

On completion of this subject the student should be able to:-

1. Demonstrate understanding of the role of mathematics in expressing physical concepts;
2. Apply the rules of vector algebra to problems in physics;
3. Understand the special role of trigonometric and exponential functions in physics.

Syllabus:

Concept of dependent and independent variables in physics. Algebraic functions and equations. Formulae as expressions of physical laws. Manipulation and graphical representation of formulae. Vectors. Physical problems involving addition and subtraction of vectors. Vector triangles, the distinction between force diagrams and vector diagrams. Scalar product of two vectors, mechanical work, electric flux. Vector product, angular momentum. Special role of trigonometric and exponential functions in physics. Examples from mechanics, electricity and modern physics. Applications of differential and integral calculus in mechanics, wave theory, electricity and magnetism.

Textbook:

Allendoerfer, C B and Oakley, C O, Principles of Mathematics, 2nd edition (McGraw-Hill, 1963)

References:

Richard Dalven, Calculus for Physics (McGraw Hill, 1984)

Assessment:

Continuous assessment - 100%

AP 122: INTRODUCTION TO MATHEMATICAL PHYSICS II

Hours per week: 2

Prerequisite: AP 121

Objectives:

On completion of this subject the students should be able to:-

1. Demonstrate facility in expressing physical problem in mathematical terms and selecting appropriate methods of solution;
2. Apply the rules of complex number algebra to physical problems;
3. Use differential equations to solve problems in mechanics, electricity and magnetism.

Syllabus:

Complex numbers, the algebra of complex numbers, cartesian and polar forms. Geometrical representation of complex numbers. Functions of a complex variable. Special role of the exponential form in physical applications. Differentiation and integration of complex variables. Ordinary differential equations. Initial-value and boundary value problems. Application of 1st and 2nd order linear ordinary differential equations to physical problems. Partial differential equations, wave equations for strings and fluids. Electromagnetic waves. Concept of equilibrium in mechanics and thermal physics.

Textbook:

Allendoerfer, C B and Oakley, C O, Principles of Mathematics, 2nd edition (McGraw-Hill, 1963)

Reference:

John R Acton and Patrick T Squire, Solving Equations with Physical Understanding (Adam Hilger Ltd, 1985)

Assessment:

Continuous assessment - 100%

AP 131: INTRODUCTORY PHYSICS I

Hours per week: 8 (6/2)

Pre-requisite: Enrolled as a 1st year student.

Objective:

To introduce students to basic concepts in Physics in order to prepare them for applications in later years. On completion of this course, students should be able to:

1. Perform basic operations on vectors;
2. Analyze objects' motion in one, and two dimensions;
3. Solve problems in linear and planar motion, by applying concepts of force, impulse, mass, momentum, work and energy;
4. Explain the characteristics of waves, and solve problems on the wave function;

5. Understand fluids and their behavior: fluids at rest and fluid flow.
6. Thermometry and Calorimetry.
7. Gases: the gas laws.
8. Understand Heat transfer mechanisms.

Syllabus:

Fundamental physical quantities and units. Concepts of motion, velocity and acceleration as vectors. Application of the kinematic equations to linear, parabolic and circular motion. Dynamics of a particle. Concepts of mass, force, impulse and momentum. Motion of a rigid body; simple ideas on moments of inertia. Mechanical properties of solids and liquids. Simple Harmonic Motion (SHM). The kinetics and dynamics of SHM. Energy in SHM. Application to spring problems and the pendulum. Natural and artificial damping. Classification of wave motion. Travelling waves, wave fronts and rays. Superposition of waves, and phase difference, equation of a progressive wave. Beats: the phenomenon of beats. Stationary (standing) waves: the formation and properties of stationary waves.

The Doppler effect: derivation of expression for frequency change, the Doppler effect with light.

Fluid Statics: Physical properties of fluids, buoyancy. Pascal's and Archimedes' Principle. Fluid Dynamics: Basics concepts of ideal flow, applications of continuity equation, Bernoulli and momentum equations, concept of laminar and turbulent flow.

Thermometry and calorimetry: temperature scales, heat capacity, measuring specific heat capacities, latent heat, cooling laws.

Gases: the gas laws, concept of ideal gas and ideal gas equation, the kinetic theory of gases. Avogadro's law, external work done by an expanding gas, first law of thermodynamics, isothermal processes, adiabatic processes, Van Der Waals' equation of state.

Heat transfer: thermal conduction, definition of thermal conductivity, thermal radiation, the concept of black body, convection. Stefan's law.

Textbook:

Young, H. D., "University Physics", 8th Ed., Addison-Wesley, 1992.

Assessment:

- Continuous assessment - 40%
Written Examination - 60% (1 x 3 hours)

AP 132: INTRODUCTORY PHYSICS II

Hours per week: 8 (6/2)

Prerequisite : Enrol as a first year student

Objectives:

To introduce students to basic concepts in Physics in order to prepare them for applications in later years. On completion of this course, students should be able to:

1. Apply the concepts of electrostatics to simple point and continuous charge distributions;
2. Calculate currents in branched circuits;
3. Apply the laws of electromagnetism to simple problems;
4. Discuss Geometrical Optics concepts related to lenses, mirrors, and basic optical instruments.;
5. Understand waves concepts applied to electromagnetic waves.
6. Discuss the wave properties of light.

Syllabus:

Geometrical Optics. Refraction: laws of refraction. Lenses and mirrors: basic properties, images, determination of focal length, lenses and mirrors formula, etc.

Waves and wave properties of light. Basic properties of waves. Interference of light waves. Young's double-slit experiment. Diffraction of light waves, diffraction at a single slit, diffraction produced by multiple slits. Polarization of light waves.

Electromagnetic waves: optical spectra, the electromagnetic spectrum.

Electrostatics. Concepts of charge and electric field. Coulomb's law. Gauss' law. Calculations of electric field for discrete and continuous charge distributions. Electrostatic potential. Capacitance. Current electricity. Ohm's law. Electromotive forces, the circuit equations, Kirchhoff's rules. Simple bridge circuits. Magnetism. Magnetic force on current-carrying conductors, the electric motor. Magnetic field due to a current, the Biot-

Savart law. Force between currents, the Ampere. Laws of electromagnetic induction. Application to the dynamo, eddy currents. Self-inductance, energy stored in an inductor. Alternating current circuits. A.C. applied across resistor, inductor and capacitor, phase relations. Vector impedance diagrams.

Textbook:

Young, H.D., "University Physics", 8th Ed., Addison-Wesley, 1992.

Assessment:

Continuous assessment - 40%
Written Examination - 60% (1 x 3 hours)

AP 211: INTRODUCTION TO QUANTUM THEORY AND ATOMIC SPECTRA

Hours per week: 4 (3/1)

Objectives:

On completion of this subject the student should be able to:-

1. Explain how the classical theory of radiation failed to account for the photoelectric effect and the line spectra of atoms;
2. Explain the concept of matter waves and calculate the de Broglie wavelength of particles in typical situations;
3. State and apply the Uncertainty Principle;
4. Construct the electron probability density from the wave function;
5. Sketch and interpret the electron densities corresponding to s, p and d eigen functions of atomic hydrogen;
6. Discuss the concept of electron spin and the nature of the spin-orbit interaction;
7. Explain the basis of the Exclusion Principle and apply it to finding the electronic configuration of atoms in the ground state;
8. Explain the characteristic absorption and emission spectra of simple systems.

Syllabus:

Origins of a quantum theory of radiation. Brief review of classical radiation theory. Detailed discussion of the photo-electric effect. The

quantum of energy. Emission spectra of the semi-classical theory of Bohr. Origins of a quantum theory of matter. The de Broglie hypothesis, calculation of the de Broglie wavelength. Electron diffraction.

Mathematical formulation of matter waves. Travelling waves. The inadequacy of a single travelling wave to represent a moving particle. Wave packets and group velocity. The Uncertainty Principle. Interpretation of the wave function. Standing waves in strings, analogy to the particle-in-a-box problem. Node counting and quantum numbers. The particle probability density. Calculation of the electron density for the 1s state of hydrogen. The wave equation. Kinetic, potential and total energy. The time independent Schrödinger equation. Boundary conditions. Solutions for simple model potential's. The hydrogen atom: outline solution for spin-free eigenstates. Pictorial representation of radial probability distributions. The Phipps-Taylor experiment and electron spin. Effect of spin-orbit interaction on the spectrum of atomic hydrogen. Multi-electron atoms. Symmetry and particle identity, the Exclusion Principle. Electronic configurations of atoms, the Periodic Table. Brief treatment of optical excitations.

Textbook:

Young, H.D., University Physics, 8th edition (Addison-Wesley, 1992).

Assessment:

Continuous assessment - 40%
Written Examination - 60% (1x3hrs)

AP 231: CIRCUIT THEORY

Hours per week: 5 (3/2)

Objectives:

On completion of this subject the student should be able to:-

1. Solve problems on the behaviour of simple d.c. circuits having a combination of resistors and voltage sources;
2. Explain the theories of d.c. circuit analysis, and solve numerical problems using nodal and mesh analysis, etc;

3. Explain the behaviour of d.c. circuits containing resistor and capacitor;
4. Solve simple problems on alternating voltage circuits having active and passive components;
5. Analyse the behaviour of a.c. circuits in resonance and non-resonance conditions;
6. Analyse the behaviour of some filter circuits.

Syllabus:

Electrical conduction in metals. Resistance and Ohm's law, e.m.f. and internal resistance. Kirchhoff's rules. Application to series and parallel circuits. Capacitors. Transients in RC circuits. Response to d.c. voltages. Time constants. Applications to time base and pulse shaping. Measurement of high resistance by capacitor leakage. Mesh and Nodal Analysis of d.c. circuits. Analysis of circuits with current sources and resistors. Thevenin's theorem; Norton's theorem; Millman's theorem. A.C. voltage across the resistor, capacitor and inductor. Active and passive elements. Vector Impedance diagrams. Complex number representation. Power in a.c. circuits. Series and parallel RLC circuits. The resonance condition. Nodal and mesh analysis for a.c. circuits. Filter circuits: active and passive filters. The low pass filter, band pass filter, and high pass filter.

Textbook:

Grob, B., Direct and Alternating Current Circuits (McGraw-Hill, 1986).

Assessment:

Continuous Assessment - 40%
Written examination - 60% (1x3 hrs)

AP 231: CIRCUIT THEORY

Hours per week: 4 (3/1)

Objectives:

On completion of this subject the student should be able to:

1. Solve problems on the behaviour of simple d.c. circuits having a combination of resistors and voltage sources;
2. Explain the theories of d.c. circuit analysis, and solve numerical problems using nodal

- and mesh analysis, etc;
3. Explain the behaviour of d.c. circuits containing resistor and capacitor;
 4. Solve simple problems on alternating voltage circuits having active and passive components;
 5. Analyse and solve a.c. circuits involving complex numbers;
 6. Analyse the behaviour of a.c. circuits in resonance and non-resonance conditions;
 7. Analyse the behaviour of some filter circuits.

Syllabus:

Electrical conduction in metals. Resistance and Ohm's law, e.m.f. and internal resistance. Kirchhoff's rules, Application to series and parallel circuits, Capacitors. Transients in RC circuits, Response to d.c. voltages, Time constants, Applications to time base and pulse shaping, Measurement of high resistance by capacitor leakage. Mesh and Nodal Analysis of d.c. circuits, Analysis of circuits with current sources and resistors, Thevenin's theorem; Norton's theorem; Millman's theorem. A.C. voltage across the resistor, capacitor and inductor, Active and passive elements. Vector Impedance diagrams, complex number representation, Power in a.c. circuits, The resonance condition, Nodal and mesh analysis for a.c. circuits. Filter circuits: active and passive filters, The low pass filter, band pass filter, and high pass filter.

Textbook:

Grob, B., Direct and Alternating Current Circuits (McGraw-Hill, 1986).

Assessment:

Continuous Assessment - 40%
Written examination - 60% (1 x 2 hrs)

AP 241: PHYSICAL TRANSDUCERS

Hours per week: 2 (2/0)

Objectives:

To provide students with an understanding of different transducer technologies and the

principles of applying these techniques for detection and measurement of some physical quantities.

On completion of this subject the student should be able to describe:-

1. Physical sensing processes;
2. Principles of transducers;
3. Application of transducers;
4. Semiconductor transducers.

Syllabus:

Sensing processes (physical). Piezoresistivity, piezo-electricity, thermo-electricity, magnetostriction, semiconductor properties for sensing, and other important physical effects. Principles of transducers. Variable resistance transducers, potentiometric, wheatstone bridge, wire strain gauge, piezoresistive transducers, thermistors, piezoelectric transducers, ultrasonic transducers, electrodynamic transducers, differential transformer transducers, magnetostrictive transducers, variable capacitance transducers. Applications of transducers. Techniques for absolute, direct and influential measurement of basic physical parameters: pressure, level, flow, temperature, displacement, vibration and acceleration. Semiconductor transducers. Physical principles used in semiconductor sensors both elemental and compound; properties of junctions, principles of galvanomagnetism. Applications of magnetoresistivity and Hall effect.

Textbook:

Jacob Fraden, AIP Handbook of Modern Sensors - Physics, Design and Applications, New York, 1993.

Reference:

Students will be referred to appropriate material during the lectures.

Assessment:

Continuous assessment - 100%

AP 242: ATOMIC AND NUCLEAR PHYSICS

Hours per week: 4 (3/1)

Objectives:

On completion of this subject the student should be able to:-

1. Solve problems based on the energy units used in atomic physics, and be able to convert from one to the other;
2. Explain - particle scattering experiments and their bearing on atomic structure;
3. State the constituents of the nucleus, and the nature of nuclear forces;
4. Explain the significance of nuclear binding energies and solve simple problems on them;
5. Interpret the stability (N-Z) curve and state the properties of the radiations given off in radioactive decay;
6. State the ways of artificially producing radioactive substances, and also states some of the uses of such substances.

Syllabus:

Energy units. The joule, electron-volt (eV). Relativistic mass-energy relation. The atomic mass unit (amu) as an expression of energy. Relation between amu and MeV. Atomic constituents. Alpha-particle scattering and the Rutherford model. Atomic spectra. Bohr theory and the hydrogen spectrum. X-rays: nature, production and uses. Diffraction of x-rays. The continuous and characteristic spectrum. Moseley's work on x-rays and its significance. Interaction of x-rays with matter, Compton scattering. The atomic nucleus. Nucleons and nuclear forces. Nuclear mass and abundance of nuclides. Mass defect. Nuclear binding energy and its significance. Nuclear models. The liquid-drop, shell, and collective models treated qualitatively. Nuclear stability. The N-Z curve. Radiations from radioactive substances, alpha, beta and gamma radioactivity. Transmutation equations following decay. Equations of radioactive decay. The decay law. Half life and disintegration constant. Secular equilibrium and the radioactive series. Radioactive dating. Cosmic rays. Natural background. Production of radioisotopes. Uses of radioisotopes in industry, medicine, mining, agriculture etc. Principles of radiation detection. Ionisations and excitations. Survey of detector types. Gas-filled, scintillation, and semiconductor detectors. Measurement statistics and detector resolving times.

Textbook:

Littlefield, T.A. & Thorley, N., Atomic and Nuclear Physics, 3rd edition, (ELBS and van Nostrand Reinhold Co., 1979).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3rs)

AP 242: ATOMIC AND NUCLEAR PHYSICS

Hours per week: 4 (3/1)

Objectives:

On completion of this subject the student should be able to:

1. Solve problems based on the energy units used in atomic physics, and be able to convert from one to the other;
2. Explain - particle scattering experiments and their bearing on atomic structure;
3. State the constituents of the nucleus, and the nature of nuclear forces;
4. Explain the significance of nuclear binding energies and solve simple problems on them;
5. Interpret the stability (N-Z) curve and state the proper ties of the radiations given off in radioactive decay. Explain Nuclear energy thru fission and fusion processes
6. State the ways of artificially producing radioactive substances, and also states some of the uses of such substances.

Syllabus:

Atomic constituents. Alpha-particle scattering and the Rutherford model. Atomic spectra. Bohr's theory of hydrogen atom, energy level diagram and the hydrogen spectrum. Multi electron atoms, Pauli's exclusion Principle, Zeeman effect.

X-rays: nature, production and uses. Diffraction of x-rays. The continuous and characteristic spectrum. Moseley's work on x-rays and its significance. Interaction of x-rays with matter, Compton scattering.

Energy units. The joule, electron-volt (eV). Relativistic mass-energy relation. The atomic

mass unit (amu) as an expression of energy.

Relation between a.m.u and MeV. The atomic nucleus. Nucleons and nuclear forces. Nuclear mass and abundance of nuclides. Mass defect. Nuclear binding energy and its significance. Nuclear models. The liquid-drop, shell, and collective models treated qualitatively. Nuclear stability. The N-Z curve.

Radiations from radioactive substances, alpha, beta and gamma radioactivity. Transmutation equations following decay. Equations of radioactive decay. The decay law. Half life and disintegration constant. Secular equilibrium and the radioactive series. Radioactive dating. Nuclear Reactions, Nuclear fission & Fusion and Nuclear Reactors.

Cosmic rays. Natural background. Production of radioisotopes. Uses of radioisotopes in industry, medicine, mining, agriculture etc.

Textbooks:

Young H.D., University Physics, 12th edition, (Addison-Wesley, 2005)

Littlefield, T.A. & Thorley, N., Atomic and Nuclear Physics, 3rd edition, (ELBS and van Nostrand Reinhold Co., 1979).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 3 hrs)

AP 251: MATHEMATICAL PHYSICS

Hours per week: 4

Objectives:

On completion of this subject, the student should be able to:

1. Understand the role of mathematics in expressing the physical concepts;
2. Apply the rule of vector algebra to various problems in Physics;
3. Strongly understand the importance of the vector analysis in various fields of Physics;
4. Apply the differential and integral calculus in various fields of Physics and also to understand the importance of differential equations;

5. Understand the role of special functions, complex functions and transforms in solving different problems in Physics.

Syllabus:

Scalars and Vectors, Vector multiplication, Differentiation and integration of vector functions: Line integral, surface integral and volume integral of a vector, Concept of gradient of a scalar field, divergence and curl of a vector field, Solenoidal and Irrotational vectors, Gauss's divergence theorem and Stoke's theorem, Application of differential and integral calculus in mechanics, wave theory, electricity and magnetism, Introduction of differential equation. Legendre and Bessel functions. b and g functions, Series Expansions and approximations, Complex numbers and complex functions, Integration of complex quantities, Laplace transform, Z-transform and Fourier transform.

Textbooks:

Allendoerfer, C.B and Oakley, C.O, Principles of Mathematics, 2nd edition (Mcgraw – Hill, 1963), Anton H, Calculus with analytical Geometry, 5th edition (Wiley, 1999).
Engineering Mathematics, K.A. Stroud, Third edition, 1987 (English Language Book Society – ELBS)

Reference Books:

Richard Dalven, Calculus for Physics (Mcgraw – Hill, 1984). Kreyszig.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 3 hrs)

AP 262: PHYSICS OF MATERIALS

Hours per week: 4 (3/1)

Objectives:

On completion of this subject the student should be able to:-

1. Discuss the properties of a material that are relevant to its use in engineering products;
2. Give scientific definitions of characteristic properties and calculate their values from

- appropriate data;
3. Discuss how crystal structures are characterised and how they are determined experimentally;
4. Explain in terms of electron and ion interactions the various types of bonding and the crystal structures that typically result therefrom;
5. Explain how characteristic properties of metal semiconductors, polymers and ceramics depend on chemical composition and structure.

Syllabus:

Overview of mechanical, electrical and thermal properties that may be relevant to the function of an engineering product. Definitions of Young's modulus, toughness, tensile and compressive strength. Types of conduction process. Electrical conductivity and carrier mobility. Thermal expansion coefficients. Thermal conductivity. Crystalline, polycrystalline and amorphous forms of condensed matter. Atomic packing in crystals. Packing diagrams, space lattices. Miller indices. Determination of crystal structures. Bonding in solids. Metallic bonding and metallic crystals. Ionic bonds and ionic crystals. Covalent bonds in molecules, hybrid orbitales, tetrahedral bonds, covalent crystals. Hydrogen bonds. Van der Waals forces. Imperfections in crystals. Point defects, energy of formation, diffusion. Edge and screw dislocations, Burger's vector. Dislocation energy. Mobility of dislocations and its role in plastic deformation. Pinning of dislocations. Fundamental problem of materials science: clarification of the relationship between chemical composition, bonding type, crystal structure and characteristic properties. The relationship will be discussed for four solid types: metals, semiconductors, polymers and ceramics.

Textbook:

Anderson, J.C., Leaver, K.D., Rawlings, R.D. and Alexander, J.M., Materials Science, 4th edition (Chapman and Hall, 1990).

Assessment:

Continuous Assessment - 100%

AP 272: THERMODYNAMICS

Hours per week: 4 (3/1)

Objectives:

On completion of this subject the student should be able to:-

1. Define concepts of thermodynamics such as isolated, closed and open system, thermodynamic equilibrium, quasi-static and non-quasi-static processes, etc;
2. State the laws of thermodynamics and discuss some of the consequences of the first and second laws of thermodynamics;
3. Define Helmholtz and Gibbs functions; write down Maxwell relations;
4. Describe, using the Claussius-Clapeyron equation, how pressure varies with temperature of a system consisting of two phases in equilibrium;
5. Apply principles of thermodynamics to radiant energy within an enclosure.
6. Discuss classical and quantum statistics.

Syllabus:

Scope of thermodynamics. State of a thermodynamic system. Thermal equilibrium and temperature. The zeroth law of thermodynamics. Empirical and thermodynamic temperatures. Equation of state of an ideal gas. Equations of state of real gases. P-V-T surfaces for substances. Expansivity and compressibility. Concepts of work and adiabatic process. The first law of thermodynamics. Internal energy. Heat flow. The mechanical equivalent of heat. Heat capacity. Enthalpy. Some consequences of the first law. The second law of thermodynamics. Thermodynamic temperature. Entropy. Temperature-entropy diagrams. The principle of increase of entropy. The Helmholtz-Gibbs functions. Thermodynamic potentials. The Maxwell relations. Phase transitions. The Claussius-Clapeyron equation. The third law of thermodynamics. Introduction to statistical mechanics.

Textbook:

Sears, F.W. and Salinger, G.L., Thermodynamics, Kinetic Theory and Statistical Thermodynamics, 3rd edition

(Addison-Wesley, 1975).

Reference:

Zemansky, M.W. and Dittman, R.H., Heat and Thermodynamics, 6th edition (McGraw-Hill, 1981).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3hrs)

AP 271: THERMODYNAMICS

Hours per week: 4 (3/1)

Objectives:

On completion of this subject the student should be able to:

- 1 Define concepts of thermodynamics such as isolated, closed and open system, thermodynamic equilibrium, quasi-static and non-quasi-static process, etc;
- 2 State the laws of thermodynamics and discuss some of the consequences of the first and second laws of thermodynamics;
- 3 Define Helmholtz and Gibbs functions; write down Maxwell relations;
- 4 Describe, using the Claussius-Clapeyron equation, how pressure varies with temperature of a system consisting of two phases in equilibrium;
- 5 Apply principles of thermodynamics to radiant energy within an enclosure;
- 6 Discuss classical and quantum statistics.

Syllabus:

Scope of thermodynamics. State of a thermodynamic system. Thermal equilibrium and temperature. The zeroth law of thermodynamics. Empirical and thermodynamic temperatures. Equation of state of an ideal gas. Equations of state of real gases. P-V-T surfaces for substances. Expansivity and compressibility. Concepts of work and adiabatic process. The first law of thermodynamics. Internal energy. Heat flow. The mechanical equivalent of heat. Heat capacity. Enthalpy. Some consequences of the first law. The second law of thermodynamics.

Thermodynamic temperature.
Entropy. Temperature-entropy diagrams. The principle of increase of entropy.
The Helmholtz-Gibbs functions. Thermodynamic potentials. The Maxwell relations.
Phase transitions. The Clausius-Clapeyron equation. The third law of thermodynamics. Introduction to statistical mechanics in terms of energy states and energy levels. Macrostates and microstates, probability theory, Bose-Einstein, Fermi-Dirac and Maxwell-Boltzmann statistics and their distribution functions, and others if time permits.

Textbook:

Sears, F.W. and Salinger, G.L., Thermodynamics, Kinetic Theory and Statistical Thermodynamics, 3rd edition (Addison-Wesley, 1975).

Reference:

Zemansky, M.W. and Dittman, R.H., Heat and Thermodynamics, 6th edition (McGraw-Hill, 1981). Mandl, F. 1988, Statistical Physics, 2nd edition, Wiley. Finn, C.B.P., 1993. Thermal Physics, Chapman and Hall.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 3 hrs)

AP 274: CLASSICAL MECHANICS

Hours per week: 4 (3/1)

Prerequisite: AP 131

Objectives:

On completion of the subject, students should be able to:

1. Describe how a particle moves in a given situation in the simplest manner;
2. Explain the motion of a particle with reference to a coordinate system which itself is moving;
3. Define central force and discuss celestial mechanics;
4. Discuss the motion of a system of a particle;
5. Discuss the action principle for classical fields;

6. Discuss the application of Lagrangian and Hamiltonian formalisms to describe the motion of a rigid body.

Syllabus:

Review of kinematics and particle dynamics. Conservation theorems. Potential energy and conservative forces. Motion on a curve.

Translation of coordinate systems. Inertial and non-inertial reference systems. Rotation of coordinate system. Effects of Earth's rotation. Coriolis force and centrifugal force. The Foucault pendulum.

Gravitation and central forces. Gravitational potential. Motion in an inverse-square repulsive force field. Equations of motion, potential energy and differential equations describing the motion of a particle in a central force field. Centre of mass, kinetic energy, linear momentum and angular momentum of a system of particles.

Motion of two interacting bodies. The reduced mass. Collisions. The laboratory and centre of mass coordinate systems. Impulsive force. Motion of a body of variable mass. Rocket motion.

Rotation of a rigid body about a fixed axis. Moment of inertia. The physical pendulum. General theorem concerning angular momentum. Laminar motion of a rigid body. Rigid body rolling down an inclined plane.

Rotation of a rigid body about an arbitrary axis. Principal moments and product of inertia. Rotational kinetic energy of a rigid body. Principal axes and their directions. Euler's equations. Motion of a rigid body under no torques. Free rotation of a rigid body with an axis of symmetry. Gyroscopic precession. Motion of a top-Gyroscopes.

Generalised coordinates. Degrees of freedom. Constraints. D'Alembert's principle. Lagrange's equations. Calculus of variations. Hamilton's equations. Hamilton-Jacobi equations.

Textbooks:

Fowles, G.R., Analytical Mechanics, (Holt, Rinehart and Wilson, latest edition).
Goldstein, H., Poole, C. & Safko, J., Classical Mechanics (Addison Wesley, latest edition).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 3 hrs)

AP 311: ELECTROMAGNETIC FIELDS

Hours per week: 5 (3/2)

Objectives:

On completion of this subject the student should be able to:-

1. Demonstrate familiarity with the physical concepts relating to electric and magnetic fields in free space and in materials;
2. Calculate the strengths of electric and magnetic fields and their potentials in a variety of systems;
3. Apply knowledge of electromagnetic fields to solve problems of design of actual devices.

Syllabus:

Brief review of conservative fields. The electric field and electrostatic potential. Gauss's law and divergence. Deductions from Gauss's law. Earnshaw's theorem. Laplace's and Poisson's equations. Equipotentials and lines of force. Line and surface charge. Electric dipoles and quadruples. Dielectrics. Polarisation, displacement, boundary conditions for displacement and electric field. Energy in a field with dielectrics. Magnetic field of a current: the Biot-Savart Law, Ampere's Law, application to the helical solenoid.

Magnetostatic potential, magnetomotive force, vector potential. Electromagnetic induction, Faraday's laws, Lenz's law. Eddy currents and induction heating. Transmission lines. Input impedance of lossless parallel wire and coaxial lines. Mismatching, voltage standing wave ratio. Input impedance of mismatched and lossy lines.

Textbook:

Grant, I.S., and Phillips, W.R., Electromagnetism (ELBS, 1978).

Reference:

Lorrain, P., Corson, D.P. and Lorrain, F., Electromagnetic Fields and Waves (W.H. Freeman, 1988).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3hrs)

AP 321: QUANTUM MECHANICS

Hours per week: 4 (3/1)

Prerequisite: AP 211

Objectives:

On completion of this subject the student should be able to:-

1. Apply the time-independent Schrödinger equation to standard potentials;
2. Discuss orbital and spin magnetic moments in atoms
3. Explain how spin-orbit interactions affect the eigenvalue spectra;
4. Explain the importance of exchange forces in the theory of many-electron atoms;
5. Describe the standard approximation methods used in the theory of atoms and molecules;
6. Outline the applications of quantum mechanics to crystalline solids.

Syllabus:

Postulates of Schrödinger wave mechanics. The time-independent Schrödinger equation. Solution for square well potentials, barrier potentials and the Coulomb potential. Orbital magnetic moments. Electron spin. The spin-orbit interaction and total angular momentum. Application to the hydrogen atom. Relativistic corrections to the hydrogen spectrum. Transition rates and selection rules. Multi-electron atoms. Antisymmetry and the Exclusion Principle. Spin eigenfunctions. Slater determinants. Exchange forces. Matrix formulation of operator equations.

Approximation methods. Hartree SCF theory of atoms. Hartree-Fock theory. LCAO methods in molecular quantum mechanics. Electronic, vibrational and rotational spectra of molecules. Raman effect. Introduction to the quantum theory of solids. One-electron band structure. Introduction to many-body theory. Superconduction, elements of the BCS theory.

Textbook:

Eisberg, R. and Resnick, R., Quantum Physics (Wiley, 1974).

Assessment:

Continuous Assessment - 40%
Written examination - 60% (1x3hrs)

AP 342: ELECTROMAGNETIC WAVES

Hours per week: 4 (3/1)

Prerequisite: AP 311

Objectives:

On completion of this subject the student should be able to:-

1. Give a relativistic explanation of magnetic fields;
2. Explain in mathematical terms the propagation of electromagnetic waves in non-conducting and conducting media;
3. Apply given theoretical methods to practical systems, such as waveguides and antennas.

Syllabus:

Inertial reference frames. Galilean transformations, axioms of special relativity. The Lorentz transformation. The Fitzgerald contraction. Time dilation. Transformation of velocity. Relativistic mass, momentum and force. Four-vectors, the fourmomentum. Relativistic energy. Invariance of electric charge. The four-current density. The operator and wave equations. Charge conservation. Force fields of a moving point charge, the Lorentz force Maxwell's equations in differential and integral forms. Electric waves in non-conducting media. Vector and scalar potentials. Retarded

potentials. Energy flow in plane waves, Poynting vector. Reflection and refraction for non-conducting media. Phase change and polarisation. Electric waves in conducting media. Reflection at a metallic surface, skin effect. Application to the hollow rectangular waveguide. TE modes. Signal and group velocities. Attenuation. Radiation field of accelerated point charge. The single half-wavelength antenna. Brief treatment of antenna arrays.

Textbook:

Grant, I.S. and Phillips, W.R., Electromagnetism, ELBS edition (John Wiley, 1978)

Reference:

Lorrain, P., Carson, D.P. and Lorrain, F., Electromagnetic Fields and Waves, 3rd edition (W.H. Freeman, 1988).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3hrs)

AP 345: INSTRUMENTATION I

Hours per week: 4 (3/1)

Objectives:

To provide a broad understanding to general instrumentation systems. This subject together with AP346: Instrumentation II provide a sound theoretical and practical basis on Instrumentation systems, and will enable the student to think out the best measurement method, technique and apparatus to use in a given situation.

On completion of the subject, students should be able to understand and describe the following aspects and/or elements of instruments:

1. General approach to measurement, quantities and instruments
2. Analytical techniques for system analysis
3. Primary Sensing Elements
4. Transducers
5. Signal conditioning and conversion

Syllabus:

[General approach to measurement, quantities and

instruments]: Classification of variables and analogies; Generalized approach to a measuring system; Performance characteristics of instruments; Analysis of errors; units.

[Analytical techniques for system analysis]: The Laplace transforms; Transfer functions; Pole-zero plots; Polar plots; General properties of feedback systems; Assessment of Stability.

[Primary Sensing Elements]: Electrical filters; Mechanical Springs; Pressure-sensitive elements; Flow-rate sensing elements.

[Transducers]: Passive transducers; Active transducers, Digital transducers.

[Signal conditioning and conversion]: Transducer bridges; Instrumentation amplifiers; Analogue-digital data and sampling; A/D and D/A converters; Interference, grounding, screens and shielding.

Textbooks:

Barry E Jones, 1978 (24th reprint 2005). Instrumentation Measurement and Feedback. Tata McGraw-Hill.

Reference:

Bentley, J.P., 1986. Principles of Measurement Systems. Longman Group Ltd.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 3 hrs)

AP 346: INSTRUMENTATION II

Hours per week: 4 (3/1)

Prerequisite: AP 345

Objectives:

To provide a broad understanding to general instrumentation systems. This subject together with AP345: Instrumentation II provide a sound theoretical and practical basis on Instrumentation systems that will enable the students to think out the best measurement method, technique and apparatus to use in a given situation.

On completion of the subject, students should be able to understand and describe the following aspects and/or elements of instruments:

- 1 Data transmission and telemetry
- 2 Signal Recovery
- 3 Data processing, display and recording
- 4 Feedback – measuring systems and inverse transducers
- 5 System performance measurement

Syllabus:

[Data transmission and telemetry]: Modulation and encoding methods; Transmission media; Bandwidth and noise restrictions; Statistical measurements; Multiplexing.

[Signal recovery]: Signal filtering; Signal averaging; Signal correlation; signal coding.

[Data processing, display and recording]: Data processing; Data display; Data recording.

[Feedback-measuring systems and inverse transducers]: Feedback for control and measurement; balance; Temperature balance; Inverse transducers

[System performance measurement]: System inputs; System linearity and distortion; Fourier analysis and synthesis; Sinewave testing; Pulse testing; Random-noise test signals; Time and frequency domain analysis equipment.

Textbooks:

Barry E Jones, 1978 (24th reprint 2005). Instrumentation Measurement and Feedback. Tata McGraw-Hill.

Reference:

Bentley, J.P., 1986. Principles of Measurement Systems. Longman Group Ltd.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 3 hrs)

AP 352: SOLID STATE PHYSICS

Hours per week: 4 (3/1)

Prerequisite: AP 321

Objectives:

On completion of this subject the student should be able to:-

1. Discuss the problems with which solid state

- physics is concerned;
2. Explain the meaning of band structure;
 3. Apply band structure to the explanation of electrical properties of metals, semiconductors and dielectrics;
 4. Explain the origin of the rectification properties junctions;
 5. Discuss transport properties from a general point of view.

Syllabus:

Review of questions on the properties of solids that solid state physics attempts to answer.

Review of bonding types and crystal structures. Electrons in crystals. The crystal potential. Reciprocal space. Brillouin zones. Crystal wave functions, Bloch Theorem. Eigenvalues of the crystal wave equation, energy band structure. Nearly-free electron model. Classification of materials as conductors, insulators or semiconductors. Dynamics of electrons in a crystal lattice. Effective mass. The hole concept. Density of states function. Electron statistics. The Fermi function, the Fermi level. Temperature dependence of the Fermi level. Intrinsic semiconductors. Electron distributions. Dependence of Fermi level on temperature and effective mass. Extrinsic semiconductors. Electron distributions and their temperature dependence. Metal-semiconductor contacts. Contact potential. Depletion layer. Junction rectifiers. Introduction to electron transport phenomena. Electrical and thermal current densities. Boltzmann transport equation. Hall effect in metals and semiconductors.

Textbook:

Myers, H.P., Introductory Solid State Physics, (Taylor Francis, 1990).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3hrs)

AP 352: SOLID STATE PHYSICS

Hours per week: 4 (3/1)

Objectives:

On completion of this subject the student should be able to:

1. Discuss the problems with which solid state physics is concerned;
2. Explain the meaning of band structure;
3. Discuss the BCS theory of superconductivity and its inability to explain high temperature super conduction;
4. Explain the concepts of dia, para and ferromagnetism.

Syllabus:

Review of questions on the properties of solids that solid state physics attempts to answer.

Review of bonding types and crystal structures. Crystals of inert gases-London interaction-Ionic crystals-covalent crystals-elastic constants-Crystal vibrations-Phonons-first Brillouin zones-force constants-quantization of elastic waves-Thermal properties of phonons-heat capacity-Debye * Einstein models of density of states-Thermal conductivity-resistivity of phonon gas.

Super-conductivity. Review of experimental results. Influence of magnetic fields, the Meissner effect, type I and II superconductors. The superconducting gap. Isotope effect. Elements of BCS theory. Tunneling, a.c. and d.c. Josephson effects. Introduction to ceramic superconductors.

Quantum theory of diamagnetism and paramagnetism. Spectroscopic g factor. Susceptibility. Ferromagnetism. Curie temperature and exchange integral. Temperature dependence of Saturation Magnetization. Magnons. Neutron magnetic scattering. Antiferromagnetism. Ferrimagnetism. Ferromagnetic domains-Origin of Domains-Coercive force and Hysteresis.

Textbook:

Kittel, C., Introductory to Solid State Physics, 8th edition (John Wiley, 2005)

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 3hrs)

AP 353: FEEDBACK INSTRUMENTATION

Hours per week: 4 (3/1)

Objectives:

On completion of this subject the students should be able to describe:-

1. Feedback for measurement and control system;
2. Instrument control system.

Syllabus:

General properties of feedback systems; steady-state error and performance criteria; assessment of stability; s domain and frequency approaches. Feedback for control and measurement; similarities and differences. Feedback measuring systems; types of system.

Instrument systems. Case studies will be used which illustrate the use of feedback in both measurement and instrument control applications and indicate means of system design.

Textbooks:

Schwarzenback, J. and Gill, K.F., System Modelling and Control (2nd Edition) Arnold, 1984. Jones, B.E., Instrumentation Measurement and Feedback, McGraw Hill, 1977.

Reference:

Students will be referred to appropriate material during the lectures.

Assessment:

Continuous assessment - 40%
Written examination - 60% (1x3hrs)

AP 372: RIGID BODY DYNAMICS

Hours per week: 4 (3/1)

Objectives:

On completion of this subject the student should be able to:-

1. Describe how a particle moves in a given situation in the simplest manner;
2. Explain the motion of a particle with reference to a coordinate system which itself is moving;
3. Define central force and discuss celestial

mechanics;

4. Discuss the motion of a system of particles;
5. Discuss the motion of a rigid body.

Syllabus:

Review of kinematics and particle dynamics. Potential energy and conservative forces. Motion on a curve. Translation of coordinate systems. Inertial reference system. Rotation of coordinate system, non-inertial reference systems. Effect of earth's rotation. The

Foucault pendulum. Law of gravity. Potential energy in a gravitational field. Angular momentum in a central force field. Motion in an inverse-square repulsive force field.

Central mass and linear momentum of a system of particles. Kinetic energy of a system of particles. Motion of two interacting bodies.

The reduced mass. Collisions. The laboratory and centre of mass coordinate systems. Impulse. Motion of a body of variable mass. Static equilibrium of a rigid body about a fixed axis. Moment of inertia. Planar motion of a rigid body. Rigid body rolling down an inclined plane. Motion of rigid body under an impulsive force.

Angular momentum of a rigid body. Principal axes of a rigid body. Moment of inertia of a rigid body about an arbitrary axis. Rotational kinetic energy of a rigid body. Euler's equations. Motion of a rigid body under no torques. Free rotation of a rigid body with an axis of symmetry. Gyroscopic precession. Motion of a top.

Textbook:

Fowles, G.R., Analytical Mechanics, 4th edition (Holt, Rinehart and Wilson, 1986).

Reference:

Becker, R.A., Introduction to Theoretical Mechanics, (McGraw-Hill, 1954).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3hrs)

AP 373: QUANTUM PHYSICS

Hours per week: 4 (3/1)

Objectives:

On completion of the subject, students should be able to:

- Understand and explain at least three experimental results which lead to the overthrow of some of the concepts of classical physics
- Explain and apply the new concepts and formalism which were introduced to replace classical physics
- Use the formalism of quantum mechanics to solve simple problems, including applications to the hydrogen atom, orbital and spin angular momentum, atomic spectra, etc
- Discuss the conceptual problems of quantum mechanics, including the measurement problem, entanglement and non-locality.

Syllabus:

- **Introduction:**
 - Photoelectric Effect
 - Compton Effect
 - Davisson-Germer experiment
 - De Broglie waves
 - Wave-particle duality
- **Schrodinger Equation**
 - Postulates of quantum mechanics,
 - Heisenberg Uncertainty Principle,
 - Eigenvalues and eigenstates,
 - Free particle solution
- **Simple Applications**
 - Infinite potential well,
 - Finite potential well,
 - Barriers and steps,
 - Tunneling,
 - Simple harmonic oscillator in one-dimension
- **Hydrogen Atom**
 - Rutherford scattering
 - Bohr model of atom
 - Central field solution
 - Quantum numbers
 - Probability density
 - Expectation values

- **Angular Momentum**

- Vector diagrams
- Space quantization
- Interaction with a magnetic field (Zeeman Effect)
- Stern-Gerlach experiment
- Spin angular momentum

- **Atoms**

- Pauli Exclusion Principle
- Atomic spectra

Textbooks:

Eisberg, R. and Resnick, R., Quantum Physics (Wiley).

Serway, Moses and Moyer, Modern Physics, 3rd ed. Thomson/Brooks Cole.

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1 x 3 hrs)

AP 382: PHYSICAL ELECTRONICS

Hours per week: 4 (3/1)

Objectives:

On completion of this subject the student should be able to:-

1. Describe the basic properties of solids as they relate to semiconductors;
2. Discuss the crystal structure and electron band structure of semiconductors and derive relationships for the basic electrical properties of semiconductors;
3. Explain the operation of a p-n junction and derive the Shockley diode equation;
4. Discuss quantitatively the operation and electrical characteristics of MOST's and CCD devices;
5. Describe the operation of the bipolar transistor and derive expressions for the common figures of merit of such devices.

Syllabus:

Review of quantum physics and electrons in solids that is relevant to the physics of semiconductors. Crystal structure of common semiconductors. Energy band model of semiconductors, intrinsic and extrinsic

conduction. Calculation of electron and hole densities and the Fermi level in each case, charge transport, drift, diffusion, mobility.

The p-n Junction. Fabrication of practical p-n junction diodes: alloying, diffusion, ion implantation, photoengraving. Quantitative discussion of p-n junctions in equilibrium: drift, diffusion, Fermi level, built in potential, space charge region. Current flow in p-n junctions: drift and diffusion currents, Shockley diode equation, majority and minority currents.

MOST and CCD devices: MOS capacitor, MOS transistor operation, MOST I-V characteristics. Charge storage and coupling, CCD structures: 2 and 3 phase and buried channel devices.

Bipolar Transistor: Fundamentals of bipolar transistor operation, current flow in a typical device, definition of figures of merit. Terminal currents and their relationship with figures of merit.

Textbook:

Seymour, J., Electronic Devices and Components, 2nd edition (Longman, 1988).

Reference:

Sparkes, J.J., Semiconductor Devices (Van Nostrand Reinhold, 1987). Bar Lev, A., Semiconductors and Electron Devices, 2nd edition (Prentice Hall, 1984).

Assessment:

Continuous assessment - 40%

Written examination - 60% (1x3hrs)

AP 382: PHYSICAL ELECTRONICS

Hours per week: 4 (3/1)

Objectives:

On completion of this subject the student should be able to:

1. Describe the basic properties of solids as they relate to semiconductors;
2. Discuss the crystal structure and electron band structure of semiconductors, derive relationships for the basic electrical properties of semiconductors and to know the

importance of transport equation;

3. Explain the operation of a p-n junction and derive the Shockley diode equation;
4. Describe the operation of the bipolar transistor and derive expressions for the common figures of merit of such devices.
5. Discuss quantitatively the operation and electrical characteristics of MOST's and CCD devices and also of LED, LDR and solar cells.

Syllabus:

Review of quantum physics and electrons in solids that is relevant to the physics of semiconductors.

Classification of materials as conductors, insulators or semiconductors. Crystal structure of common semiconductors. Energy band model of semiconductors, Effective mass. The hole concept. Density of states function. Electron statistics. Fermi level and Fermi function; Intrinsic and Extrinsic semiconductors; Calculation of electron and hole densities and the Fermi level in each case, charge transport, drift, diffusion, mobility. Temperature and effective mass dependence of Fermi level.

The p-n junction diode, formation of a barrier, contact potential, space charge region, biasing of a junction, current flow in p-n junction, drift and diffusion currents, Fermi level, derivation of Shockley diode equation, Junction rectifiers.

Fabrication of practical p-n junction diodes: alloying, diffusion, ion implantation, photoengraving.

Introduction to electron transport phenomena. Boltzmann transport equation. Hall effect in metals and semiconductors.

Bipolar Transistor: Fundamentals of bipolar transistor operation, current flow in a typical device, Input and output characteristics of the bipolar transistors, Figure of merit of such devices.

Brief Introduction of LED, LDR, Solar cells, tunnel diodes, MOST and CCD devices.

Textbook:

Seymour, J., Electronic Devices and Components, 2nd edition (Longman, 1988).
Simon M. Sze, Kwok K. Ng, Physics of Semiconductor Devices; 3rd Edition, Wiley, 2006.

Reference:

Sparkes, J.J., Semiconductor Devices (Van Nostrand Reinhold, 1987).
Bar Lev, A., Semiconductors and Electron Devices, 2nd edition (Prentice Hall, 1984).

Assessment:

Continuous assessment - 40%
Written examination. - 60% (1 x 3 hrs)

AP 401: PROJECT**Hours per week: 6****Objectives:**

On completion of this subject, students should be able to:-

1. Identify, select and develop small research projects relevant to Applied Physics.
2. Carry out literature surveys related to the selected topics.
3. Demonstrate the ability to plan a schedule of research activities to complete the project in time.

Syllabus:

Under the guidance of Academic Staff students select theoretical or experimental research topics relevant to Applied Physics with Electronics and Instrumentation. Students conduct a literature search on chosen topics, propose the research methodology and a schedule of their research activities. Students, in consultation with staff supervisors, design and set up research equipment and give progress reports at the Departmental research seminars.

Assessment:

Continuous Assessment - 100%

AP 402: PROJECT**Hours per week: 6****Objectives:**

On completion of this subject, students should be able to:-

1. Design and carry out a simple research work.
2. Plan an experiment with accuracy appropriate to its purpose.
3. Collect and interpret obtained results.
4. Take steps to minimise errors in methods and instruments.
5. Write a standard report on the project work.

Syllabus:

Students carry out research on approved project proposals, collect data and interpret research results. Students give seminars on research findings, write the final standard reports on the project work and submit reports to examiners for assessment.

Assessment:

Continuous Assessment - 100%

AP 411: ADVANCED SOLID STATE PHYSICS**Hours per week: 4 (3/1)****Prerequisite: AP 352****Objectives:**

On completion of this subject the student should be able to:-

1. Discuss in detail the theory of lattice vibrations;
2. Explain the physics of excitations in the electron gas;
3. Discuss the various optical electronic excitations in crystals and explain the physics of photoemission spectroscopy;
4. Discuss the BCS theory of superconductivity and its inability to explain high temperature superconduction;
5. Explain the magnetic properties of crystals and the uses of magnetic resonance spectroscopy.

Syllabus:

Lattice vibrations. Einstein and Debye models of specific heat. The linear lattice, mode counting. Acoustic and optical modes. Phonons. Vibrational spectra of three dimensional lattices. Plasma oscillations in the electron gas. Plasmons. Electrostatic screening in metals. Metal-insulator transitions. Polaritons. Electron-phonon coupling. Polarons. Optical excitations in solids. Excitons. Frenkel excitons, Mott-Wannier excitons. Exciton condensation. Inelastic scattering, the Raman effect. X-ray photoemission spectroscopy, ultraviolet photoemission spectroscopy. ESCA. Superconductivity. Review of experimental results. Influence of magnetic fields, the meissner effect, type I and II superconductors. The superconducting gap. Isotope effect. Elements of BCS theory. Tunnelling, a.c. and d.c. Josephson effects. Introduction to ceramic superconductors. Magnetic phenomena in crystals. Quantum theory of diamagnetism and paramagnetism. Spectroscopic g factor. Susceptibility. Ferromagnetism. Curie point. Magnons. Neutron magnetic scattering. Antiferromagnetism. Ferrimagnetism. Domain theory. Introduction to magnetic resonance spectroscopy.

Textbook:

Kittel, C., Introduction to Solid State Physics, 6th edition (Wiley, 1986)

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3hrs)

AP 412: ELECTROMAGNETIC SHIELDING AND NOISE SUPPRESSION

Hours per week: 4 (3/1)

Objectives:

On completion of this subject the student should be able to describe:-

1. The ability of an electronic instrument system to function properly in its intended electromagnetic environment;
2. The ability of an electronic instrument system

not to be a source of pollution to an environment;

3. The practical aspects of electromagnetic interference suppression and control in electronic instrumentation system.

Syllabus:

Classification of interference; source, modes of coupling. Electromagnetic fields; characteristics of far and near fields. Shielding effectiveness of conducting shields against radiated electromagnetic interference; shielding characteristics in near and far fields. Shielding against conducted interference. Shielding performance of electronic components; cables; connectors and enclosures.

Textbook:

Ott, H.W., Noise Reduction Techniques in Electronic Systems, (2nd Edition) Wiley & Sons, 1988.

Reference:

Students will be referred to appropriate material during the lectures.

Assessment:

Continuous assessment - 40%
Written examination - 60% (1x3hrs)

AP 422: MODERN OPTICS AND LASERS

Hours per week: 4 (3/1)

Prerequisite: AP 352

Objectives:

On completion of this subject the student should be able to:-

1. Discuss the fundamentals of modern optics;
2. Understand the theories of coherence, diffraction and interference;
3. Explain reflection, refraction and polarization of light using Fresnel's equations;
4. Discuss the processes of amplification of light;
5. Discuss the operation and performance of typical laser systems;
6. Describe the operation, performance and application of some optical devices.

Syllabus:

The electromagnetic nature of light. The scalar wave equation and its solution. The complex wave function. Polarization of light.

Fresnel's equations for reflection and refraction of light at a plane boundary. Theory of coherence. Theory of multiple-beam interference. High-reflectance and antireflecting films. Fraunhofer and Fresnel diffraction theories. Laws of geometric optics.

Introduction to holography and holographic interferometry. Spontaneous and stimulated emission of photons. Amplification of light in a medium. Methods of producing a population inversion, two, three and four level systems. Optical-resonator theory. Typical gas, solid state and semiconductor lasers. Tunable lasers. Applications of lasers. Optical modulation: magneto-optic and electro-optic effects. Photodetectors and light emitting diodes.

Textbook:

Guenther, R.D., Modern Optics (Wiley, 1990).

References:

Jones, K.A., Introduction to Optical Electronics (Harper and Row, 1987).

Watson, J., Optoelectronics (Van Nostrand Reinhold (UK) Co Ltd, 1988).

Fowles, G.R., Introduction to Modern Optics (Holt, Rinehart and Winston, 1968).

Assessment:

Continuous assessment - 40%

Written Examination - 60% (1x3 hours)

AP 432: PHYSICS OF THE ENVIRONMENT

Hours per week: 4 (3/1)

Objectives:

On completion of this subject the student should be able to:-

1. State the scope of environmental physics;
2. List the main parameters that determine the survival of the species in the physical environment of plants and animals;
3. Explain the behaviour of a system and state the simplest way of describing it in terms of

governing concepts such as Boyle's Law and Newton's Laws of motion;

4. Explain the central notion of the exchange of radiation, heat, mass and momentum between organisms and their environment;
5. Describe rates of various transfer and exchange between organisms and their environment by electrical analogues or use of Ohm's Law.

Syllabus:

Scope of environmental physics including the main components determining the survival of species. Review of Gas laws. The physical properties of gases in the exchanges that take place between organisms and their environment. Transport laws involving molecular transfer processes. Direct and diffuse solar radiation, terrestrial radiation as energy source for the environment. Heat and mass transfer sustained by molecular diffusion through a boundary layer in contact with the surface. Review of heat transfer by free and forced convection and conduction in solids and still gases. Steady state heat balance in particular the heat flow in soil; its thermal properties and analysis. Profiles and fluxes of crop/trees and the measurement of flux above canopy by method of aerodynamic, Bowen ratio and Eddy correlation. Resistance analogues as a means of interpretation of measurements of rate of exchange of entities in an environment; eg carbon dioxide and growth, sulphur dioxide and pollutant fluxes to crops.

Textbook:

Monteith, J.L. and Unsworth, M.H., Principles of Environmental Physics, 2nd edition (Chapman and Hall, 1990).

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1x3hrs)

AP 442: RADIATION PHYSICS

Hours per week: 4 (3/1)

Objectives:

On completion of this subject the student should

be able to:-

1. Describe the theoretical aspects of alpha, beta and gamma decay processes;
2. Describe the techniques used in charged particle acceleration and some accelerator types;
3. Outline the different nuclear analytical methods and the domain of application of each;
4. Explain the general principles of the application of nuclear radiation to problems in mining, industry, medicine and the environment;
5. Discuss the practical aspects of radiation laboratory management, shielding and radiation protection.

Syllabus:

Alpha, beta and gamma decay processes. Theory of gamma decay, quantum mechanical tunnelling, the Gamow factor, alpha decay spectroscopy. Types of beta decay processes, x-rays following beta decay, the Fermi theory of beta decay. Energetics of gamma decay, internal conversion, isomeric transitions, branching ratios and lifetimes of excited states. Review of the interaction of gamma rays with matter.

Charged particle acceleration. Ion sources and principles of acceleration. A survey of accelerator types. Radiation measurement and spectroscopy. Scintillation detectors; NaI (Tl) detector, characteristics and resolving time; liquid scintillation counting, quenching. Solid state detectors, the HPGe and HPSi detectors. Photopeak efficiencies and multichannel pulse height analysis. Detector resolution. Nuclear analytical methods. Thermal and fast neutron activation, neutron sources and neutron reactions, reaction cross sections, energy dependence, resonance. Neutron activation analysis, applications. X-ray fluorescence analysis, the yield equation, sources, domain of application, analytical parameters. Track analysis, principles, fission and charged particle tracks, radon measurements. Isotope dilution and solvent extraction methods of radiometric analysis. Radiation shielding and protection. Attenuation coefficients and half thicknesses, neutron shielding. Maximum permissible doses. Radioactive waste disposal. Decontamination procedures.

Textbook:

Krane, K.S., Introductory Nuclear Physics, (J. Wiley and Sons, 1988).

Reference:

Knoll, G., Radiation Detection and Measurement, (J. Wiley and Sons, 1989).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3hrs)

AP 443: GLOBAL GEOPHYSICS

Hours per week: 4(3/1)

Objectives:

On completion of this subject the student should be able to:-

1. Describe briefly the interior of the Earth and the basis of its stratification.
2. Describe how Earth's gravity field accounts for the internal mass distribution and how isostatic compensation accounts for the surface undulation of the Earth.
3. Explain the origin of geomagnetic fields, the effects of both internal and external variations and Earth's rotation
4. Explain how seismology reveals the broad divisions of the Earth into crust, mantle and core, how this discipline provides the most certain information on the parts of the Earth which can not be directly examined
5. Establish a time scale for events in the past history of the Earth and to show how the varying distribution of the products of radioactive distribution provides a means of tracing the history of minerals.
6. Explain detailed characteristics of the modern concepts of plate tectonics and continental drift.

Syllabus:

Origin and development of solar system,, the planet: Earth – its evolution, surface features, structures and chemical compositions.

The dynamic Earth, crust, mantle and core, phase changes, lithosphere and asthenosphere boundary. The Earth's gravity field and its measurement, gravimeters, figure of earth, gravity formula,

geoid, Mechanism of isostatic compensation, Earth tide.

The Earth's magnetic field and its measurement, magnetometers, dynamo theories, time variation of the magnetic field.

Seismology and global tectonics, seismic wave propagation, seismic body waves, travel-time tables, Surface waves, free oscillations.

Earthquakes: cause, magnitude and energy, seismicity, faults and fractures, theory of elastic rebound, source mechanism, fault plane solution, tsunamis, seismographs, synthetic seismograms, strategies for earthquake prediction.

Age and thermal state of Earth, radioactivity and geochronology, heat flow measurements, volcanic eruptions.

Concepts of modern plate tectonics, plate motion and driving force, seafloor spreading and continental drift, mantle convection, geophysical history of Papua New Guinea.

Textbook:

Garland, G.D., Introduction to Geophysics, 3rd edition (W.B. Saunders Co., 1982).

Reference:

Bullen, K.E. and Bolt, B., An Introduction to Seismology, 4th edition (Cambridge University Press, 1986). Aki, K. and Richards, P.G., Quantitative Seismology - Theory and Methods, (Freeman, 1980). Kenneth, B.L.N., Seismic Wave Propagation in Stratified Media, (Cambridge University Press, 1983).

Assesment:

Continuous Assessment - 40%
Written examination - 60% (1x3 hrs)

AP 461: COMPUTER SIMULATION

Hours per week: 4 (3/1)

Objectives:

On completion of this subject the student should be able to:-

1. Use computers to solve physics problems;
2. Simulate physical phenomena and compare with experimental results.

Syllabus:

Introduction of computer simulation in physics. The Euler algorithm, coffee cooling problem. The force on a falling object, Euler method for Newton's law of motion. Two body problem, the equations of motion. Simple linear and non-linear systems, numerical simulation of the harmonic oscillator. Numerical integration, Monte Carlo methods.

Textbook:

Gould, H. and Tobochnik, J, An Introduction to Computer Simulation Methods (2nd Edition), (Addison-Wesley 1996)

Reference:

Stauffer, D., Hehl, F.W., Winkelmann, V., Zabolitzky, J.G., Computer Simulation and Computer Algebra (2nd Edition), (Springer-Verlag 1988)

Assessment:

Continuous assessment - 100%

AP 462: ENERGY SOURCES

Hours per week: 4 (3/1)

Prerequisite: AP 431

Objectives:

On completion of this subject the student should be able to:-

1. Give examples of renewable and non-renewable energy sources
2. Discuss the variables affecting the direct uses of solar radiation
3. Explain the photovoltaic process by which solar energy is converted into electricity
4. Discuss solar cell design parameters
5. Discuss the design of mechanical hydro pumps and of hydroelectric systems
6. Explain how energy is obtained from the wind, the oceans and the Earth's interior
7. Discuss factors affecting the storage and distribution of energy from each kind of generator.

Syllabus:

Types of energy: mechanical, electromagnetic, thermal, nuclear and chemical.

Energy sources, their classification as renewable or non-renewable. Review of fluid mechanics. Bernoulli's equation. Viscosity. Laminar and turbulent flow in pipes. Review of heat transfer processes. Transfer of heat by mass transport. Circuit analogues. Direct applications of solar energy: space and water heating, distillation of water, crop and timber drying. Indirect applications of solar energy: photovoltaics, effect of radiation on the p-n junction. Design of solar cells. Hydro-power. Mechanical considerations. The hydraulic ram pump. Micro hydroelectric schemes. Wind power. Wind characteristics. Types of wind turbine. Thrust, torque and drag. Efficiency of energy extraction, dynamic matching. Mechanical power and electricity generation.

Geophysical energy sources: ocean thermal energy conversion, geothermal energy. Design of heat exchangers. Energy storage and distribution. Chemical and electrical storage, fuel cells. Mechanical storage. Factors affecting distribution.

Textbook:

Twidell, J.W. and Weir, A.D., Renewable Energy Resources (C.U.P., 1986).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hours)

AP 471: INDUSTRIAL TRAINING

Period: 5 weeks industrial training accumulated during the vacations of the BSAP course.

Objectives:

On completion of this subject the student should be able to:-

1. Be familiar with aspects of industrial activities and facilities;
2. Work as a practical Applied Physicist;
3. Write a technical report.

Syllabus:

Training in industry. Perform a short practical project. Write a technical report on the project.

Assessment:

Continuous Assessment - 100%

AP 472: POLYMER PHYSICS

Hours per week: 4 (3/1)

Prerequisite: AP262, AP352

Objectives:

On completion of this subject the student should be able to:-

1. Give full information on composition, structure and morphology of polymers
2. Discuss the relationship between this information and mechanical properties
3. Explain how molecular and crystal symmetry affect electronic band structure
4. Explain how electronic excitations determine electrical and optical properties.

Syllabus:

Chemical composition and molecular structure of linear homopolymers, cis and transforms. Branching, cross-linking and network formation. Ordered and disordered chain formation. Rubbers and glasses, glass transition temperature. Crystal structure of common polymers. Polymer morphology in films and fibres. Mechanical properties of common polymers. Young's modulus, effect of degree of crystallinity and cross-linking. Elasticity. Dynamic mechanical behaviour. Drawing and plastic flow. Polymer symmetry groups. Electronic band structure. Optical properties of polymers, birefringence. Light scattering in films. UV absorption spectra, band structure interpretation. IR absorption spectra and interpretation in terms of molecular motions. Electrical properties of polymers. Dielectric relaxation in solid polymers, Maxwell-Wagner effect. Electrical conductivity. Mechanisms of dielectric breakdown. Organic semiconductors. Inorganic polymers. Superconduction in polymers.

Textbook:

Mark, J.E., Physical Properties of Polymers (American Chemical Society, 1984). Blythe, A.R., Electrical Properties of Polymers (Cambridge University Press, 1980).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hours)

AP 484: EXPLORATION GEOPHYSICS

Hours per week: 4(3/1)

Prerequisite: AP443

Objectives:

On completion of this subject the student should be able to:-

1. Discuss the general characteristics of Earth's crustal layer.
2. Discuss the properties of sedimentary and tectonic structures favorable for the localization of Petroleum and minerals.
3. Describe the principles, applications and limitations of the important geophysical exploration methods.
4. Explain the techniques of geophysical methods.
5. Case histories of the major fields of application of geophysical methods.

Syllabus:

The Earth's crust, resources of the Earth, geological properties of the sedimentary and tectonic structures favorable for the localisation of petroleum and mineral deposits.

Methods of geophysical exploration, principles, application and limitations,,

Detailed discussion on data acquisition, processing and interpretation in geophysical exploration methods: gravity, magnetics, seismic, telluric, magnetotelluric, AFMAG, electrical, electromagnetic, radiometric.

Vertical seismic profiling, geophysical tomography, geophysical borehole logging and remote sensing, Mining geophysics.

Geophysical data processing: spectral analysis, waveform processing and digital filtering, seismic signal analysis.

Case histories of the major fields of application of geophysical methods.

Textbook:

Grant, F.S. and West, G.F., Interpretation Theory in Applied Geophysics (McGraw-Hill, 1965).

Reference:

Telford, W.M., Geldart, L.P., Sheriff, R.E. and Deys, D.A., Applied Geophysics (McGraw-Hill, 1976). Dobrin, M.B., Introduction to Geophysical Prospecting (McGraw-Hill, 1976). Kearey, P. and Brooks, M., An Introduction to Geophysical Exploration (Blackwell, 1984). Aki, K. and Richards, P.G., Quantitative Seismology – Theory and Methods (Freeman, 1980).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

AP 492: PHYSICS OF NON-DESTRUCTIVE TESTING

Hours per week: 6 (4/2)

Prerequisites: AP 311

Objectives:

On completion of this subject the student should be able to:-

1. Discuss the various kinds of mechanical Waves in solids and at interfaces
2. Explain how ultrasonic waves are generated and how they are used to detect imperfections in solids
3. Explain the physical basis of eddy current methods of defect detection
4. Discuss the physical basis of holography and explain how holography is employed in non-destructive testing.

Syllabus:

Ultrasonics. Review of elementary wave theory. Bulk waves in solids, longitudinal (compression) waves and transverse (shear) waves.

Polarization. Expressions for velocity of compression and shear waves.

Surface waves in solids. Free surfaces, Rayleigh waves. Dispersion relations. Liquid/Solid and solid/solid interfaces. Stoneley waves. Love waves. Lamb waves.

Acoustic impedance of boundaries. Mode conversion. Ultrasonic optics. Diffraction effects. Attenuation.

Ultrasonic generators. Piezoelectric effect. Magnetostrictive effect. Electromagnetic-acoustic effect. Thermoelastic effect. Practical applications. Probe output and calibration. Distance-amplitude correction. Probe configurations. Detection and characterization of defects. Electromagnetic methods. The impedance plane diagram. Skin effect. Eddy current methods. Pulsed eddy currents. Probe design and instrumentation.

Holography. Coherence and interference of light rays. Summary of hologram types: transmission, reflection and phase holograms. Fresnel diffraction and the zone plate. Optical holography, speckle pattern interferometry. Acoustic holography. Neutron holography.

Textbook:

Halmshaw, R., Non-Destructive Testing, 2nd edition, (Edward Arnold, 1991).

Assessment:

Continuous assessment - 40%
Written examination - 60%

PH 101: PHYSICS FOR ARCHITECTS AND BUILDERS

Hours per week: 4

Objectives:

On completion of this subject the student should be able to:-

1. Explain basic physical quantities, units and uncertainties that exist in measurements and experiments.
2. Describe and analyze motion of particles in one dimension and in circular path.
3. Apply correct the concepts of force, mass and motion to work, energy and power.
4. Should solve problems in rotational dynamics and explain applications of torque.
5. Explain the properties of fluids at rest

(Pascal's and Archimedes Principles) and in motion.

6. Discuss and explain the properties of matter in terms of Hooke's law.
7. Describe and apply the fundamentals of thermal physics
8. Explain the wave phenomena in sound; light and electromagnetic radiation.
9. Describe and apply basic laws of electrostatics, circuit theory and explain applications in electromagnetism.

Syllabus:

Measurements, one-dimensional motion, description and laws of motion. Force and motion, work, energy and power. Circular motion and rotational dynamics. Properties of solids, Hooke's law and elasticity. Fluidstatics, Pascal's and Archimedes principles and fluid dynamics. Thermometers, thermal expansion and heat transfer. Calorimetry and latent heat. Gas laws. Waves, types of waves, sound, light and geometrical optics, optical instruments. Electrostatics, Current, Ohms law and circuit theory. Magnetism and induction.

Textbook:

Young, H.D. University Physics, 8th Edition (Eddison-Wesley, 1992).

Assessment:

Continuous Assessment - 50%
Written Exam - 50%

PH 103: PHYSICS FOR SURVEYORS I

Hours per week: 4 (2/2)

Objectives:

On Completion of this subject the student should be able to:-

1. Rationalise units, estimates errors and define basic physical quantities;
2. Analyse one-dimensional particle motion and circular motion;
3. Apply the basic principles of mechanics involving force momentum, work, energy and power;
4. Discuss the properties of fluid at rest and in

- motion;
5. Discuss the fundamentals of thermal physics;
6. Explain the wave phenomena in sound.

Syllabus:

Mechanics: Measurements; motion in one dimension; force; vector concept; momentum; energy; work and power; conservation of energy and momentum; circular motion; pressure; density; Pascal's and Archimedes' principles. Heat: Nature of heat; change of state; expansion and heat transfer. Gas laws. Waves: Wave concepts; wave phenomena; sound.

Textbook:

Young, H. D., University Physics, 8th edition, (Addison-Wesley, 1992).

Assessment:

Continuous assessment - 50%
Written examination - 50% (1x3 hrs)

PH 104: PHYSICS FOR SURVEYORS II

Hours per week: 4 (2/2)

Prerequisite: PH 103

Objectives:

On Completion of this subject the student should be able to:-

1. Explain the concepts of different fields,
2. Apply the basic laws of electrostatics and electrodynamics,
3. Discuss the fundamentals of optics,
4. Discuss the use of different instruments with reference to surveying,
5. Outline the ideas of quantum theory and modern physics.

Syllabus:

Fields: Gravitational fields; electric field; electrostatics; magnetic field; electromagnetic induction and applications. Current electricity: Conduction; electron flow; resistance; energy and power; electricity in home. Optics: Light and colour; reflection; refraction; diffraction; interference; optical and sonar instruments with reference to surveying. Modern Physics: Brief

description of the following: atomic structure; spectra; waves and particles; basic quantum theory; photoelectric effect; mass energy equivalence; rest and moving mass; frames of reference. Instrumentation - as applied to surveying, also basic electronic components (black box treatment).

Textbook:

Young, H. D., University Physics, 8th edition, (Addison-Wesley, 1992).

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3hours)

PH 113: PHYSICS FOR COMPUTER SCIENCE I

Hours per week: 5 (3/2)

Objectives:

The aim of this subject is to make students aware of how physical concepts and principles relate and constrain the design and operation of computers today. On completion of this subject the student should be able to:-

1. Analyse physical situations using the concepts of force, impulse, mass, momentum and energy;
2. Explain the general properties of waves, and their applications;
3. Discuss the thermal properties of materials.

Syllabus:

Fundamental physical quantities and units. Concepts of linear and uniform circular motion. Concepts of mass, force, impulse and momentum. Work, energy and power. Conservation of energy. Oscillations and waves. Classification of waves; the wave function and superposition of waves. Simple applications of the superposition principle to interference and diffraction. Thermal Properties. Temperature, heat capacities, thermal expansion, thermal conduction. Applications to heat sinks and insulators.

Textbook:

H.D. Young, "University Physics", Addison-Wesley, 8th Edition (1992)

Assessment:

Continuous assessment - 40%
Written Examination - 60% (1 x 3 hrs)

PH 114: PHYSICS FOR COMPUTER SCIENCE II

Hours per week: 5 (3/2)

Prerequisite: PH 113

Objectives:

The aim of this subject is to make students aware of how physical concepts and principles relate and constrain the design and operation of computers today. On completion of this subject the student should be able to:-

1. Discuss concepts of electrostatics and its applications;
2. Calculate currents in simple branched circuits;
3. Apply the laws of electromagnetism to simple problems;
4. Analyse the behaviour of alternating current circuits;
5. Describe the action of simple electronics devices.

Syllabus:

Electrostatics. Coulomb's law. Electric potential, capacitance. Current electricity. Ohm's law; electromotive force and the circuit equation. Kirchhoff's rules; simple bridge circuits. Magnetism. magnetic force on a current-carrying conductor, the electric motor. magnetic force due to a current; the Biot-Savart law. Force between currents. Laws of electromagnetic induction, eddy currents, self inductance and the transformer. RL, LC and LRC circuits. Alternating currents; resistance and reactance. Power. Resonance circuits. Electronics. Digital electronics. Logic gates, flip-flops, counters and displays. Semiconductors. Transistors. Operational amplifiers. Single and three-phase power supply. Computer power supply and its protection.

Textbook:

H.D. Young, "University Physics", Addison-Wesley, 8th Edition (1992)

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

PH 141: PRINCIPLES OF PHYSICS I

Hours per week: 5 (4/1)

Objective:

On completion of this subject the student should be able to:-

1. Apply principles of statics to Engineering problems
2. Analyse particle motion in one and two dimensions
3. Use the concepts of force, impulse, mass, momentum, work and energy to solve problems in linear and planar motion
4. Explain the characteristics of waves
5. Solve problems on the wave function.
6. Explain wave phenomena of interference and diffraction.

Syllabus:

Fundamental physical quantities and units. Statics: Equilibrium of forces and moments. Free body diagrams vectors. Concepts of motion, velocity and acceleration as vectors. Application of the kinematic equations to linear, parabolic and circular motion.

Dynamics of a particle. Concepts of mass, force, impulse and momentum. Energy, energy sources and systems.

Motion of a rigid body; simple ideas on moments of inertia.

Mechanical properties of solids and liquids.

Simple Harmonic Motion (SHM). The kinetics and dynamics of SHM.

Energy in SHM. Application to spring problems and the pendulum. Natural and artificial damping.

Classification of wave motion. Traveling waves, wave fronts. Superposition of waves, interference and diffraction of light wave. Reflection at a boundary, standing waves in strings.

Textbook:

Young, H.D., "University Physics", Addison-Wesley, 8th Edition (1992).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 3 hrs)

PH 142: PRINCIPLES OF PHYSICS II

Hours per week: 5 (4/1)

Objective:

On completion of this subject the student should be able to:-

1. Apply the concepts of electrostatics to simple point and continuous charge distributions.
2. Calculate currents in branched circuits
3. Discuss the principles of A.C circuits
4. Describe electronic devices, amplifiers and digital circuits
5. Apply the laws of electromagnetism to simple problems
6. Explain the concepts of temperature measurement
7. Discuss modes of heat transfer and apply the basic equations
8. Compute isothermal and adiabatic changes to a gas

Syllabus:

Electrostatics. Concepts of charge and electric field. Coulomb's law. Gauss' Law. Calculations of electric field for discrete and continuous charge distributions. Electrostatic potential. Capacitance.

Current electricity. Ohm's Law. Electromotive forces, the circuit equation, Kirchhoff's rules. Circuit analysis.

AC circuits, RLC circuits

Electronics: electronic devices and amplifiers. Digital gates, truth tables. Basic Communications System. Simple Computer Network. Magnetism. Magnetic force on current-carrying conductors, the electric motor. Magnetic field due to a current, the Biot-Savart law. Force between currents, the Ampere.

Laws of electromagnetic induction. Application to the dynamo, eddy currents. Self-inductance,

energy stored in an inductor.

Thermal equilibrium and temperature. Thermometric properties and temperature scales. Thermal energy and calorimetry. Thermal expansion. Radiant energy, Stefan's Law. Thermal conductivity. Natural and forced convection. Thermodynamic equilibrium, equations of state. Indicator diagrams for reversible processes in gases. First law of thermodynamics. Applications to isothermal and adiabatic processes.

Textbook:

Young, H.D., "University Physics", 8th Edition (Addison-Wesley (1992).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 3 hrs)

PH 173: PHYSICS FOR NATURAL RESOURCES I

Hours per week: 4 (2/2)

Objectives:

On completion of this subject the student should be able to:-

1. Define and explain basic physical quantities, units, errors, uncertainties that exist in measurements and experiments;
2. Describe and analyse motion of particles in one-dimension and two dimensions;
3. Apply correctly concepts of force, mass, momentum, motion, work, energy, power, torque and solve problems in linear, circular and rotational motion applying basic principles of mechanics;
4. Discuss and explain the properties of matter including macro and micro behaviour of gases; Hooke's Law; Young's Modulus; Bulk Modulus and Shear Modulus;
5. Explain the properties of fluids at rest and in motion; Pascal's and Archimedes' Principles.

Syllabus:

Mechanics Part 1: Measurements; one-dimensional motion; description of motion; laws

of motion; equations of motion; concurrent forces; torque; work power, energy; circular and rotational motion; momentum and conservation of momentum and momentum. Mechanics Part 2: Properties of solids and liquids; pressure; Hooke's law; Young's modules; bulk modulus; shear modulus; density; Pascal's and Archimedes' principles and fluid flow.

Textbook:

Young, H.D. University Physics, 8th Edition (Addison-Wesley, 1992).

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3 hrs)

PH 174: PHYSICS FOR NATURAL RESOURCES II

Hours per week: 4 (2/2)

Prerequisites: PH 173

Objectives:

On completion of this subject the student should be able to:-

1. Describe and apply the fundamentals of thermal physics;
2. Explain the wave phenomena in sound; light and electromagnetic radiation;
3. Describe and apply the basic laws of electrostatics and magnetism;
4. Describe the motion of photoelectric effects, atomic structure and atomic nucleus.

Syllabus:

Thermometry and Calorimetry: Temperatures scales; Thermocouples; Thermometers; Heat Capacities. Gas Laws: Boyles; Charles; pressure; Avogadro's; Dalton's partial pressures. Difference between heat and temperature, Nature of Heat; Thermal Expansion; and Heat process in Environment. Waves: Types of waves; wave phenomena; sound as wave, electromagnetic nature of light; waves as particles; reflection; refraction; diffraction; interference; optical instruments. Electrostatics: Conduction and electron flow; resistance; energy,

power; application of electricity.

Modern Physics: Brief description of photoelectric effect; atomic structure and atomic nucleus.

Textbook:

Young, H.D. University Physics, 8th Edition (Addison-Wesley, 1992).

Assessment:

Continuous Assessment - 50%
Written Examination - 50%(1x3 hrs)

PH 176: PHYSICS FOR AGRICULTURE

Hours per week: 5 (4/1)

Objectives:

On completion of this subject the student should be able to:-

1. Explain basic physical quantities, units and uncertainties that exist in measurements and experiments.
2. Describe and analyze motion of particles in one dimension and in circular path.
3. Apply correct the concepts of force, mass and motion to work, energy and power.
4. Should solve problems in rotational dynamics and explain applications of torque.
5. Explain the properties of fluids at rest (Pascal's and Archimedes Principles) and in motion.
6. Discuss and explain the properties of matter in terms of Hooke's law.
7. Describe and apply the fundamentals of thermal physics
8. Explain the wave phenomena in sound; light and electromagnetic radiation.
9. Describe and apply basic laws of electrostatics, circuit theory and explain applications in electromagnetism.

Syllabus:

Measurements, one-dimensional motion, description and laws of motion. Force and motion, work, energy and power. Circular motion and rotational dynamics. Properties of solids, Hooke's law and elasticity. Fluidstatics, Pascal's and Archimedes principles and fluid dynamics.

Thermometers, thermal expansion and heat transfer. Calorimetry and latent heat. Gas laws. Waves, types of waves, sound, light and geometrical optics, optical instruments. Electrostatics, Current, Ohms law and circuit theory. Magnetism and induction.

Textbook:

Young, H.D. University Physics, 8th Edition (Eddison-Wesley, 1992).

Assessment:

Continuous Assessment - 50%
Written Exam - 50%

PH 183: PHYSICS FOR APPLIED SCIENCES I

Hours per week: 5 (3/2)

Objectives:

On completion of this subject the student should be able to:-

1. Define and explain basic physical quantities, units, errors, uncertainties that exist in measurements and experiments;
2. Describe and analyse motion of particles in one-dimension and two dimensions;
3. Apply correctly the notion of force; work; energy, power, torque;
4. Solve problems in torque, linear, circular and rotational motion applying basic principles of mechanics;
5. Discuss and explain the properties of matter including macro and micro behaviour of gases; Hooke's Law; Young's modules, bulk and shear modulus;
6. Explain the properties of fluids at rest and in motion.

Syllabus:

Mechanics Part A: Measurements; One-dimensional motion; description of motion; laws of motion; concurrent forces; work, energy, and power energy, torque; linear, circular and rotational motion; conservation of energy and momentum; Simple harmonic motion. Mechanics Part B: Properties of solids and liquids; surface tension; pressure; elasticity of Hooke's law;

Young's modulus; bulk and shear modulus; density; Pascal's and Archimedes principles and fluid Flow.

Textbook:

Young, H.D. University Physics, 8th Edition (Addison-Wesley, 1992).

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3 hrs)

PH 184: PHYSICS FOR APPLIED SCIENCES II

Hours per week: 5 (3/2)

Prerequisites: PH 183

Objectives:

On completion of this subject the student should be able to:-

1. Describe and apply the fundamentals of thermal properties of matter;
2. Explain and apply the wave phenomena in sound, light and electromagnetic radiation;
3. Describe and apply the basic laws of electricity and magnetism;
4. Explain and apply the fundamentals of geometrical optics;
5. Describe the notion of photoelectric effect, atomic structure and atomic nucleus.

Syllabus:

Heat and Temperature: Difference between heat and temperature, nature of heat; change of state; thermal expansion; and heat process in environment. Thermometry and Calorimetry: Temperatures scales; thermocouples; thermometers; ideal gas; capacities; heat capacities. Gas laws: Boyle's, Charles; Pressure; Avogadro's; Dalton's partial pressures. Waves and Optics: Types of waves, wave and sound phenomena; electromagnetic nature of light; waves as particle; reflection; refraction; diffraction; interference; optical instruments (Microscope and Spectrometer). Electricity and Magnetism: Conduction and electron flow; resistance; energy, power; application of

electricity; nature of magnets; field strength; current in magnetic fields; flux and induction. Modern Physics: Brief description of photoelectric effect; x-ray, production; atomic structure and atomic nucleus.

Textbook:

Young, H.D. University Physics, 8th Edition (Addison-Wesley, 1992).

Assessment:

Continuous Assessment - 50%

Written Examination - 50% (1x3 hrs)

PH 251: PHYSICS FOR ENGINEERING MATERIALS I

Hours per week: 2 (2/0)

Objectives:

On completion of this subject the student should be able to:-

1. Explain the properties and behaviour of materials on the basis of quantum mechanics;
2. Explain how the electronic configuration of atoms is obtained;
3. Explain how bonding type is related to electronic configuration;
4. Explain how the packing diagram and crystal structure result from the bonding type.

Syllabus:

Review of the sources, production and uses of modern engineering materials.

Introduction to quantum theory, the semi-classical Bohr theory. Application to emission spectra. Light as particles, the photoelectric effect. Matter as waves, calculation of the de Broglie wavelength. Electron diffraction.

Mathematical formulation of matter waves. Wave packets and group velocity. The Uncertainty Principle.

Interpretation of the wave function. Standing waves in strings, analogy to particle-in-a-box problem. Node counting and quantum numbers. Probability density. Calculations for the hydrogen 1s state. Brief mention of the time-independent Schrödinger equation, origin of the quantum numbers n, l, m . Tabulation of the (spin free)

eigenstates of atomic hydrogen. Pictorial representations of radial probability distributions. Electronic configurations of many-electron atoms. Metallic bonding, and metallic crystals. Ionic bonding in ionic crystals. Covalent bonding, resonance, hybridisation. Diamond and graphite as examples of covalent crystals. Brief treatment of hydrogen bonding and Vander Waals forces.

References:

Anderson, J C, Leaver, K D, Rawlings R D and Alexander J M, Materials Science, 4th edition (Chapman & Hall, 1990) Callister Jr, W D, Materials science and Engineering, 3rd edition (John Wiley, 1994).

Assessment:

Continuous Assessment - 100%

PH 252: PHYSICS OF ENGINEERING MATERIALS II

Hours per week 2 (2/0)

Objectives:

On completion of this subject the student should be able to:-

1. Explain how the physical properties of materials derive from the crystal structure;
2. Discuss the dynamics of electrons and holes in semiconductors;
3. Explain the rectifying properties of semiconductor junctions.

Syllabus:

Elements of formal crystallography. Preferred crystal structures of metallic, ionic and covalent crystals.

Introduction to imperfections in crystals, point and line defects. Effect of dislocations on mechanical strength. Comprehensive explanation of mechanical, electrical, thermal and optical properties in terms of chemical composition and crystal structure. Origin of energy bands in covalent crystals. Classification of crystals as metals, insulators and semiconductors; the four basic types of semiconductor. Electron dynamics in semiconductors. The effective mass. The hole

concept. Density of states function. The Fermi level in metals and semiconductors.
Contact potential between dissimilar metals.
Extrinsic semiconductors. Volume and surface densities of impurity states, Metal-semiconductor contacts, the depletion layer, effect of applied voltage. Non-rectifying metal-semiconductor junctions. Rectifying junctions, the p-n junction.

References:

Anderson, J C. Leaver, K D, Rawlings R D and Alexander J M, Materials Science, 4th edition (Chapman & Hall, 1990) Callister Jr, W D, Materials Science and Engineering, 3rd edition (John Wiley, 1994).

Assessment:

Continuous Assessment - 100%

STRUCTURE OF COURSE

BACHELOR OF SCIENCE IN RADIATION THERAPY (BSRT)

Code	Subject Hours	Weekly
Year 1		
First Semester		
AP131	Introductory Physics I	6
AS131	Chemistry I (C)	4
MA167	Engineering Mathematics I (A)	5
CS145	Introduction to Information Technology (A)	2
LA101	Study Skills	3
FR111	Plant Biology	5
		25
Year 1		
Second Semester		
AP132	Introductory Physics II	6
MA168	Engineering Mathematics I (B)	5
AS132	Chemistry 2 (C)	4
CS146	Introduction to Information Technology (B)	2
LA102	Reading and Writing Skills	3
AG112	Animal Biology	5
		25

Year 2

First Semester

RT211	Radiation Physics I	5
RT213	Radiation Therapy and Diagnostic Imaging	6
RT215	Anatomy and Physiology I	6
RT217	Nursing Care for Radiation Therapists	4
RT219	Clinical Practice I	-

Year 2

Second Semester

RT222	Radiation Physics II	5
RT224	Clinical Practice II	-
RT226	Anatomy II	6
RT228	Radiation Therapy Planning I	8
RT262	Radiation Treatment Techniques I	5

Year 3

First Semester

RT311	Anatomy III	6
RT313	Radiotherapy Planning II	5
RT315	Radiotherapy Technique II	7
RT317	Clinical Practice III	-
RT319	Pathology	6
		-

Year 3

Second Semester

RT322	Anatomy IV	6
RT324	Radiation Therapy Techniques III	8
RT326	Radiation Therapy Planning III	8
RT328	Clinical Practice IV	-
RT348	Radiation Physics III	3
		-

Year 4

First Semester

RT411	Radiation Therapy Techniques IV	6
RT413	Clinical Practice V	-
RT415	Radiation Therapy Planning IV	6
RT417	Psychology for Radiation Therapists	3
		-

Year 4

Second Semester

RT422	Radiotherapy Techniques V	6
RT426	Radiation Therapy Planning V	6

RT428 Project

10

SUBJECT DETAILS

AP 131: INTRODUCTORY PHYSICS I

Hours per week: 6(4/2)

Prerequisite: Grade 12 Physics or equivalent

Objectives:

On completion of this subject the student should be able to:

1. Analyze particle motion in one and two dimensions,
2. Use the concepts of force, impulse, mass, momentum,
3. Explain the characteristics of waves.
4. Solve problems on the wave function.
5. Explain wave phenomena of interference and diffraction and polarization.

Syllabus:

Fundamental physical quantities and units. Concepts of motion, velocity and acceleration as vectors. Application of the kinematic equations to linear, parabolic and circular motion.

Dynamics of a particle. Concepts of mass, force, impulse and momentum. Motion of a rigid body; simple ideas on moments of inertia. Mechanical properties of solids and liquids. Simple Harmonic Motion (SHM).

The kinetics and dynamics of SHM. Energy in SHM. Application to spring problems and the pendulum. Natural and artificial damping. Classification of wave motion. Travelling waves, wave fronts. Superposition of waves, interference and diffraction and polarization of light waves. Reflection at a boundary, standing waves in pipes and strings.

Textbook:

Young, H.D., "University Physics", Addison-Wesley, 8th Edition (1992).

Assessment:

Continuous Assessment - 40%
Written Examination - 60%

AS 131: CHEMISTRY I (C)

Hours per week: 4 (3/1)

Prerequisite: Grade 12 Chemistry or equivalent

Objectives:

On completion of this subject the student should be able to:

1. Name and write the formulae of elements and compounds.
2. Write balanced chemical, ionic and net ionic equations for chemical reactions, including oxidation-reduced reactions.
3. Discuss the properties of elements and compounds in terms of their position in the periodic table and Lewis structure.
4. Discuss chemical bonding and draw Lewis diagrams for different types of bonding.
5. Do calculations involving moles, molarity concentration, dilution, limiting reagent and empirical formulae.
6. Apply the Gas Laws including the Ideal Gas Equation.

Syllabus:

Naming, Formulae, Equations – chemical, ionic and net ionic. Atomic structure, isotopes, calculation of average atomic mass. Electronic Configuration, Stoichiometry, Avogadro's number, moles, molarity, dilution, empirical formula, limiting reagent. Oxidation-Reduction reaction: Oxidation number and electron transfer, half-reaction, balancing redox equations. Chemical bonding; ionic, covalent, polar covalent, metallic. Lewis diagrams, shapes of molecules. Periodicity; size, electro-negativity, ionization energy, metals, non-metals, metalloids. Gas Laws: Boyle's law, Charles' law and Ideal gas equation.

Textbook:

Hill, G.C. and Holman, J.S., Chemistry in Context, 3rd ELBS Edition (Thomas Nelson & Sons, Surrey, UK, 1989).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

**MA 167: ENGINEERING MATHEMATICS I
(A)**

Hours per week: 5

Objectives:

On completion of this subject the student should be able to:

1. Solve problems involving complex numbers.
2. Demonstrate a clear understanding of trigonometric, logarithmic, exponential and hyperbolic functions, and their inverses.
3. Apply the techniques of differentiation to solve problems involving maxima and minima and related rates.
4. Use integration to find areas enclosed between curves, and volumes of solids of revolution.

Syllabus:

Revision: Some revision of high school mathematics will occur in the appropriate places.

Complex Numbers: Cartesian, polar and exponential forms of a complex number; Euler's Formula: De-Moivre's Theorem; Roots of a complex number. Functions: Types of functions; Composition of functions; Inverse functions; Logarithmic and exponential functions; Trigonometric and hyperbolic functions.

Differentiation: Differentiation by using limits; Techniques of differentiation; Applications of differentiation – maxima and minima, tangents to curves, small increments.

Integration: Anti-derivatives; The first and second Fundamental Theorems of calculus; Techniques of integrations – substitution, by parts; Applications of integration – the area enclosed between two curves, volumes of solids of revolutions.

Textbook:

Anton, H., Calculus with analytic geometry, 6th Edition (Wiley, 1999).

Reference:

Stroud, K.A., Engineering Mathematics: Programs and Problems, 4th Edition (ELBS/Macmillan, 1995).

Equipment:

Scientific calculator

Assessment:

Continuous Assessments - 50%

Written Examination - 50% (1x3 hrs)

**CS 145: INTRODUCTION TO
INFORMATION TECHNOLOGY (A)**

Hours per week: 2

Objectives:

On completion of this subject the student should be able to:

1. Produce quality documents that are well organized, presented and laid out using a commonly available word-processing package.
2. Layout spreadsheets and develop applications using text, numerals and formulae.
3. Graphically present the results of their academic work using simple graphics from a paint program or spreadsheet charting tool.
4. Manage a simple file store using suitable tools to organize, transfer and backup their files.

Syllabus:

Components of a micro-computer system. Main memory and secondary storage. Structure of network: Use and care of floppy disks.

Use of keyboard and mouse. Introduction to WIMP interface. Use of simple paint program, word processor and spreadsheet. Use of cut and paste buffer and program manager to transfer data between applications. Use of file manager.

Textbook:

Computer Science Department Modules.

Assessment:

Continuous Assessment - 100%

LA 101: STUDY SKILLS

Hours per week: 3

Objectives:

On completion of this subject the student should be able to:

1. Engage in pre-lecture preparation.
2. Organise their study time.
3. Handle basic study problems.
4. Employ efficient study strategies.
5. Listen effectively and accurately at lectures and take notes.
6. Use the library effectively and make coherent notes from a variety of written sources.
7. Demonstrate mastery of basic skills essential for effectively reading, writing, speaking and listening.
8. Show ability to produce spoken and written texts that are critically and logically developed.
9. Use dictionary and thesaurus efficiently for reading, writing, listening and speech purposes.
10. Communicate with grammatical correctness, clarity and precision.
11. Master strategies for preparing for and writing tests and examinations.
12. Demonstrate ability to summarise texts of various length and complexity.

Syllabus:

Study skills: time management, effective study habit, note making from printed sources and note-taking from lectures.

Effective use of the library, textbooks, references books, dictionary and thesaurus. Some study problems and how to deal with them. Pre-lecture preparation. Information literacy skills.

Reading strategies: Types of reading. Purpose of reading. Strategies in reading. Skimming, scanning, study-type reading.

Writing: The sentence in English; qualities and types of sentences. Sentence variation in writing.

The paragraph: qualities of a good paragraph, structure of a basic paragraph.

The 1-3-1 short essay. Gender sensitivity in speech and writing, ethics, morality and counseling.

Textbook:

Buschenhofen, P., Ed., Academic and Professional Communication. PNG University of

Technology, Department of Language and Communication Studies, Lae, 1998.

Oxford Advanced Learners Dictionary, 5th edition, OUP, Oxford, 1996.

Reference:

Crystal, D., Discover Grammar, Longman: London (1992).

Kanal, C., The confident students, New York, Houghton Mifflin (1991).

Assessment:

Continuous Assessment - 100%

FR 111: PLANT BIOLOGY

Hours per week: 5

Prerequisite: Grade 12 Biology or equivalent

Objectives:

On completion of this subject the student should be able to:

1. Develop understanding about the plant structure and function and classification.
2. Plant ecology, environment and evolution.
3. Gather introductory knowledge about cell biology.
4. Be familiar with metabolic and anabolic processes in plant.
5. Develop ideas about micro-organisms: bacteria, virus, fungi and algae.

Syllabus:

Plant structure and function. Classification of plants. Plant ecology, environment and evolution. Introduction to cell biology: structure and function, cell chemistry. Various in plants. Micro-organisms: bacteria, fungi, algae.

Textbook:

Biology Study Guide: Laboratory Manual.

Roberts, M.B.V., Biology: A Functional Approach, 4th Edition, ELBS (1986).

Berrie, G.L., A. Berrie & J.M. O. Eze, Tropical Plant Science, ELBS (1987).

Assessment:

Continuous Assessment - 50%

Written Examination - 50%

AP 132: INTRODUCTORY PHYSICS II

Hours per week: 6 (4/2)

Prerequisite: AP 131

Objectives:

On completion of this subject the student should be able to:

1. Apply the concepts of electrostatics to simple point and continuous charge distributions.
2. Calculate currents in branched circuits.
3. Apply the laws of electromagnetism to simple problems.
4. Explain the concepts of temperature measurement.
5. Discuss modes of heat transfer and apply the basic equations.
6. Compute isothermal and adiabatic changes of a gas.

Syllabus:

Electrostatics. Concepts of charge and electric field. Coulomb's law. Gauss' Law. Calculations of electric field for discrete and continuous charge distributions. Electrostatic potential. Capacitance. Current electricity. Ohm's Law. Electromotive forces, the circuit equation. Kirchhoff's rules. Simple bridge circuits.

Magnetism. Magnetic force on current-carrying conductors, the electric motor. Magnetic field due to a current, the Biot-Savart law. Force between currents, the Ampere. Laws of electromagnetic induction. Application to the dynamo, eddy currents. Self-inductance, energy stored in an inductor. Alternating current circuits. A.C. applied across resistor, inductor and capacitor, phase relationships. Vector impedance diagrams. Thermal equilibrium and temperature. Thermometric properties and temperature scales. Thermal energy and calorimetry. Thermal expansion. Radiant energy, Stefan's Law. Thermal conductivity. Natural and forced convection. Thermodynamic equilibrium, equations of state. Indicator diagrams for reversible processes in gases. First law of

thermodynamics. Applications to isothermal and adiabatic processes.

Textbook:

Young, H.D., University Physics, 8th Edition (Addison-Wesley, 1992)

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

MA 168: ENGINEERING MATHEMATICS I (B)

Hours per week: 5

Prerequisite: MA 167

Objectives:

On completion of this subject the student should be able to:

1. Compute the dot, cross and scalar triple products of vectors.
2. Solve problems involving the Vectorial equations of lines and planes in 3-D space.
3. Compute the products, determinants and inverse of matrices.
4. Use Cramer's rule and Gauss elimination to solve systems of linear equations, including those with infinitely many solutions, geometric interpolation.
5. Test series for convergence, and find radii and intervals of convergence of power series.
6. Solve problems involving Taylor and Maclaurin series.

Syllabus:

Vectors: Dot product; Cross product; scalar triple product; parametric equations of a line; planes in 3-space.

Matrices: Addition and multiplication of matrices; Systems of linear equations; Gauss elimination; Determinants; Inverse; Cramer's rule.

Infinite Series and Processes: Inverses; Partial sums; Tests for convergence of a series of real numbers; Power series; radius and interval of convergence of a power series; Taylor and Maclaurin series. Partial differentiation; Chain rules for functions of two variables.

Textbook:

Anton, H., Calculus with analytic geometry, 6th Edition (Wiley, 1999).

Reference:

Kreyszig, E., Advanced Engineering Mathematics, 7th Edition (Wiley, 1993).

Stroud, K.A., Engineering Mathematics: Program and Problems, 4th Edition (ELBS/Macmillan, 1995).

Assessment:

Continuous Assessment - 50%
Written Examination - 50%

AS 132: CHEMISTRY 2 (C)

Hours per week: 4 (3/1)

Pre-requisite: AS 131

Objectives:

On completion of this subject the student should be able to:

1. Name, draw the structure and know the reactions of generic organic functional groups and simple organic compounds.
2. Understand solvent properties and solvation effects in aqueous and non-polar solvents.
3. Calculate product distributions at equilibrium in homogeneous and heterogeneous reactions, including acid-base systems.

Syllabus:

Organic Chemistry: Systematic naming, structure and elementary reaction chemistry of alkanes, alkynes, aromatic hydrocarbons, alcohols, amines, aldehydes, ketones, carboxylic acids and their simple derivatives.

Physical Chemistry: Solvent types: aqueous, non-polar and dipolar aprotic. Hydrogen bonding and ionic dissolution. Water chemistry. Equilibrium: static, dynamic equilibrium systems, equilibrium constant expressions K_c , homogeneous systems, Le Chatelier's principle, equilibrium calculations including sparingly soluble salts, strong and weak acids, bases and buffers.

Textbook:

Hill, G.C. and Holman, J.S., Chemistry in Context, 3rd ELBS Edition (Thomas Nelson & Sons, Surrey, UK, 1989).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

CS 146: INTRODUCTION TO INFORMATION TECHNOLOGY (B)

Hours per week: 2

Prerequisite: CS 145

Objectives:

On completion of this subject the student should be able to:

1. Analyse the data for a particular application and produce a simple database to store that data.
2. Produce reports of ordered and selected data from a database.
3. Describe the peripherals necessary for given application.
4. Produce technical diagrams appropriate to their discipline using an objective oriented graphics package.
5. Extend the functionality of a spreadsheet package by producing user-defined functions.

Syllabus:

Analysis of data required in a database. Use of a simple database, to enter, modify, sort, search, and report on a flat database. Description of a computer peripherals and their characteristics. Examination of the use and benefits of the internet. Use of an object oriented graphics package to draw, move, scale, and group and link graphical objects. Simple use of macro language features in a modern spreadsheet to write simple functions.

Textbook:

Computer Science Department Modules.

Assessment:

Continuous Assessment - 100%

LA 102: READING AND WRITING SKILLS

Hours per week: 3

Prerequisite: LA 101

Objectives:

On completion of this subject the student should be able to:

1. Demonstrate mastery of the phrases of the writing process – prewriting, and revising actual writing.
2. Develop essays from the planning through outlining to the final writing stages.
3. Demonstrate a higher order level of reading comprehension.
4. Demonstrate ability to think and analyse information critically in their reading and writing.
5. Develop skills in composing different types of essays.
6. Apply information literacy skills in their search for information for reading and writing purposes.
7. Apply principles of grammatical organization that characterize the style of different writing genres.
8. Demonstrate audience-sensitive writing skills.

Syllabus:

Academic writing skills. Different essay types and their functions: Argumentative, descriptive analytical, narrative, expository, research, book reviews, reports, basic business writing.

Steps in essay planning and writing: choosing a topic, narrowing down a broad topic, forming a point of view, searching for facts, analyzing and arranging the facts, drawing an outline, writing the essay. Academic reading skills and writing: reading for basic literature review, summarizing, paraphrasing, quoting, reading for content analysis, developing reading comprehension skills, proof-reading. Mechanical skills in writing: punctuation, capitalization, editing skills, sentence-structure, common errors in writing.

Usages: technical versus general, connotative versus denotative, formal and informal. Research-based writing/Group writing projects.

Textbook:

Buschenhofen, P., Ed., Academic and Professional Communication, PNG University of Technology, Department of Language and Communication Studies, Lae, 1998.

Oxford Advanced Learners Dictionary (5th Edition), OUP, Oxford, 1996.

Reference:

Crystal, D., Discover Grammar, Longman, London (1992).

Kanal, C., The Confident Student, New York, Houghton Mifflin, (1991).

Assessment:

Continuous Assessment - 100%

AG 112: ANIMAL BIOLOGY

Hours per week: 5

Prerequisite: Grade 12 Biology or equivalent

Objectives:

On completion of this subject the student should be able to:

1. To enable students to appreciate the extent of Biology as a theoretical and applied discipline.
2. To use the scientific methods in its development in PNG.

Syllabus:

Basic theories on origins, evolution and taxonomic classification. Phylogeny and diversity of animals. Outline of animal chemistry, cell, tissues, and organs. Introduction to animal physiological systems: digestion, circulation, nervous, endocrine, locomotion, skeletal, respiratory, excretion and reproduction. Introduction to genetics; mitosis and meiosis, inheritance, pattern and chemistry of inheritance, Introduction to ecology including ecosystem and communities. Application of animal biology in agriculture.

Textbook:

Roberts, M.B.V., Biology: A Functional Approach (4th Edition, ELBS, 1986)

Reference:

Biology Study Guide. Revised by D. Hector and J.C. Reid.

Assessment:

Continuous Assessment - 50%
Written Examination - 50%

RT 211: RADIATION PHYSICS I

Hours per week: 5 (3/2)

Prerequisite: Nil

Objectives:

On completion of this subject the student should be able to:

1. Explain the physical basis for the production of ionizing radiation, and to describe the properties of ionizing radiation which affect its behavior in diagnostic imaging and Radiation Therapy.
2. Provide information on electric and magnetic fields, which underpin the construction and design details of x-ray equipment.
3. Discuss how x-rays are generated, the design construction and materials used in the x-ray tube and high voltage generators.
4. Describe the operation of radiotherapy x-ray tubes.

Syllabus:

Atomic structure, radioactivity and the interaction of x-rays with matter. Radiation dosimetry, radiation units and radiation detection. Electric and magnetic fields, motion of charged particles. The properties of X-rays, construction and design of x-ray tubes for both diagnostic and Radiotherapy modalities. High voltage generation, transformers, rectifiers and linear accelerators, Ratings of x-ray tube and tube failure.

Textbook:

Bushong, S.J., Radiological Science for

Technologists, 9th Edition, Mosby (2009).

Reference:

Bushberg, J.T. et al, The Essential Physics of Medical Imaging, 2nd Edition, Williams and Wilkins (2002).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

RT 213: RADIATION THERAPY AND DIAGNOSTIC IMAGING

Hours per week: 6 (3/3)

Prerequisite: Nil

Objectives:

On completion of this subject the student should be able to:

1. Describe the principles for the production of x-ray images and apply this knowledge in the laboratory situation.
2. Describe the physical principles of operation and clinical applications of a range of imaging modalities.
3. Describe types of cancer and methods of classification.
4. Describe the techniques used in the diagnosis and treatment of cancer.

Syllabus:

Diagnostic imaging, Fundamentals of Radiography. Dark Room Procedures. Terminology, Computed Tomography (CT), Fluoroscopy, Ultrasound, Magnetic Resonance Imaging (MRI), Nuclear Medicine, Radiation Therapy. Tumor Diagnosis and classification, Chemotherapy, Surgery and Radiation Therapy individually and in combination.

Textbook:

Bushong, S.C., Radiological Science for Technologists, 8th Edition, Mosby. Washington, C.M. and Leaver, D., Principles and Practice of Radiation Therapy, 2nd Edition, Mosby.

Reference:

Bomford, C.K., et al, Walter and Miller's Textbook of Radiotherapy, 7th Edition, Churchill Livingstone.

Mosby's Medical Nursing & Allied Health Dictionary for the Health Professional, Williams & Wilkins.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

RT 215: ANATOMY AND PHYSIOLOGY I

Hours per week: 6 (4/2)

Prerequisite: Nil

Objectives:

On completion of this subject the student should be able to:

1. Compare and identify features, locations and major functions of the primary tissues of the human body.
2. Identify and describe features of the human skeleton.
3. Recognise variability that can occur within the human skeleton.
4. Identify the different muscle groups within the human body.
5. Identify the different characteristics between different cell types.

Syllabus:

Cells, Muscles: Major muscle groups. Bones: Identification of bones and associated features. Tissue: bone tissue, cartilage, nervous tissue, macroscopic and microscopic study of epithelial tissue.

Textbook:

Macdonald, B.W. & Gregory, L., LSB145 Anatomy 1 Teaching & Learning Manual, QUT Publishing (2009).

McKinley, M. & O'Loughlin, V.D., An Anatomy, McGraw Hill (2008).

Allen, C. & Harper, V., Laboratory Manual for Human Anatomy, John Wiley & Sons (2005).

Reference:

Mosby's Medical, Nursing and Applied Dictionary, 5th Edition, Mosby (1998).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

RT 217: NURSING CARE FOR RADIATION THERAPISTS

Hours per week: 4 (2/2)

Prerequisite: Nil

Objectives:

On completion of this subject the student should be able to:

1. Evaluate dynamics involved with communication between individuals.
2. Develop effective communication with patients and their families from varying cultural background.
3. Determine the health care needs of patients receiving Radiation Therapy.
4. Recognise the role of a Radiation Therapist in providing effective patient care.
5. Apply resuscitation techniques in emergency situations.
6. Evaluate the ethical and legal responsibilities of a Radiation Therapist.
7. Understand the need of appropriate infection control measures and impacts of poor maintenance of infection control.
8. Recognise the signs and symptoms of stress in the patient and how to reduce it.

Syllabus:

Effective verbal and non-verbal communication skills, listening skills, special needs of patients and their potential requirements, time management skills, stress management skills, problem solving and conflict resolution skills, ethics and legal implications of the health professional. Infection Control and Manual Handling.

Textbook:

Northouse, L.L. & Northouse, P.G., Health

Communication Strategies for Health Professionals, Connecticut: Appleton & Lange (1998).

Ehrlich & McCloskey, Patient Care in Radiology, 5th Edition, St Louise: Mosby (1999).

Jensen & Peppers, Pharmacology and Drug Administration for Imaging Technologists, Mosby (2006).

Lee & Bishop, Microbiology and Infection Control for Health Professionals, 2nd Edition, Prentice Hall (2002).

Wilson, Ethics and Basic Law for Medical Imaging Professionals, Davis (2004).

Reference:

Burnard, P., Effective Communication Skills for Health Professionals, 2nd Edition, Cheltenham: Stanley Thomes Pub Ltd (1997).

Dickson, D., Hargie, O., & Morrow, N., Communication Skills Training for Health Professionals (1997).

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1x3 hrs)

RT 219: CLINICAL PRACTICE I

Hours per week: 1 week full-time

Prerequisite: Nil

Objectives:

On completion of this subject the student should be able to:

1. Observe radiation therapy planning and treatment techniques.
2. Observe and gain experience in appropriate communication skills required in clinical practice both with patients, patient's family and other health professionals.
3. Observe skills required in patient care.
4. Evaluate and report on departmental design and radiation safety procedures.

Syllabus:

Observe simulation of basic treatment techniques. Observe dosimetry and manual calculations for

basic techniques. Observe Radiation Therapy treatments.

Textbook:

Clinical Handbook: To be developed.

Reference: Nil

Assessment:

Continuous Assessment - 100%

RT 222: RADIATION PHYSICS II

Hours per week: 5 (3/2)

Prerequisite: RT 211

Objective:

On completion of this subject the student should be able to:

1. Recognise the consequences of being exposed by ionizing radiation on populations and individuals.
2. Recognise the risks associated with radiation exposure.
3. Understand principles of radiation protection.
4. Specify and regulate delivery of radiation therapy to pregnant patients.
5. Conduct contamination monitoring.

Syllabus:

Examination of the role of the International Commission on Radiological Protection. Codes of practice associated with radiation workers. Short and long term effects of radiation exposure at a cellular, whole body and population level. Radiation protection apparatus and considerations for departmental design including radioisotope laboratories. Considerations for pregnant patients during delivery of radiation therapy. Natural sources of radiation. Contamination monitoring.

Textbook:

Noz, M.E., & McGuire, G.O., Radiation Protection in the Radiologic and Health Sciences, Lea & Febiger (1979).

Bushong, S.C., Radiologic Science for Technologists, 7th Edition, Mosby (2001).

Coggie, J.E., Biological Effects of Radiation, 2nd Edition, Taylor & Francis (1983).
Hall, E.J., Radiobiology for the Radiologist, 5th Edition, JB Lippincott, Williams and Wilkins (2000).

Reference: Nil

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

RT 224: CLINICAL PRACTICE II

Hours per week: 3 weeks full-time

Prerequisite: RT 219

Objectives:

On completion of this subject the student should be able to:

1. Observe and participate in basic planning and treatment techniques.
2. Observe and develop experience in effective communication with various health professionals, patients and their relatives.
3. Evaluate patient care support available within the department.
4. Familiar with techniques of dose estimation and regulation of basic treatment techniques.

Syllabus:

Simulation of basic treatment techniques. Dosimetry and manual calculations for basic techniques. Regulation of basic treatment techniques.

Textbook:

Clinical Handbook: To be developed or prescribe in due course.

Reference: Nil

Assessment:

Continuous Assessment - 100%
Written Examination: - 0%

RT 226: ANATOMY II

Hours per week: 6 (3/3)

Prerequisite: RT 215

Objectives:

On completion of this subject the student should be able to:

1. Identify and describe the macroscopic features, locations, relationships and major functions of the organs and body structures of the organ systems of the human body by applying accurate anatomical terminology.
2. Identify and describe the major microscopic features of selected organs.
3. Relate structure to function.
4. Apply facets, concepts, theories and terms related to disease processes.
5. Develop appropriate computer and information retrieval skills, and generic writing skills including referencing.

Syllabus:

Cardiovascular System: Macroscopic and microscopic features of arteries, veins and capillaries. Lymphatic, nervous, digestive, urinary, respiratory and endocrine systems. Male and female reproductive system. Introductory Pathology: Cellular adaptation and cell death, inflammation and repair, infection, circulatory disorders, immune defense, genetics of disease and neoplasia.

Textbooks:

Macdonald, B.W. & Gregory, L., Anatomy 2 Teaching & Learning Manual, QUT Publishing (2008).

McKinley, M. & O'Loughlin, V.D., Human Anatomy, 2nd Edition, McGraw Hill (2008).

Allen, C. & Harper, V., Laboratory Manual for Human Anatomy, John Wiley & Sons (2005).

Reference:

Mosby's Medical, Nursing and Applied Dictionary, 5th Edition, Mosby (1998).

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1x23 hrs)

RT 262: RADIOTHERAPY TREATMENT TECHNIQUES I

Hours per week: 5 (3/2)

Prerequisite: RT 213

Objectives:

On completion of this subject the student should be able to:

1. Develop an understanding of various technology and equipment used in the accurate delivery of radiation therapy.
2. Develop the practical skills required to perform treatment techniques safely and accurately.
3. Recognise the work practices involved in ensuring radiation safety and protection to the patient, staff and the general public is assured.

Syllabus:

Radiation therapy treatment equipment: principles and quality assurance. Basic treatment techniques: single fields, opposed pairs, breast tangential treatment and 4 field pelvis. Patient positioning: surface anatomy, straightening and leveling methods and reproducibility. Stabilisation devices. Patient transfers. Department design and associated radiation safety measures. Medico-legal and ethical responsibilities.

Textbook:

Washington, C.M. and Leaver, D., Principles and Practice of Radiation Therapy, 3rd Edition, St Louise: Mo Mosby (2009).

Reference:

Bentel, G.C., Radiation Therapy Planning, 3rd Edition, McGraw Hill (2003).
 Lenhard, R., Osteen, R. & Gansler, T., The American Cancer Society's Clinical Oncology, the American Cancer Society (2001).
 Perez, C. & Brady, L., Principles and Practice of Radiation Oncology, 4th Edition, Lippincott (2004).

De Vita, et al., Cancer; Principles and Practice of Oncology, 7th Edition, Lippincott.
 Specialised Radiation Oncology Journals and online resources (2005).

Assessment:

Continuous Assessment - 40%
 Written Examination - 60% (1x3 hrs)

RT 228: RADIATION THERAPY PLANNING I

Hours per week: 8 (3/3/2)

Prerequisite: RT 213

Objectives:

On completion of this subject the student should be able to:

1. The student will be able to demonstrate a basic level of understanding and competency in radiotherapy treatment planning.
2. The student will be able to identify the most appropriate radiotherapy technique for the treatment of single and opposing field radiotherapy treatments.
3. The student will be able to demonstrate the practical skills required to represent the patient outline and anatomy appropriate for these techniques.

Syllabus:

Radiation Therapy Terminology. Patient positioning, Simulation of spine, limbs, skull, chest and pelvis. Patient contouring techniques and data translation. ICRU Report 50 dose specifications. Use of Percentage Depth Dose (%DD) and variations in dose due to depth SSD and attenuators. Use of Tissue Air Ratio (TAR), Tissue Phantom Ratio (TPR), Tissue Maximum Ratio (TMR) in isocentric treatments. Dose normalization. Characteristics of isodose curves and charts; Scatter and beam size and shape. Effects of surface Obliquity and manually correcting for it. Shielding and wedges to manipulate dose. Single field techniques. Manual calculation and isodose distribution of two field techniques. Four field pelvis planning, Introduction to CT planning CT scans.

Textbooks:

Bentel, G.C., Radiotherapy Planning, 2nd Edition, McGraw Hill (1996).

Washington, C.M. & Leaver, D., Principles and Practice of Radiation Therapy, 3rd Edition, Mosby (2009).

Kahn, F.M., The Physics of Radiation Therapy, 2nd Edition, Williams and Wilkins Publishers (1994).

Metcalf, P.K. & Hoban, P., Medical Physics Publishing (2007).

Reference:

Moore, K., Clinically Oriented Anatomy, 3rd Edition, Williams and Wilkins Publishers (1992).

Weir, J. & Abrahams, P.H., An Imaging Atlas of Human Anatomy, Wolfe Publish (1992).

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1x3 hrs)

RT 311: ANATOMY III

Hours per week: 6 (4/2)

Prerequisite: RT 226

Objectives:

On completion of this subject the student should be able to:

1. Describe the anatomy of the organs and structures that are localized within the upper and lower limbs, head and neck regions and identify these structures using anatomical models, photographs of axial (cross) sections and illustrations.
2. Identify the major structures of the head, neck and upper and lower limbs in magnetic resonance, computerized tomography, and plain and contrast radiographic images in a variety of anatomical planes.
3. Describe the radiographic appearance of the major structures of the head, neck and upper and lower limbs in radiographs and computer tomography images; and signal intensity of these structures in magnetic resonance images.

Syllabus:

Upper Limb: Osteology; radiographic anatomy; regional and surface anatomy; blood and lymphatic vessels; MRI and axial sectional anatomy.

Lower Limb: Osteology; radiographic anatomy; regional and surface anatomy; blood and lymphatic vessels; MRI and axial sectional anatomy.

Head and Neck: Osteology; radiographic anatomy; surface anatomy; regional and surface anatomy; blood vessels, nerves and lymphatics.

Textbook:

Macdonald, B.W & Gregory, L., LSB345 Regional and Imaging Anatomy 1, Teaching and Learning Manual (updated annually), QUT Publications (2009).

Reference:

Moore, K.L. & Dalley, A.A., Clinically Oriented Anatomy, 5th Edition, Williams and Wilkins Publishers (2006).

Weir, J. & Abrahams, P.H., An Imaging Atlas of Human Anatomy, 2nd Edition, Wolfe Publishers (1997).

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1x3 hrs)

RT 313: RADIOTHERAPY PLANNING II

Hours per week: 5 (3/2)

Prerequisite: Nil

Objectives:

On completion of this subject the student should be able to:

1. Demonstrate ability to acquire suitable x-ray films and recognize the skills required to improve film quality.
2. Complete acquisition of patient outlines and critical structures using plain x-rays and phantom models in preparation for dosimetry planning.
3. Make use of wedging and weighting of beams to improve dosimetry planning.

4. Discuss electron beam characteristics and how they differ from photons.
5. Interpret C.T. image and use in data acquisition.

Syllabus:

Calculation of doses for both electron and beams. Data acquisition and contouring techniques through various planes of the human body. Multiple field techniques using prescribed protocols, including two, three and four fields, and tangential beams. Use of wedging and weighting of beams to improve dosimetry planning. Normal tissue tolerances and associated short and long term side effects that can result at various dose level constraints. Variations within the body due to varying density of various tissues within the body. Discussion on electron beam characteristics and how they differ from photons including advantages and disadvantages of both. Sites for dosimetry plans to be considered include lung, larynx, breast, parotid, oesophagus, prostate, bladder, rectum, cervix, uterus, pituitary. C.T. image interpretation and use in data acquisition.

Textbook:

Bentel, G.C., Radiation Therapy Planning, 3rd Edition, McGraw Hill (2003).
Khan, F.M. & Potish, R.(ed), Treatment Planning in Radiation Oncology, Williams & Wilkins (1998).
Dobbs, J., Practical Radiotherapy Planning, 3rd Edition, Oxford University Press (1999).
Williams, J.R. & Thwaites, D.I., Radiotherapy Physics in Practice, 2nd Edition, Oxford Medical Publications (2000).

Assessment:

Continuous Assessment - 100%
Written Examination - 0%

RT 315: RADIOTHERAPY TECHNIQUE II

Hours per week: 7 (4/3)

Prerequisite: Nil

Objectives:

On completion of this subject the student should be able to:

1. Explain why Radiation Therapy is chosen for specific sites, and the treatment technique chosen for each site.
2. Translate their theoretical knowledge into a practical approach through clinical practices based at a Radiation Therapy Department.
3. Critically evaluate treatment portal films to detect errors in field placement.

Syllabus:

Radiation tolerances to critical organs and tumor doses. Fractionation and the biological effects of altering fractionation and dose. Advantages and disadvantages of various cancer treatment modalities and the use of combined modalities in the treatment of cancer. Pathology, avenues of spread, symptoms and treatment complications will be discussed. Treatment field limits, regional anatomy, patient positioning, data acquisition and portal film evaluation and patient care will be considered. The following sites will be considered: Brain, pituitary, metastatic bone, primary bone and sarcoma, parotid, tonsil, tongue, mandible, antrum, nasopharynx, spine and CSF and skin.

Textbooks:

Washington, C.M., Leaver, D. (editors), Principles and Practice of Radiation Therapy, 2nd Edition, St Louise: Mo Mosby (2004).
Griffiths, S., Short, C., Principles to Practice, A Manual for Quality Treatment Delivery, Churchill Livingstone (1994).
Dobbs, J., Barrett, A. & Ash, D., Practical Radiotherapy Planning, 3rd Edition, Edward Arnold (1998).
Lenhard, R., Osteen, R. & Gansler, T., The American Cancer Society's Clinical Oncology, The American Cancer Society (2001).
Perez, C. & Brady, L., Principles and Practice of Radiation Oncology, 4th Edition, Lippincott (2004).
De Vita, et al., Cancer; Principles and Practice of Oncology, 7th Edition, Lippincott (2005).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

RT 317: CLINICAL PRACTICE III

Hours per week: 4 weeks full-time

Prerequisites: Nil

Objectives:

On completion of this subject the student should be able to:

1. Gain hands on experience on basic and more complex standard planning and treatment techniques.
2. Develop and demonstrate effective communications.
3. Develop and demonstrate effective patient care skills in a clinical setting.

Syllabus:

Simulation of standard 2, 3 and 4 field planning techniques. Manual and computer planning of 2, 3 and 4 field planning techniques. Treatment of standard 2, 3 and 4 field techniques,

Textbook:

Clinical Handbook: To be developed.

Assessment:

Continuous Assessment - 100%
Written Examination - 0%

RT 319: PATHOLOGY

Hours per week: 6 (4/2)

Prerequisite: Nil

Objectives:

On completion of this subject the student should be able to:

1. Know, understand and be able to apply facts, concepts, and terms in disease processes as they relate to the major diseases of each of the organ system.
2. Know and understand the major congenital and acquired diseases, including neoplasia, of each organ system.
3. Recognize major pathological processes/conditions from preserved specimens or diagrams.

Syllabus:

Systems covered in this unit includes cardiovascular, respiratory, nervous, endocrine, skin, alimentary, haematological, and uro-genital systems.

Textbook:

Kumar, Abbas & Fausto, Robbins and Cotran Pathological Basis of Disease, Current Edition, Elsevier Medical Dictionary.

Reference:

Cooke, R.A. & Stewart, B., Colour Atlas of Anatomical Pathology, Churchill Livingstone (1995).

Cotran, R.S., Kumar, V. & Robbins, S.L., Robbins Pathologic Basis of Disease, WB Saunders (1999).

Underwood, J.C.E., General and systematic Pathology, Churchill Livingstone (2000).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

RT 322: ANATOMY IV

Hours per week: 6 (4/2)

Prerequisite:

Objectives:

On completion of this subject the student should be able to:

1. Be able to identify anatomical structures within the chest, abdomen and pelvis and be able to provide anatomical detail about each organ of interest.
2. Be able to use various imaging modalities such as diagnostic x-ray, computed tomography and magnetic resonance imaging to identify the various structures within the chest, abdomen and pelvis.

Syllabus:

Regional and imaging anatomy of the Back: relevant osteology; muscles and ligaments of the back; content of the vertebral column including spinal cord, meninges and spinal nerves; plain

radiographic anatomy; myelography; computerized tomography of the lumbar region; MRI of the vertebral column and its contents.

Regional and Imaging anatomy of the Thorax: relevant osteology; thoracic wall, lungs and pleura, and the mediastinum; axial sectional anatomy; plain radiographic anatomy; coronary arteriography, mammography; computerized tomography.

Regional anatomy of the Pelvis and Perineum: pelvic wall, male and female pelvic organs, contents of the male and female perineum; axial sectional anatomy.

Imaging anatomy of the Abdomen and Pelvis: plain radiographic anatomy; computerized tomography; contrast radiographic anatomy of the gastrointestinal tract, urinary, biliary tract, and uterus and uterine tubes.

Textbook:

Moore, K.L. & Dalley, A.A., Clinically Oriented Anatomy, 5th Edition, Williams and Wilkins Publishers (2006).

Weir, J. & Abrahams, P.H., An Imaging Atlas of Human Anatomy, 3rd Edition, Wolfe Publishers (2003).

Assessment:

Continuous Assessment: 40%

Written Examination: 60% (1x3hrs)

RT 324: RADIATION THERAPY TECHNIQUES III

Hours per week: 8 (3/3/2)

Prerequisite: RT 228

Objectives:

On completion of this subject the student should be able to:

1. The student should be able to explain why Radiation Therapy is chosen for specific sites, and the treatment technique chosen for each site.
2. The student should be able to translate their theoretical knowledge into a practical approach through clinical practices based at a Radiation Therapy Department.

3. Students should be able to critically evaluate treatment portal films to detect errors in field placement.

Syllabus:

Radiation tolerances to critical organs and tumour doses. Fractionation and the biological effects of altering fractionation and dose. Advantages and disadvantages of various cancer treatment modalities and the used of combined modalities in the treatment of cancer. Pathology, avenues of spread, symptoms and treatment complications to be discussed. Treatment field limits, regional anatomy, patient positioning, data acquisition and portal film evaluation and patient care to be considered. The following sites to be considered: Brain, pituitary, metastatic bone, primary bone and sarcoma, parotid, tonsil, tongue, mandible, antrum, nasopharynx, spine and CSF and skin.

Textbook:

Washington, C.M., Leaver, D. (editors), Principles and Practice of Radiation Therapy, 2nd Edition, St Louise: Mo Mosby (2004).

References:

Griffiths, S., Short, C., Principles to Practice, A Manual for Quality Treatment Delivery, Churchill Livingstone (1994).

Dobbs, J., Barrett, A. & Ash, D., Practical Radiotherapy Planning, 3rd Edition, Edward Arnold (1998).

Lenhard, R., Osteen, R. & Gansler, T., The American Cancer Society's Clinical Oncology, The American Cancer Society (2001).

Perez, C. & Brady, L., Principles and Practice of Radiation Oncology, 4th Edition, Lippincott (2004).

De Vita, et al., Cancer; Principles and Practice of Oncology, 7th Edition, Lippincott (2005).

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1x3 hrs)

RT 326: RADIATION THERAPY PLANNING III

Hours per week: 8 (2/3/3)

Prerequisite: RT 313**Objectives:**

On completion of this subject the student should be able to:

1. The student will learn how to create and optimize dose distributions using a three dimensional planning system.
2. Planning techniques in the simulator will be undertaken at a more advanced level. The processes and advantages of taking simulator films after a dosimetry plan is complete will also be considered.
3. The student will learn how data is measured, the importance of measured data and how it can affect dosimetry plans and the various computational algorithms that are available.

Syllabus:

Simulation techniques. Translation of patient contours and critical structures for the 3D environment. Introducing the student to a 3D radiotherapy computer planning system. Strategies for altering the dose distribution to optimize the plan using various compensation techniques. Electrons and wax compensation techniques. Dosimetry planning for complex plans requiring multi phase planning such as boost treatment. Dosimetry planning to tumour volume. Evaluation of methods used to critically analyse dosimetry plans including Dose Volume Histograms. Sites considered will include pelvis, abdomen, lung, breast, brain and head and neck.

Textbook:

Purdy, J.A., Starkschall, G., A Practical Guide to 3D Planning and conformal Radiation Therapy, Advanced Medical Publishing (1999).

Bentel, G.C., Radiation Therapy Planning, 2nd Edition, McGraw Hill (1996).

References:

Kahn, F. & Potish, R. (editors), Treatment Planning in Radiation Oncology, Williams and Wilkins (1998).

Khan, F.M., Physics of Radiation Therapy, 3rd Edition, Williams and Wilkins (2003).

Ellis, H., Logan, B.M. & Dixon, A.K., Human Sectional Anatomy: Pocket Atlas of Body

Sections, CT and MRI Images, 2nd Edition, Arnold (2001).

Van Dyk, J., The Modern Technology of Radiation Oncology: A Compendium for Medical Physicists and Radiation Oncologists, Volumes 1 and 2 Medical Physics Pub (1999, 2005).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

RT 328: CLINICAL PRACTICE IV

Hours per week: 5 weeks full-time

Prerequisite: RT 317**Objectives:**

On completion of this subject the student should be able to:

1. Gain hands on experience on basic and more complex standard planning and treatment techniques.
2. Develop and demonstrate effective communications.
3. Develop and demonstrate effective patient care skills in a clinical setting.

Syllabus:

Simulation of standard 2, 3 and 4 field planning techniques. Manual and computer planning of 2, 3 and 4 field planning techniques. Treatment of standard 2, 3 and 4 field techniques.

Textbook:

Clinical Handbook: To be developed.

Assessment:

Continuous Assessment - 100%
Written Examination - 0%

RT 348: RADIATION PHYSICS III

Hours per week: 3 (2/1)

Prerequisite: RT 222

Objectives:

On completion of this subject the student should be able to:

1. The student will be able to demonstrate an understanding of the physics principles behind the operation of linear accelerators.
2. The student will be able to explain the quality assurance processes related to the operation of a linear accelerator.

Syllabus:

Magnetron & klystron, Electron beams, Waveguide, Target and bending magnets, Interaction of radiation with tissue, Dose measurement: tlds, diodes and ion chambers, Electronic portal imaging, Shielding – lead shielding versus MLCs, Quality assurance, Radiation safety and protection in a Radiation Therapy department.

Textbook:

Greene, D. & Williams, P.C., Linear Accelerators for Radiation Therapy, 2nd Edition, Institute of Physics, ISBN0 7503 0476 6.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

**RT 411: RADIATION THERAPY
TECHNIQUES IV**

Hours per week: 6 (4/2)

Prerequisite: RT 324

Objectives:

On completion of this subject the student should be able to:

1. Understand the principles, dose calculation and clinical application of orthovoltage treatments.
2. Understand the principles and clinical application of brachytherapy techniques in the treatment of cancer.
3. Understand the principles, dose calculation and clinical application of superficial treatment.

Syllabus:

Brachytherapy: Interstitial and intracavity techniques, comparative analysis between brachytherapy and external beam radiation therapy. Radioactive source production, properties and use. Orthovoltage Treatment: equipment, treatment techniques for various anatomical sites, dose calculation and patient care, Superficial Treatment: Equipment, treatment techniques for various anatomical sites, dose calculation, and patient care.

Textbook:

Pierquin, B. & Marinello, G., A Practical Manual of Brachytherapy, Medical Physics Publishing (1997).

Khan, F.M. & Potish, R.A., Treatment Planning in Radiation Oncology, Williams and Wilkins (1998).

Reference:

Bentel, G.C., Radiation Therapy Planning, 2nd Edition, McGraw Hill (1996).

Khan, F.M., The Physics of Radiation Therapy, 2nd Edition, Williams and Wilkins (1992).

Levitt, S.H., Khan, F.M. & Potish, R.A., Technological Basis of Radiation Therapy: Practical Clinical Applications, 2nd Edition, Lea & Febiger (1992).

Williams, J.R. & Thwaites, D.I., Radiotherapy Physics in Practice, 2nd Edition, Oxford Medical Publishing (2000).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

RT 413: CLINICAL PRACTICE V

Hours per week: 6 weeks full-time

Prerequisite: RT 328

Objectives:

On completion of this subject the student should be able to:

1. Develop skills in Radiation Therapy simulation and dosimetry to a role of

assistant and observed performer of standard Radiation Therapy techniques.

2. Continue to develop effective communication skills.

Syllabus:

Maintenance of a student diary recording experiences while on clinical placement. Clinical experience in simulation, dosimetry and treatment.

Textbook:

Clinical Handbook: To be developed.

Reference: Nil

Assessment:

Continuous Assessment - 100%

Written Examination - 0%

**RT 415: RADIATION THERAPY
PLANNING IV**

Hours per week: 6 (3/3)

Prerequisite: RT 326

Objectives:

On completion of this subject the student should be able to:

1. Design, critically analyse and optimize radiation therapy treatment plans using CT data.
2. Explain computerized tomography principles.
3. Develop 3D computer planning algorithms.
4. Develop further understanding of the quality assurance processes associated with CT planning.

Syllabus:

CT data acquisition and translation. Compensation techniques. Junction Geometry for photons and electrons. Non-coplanar treatment techniques. Computed Tomography principles. 3D computer planning algorithms. Quality assurance.

Textbook:

Purdy, J.A. & Starkschall, G., A Practical Guide to 3D Planning and conformal Radiation Therapy,

Advanced Medical Publishing (1999).

Bentel, G.C., Radiation Therapy Planning, 2nd Edition, McGraw Hill (1996).

Reference:

Khan, F.M. & Potish, R. (editors), Treatment Planning in Radiation Oncology, Williams and Wilkins (1998).

Ellis, H., Logan, B.M. & Dixon, A.K., Human Sectional Anatomy: Pocket Atlas of Body Sections, CT and MRI Images, 2nd Edition, Arnold (2001).

Gregoire, V., Scalliet, P., Ang, K.K. (editors), Clinical Target Volumes in Conformal and Intensity Modulated Radiation Therapy: A Clinical Guide to Cancer Treatment, Berlin; New York: Springer (2004).

Khan, F.M., Physics of Radiation Therapy, 3rd Edition, Williams and Wilkins (2003).

Van Dyk, J., The Modern Technology of Radiation Oncology: A Compendium for Medical Physicists and Radiation Oncologists, Volumes 1 and 2 Medical Physics Pub (1999, 2005).

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1x3 hrs)

**RT 417: PSYCHOLOGY FOR RADIATION
THERAPISTS**

Hours per week: 3 (2/2)

Prerequisite: Nil

Objectives:

On completion of this subject the student should be able to:

1. Learn skills to deal with loss and grieving related to cancer patients.
2. Develop management strategies for work place grievance.
3. Learn about varying cultural needs of the patient.
4. Learn about varying styles of human psychology and how it can impact the work environment.

Syllabus:

Styles of human psychology and its impacts on work environment. Symptoms of psychological trauma and impacts of managed care. Aspects of psychological assessment and psychological engagement in relation to clinical practice. Psychological and emotional impacts in the field of radiation therapy between professionals and patients. Loss and grieving. Management strategies for workplace grievances. Development of skills to recognize and minimize negative impacts and to deal with loss and grieving related to cancer patients. Understanding the varying cultural needs of patients.

Textbook:

Compas, Bruce & Gotlib, Ian, Introduction to Clinical Psychology, McGraw Hill, ISBN 0070124914.

Groth-Marnat, G., Handbook of Psychological Assessment, 4th Edition, John Wiley & Sons (2003).

Assessment:

Continuous Assessment - 100%
Written Examination - 0%

RT 422: RADIOTHERAPY TECHNIQUES V

Hours per week: 6 (4/2/)

Prerequisite: RT 411

Objectives:

On completion of this subject the student should be able to:

1. Updated on new and evolving technology within the field of Radiation Therapy and cancer care.
2. Updated about new Radiation Therapy techniques available for the treatment of cancer for various sites of a more complex nature.

Syllabus:

Image guided Radiation Therapy. Stereotactic Radiation Therapy. Radiosurvey. Paediatric Radiation Therapy. Whole Body Radiation Therapy. Proton Therapy. Chemotherapy.

Textbook:

Schlegel, W., Bortfeld, T. & Grosu, A.L. (editors), New Technologies in Radiation Oncology, Springer (2006).

Reference:

Meyer, J.L., IMRT, IGRT SBRT Advances in the treatment planning a delivery of Radiotherapy, Karger (2007).

Murphy, G., Lawrence, W. & Lenhard, R. (editors), American Society Textbook of Clinical Oncology, 3rd Edition, American Cancer Society (2000).

Van Dyk, J. (editor), The Modern Technology of Radiation Oncology, Medical Physics Publishing (1999).

Perez, C. & Brady, L., Principles and Practice of Radiation Oncology, 3rd Edition, Lippincott (1998).

De Vita, et al, Cancer: Principles and Practice of Oncology, 4th Edition, Lippincott (2000).

Leibel, S.A. & Phillip, T.L. (editors), Textbook of Radiation Oncology, 1st Edition, Saunders (1998).

Khan, F.M. & Potish, R. (editors), Treatment Planning in Radiation Oncology, Williams and Wilkins (1998).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

RT 426: RADIATION THERAPY PLANNING V

Hours per week: 6 (3/3)

Prerequisite: RT 415

Objectives:

On completion of this subject the student should be able to:

1. Demonstrate the ability to fuse multiple modalities to identify planning tumour volume.
2. Use the skills to demonstrate advance planning skills in multiple sites throughout the human body.

Syllabus:

MRI: Imaging, Reconstruction, Relaxation times, Quality Assurance, Troubleshooting.

PET: Principles, Imaging, Radiation doses, Reconstruction, Quality assurance, Troubleshooting, PET Vs CT PET.

Advance treatment planning.

Textbook:

Schlegel, W., Bortfeld, T. & Grosu, A.L. (editors), New Technologies in Radiation Oncology Springer (2006).

Khan, F.M., The Physics of Radiation Therapy, 3rd Edition, Lippincott, Williams and Wilkins (2003).

Purdy, J.A., 3D Conformal and Intensity Modulated Radiation Therapy: Physics and Clinical Applications, Madison, WI. Advanced Medical Pub (2001).

Van Dyk, J. (editor), The Modern Technology of Radiation Oncology, Medical Physics Publishing (1999).

Reference:

ICRU Report 62, Prescribing, Recording and Reporting Photon Beam Therapy (Supplement to ICRU Report 50), International Commission on Radiation Units and Measurements (1999).

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1x3 hrs)

RT 428: PROJECT

Hours per week: 10

Prerequisite: RT 427

Objectives:

On completion of this subject the student should be able to:

1. Develop the ability to conduct preliminary research to develop a research topic.
2. Demonstrate skills of effective data collection, organization, and acquisition/interpretation of information.
3. Develop presentation skills.

4. Develop and strengthen team work.

Syllabus:

Ethics, Information retrieval skills, Statistics, Report Writing, Word processing skills including Powerpoint, poster development, Survey writing.

Textbook: Nil

Assessment:

Continuous Assessment - 100%

Written Examination - 0%

DEPARTMENT OF APPLIED SCIENCE

DEPARTMENT OF APPLIED SCIENCES

Acting Head of Department:

Akoitai, S.A., Ph.D. (Cant), M.Sc. (Cant), B.Sc (PNGUT). HTC (Lae Tech).

Applied Chemistry Section

Associate Professor:

Akoitai, S.A., Ph.D. (Cant), M.Sc. (Cant), B.Sc (PNGUT). HTC (Lae Tech).

Senior Lecturer:

Janarthanan, G., Ph.D (IIT Madras), MSc. (The American College, Madurai), BSc (GTN Arts College, Dindigul).

Lecturer:

Narimbi, J., MSc Tech. (UNSW), BSc (PNGUT)
Timi, D. MPhil (PNGUT), BSc (PNGUT)

Technical Instructor:

Sandy Puy, B.Sc. (PNGUT)

Food Technology Section

Senior Lecturer:

Lecturer:

Pue, A., M. Biochem. Eng. (Yamanashi), PG Dip. Chem. (UPNG), B.Sc. (PNGUT)
Nigo, R., M.Sc (Reeding), B.Sc. (PNGUT)
Rubiang-Yalambing, L., MSc (Kings College). B.Sc. (PNGUT)

Senior Technical Instructor:

Gubag-Sipou, R., M.Phil., B.Sc. (PNGUT)

Lab Manageress:

Kusunan, N., B.Sc. (PNGUT)

Principal Technical Officer:

Kuipa, W., CHTE (Lae Tech), Ass. Dip. Food Tech. (Gatton)
Yawing, L., B.Sc. (PNGUT)

Senior Technical Officer:

Lui, M., CHTE (Lae Tech)
Wangiwon, P., Dip (Lae Tech)

Technical Officer

Badawool, P., Dip. (Lae Tech)

Senior Secretary:

Mobiha, E., Basic Sec. Cert. (Rabaul Sec. College)

Secretary:

Elisha, Y., Basic Sec. Cert. & Steno. Cert (Lae Tech.)

The Department consists of two main sections, viz. Applied Chemistry and Food Technology. Apart from the service courses, the Department offers the following four-year academic programmes leading to:-

- (a) Bachelor of Science in Applied Chemistry
- (b) Bachelor of Science in Food Technology, and
- (c) Bachelor of Science in Human Nutrition.

The Bachelor of Science in Human Nutrition is a new degree programme which has been frozen since 1995. The degree courses are designed to produce Chemists, Food Technologists and Nutritionists who will be able to pursue careers in industry, teaching or government. Applied chemists perform analysis, testing and investigations into a wide range of materials. Food technologists are concerned with production, processing, preservation, distribution and utilization of foods. Nutritionists deal with the many aspects of food and health, ensuring that the body is adequately nourished for growth and development.

The first Year of each course is designed to form a common foundation upon which Years 2, 3 and 4 of the separate professional options are based.

Entry requirements:

- i) Grade 12 with minimum C grades in Chemistry, Physics or Biology and Maths A or B grade in Maths B.
or
- ii) Mature students who have performed with average B grades in Adult Matriculation courses.
or

- iii) Higher Technicians Certificate from Lae Technical College with Credit grades in subjects or its equivalent.
or
iv) A Diploma from Goroka Teacher's College with passes in Maths and Science teaching methods or its equivalent.

The Department has the facilities to offer Postgraduate degrees (M.Sc., M.Phil. and PhD) as well as Postgraduate Diploma.

Chemistry is taught to Agriculture, Forestry, Applied Physics and Engineering students. Chemistry is also being offered in the Summer Session as a component of the University's new Adult Matriculation programme.

STRUCTURE OF COURSES

Code	Subjects	Av. Weekly Hours

FOUNDATION YEAR IN APPLIED SCIENCES

Year 1	First Semester	
FR111	Plant Biology	5
AS121	Chemistry I (B)	8
LA101	Learning & Communication Skills	3
MA171	Mathematics I AS	5
PH183	Physics for Applied Sciences I	5
		26

Year 1	Second Semester	
AG112	Animal Biology	5
AS122	Chemistry II (B)	8
PH184	Physics for Applied Sciences II	5
MA172	Mathematics I AS	5
LA102	Study & Academic Skills	3
		26

BACHELOR OF SCIENCE IN APPLIED CHEMISTRY

Year 2	First Semester	
CH211	Organic Chemistry I	3
CH221	Analytical/Inorganic Chemistry I	5
CH231	Physical Chemistry I	3

FT201	Introduction to Food Technology	2
MA271	Mathematics 2 AS (A)	4
CS145	Introduction to Information Technology I	2
		19

Year 2	Second Semester	
CH212	Organic Chemistry II	3
CH222	Analytical/Inorganic Chemistry II	5
CH232	Physical Chemistry II	3
AS282	Computer aided data analysis in Applied Sciences	3
MA272	Mathematics 2 AS (B)	4
CS146	Introduction to Information Technology II	2
		20

Year 3	First Semester	
CH311	Instrumental Analysis I	5
CH321	Analytical/Inorganic Chemistry III	5
CH331	Instrumental Analysis II	4
CH341	Geochemistry/Mineral Technology	4
LA201	Advanced Academic and Research Skills	3
		21

Year 3	Second Semester	
CH332	Instrumental Analysis III	4
CH342	Water Analysis	4
CH352	Petroleum chemistry	3
CH362	Environmental chemistry I	3
CH372	Food analysis for chemists	3
		17
CH302	Industrial Training	40

Second Semester subjects are taught until the mid-semester break. Students then sit for examinations. The rest of the semester is spent on Industrial Training. Satisfactory Industrial Training is a prerequisite for entry into the fourth Year of the degree course.

Year 4	First Semester	
CH401	Research Project	3
CH431	Instrumental Analysis IV	3
CH461	Environmental Chemistry II	6
MP341	Hydrometallurgy I	4
LA202	Writing a Research Paper	2
		18

Year 4	Second Semester	
CH402	Research Project	5
CH442	Applied Analytical Chemistry	6
CH452	Topics in Advanced Chemistry	4
CH462	Industrial Chemistry	4
		19

BACHELOR OF SCIENCE IN FOOD TECHNOLOGY

Year 2	First Semester	
FT211	Introduction to Process Technology	4
FT241	Nutrition I	4
FT251	Food Processing Practical I	5
FT281	Food Analysis	4
FT291	Food Chemistry I	3
CS145	Introduction to Information Technology I	2
MA271	Mathematics 2 AS (A)	4
		26

Year 2	Second Semester	
FT212	Unit Operations I	3
FT252	Introduction to Food Biochemistry	2
FT262	General Microbiology	5
ME276	Workshop Technology and Practice For Food Technology	2
ME292	Thermodynamics for Food Technology	3
AS282	Applications of Computing in Applied Sciences	3
CS146	Introduction to Information Technology II	2
MA272	Mathematics 2 AS (B)	4
		24

Year 3	First Semester	
FT311	Process Technology	4
FT321	Food Canning and Packaging	4
FT331	Food Chemistry II	4
FT351	Food Microbiology	5
FT391	Quality Control and Sensory Evaluation	5
LA201	Advanced Academic and Research Skills	2
		24

Year 3	Second Semester	
FT312	Advanced Nutrition	5
FT332	Cereal Technology and Legume	

	Processing	3
FT352	Post-Harvest Physiology and Storage Technology	3
FT362	Unit Operations II	4
FT372	Food Processing Practical II	5
FT392	Food Process Engineering I	4
		24

FT302	Industrial Training	40

Year 4	First Semester	
FT401	Research Project	4
FT411	Industrial Microbiology and Food Biotechnology	5
FT431	Meat Technology	3
BA131	Introduction to Business	3
FT471	Food Processing Practical III	5
FT491	Milk and Dairy Technology	3
LA202	Writing a Research Paper	2
		25

Year 4	Second Semester	
BA132	Principles of Management	3
FT402	Research Project	4
FT422	Fruits and Vegetables Processing	3
FT452	Processing of Roots and Tubers	3
FT462	Processing of Miscellaneous Food Commodities	3
FT472	Food Processing Practical IV	5
FT482	Food Process Engineering II	2
		23

BACHELOR OF SCIENCE IN HUMAN NUTRITION

Year 2	First Semester	
FT241	Nutrition I	4
FT231	Biochemistry	4
FT251	Food Processing Practical I	5
FT281	Food Analysis	3
CS141	Introduction to Information Technology I	2
MA271	Mathematics 2 AS (A)	4
		22

Year 2	Second Semester	
FT212	Unit Operations I	3
FT222	Food Chemistry I	3
FT262	General Microbiology	5
FT272	Human Anatomy and Physiology	4
CS142	Introduction to Information	

MA272	Technology II	2	SUBJECTS TAUGHT BY THE DEPARTMENT	
AS282	Mathematics II AS (B)	4		
	Applications of Computing in Applied Sciences	3		AS111 Chemistry I (A)
		24		AS112 Chemistry II (A)
Year 3	First Semester			AS121 Chemistry I (B)
FT321	Food Canning and Packaging	4		AS122 Chemistry II (B)
FT331	Food Chemistry II	4		AS131 Chemistry I (C)
FT341	Food, Culture and Nutrition Interface	4		AS132 Chemistry II (C)
FT351	Food Microbiology	5		AS282 Computer aided data analysis in Applied Sciences
FT391	Quality Control and Sensory Evaluation	4		CH201 Organic Chemistry I
LA201	Advanced Academic and Research Skills	3		CH212 Organic Chemistry II
		26		CH221 Analytical/Inorganic Chemistry I
Year 3	Second Semester			CH222 Analytical/Inorganic Chemistry II
FT312	Advanced Nutrition	5		CH231 Physical Chemistry I
FT332	Cereal Technology and Legume Processing	3		CH232 Physical Chemistry II
FT342	Pathology	4		CH302 Industrial Training
FT352	Post-Harvest Physiology and Storage Technology	3		CH311 Instrumental Analysis I
FT362	Unit Operations II	4		CH321 Analytical/Inorganic Chemistry III
FT382	Nutrient Needs	5		CH331 Instrumental Analysis II
		24		CH332 Instrumental Analysis III
FT302	Industrial Training	40		CH341 Geochemistry/Mineral Technology
Year 4	First Semester			CH342 Water Analysis
FT401	Research Project	4		CH351 Instrumental Analysis for Food Technology
FT491	Milk and Dairy Technology	3		CH352 Petroleum Chemistry
FT421	Community Nutrition I	5		CH362 Environmental chemistry I
FT441	Biostatistics and Epidemiology I	4		CH372 Food Analysis for Chemists
BA131	Introduction to Business	3		CH401 Research Project
FT471	Food Processing Practical III	3		CH402 Research Project
		24		CH431 Instrumental Analysis IV
Year 4	Second Semester			CH442 Applied Analytical Chemistry
BA132	Principles of Management	3		CH452 Topics in Advanced Chemistry
FT402	Research Project	4		CH461 Environmental Chemistry II
FT422	Fruits and Vegetables Processing	3		CH462 Industrial Chemistry
FT432	Community Nutrition II	3		FT201 Introduction to Food Technology
FT452	Processing of Roots and Tubers	3		FT211 Introduction to Process Technology
FT462	Processing of Miscellaneous Food Commodities	3		FT212 Unit Operations I
FT492	Biostatistics and Epidemiology II	4		FT241 Nutrition I
		24		FT222 Food Chemistry I
				FT231 Biochemistry
				FT262 General Microbiology
				FT251 Food Processing Practical I
				FT252 Introduction to Food Biochemistry
				FT272 Human Anatomy and Physiology
				FT281 Food Analysis
				FT302 Industrial Training
				FT311 Process Technology

FT312	Advanced Nutrition
FT321	Food Canning and Packaging
FT331	Food Chemistry II
FT332	Cereal Technology and Legume Processing
FT341	Food, Culture and Nutrition Interface
FT342	Pathology
FT351	Food Microbiology
FT352	Post-Harvest Physiology and Storage Technology
FT362	Unit Operations II
FT371	Introduction to Tropical Crops
FT372	Food Processing Practical II
FT382	Nutrient Needs
FT391	Quality Control and Sensory Evaluation
FT392	Food Process Engineering I
FT401	Research Project
FT402	Research Project
FT491	Milk and Dairy Technology
FT411	Industrial Microbiology and Food Biotechnology
FT421	Community Nutrition I
FT422	Fruits and Vegetables Processing
FT431	Meat Technology
FT432	Community Nutrition II
FT441	Biostatistics and Epidemiology I
FT452	Processing of Roots and Tubers
FT462	Processing of Miscellaneous Food Commodities
FT471	Food Processing Practical III
FT472	Food Processing Practical IV
FT482	Food Process Engineering II
FT492	Biostatistics and Epidemiology II
CH181	Chemistry for Engineers I ^φ
CH182	Chemistry for Engineers II ^φ Subject details in First Year Engineering.

SUBJECT DETAILS

AS 111: CHEMISTRY 1 (A)

Hours per week: 6 (3/3) includes 1 hr tutorial.

Prerequisite: Grade 12 Chemistry or equivalent

Objectives:

On completion of this course, the student should be able to:-

1. Understand and apply safe working practices in the laboratory.
2. Name and write the formulae of elements and compounds.
3. Write balanced chemical, ionic and net ionic equations for chemical reactions, including oxidation-reduction reactions.
4. Introduction to the properties of elements and compounds in terms of their position in the periodic table and Lewis structure.
5. Discuss chemical bonding and draw Lewis diagrams for different types of bonding.
6. Do calculations involving moles, molarity concentration, dilution, limiting reagent and empirical formulae.
7. Apply the Gas Laws including the Ideal Gas Equation.

Syllabus:

Safety in the laboratory. Naming, Formulae, Equations - chemical, ionic and net ionic. Atomic Structure, isotopes, calculation of average atomic mass. Electronic Configuration, Stoichiometry, Avogadro's number, moles, molarity, dilution, empirical formula, limiting reagent. Oxidation-Reduction reaction: Oxidation number and electron transfer, half-reactions, balancing redox equations. Chemical bonding; ionic, covalent, polar covalent, metallic. Lewis diagrams, shapes of molecules. Periodicity; size, electronegativity, ionisation energy, metals, non-metals, metalloids. Gas Laws: Boyle's Law, Charles' Law and Ideal Gas Equation.

Textbook:

Zumdahl, S.S and Zumdahl, S.A; Chemistry, 8th Edition, (Brooks Cole, USA, 2010).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 2 hrs)

AS 112: CHEMISTRY 2 (A)

Hours per week: 6 (3/3) includes 1 hr tutorial.

Prerequisite: AS 111

Objectives:

On completion of this course, the student should be able to:-

1. Name, draw the structure and know the reactions of generic organic functional groups and simple organic compounds.
2. Understand solvent properties and solvation effects in aqueous and non-polar solvents.
3. Calculate product distributions at equilibrium in homogeneous and heterogeneous reactions, including acid-base systems.

Syllabus:

Organic Chemistry: Systematic naming, structure and elementary reaction chemistry of alkanes, alkenes, alkynes, aromatic hydrocarbons, alcohols, amines, aldehydes, ketones, carboxylic acids and their simple derivatives.

Physical Chemistry: Solvent types; aqueous, non-polar and dipolar aprotic. Hydrogen bonding and ionic dissolution. Water chemistry. Equilibrium: static, dynamic equilibrium systems, Le Chatelier's Principle, equilibrium calculations including sparingly soluble salts, strong and weak acids, bases and buffers.

Textbook:

Zumdahl, S.S and Zumdahl, S.A; Chemistry, 8th Edition, (Brooks Cole, USA, 2010).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 2 hrs)

AS 121: CHEMISTRY I (B)

Hours per week: 8 (5/3) includes 2 hrs tutorial.

Prerequisite: Grade 12 Chemistry or equivalent

Objectives:

On completion of the subject, the student should be able to:-

1. Understand and apply safe working practices in the laboratory.
2. Name and write the formulae of elements and compounds.

3. Write balanced chemical, ionic and net ionic equations for chemical reactions, including oxidation-reduction reactions.
4. Discuss the properties of elements and compounds in terms of their position in the periodic table.
5. Discuss chemical bonding and draw Lewis diagrams for different types of bonding.
6. Do calculations involving moles, molarity, normality, density, specific gravity, concentration, dilution, limiting reagent and empirical formulae.
7. Apply the Gas Laws including the Ideal Gas Equation and the van der Waals equation.

Syllabus:

Safety in the laboratory. Naming, Formulae, Equations - chemical, ionic and net ionic. Atomic Structure, isotopes, calculation of average atomic mass. Electronic configuration and quantum numbers, Stoichiometry, Avogadro's number, moles, molarity, normality, density, specific gravity, concentration, dilution, empirical formula, limiting reagent. Oxidation-Reduction reaction: Oxidation number and electron transfer, half-reactions, balancing redox equations. Chemical bonding; ionic, covalent, polar covalent, metallic. Lewis diagrams, shapes of molecules. Periodicity; size, electronegativity, ionisation energy, metals, non-metals, metalloids. Gas Laws: Boyle's Law, Charles' Law and Ideal Gas Equation, the van der Waals equation.

Textbook:

Zumdahl, S.S and Zumdahl, S.A; Chemistry, 8th Edition, (Brooks Cole, USA, 2010).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 2 hrs)

AS 122: CHEMISTRY 2 (B)

Hours per week: 8 (5/3) includes 1 hr tutorial.

Prerequisite: AS 121

Objectives:

On completion of this subject, the student should

be able to:-

1. Name, draw the structure and know the reactions of organic functional groups, mono and difunctional organic compounds.
2. Identify the simple types of reaction mechanisms.
3. Understand basic thermodynamic and kinetic principles. Calculate product distributions at equilibrium in homogeneous and heterogeneous reaction systems; including acid-base, gas phase and ionic solubility.
4. Discuss the separation of cations using solubility and equilibrium principles.
5. Classify the elements of periodic table according to their electronic structure.

Syllabus:

Organic Chemistry: Bonding, hybridization and structural features, including oxidation states of organic compounds. The functional group approach: Structure, nomenclature, preparation and properties of alkanes, alkenes, alkynes, benzenes, halogeno compounds, aldehydes, ketones, amines, ethers, alcohols, phenols, carboxylic acids and their derivatives. Organic redox reactions. The use of pK_a values in organic reactions. Brief treatment of organic reaction mechanisms.

Physical Chemistry: State and manipulate basic thermodynamic relationships. Introductory thermodynamics: enthalpy, The First Law and Hess's Law. Static and dynamic equilibrium systems, Le Chatelier's principle, equilibrium calculations including sparingly soluble salts, strong and weak acids, bases and buffers and chemical reactions, pH. Qualitative analysis: separation of cations.

Inorganic Chemistry: Orbital types, electronic configuration. Classification of elements by property and electronic structure. Periodicity of atomic and ionic size, ionization energy, electron affinity, electronegativity, polarizability and polarizing ability. Different types of bonds: ionic, covalent, coordinate and metallic. Properties of ionic and covalent compounds. Criteria for determining the nature of bonding. Hybridization of orbitals. Molecular shape and VSEPR theory.

Textbook:

Zumdahl, S.S and Zumdahl, S.A; Chemistry, 8th Edition, (Brooks Cole, USA, 2010).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 2 hrs)

AS 131: CHEMISTRY 1 (C)

Hours per week: 4(3/1) includes 1 hour tutorial

Prerequisite: Grade 12 Chemistry or equivalent

Objectives:

On completion of the subject, the student should be able to:-

1. Understand and apply safe working practices in the laboratory.
2. Name and write the formulae of elements and compounds.
3. Write balanced chemical, ionic and net ionic equations for chemical reactions, including oxidation-reduction reactions.
4. Discuss the properties of elements and compounds in terms of their position in the periodic table and Lewis structure.
5. Discuss chemical bonding and draw Lewis diagrams for different types of bonding.
6. Do calculations involving moles, molarity concentration, dilution, limiting reagent and empirical formulae.
7. Apply the Gas Laws including the Ideal Gas Equation.

Syllabus:

Safety in the laboratory. Naming, Formulae, Equations - chemical, ionic and net ionic. Atomic Structure, isotopes, calculation of average atomic mass. Electronic Configuration, Stoichiometry, Avogadro's number, moles, molarity, dilution, empirical formula, limiting reagent. Oxidation-Reduction reaction: Oxidation number and electron transfer, half-reactions, balancing redox equations. Chemical bonding; ionic, covalent, polar covalent, metallic. Lewis diagrams, shapes of molecules. Periodicity; size, electronegativity, ionisation energy, metals, non-metals, metalloids. Gas Laws: Boyle's Law, Charles' Law and Ideal Gas Equation.

Textbook:

Zumdahl, S.S and Zumdahl, S.A; Chemistry, 8th

Edition, (Brooks Cole, USA, 2010).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 2 hrs)

AS 132: CHEMISTRY 2 (C)

Hours per week: 4 (3/1) includes 1 hr tutorial.

Prerequisite: AS 131

Objectives:

On completion of this subject, the student should be able to:-

1. Name, draw the structure and know the reactions of generic organic functional groups and simple organic compounds.
2. Understand solvent properties and solvation effects in aqueous and non-polar solvents.
3. Calculate product distributions at equilibrium in homogeneous and heterogeneous reactions, including acid-base systems.

Syllabus:

Organic Chemistry: Systematic naming, structure and elementary reaction chemistry of alkanes, alkenes, alkynes, aromatic hydrocarbons, alcohols, amines, aldehydes, ketones, carboxylic acids and their simple derivatives.

Physical Chemistry: Solvent types: aqueous, non-polar and dipolar aprotic. Hydrogen bonding and ionic dissolution. Water chemistry. Equilibrium: static, dynamic equilibrium systems, equilibrium constant expressions K_c , homogeneous and heterogeneous systems, Le Chatelier's principle, equilibrium calculations including sparingly soluble salts, strong and weak acids, bases and buffers.

Textbook:

Zumdahl, S.S and Zumdahl, S.A; Chemistry, 8th Edition, (Brooks Cole, USA, 2010).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 2 hrs)

AS 282: COMPUTER AIDED DATA ANALYSIS IN APPLIED SCIENCES

Hours per week: 3 (1/2)

Prerequisite: CS 145

Objectives:

On completion of this subject, students should be able to:-

1. Understand the use of Microsoft Excel as the most popular application for Data Analysis
2. Perform common data analysis functions using spreadsheet
3. Understand the relevance of these data packages in scientific applications.

Syllabus:

Introduction: Errors in quantitative analysis, types of error (random, systematic, gross), handling systematic errors, planning and design of experiments.

Data Analysis: Statistics of repeated measurements (mean, standard deviation), distribution of repeated measurements, confidence limits of the mean of large samples, confidence limits of the mean of small samples, presentation of results, propagation of errors (random, systematic), Significance tests (t-tests, F-tests), outlier tests, ANOVA, regression and correlation analysis, calibration graph, slope and intercept and data presentations (charts & graphs).

Textbook:

Skoog, D.A., West, D.M. and Holler, F.J. Crouch, S.R., Fundamentals of Analytical Chemistry, 8th edition (Brooks/Cole- Thompson Learning Inc., 2004).

Reference books:

Joseph Billo, E., Excel for Chemists: A Comprehensive Guide, 2nd Edition, (John Wiley & Sons, Inc., 2004).

Miller, J. N. and Miller, J. C., Statistics and Chemometrics for Analytical Chemistry. (Essex, England, Pearson Education Limited, 2005).

Assessment:

Continuous Assessment - 100%

CH 211: ORGANIC CHEMISTRY I

Hours per week: 3 (2/1)

Prerequisite: AS 122

Objectives:

On completion of this subject, the student should be able to:

1. Name, draw the structures and predict the reactions of functional groups not covered in the first year and extend these to heterocyclic chemistry.
2. Understand and apply in more depth, the various mechanisms involved in organic chemistry.
3. Get practical experience in handling organic chemicals in a chemistry laboratory.

Syllabus:

Structure, nomenclature, preparation and properties of hetero-atoms and compounds not covered in the first year. In depth treatment of the material covered in the previous year. Reaction mechanisms; electrophilic and nucleophilic addition, substitutions and eliminations. Electrical effects in organic compounds; acidity and basicity of organic molecules. Resonance and delocalisation. Aromaticity and aromatic compounds. Bond dissociation energy (ΔH) calculations and application.

Textbook:

Brown, W.H. & Thomas Poon, Introduction to Organic Chemistry, Third Edition (John Wiley & Sons, Brisbane, 2004).

Reference book:

Solomon, T.W.G., Organic Chemistry, 2nd edition (Wiley & Sons, New York, 2000).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 2 hrs)

CH 212: ORGANIC CHEMISTRY II

Hours per week: 3 (2/1)

Prerequisite: CH 211

Objective:

On completion of this subject, students should be able to:

1. Discuss the structural units and chemistry of lipids, proteins and carbohydrates.
2. Perform classical qualitative analysis of the above.
3. Identify chiral centers and to understand the +/-, R/S and D/L nomenclature systems.
4. Describe the structure and properties of man-made polymers and plastics.
5. State and explain the principle of chromatography.

Syllabus:

Occurrence, structure and chemistry of triglycerides and fatty acids; aminoacids, peptides and proteins; mono, di and polysaccharides. Optical isomerism. Polymer chemistry: Chain and step polymerization. Copolymers and polymer alloys. Introductory to chromatography. Petroleum chemistry.

Textbook:

Brown, W.H. and Poon, T., Introduction to Organic Chemistry, 3rd edition (John Wiley & Sons, 2004).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 2 hrs)

CH 221: ANALYTICAL / INORGANIC CHEMISTRY I

Hours per week: 5 (2/3)

Prerequisite: AS 122

Objectives:

On completion of this subject, students should be able to:-

1. Discuss the basic theory and practice of volumetric analysis.
2. Carry out titrations based on acid-base, redox and precipitation reactions.
3. Carry out semi-micro qualitative analysis of cations and anions.
4. Understand and explain the chemistry, structures and bonding aspects of s- and p-block elements and their compounds.
5. Discuss the principles, types and applications of various nuclear reactions.

Syllabus:

Introduction to sampling and data handling. Introductory theory and practice of volumetric analysis. Chemical calculation practice (ppm, ppb, molarity, normality, density, specific gravity and dilutions). Primary standard, end point, equivalence point, indicators. Acid-base, redox and precipitation titrations and their calculations. Application of redox and precipitation titrations. Semi-micro Qualitative analysis: Separation of cations into groups and their confirmatory tests. Analysis of anions.

s- and p- block elements: Selected compounds of selected s- and p- block elements and their chemistry, molecular orbital theory, advanced VSEPR theory.

Nuclear chemistry: Introduction, penetrating powers of α , β , γ particles and neutrons, chain reactions, kinds of radioactive transformations, decay series, half life, induced nuclear reactions, nuclear fission and fusion, binding energy, separation of isotopes, carbon-14 dating, applications of radio isotopes, nuclear reactors.

Textbooks:

Skoog, D.A., West, D.M. and Holler, F.J. Crouch, S.R., Fundamentals of Analytical Chemistry, 8th edition (Brooks/Cole- Thompson Learning Inc., 2004).

Housecroft, C. and Sharpe, A.G., Inorganic Chemistry, II Ed., (Pearson Edn. Ltd., New Jersey, 2005).

Reference book:

Miessler, G.L. and Torr, D.A., Inorganic Chemistry, III Ed., (Prentice Hall, New Jersey, 2003).

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1 x 2 hrs)

CH 222: ANALYTICAL / INORGANIC CHEMISTRY II

Hours per week: 5 (2/3)

Prerequisite: CH 221

Objectives:

On completion of this subject, students should be able to:-

1. Describe and explain the basic theory and practice of complexometric and gravimetric analysis, spectroscopic and separation methods of analysis.
2. Understand and explain the chemistry, structures and bonding aspects of I row d-block elements and their compounds.
3. Understand the terminologies and explain basic concepts involved in transition metal coordination chemistry.

Syllabus:

Complexometric titrations: Multidentate ligands, EDTA complexes and their formation constants, conditional formation constants, indicators, scope and application of EDTA titrations.

Gravimetric analysis: Precipitating agents and precipitates, mechanism and conditions for precipitate formation, co-precipitation. Application of gravimetric analysis.

Introduction to Spectroscopic methods of analysis: Electromagnetic radiation, atomic, molecular, UV-visible spectra. Beer-Lambert Law. Colorimetry, UV-Visible spectrometry, flame photometry and atomic absorption spectrometry.

Analytical separation methods: Solvent extraction; extraction efficiency, extraction of metal chelates. Introduction to ion-exchange and chromatographic separations.

d- block elements: Selected compounds of I row d-block elements and their chemistry.

Coordination chemistry: Introduction, coordination number and geometry, nomenclature of coordination compounds, stability of metal complexes, formation constant, factors

determining stability, chelate effect, applications of coordination compounds.

Textbooks:

Skoog, D.A., West, D.M., Holler, F.J. and Crouch, S.R., Fundamentals of Analytical Chemistry, 8th edition (Brooks/Cole- Thompson Learning Inc., 2004).

Shriver, D.F. and Atkins, P.W., Inorganic Chemistry, IV Ed., (Oxford Univ. Press, Oxford, 2006).

Reference book:

Greenwood, N.N. and Earnshaw, A., Chemistry of the Elements, II Ed., (Butterworth-Heinemann, Oxford, 2002).

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1 x 2 hrs)

CH 231: PHYSICAL CHEMISTRY I

Hours per week: 3 (2/1)

Prerequisite: AS 122

Objectives:

On the completion of this subject students should be able to:

Provide students with the concepts of chemical calculations and fundamental applications of chemistry.

1. State and manipulate thermodynamic relationships
2. Explain the effect of experimental conditions on equilibrium constants
3. Analyse kinetic data and relate it to reaction mechanism
4. Explain the complementary nature of thermodynamics and kinetics

Syllabus:

Thermodynamics – Introduction, Importance and Limitations, Energy changes in relation to work and heat changes, Heat capacity of a System and second law of thermodynamics, The concept of Entropy and its physical significance, Gibbs free energy, Spontaneity of chemical reactions,

standard and non-standard conditions, relation between Gibbs free energy change and equilibrium constant, Chemical equilibrium and equilibrium constant calculations, Le Chatelier principle, Examples with effect of concentration, temperature and pressure, Acid base equilibria, weak acids and weak bases, Buffer solutions, Amphiprotic species and solubility equilibrium, Chemical (Reaction) kinetics, order of a reaction

Reaction rates: first order and second order rate equations, Half life period, mechanisms of complex reactions, Rate determining step and Concept of activation energy, Arrhenius equation and catalysis

Reference book:

Atkins, P.W and Julio De Paula, Elements of Physical Chemistry, (W.H. Freeman and Co., Australia, 2009).

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1 x 2 hrs)

CH 232: PHYSICAL CHEMISTRY II

Hours Per week: 3 (2/1)

Prerequisite: CH 231

Objectives:

On the completion of this subject students should be able to:

1. Apply the kinetic theory of gases to real gases.
2. Explain the concept of thermodynamic stability.
3. Discuss the forces of cohesion in the different states of matter.
4. State the common processes of and the difference between galvanic and electrolytic cells.
5. Perform basic electrochemical calculations.
6. Interpret phase diagrams and relate these to physical properties of systems.

Syllabus:

Kinetic theory of gases: Maxwell's distribution of speeds, Real equations of state and liquefaction of gases, Thermodynamics: Van't Hoff equation, Ellingham diagram, Lattice enthalpy and cohesive forces, Electrochemical cells: varieties of cells, Nernst equation, Gibbs free energy change and electrolysis, Faraday's law and conductivity, Phase equilibria: one component and two component systems introduction, Phase diagram and phase rule for one component and two component systems, Henry's law and Raoult's law, fractional distillation, Non-ideal solutions and colligative properties, surface tension, Capillary, colloids and viscosity of fluids

Reference book:

Atkins, P.W and Julio De Paula, Elements of Physical Chemistry, (W.H. Freeman & Co., Australia, 2009).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 2 hrs)

CH 302: INDUSTRIAL TRAINING

Hours per week: 40

Objectives:

On completion of this subject, students should be able to:-

1. Describe the products, structure and role of an organisation in a chemistry - related industry in PNG.
2. Consistently perform a task within the disciplined structure of an industrial organisation.
3. Prepare a written report upon his activities.

Syllabus:

Students will undertake 10 weeks of work experience in a suitable establishment, which will be chosen so that both breadth and depth of experience are offered. Students will be treated as trainee employees in that they will receive training and supervision from their hosts and will be expected to undertake responsible tasks in the latter stages of their placement.

Students will submit a written review of the structure and activities of their host establishment, keep a diary of their activities and submit a written report on their experiences.

Students will be supervised by a nominated employee of the host establishment who will assess their performance. They will be visited by a member of staff of the University who will assure himself/herself of their well-being and progress and who will assess their written reports.

Assessment:

Continuous Assessment - 100%

CH 311: INSTRUMENTAL ANALYSIS I

Hours per week: 5 (3/2)

Prerequisite: CH 212

Objectives:

On completion of this subject, students should be able to:

1. Describe the applications of non-instrumental methods of separation of organic compounds.
2. Apply chromatographic methods to the analysis of organic mixtures.
3. Interpret chromatograms.
4. Understand and apply quantitative spectroscopic methodology.
5. Undertake and interpret UV-visible, IR, NMR and MS spectra.
6. Undertake the interpretation of an unknown compound's spectra so as to elucidate its molecular structure.

Syllabus:

Separation and purification of organic compounds. Chromatography: instrumentation and applications of column, thin layer, paper, gel permeation, HPLC and gas chromatography.

Quantitative UV-Vis, colorimetric, and IR spectroscopic analysis: instrumentation, transmittance, absorbance, Beer's Law and its limitations.

UV-Vis: Chromophores and the Woodward-Fisher rules. IR: vibrational characteristics of functional groups. MS: isotopic abundance, fragmentation

and high resolution spectrometry. NMR: chemical shift, the n+1 rule, spin-spin coupling decoupling techniques.

Introduction to the complementary qualitative techniques of ^1H and ^{13}C NMR, IR, UV-Vis spectroscopy and mass spectrometry for the interpretation of organic molecular structure.

Textbook:

Gilbert, J.C., Experimental Organic Chemistry, 4th Edition, (Thomson Brooks/Cole, Belmont, CA, USA, 2005).

Reference book:

Williams, D.H. and Flemming, I., Spectroscopic Methods In Organic Chemistry, 5th Edition (McGraw Hill, London, 1995).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 2 hrs)

CH 321: ANALYTICAL/INORGANIC CHEMISTRY III

Hours per week: 5 (2/3)

Prerequisite: CH 222

Objectives:

On completion of this subject, students should be able to:-

1. Apply theoretical titration curves to select appropriate experimental conditions.
2. Apply VBT, CFT and LFT to certain complexes and comment on magnetic properties of complexes.
3. Interpret electronic spectra of transition metal complexes using Orgel and Tanabe-Sugano diagrams.

Syllabus:

Acid-Base titration curves: Strong acid, weak acid, polyprotic acid, mixture of acids with a strong base. Corresponding base titrations. Theory of indicators.

Precipitation titration curves: One species, mixtures. Argentometric titrations, chemical indicators.

Oxidation-reduction titration curves: Indicators, Potentiometric titrations.

Complexometric titration curves: EDTA titrations, analysis of complex materials, masking phenomena.

Coordination chemistry: Isomerism, stereochemistry of coordination complexes, bonding theories: Werner's coordination theory, Valence bond theory (VBT), Crystal field theory (CFT): Introduction, shapes of d-orbitals, orbital degeneracy, splitting of d-orbitals in octahedral, tetrahedral and square planar field, crystal field splitting energy and its values, crystal field stabilization energy, spectrochemical series, magnetic properties: diamagnetism, paramagnetism, magnetic moments of 1st transition series, limitations of CFT, ligand field theory (LFT), applications of VBT, CFT and LFT to some selected complexes, electronic spectra of coordination complexes and their interpretations, selection rules, Orgel diagrams, Racah parameters and nephelauxetic effect, introduction to Tanabe-Sugano diagrams.

Textbooks:

Skoog, D. A., West, D. M., Holler, F. J. and Crouch, S. R. "Fundamentals of Analytical Chemistry", 8th Edition, Thomson Brooks International Student Edition, Australia, 2004.
Housecroft, C. and Sharpe, A.G., Inorganic Chemistry, II Ed., (Pearson Edn. Ltd., New Jersey, 2005).

Reference book:

Greenwood, N.N. and Earnshaw, A., Chemistry of the Elements, II Ed., (Butterworth-Heinemann, Oxford, 1997).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 2 hrs)

CH 331: INSTRUMENTAL ANALYSIS II

Hours per week: 4 (1/3)

Prerequisite: CH 222

Objectives:

On completion of this subject, students should be able to:-

1. Discuss the principles of flame atomic absorption spectroscopy (FAAS) and flame emission spectroscopy (FES).
2. Describe the instrumentation used for FAAS and FES.
3. Account for interferences in FAAS and FES.
4. Describe the glass (pH) electrode and ion selective electrodes.
5. Apply the Nernst equation.
6. Discuss the use of ion selective electrodes in analysis.
7. Describe electrogravimetry and coulometry and calculate results from data.

Syllabus:

Atomic absorption spectrometers: Hollow cathode lamps, atomisers, monochromators. Single and double beam instruments. Background correction, flame chemistry and interferences. Releasing agents. Survey of metals amenable to FAAS.

The glass electrode: Response to H^+ and to Na^+ . Solid state, membrane and ion exchange ion selective electrodes. Gas sensing electrodes. Fluoride, sulphide, cyanide and halide electrodes. Metal sensing electrodes. Electrogravimetry. Primary and secondary coulometry.

Textbook:

Skoog, D.A., Holler, J.F, and Crouch S.R;
Principles of Instrumental Analysis, 6th edition
(Brooks/Cole, Australia, 2006).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 2 hrs)

CH 332: INSTRUMENTAL ANALYSIS III

Hours per week: 4 (1/3)

Prerequisite: CH 331

Objectives:

On completion of this subject, students should be able to:-

1. Describe the accessories used for flameless atomic absorption spectroscopy.
2. Discuss the advantages of flameless atomic absorption spectroscopy in inorganic analysis.
3. Describe the instrumentation used in voltammetry, polarography and anode stripping voltammetry (ASV).
4. Discuss cyclic voltammetry.
5. Discuss the origins of diffusion currents in voltammetry, polarography, pulse polarography and ASV.
6. Calculate results from data from polarographic and ASV experiments.

Syllabus:

Cold vapour, hydride generation and carbon furnace atomic absorption spectroscopy: carbon furnace, temperature programming, Zeeman background correction.

Voltammetry: The dropping mercury electrode, diffusion currents and polarography. Differential and square wave polarography. Anodic stripping voltammetry. Cyclic voltammetry.

Textbook:

Skoog, D.A., Holler, J.F, and Crouch S.R;
Principles of Instrumental Analysis, 6th edition
(Brooks/Cole, Australia, 2006).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 2 hrs)

CH 341: GEOCHEMISTRY/MINERAL TECHNOLOGY

Hours per week: 4 (1/3)

Prerequisite: CH 222

Objectives:

On completion of this subject, students should be able to:-

1. Discuss the basic theory on mineral hydrometallurgical and pyrometallurgical processing methods.
2. Appreciate the importance of geochemical/metallurgical sampling, sample

preparations and the significance in analytical results.

3. Describe and explain Fire Assaying techniques of gold/silver ores, their metallurgical products and bullion analysis.
4. Describe steps taken to minimize sampling and analytical errors in geochemical analysis.
5. Discuss the practice and application of the analytical techniques involved in the analysis of geochemical and ore samples.

Syllabus:

Introduction to basic mineral hydro-metallurgical and pyrometallurgical processing methods.

Sampling theories, sample comminution, error propagation and reduction in geochemical samples. Sampling and sample preparation based on mineralogical characteristics of samples. Problems in gold sampling.

Application of instrumental and classical methods to the analysis of geochemical ores and metallurgical samples: XRF, ICPAES, AAS. Fire Assaying techniques for gold and silver in ore and metallurgical samples.

Trace analysis in geochemical and silicate samples, sample dissolution: acid/acid mixtures, micro-wave digestions, fusion techniques, acid and alkaline fluxes. Reference standards and preparation of in-house reference materials.

Practicals on iodometry, application of AAS in ore analysis and gold analysis by aqua regia digestion, electrolysis, sample comminution, and division, field-trip to a Fire Assay laboratory.

Reference books:

Pawliszyn J., Sampling and Sample Preparation for Field and Laboratory: Fundamental and New Directions in Sample Preparation, (Elsevier, 2002).

Wills, B.A., Mineral Processing Technology, 3rd edition (Pergamon Press, London, 1985).

Bugbee, E.E., A Textbook of Fire Assaying, 3rd edition (Colorado School of Mines, Colorado, 1940).

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1 x 2 hrs)

CH 342: WATER ANALYSIS

Hours per week: 4 (1/3)

Prerequisite: CH 222

Co-requisite: CH 362

Objectives:

At the end of the course, students should be able to:

1. Explain the sources and uses of water: the hydrological cycle, constituents of seawater and river water;
2. Describe the importance of water quality, types and sources of aquatic pollution;
3. Treatment of drinking water and wastewater;
4. Explain the necessity of water analysis;
5. Describe and discuss steps taken in preparing water sample collection vessels, sample collection, treatment and storage techniques;
6. Discuss instrumental and non-instrumental techniques for water analysis;
7. Perform common chemical and physical tests from water standard methods and understand the limitations of these methods;
8. Interpret analytical data with respect to the aims and objectives of a given water testing method.
9. Discuss trace metal speciation.

Syllabus:

Properties of water. Define hydrology, limnology and oceanography. The hydrological cycle; major and minor constituents of rainwater, river and seawater.

Properties of estuaries, thermal stratification: epilimnion, thermocline and hypolimnion, and how Lihir, Misima and Ramu apply these properties to discharge mining tailings.

Why analyse: defining objectives in environmental analysis, monitoring to determine the extent of a problem, base line studies, determination of control procedures, legislative compliance monitoring, monitoring to ensure the problem has been controlled.

Sources of aquatic pollution: industrial, agricultural, eutrophication, mining and quarrying. Trace Analysis of metals and speciation: Speciation in natural waters; speciation and biological availability and toxicity of trace metals; the importance of metal-organic and metal-colloid interactions in determining speciation. Analytical methods.

Textbooks:

Laidler, G., Environmental Chemistry - An Australian Perspective, (Longman Cheshire, current volume).

Ibanez, J.G., Hernandez-Esparza, M., Doria-Serrano, C., Fregoso-Infante, A., Singh, M.M., Environmental Chemistry: Fundamentals, (Springer, Secaucus, New Jersey, USA. 2007).

Reference books:

American Public Health Association (APHA), Standard Methods for Examination of Water and Wastewater, (Washington, latest edition).

Grasshoff, K., Ehrhardt, M. and Kremling, K. (Ed.), Methods of Seawater Analysis, (Verlag Chemie, latest edition).

Ibanez, J.G., Hernandez-Esparza, M., Doria-Serrano, C., Fregoso-Infante, A., Singh, M.M., Environmental Chemistry: Microscale Laboratory Analysis, (Springer, Secaucus, New Jersey, USA. 2008).

Assessment:

Continuous Assessment - 40%

Written examination - 60% (1 x 2 hrs)

CH 352: PETROLEUM CHEMISTRY

Hours per week: 3 (3/0)

Prerequisite: CH 212

Objectives:

On completion of the subject, students should be able to:

1. Discuss on the origin and composition of petroleum
2. Discuss on various types of fractions obtained from the crude oil

3. Understand and apply various parameters measured for grading the petroleum
4. Describe the types of additives added to the petroleum and their uses

Syllabus:

Introduction to crude oils, classification of crude oils (physical and chemical). Origin and mining of petroleum. Brief introduction to methods of exploration (magnetic, gravity and seismic). Types of compounds occurring in petroleum. Petroleum composition, multi-component distillation. Solid, liquid and gaseous petroleum fuels and their characteristics.

Petroleum additives and their uses. Leaded and unleaded petrol. Physical and chemical characteristics of petroleum. Refinery operations. Cracking processes: catalytic cracking and steam cracking. Petroleum alteration processes: thermal maturation, deasphalting, water washing, bacterial attack and gas diffusion. Migration and entrapment of petroleum. Various parameters used for measuring the quality of petroleum: density, viscosity, surface tension, colour and fluorescence, fire and flash points, cloud and pour points, aniline point, refractive index, calorific value, diesel index, bromine number, Reid vapour pressure (RVP), sulphur content, carbon residue, water content. Instrumental analysis for determining the nature of petroleum: elemental analysis, infrared spectroscopy and nuclear magnetic resonance spectroscopy. Petrochemicals: one example each from C₁, C₂, C₃, C₄, C₅ and aromatics - production, properties and uses.

Air pollution by combustion products of fossil fuels.

Textbook:

Kinghorn, R.R.F., An introduction to the physics and chemistry of petroleum, John Wiley & Sons, New York, USA, 1983.

Reference books:

Chapman, R.E., Petroleum geology – A concise study, Elsevier Scientific Publishing Co., Amsterdam, The Netherlands, 1976.

Selley, R.C., Elements of petroleum geology, W.H. Freeman & Co., NY, USA, 1985.

Speight, J.G., The chemistry and technology of petroleum, 3rd Rev. Ed., Marcel Dekker Inc., NY,

1999.

Tissot, B.P. and Welte, D.H., Petroleum formation and occurrence, 2nd Rev. Ed., Springer-Verlag, Berlin, Germany, 1984.

Assessment:

Continuous assessment - 40%

Written examination - 60% (1 x 2 hrs)

CH 362: ENVIRONMENTAL CHEMISTRY I

Hours per week: 3 (3/0)

Co-requisite: CH 342

Objectives:

On completion of this subject, students should be able to:-

1. Define and explain the components of environment.
2. Explain the components and composition of atmosphere.
3. Explain the sources, sinks and control of common air pollutants.
4. Explain the transport and fate of pollutants in the environment.
5. Illustrate global and regional environmental impacts of atmospheric pollution.
6. Explain toxic effects of pollution on plants and animals.
7. Explain the effects of various pollutions like global warming, ozone depletion, acid rain and eutrophication.
8. Explain the pollution caused by organic chemicals and pesticides.
9. Understand and explain the common pollutant cycling.

Syllabus:

Introduction, components of environment, definition and terminology.

Air pollution: Components of atmosphere, air quality standards, atmospheric composition and structure, sources, sinks and control of air pollution caused by CO, CO₂, SO₂, NO_x and H₂S. Air pollution due to particulates and smog. Green house effect and global warming, ozone depletion. Water pollution: Sources. Pollution caused by lead, chlorine and detergents, eutrophication, acid

rain. Bioconcentration and biomagnification. Mining and radioactive pollution.

Chemical pollution: heavy metals, metalloids, cyanide, fluoride, polyaromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB), pesticides. Carcinogens and mutagens.

Major chemical cycles and effect of environmental pollution in these systems: oxygen, nitrogen, phosphorus, sulphur, hydrological.

Reference books:

Spiro, T.G. and Stigliani W.M., Chemistry of the environment, II Ed., (Prentice Hall, New Jersey, 2003).

De, A.K., Environmental chemistry, V Ed., (New Age International, New Delhi, 2003).

Assessment:

Continuous assessment - 100%

CH 372: FOOD ANALYSIS FOR CHEMISTS

Hours per week: 3 (0/3)

Prerequisite: CH 201

Objectives:

On completion of this subject, students should be able to:-

1. Describe the main chemical constituents of food.
2. Describe the main methods used for the quantitative and qualitative analysis of the main chemical constituents of food and explain the principles underlying them.
3. Choose an appropriate method for the analysis of a constituent in a given food.

Syllabus:

Analysis of food products for moisture, fat, protein, ash and fibre (proximate analysis). Food colours, additives, trace metals, contaminants.

Reference:

Joslyn, M., Methods in Food Analysis (Academic Press, New York, 1970).

Assessment:

Continuous Assessment - 100%

CH 401: RESEARCH PROJECT

Hours per week: 3 (0/3)

Objectives:

On completion of this subject, students should be able to:-

1. Conduct a literature survey.
2. Write a research proposal.
3. Make a presentation of a simple research investigation.

Syllabus:

Students are to undertake a substantial project relevant to Applied Chemistry. The topic should be so chosen that it draws together the different facets of the course and provides experience in research procedures and data handling.

Students select a topic under the supervision of a member of staff who provides guidance throughout the duration of the project.

Students will conduct a literature search, write a proposal, plan the programme of work and give a research seminar on their projects and/or as directed by the supervisor.

Assessment:

Continuous Assessment - 100%

CH 402: RESEARCH PROJECT

Hours per week: 5 (0/5)

Objectives:

On completion of this subject, students should be able to:-

1. Conduct a simple investigation.
2. Report and interpret his/her results.

Syllabus:

Students will conduct research on the project proposed in Semester 1, report their findings to fellow students and staff in the form of a 10 to 15 min seminar presentation and a full written report on the project shall be submitted for assessment.

Assessment:

Continuous Assessment - 100%

CH 431: INSTRUMENTAL ANALYSIS IV

Hours per week: 3 (1/2)

Prerequisite: CH 332

Objectives:

On completion of this subject, students should be able to:-

1. Describe the equipment required for X-ray fluorescence, X-ray diffraction and inductively coupled plasma spectroscopy and discuss the applications and merits of these techniques.
2. Describe the equipment used for tandem methods such as inductively coupled plasma in tandem with mass spectrometers/quadrupole mass spectrometers.
3. Decide when automation should be used and when it should be avoided.
4. Describe the equipment used for partial and full automation of chemical analysis.

Syllabus:

X-ray fluorescence and X-ray diffraction spectroscopy: Origins of fluorescence and diffraction of X-rays, instrumentation and applications.

Inductively Coupled Plasma spectroscopy. Tandem methods; ICP-MS and DCPMS.

Automated methods of analysis; the case for automation, autoanalyzers, flow injection analysis, centrifugal analyzers, discrete systems.

Textbook:

Skoog, D.A., Holler, J.F, and Crouch S.R; Principles of Instrumental Analysis, 6th edition (Brooks/Cole, Australia, 2006).

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1 x 2 hrs)

CH 442: APPLIED ANALYTICAL CHEMISTRY

Hours per week: 6 (2/4)

Prerequisites: CH 311, CH 331

Objectives:

On completion of this subject, students should be able to understand the application of analytical principles involved in:-

1. Forensic science.
2. Clinical chemistry.
3. Analysis of ferrous and non-ferrous metals.
4. Food microbiology.
5. Quality assurance in analytical chemistry.

Syllabus:

The concept of an expert witness; The principle of transference; non-chemical investigations; chemical investigation of fibres, glass, plastics, paint, oils, dyes, inks, inflammable liquids, explosives and ammunition. Analysis for alcohol and drugs.

The collection of blood samples: Conversion to serum, plasma and protein free filtrate. Analysis of blood for selected substances (e.g. glucose, bilirubin, urea, GOT). Use of test strips, test kits and standard sera. Significance of analytical results. Automation.

Crystal structures, alloying elements. Analysis of common steel alloying elements; Mn, Cr, Ni; instrumental and titrimetric methods. Analysis of non-ferrous materials; solder.

Bacteria, virus and fungi. Structure, replication, growth and metabolic activities of bacteria detection and control of microorganisms.

Quality in Analytical Chemistry, Quality systems, Use of statistics in quality assurance, quality control strategies applied in analytical laboratories, Accreditation (ISO 17025), Interlaboratory studies, Measurement uncertainty, Method validation.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 2 hrs)

CH 452: TOPICS IN ADVANCED CHEMISTRY

Hours per week: 4 (1/3)

Objective:

On completion of this subject, students should be able to describe in depth the chemistry of approximately four areas of chemistry which are

the subject of current research.

Syllabus:

Topics in Advanced Chemistry are intended to give students an insight into some areas of modern chemistry and research while coping with the regular staff changes that occur at Unitech. Staff may teach topics deemed appropriate by the head and staff of the Applied Chemistry Section. The subjects taught will vary from year to year to maintain topical interest.

Examples of topics deemed suitable:

Natural Product Chemistry: Terpenes, steroids, alkaloids, carbohydrates, flavones, anthocyanins, rotenones, prostaglandins, pyrethrums. Screening, extraction and uses.

Reaction Theory: Lewis acid/base, radical, redox and photo chemistries. The extended hard soft acid base principle. Unimolecular and bimolecular reactions. Single-step and multi-step reaction mechanisms.

Organometallic chemistry: Properties, classification of ligands, EAN and 18 electron rules, stability, synthesis, metal carbonyls, compounds with unsaturated ligands (alkenes and alkynes), cyanide ligands, structure and bonding, importance of organometallic compounds in catalysis (hydrogenation of alkenes, oxo reaction, oxidation of alkenes, alkene dimerization and alkene polymerization).

Bioinorganic chemistry: Introduction, importance of alkali and alkaline earth metals, metalloporphyrins: chlorophyll, haemoglobin (oxy- and deoxy-), cooperative effect and Bohr effect, myoglobin, cytochrome, iron supply and transport.

Laboratory Management: Fundamental management concepts of managing yourself, managing your job and managing others, Quality management in the laboratory (ISO 17025 standard on the general requirements for the competence of testing and calibration laboratories).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 2 hrs)

CH 461: ENVIRONMENTAL CHEMISTRY II

Hours per week: 6 (2/4)

Prerequisites: CH 342, CH 362

Objectives:

On completion of this subject, students should be able to:-

1. Describe the design and implementation of an environmental monitoring program.
2. Appreciate the significance of sampling, sample preparation and sample preservation in water, sediments, soils and foliar samples.
3. Choose the most appropriate analytical technique in a given situation and apply the chemical processes and interactions in aquatic and estuarine systems to interpret results.
4. Classify soils, perform analysis of CEC, nitrogen, organic carbon, phosphate, soil pH and conductivity.
5. Perform trace metal and boron analysis using appropriate sample dissolution procedures.

Syllabus:

Design of measurement systems: Planning; defining objectives, location, time and sampling frequency; expression of analytical results.

Selection of analytical methods: Chromatographic, electrochemical, spectroscopic, biological.

Aquatic and Estuarine Chemistry: Chemical compositions of fresh and sea waters; dissolved gases, carbon dioxide, clay and alkalinity. Adsorption and desorption of metals and anions and the chemistry of organic matter, Fe(III) and Mn(II) oxyhydroxides and colloids in estuaries. The redox chemistry of sediments: sulphate reducing bacteria, the role of sediment as a sink or a source of pollutants. Metal partitioning between sediment solid phase and pore water, Sediment Quality Criteria. Designing and implementation of a baseline monitoring programme to study primary productivity and redox status of a pristine water system; using exchange reactions in soils, wastes and pollutants in soil.

Soil analysis: cation exchange capacity, exchangeable cations, organic carbon, soil pH and conductivity, phosphate, nitrogen. Project design in monitoring nutrients in water and heavy metals in fish, shell fish and sediments in aquatic systems.

Plant analysis: Plant tissue analysis, sampling and sample preparation techniques for foliar samples.

Atmospheric pollution: Monitoring techniques, sampling problems, analysis of nitrogen dioxide (cooking gas) or sulfur dioxide (power plant emission).

Textbooks:

Manahan, S.E., Environmental Chemistry, Lewis Publishers, current volume.

Reference book:

Reeve, R.N., Environmental Analysis (ACOL, current volume).

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1 x 2 hrs)

CH 462: INDUSTRIAL CHEMISTRY

Hours per week: 4 (1/3)

Objective:

On completion of this subject, students should be able to discuss and understand the chemistry involved in:-

1. Soap and detergent manufacture.
2. Paint making.
3. Petroleum industries.
4. Agrochemicals.
5. Safety in industrial laboratories.

Syllabus:

Detergency and types of soaps and detergents; raw materials for soap and detergent manufacture, soap processing, quality control. Cationic, anionic and non-ionic detergents, detergent formulation, identification of detergent bases, biodegradability. Domestic bleach.

Paint constituents and properties; convertible and non-convertible coatings; the nature, manufacture and applications of alkyds, polyurethanes and acrylics, solvents, inorganic and organic pigments. Fertilizers, pesticides, herbicides and veterinary products; methods of manufacture and use, hazards, environmental issues.

Textbook:

Heaton, C. (Ed.), An introduction to industrial chemistry, 3rd Ed., (Blackie Academic & Professional, Melbourne, 1996).

Reference book:

Selinger, B., Chemistry in the market place, 5th Edn., (Allen & Unwin Academic Publisher, Sydney, 1998).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 2 hrs)

FT 201: INTRODUCTION TO FOOD TECHNOLOGY

Hours per week: 2 (2/0)

Prerequisites: AG 112, AS 122

Objectives:

On completion of this subject, students should be able to:-

1. Discuss the role of food technology in (inter)national food security.
2. Classify foods on the basis of their perishability indices.
3. Explain the influence of microorganisms on food stability.
4. Identify salient issues that are involved in the production of high quality food products.
5. Understand elementary concepts of malnutrition and its prevention.

Syllabus:

Review of global food situation. Introduction to food microflora. Physical, chemical and biological principles of food processing and preservation. Product development, sensory evaluation and quality control as they relate to Food Technology. Agriculture/Food Technology/Nutrition inter-phases.

Textbooks:

Williams, T., Moon, A. and Williams, M., Food, Environment and Health (WHO, Geneva, 1990).
Desrosier, N.W., Elements of Food Technology (AVI, Westport, Connecticut, 1977).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

FT 211: INTRODUCTION TO PROCESS TECHNOLOGY

Hours per week: 4 (4/0)

Prerequisites: MA 172, PH 182

Corequisite: MA 271

Objectives:

On completion of this subject, students should be able to:-

1. Explain the basis of mass and heat balances.
2. Formulate flow chart for food processing.
3. Understand the relevance of fluid statics in food processing.

Syllabus:

Dimensions and units in process work. Process systems, analysis, efficiency and flowsheets. Types of process systems, batch and continuous; steady and unsteady. Mass and heat balances; definitions, principles and applications in food processing. Introduction to steam table, extrapolation. Fluid statics, gauge pressure, vacuum, absolute pressure, pressure measurements. Tutorials on all aspects of the course content.

Textbook:

Harper, J.C., Elements of Food Engineering (AVI, Westport, Conn., 1976).

References:

Earle, R.L., Unit Operations in Food Processing (Pergamon Press, Oxford, 1983).
Coulson, J.M. and Richardson, J.F., Chemical Engineering, Vol. 1 (Pergamon Press, Oxford, 1977).
Lewis, M.J., Physical Properties of Foods and Food Processing Systems (Ellis Horwood, Chichester, 1986).

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1x3 hrs)

FT 241: NUTRITION I

Hours per week: 4 (4/0)

Prerequisite: AG 112

Objectives:

On completion of this subject, students should be able to:-

1. Define the basic terms used in the field of nutrition.
2. Describe how nutrients are obtained from food.
3. Explain the functions of nutrients in the body.
4. Identify deficiency states resulting from malnutrition.
5. Specify the main sources of each nutrient.
6. Apply the concept of Recommended Dietary Allowance (RDA).
7. Use food composition tables and tables of RDA to calculate suitable daily intakes for different population groups.
8. Convert amounts of nutrients into quantities of food and vice-versa.
9. Recognise the importance of a balanced diet in the maintenance of good health and the relationship between diet and disease.
10. Discuss the different reasons of why we eat what we do.

Syllabus:

Introduction to the biochemistry and physiology of digestion, absorption and metabolism: the digestive system, mechanisms of absorption, the liver, the endocrine system, the circulatory system, metabolism and enzymes, ATP and cellular respiration.

Nutritional composition of foods - nature, occurrence, function, deficiency and excess diseases of macro- and micro- nutrients: Carbohydrates (Diabetes, tooth decay, alcohol), Lipids (Cholesterol, cardiovascular disease), Proteins (Vegetarianism), Vitamins, minerals and water.

Recommended Dietary Allowances (RDAs). Food composition tables. Measurement of energy requirements. Basal metabolic rate. Food groups

and exchange groups. Serving size. Meal planning. Budgeting.

Relationship between diet and disease, particularly cancer and diet. Special diets related to disease and illness. Food allergies and intolerance. Natural toxicants.

Social and psychological aspects of eating. Fads and Fallacies.

Textbook:

Whitney, E.N., Hamilton, E.M. and Roites, S.R., Understanding Nutrition, 5th edition (West Publishing Co., New York, 1990).

References:

Christian, J.L. and Greger, J.L., Nutrition for Living, 3rd edition (Benjamin Cummings, Redwood City, California, 1991).

WHO, Technical Report Series 797: Diet, Nutrition and the Prevention of Chronic Diseases (WHO, Rome, Geneva, 1990).

Fox, B.A. and Cameron, A.G., Food Science, Nutrition and Health, 5th edition (Arnold, London, 1989).

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1x3 hrs)

FT 251: FOOD PROCESSING PRACTICAL I

Hours per week: 5 (0/5)

Corequisites: FT 201, FT 241, FT 281

Objectives:

On completion of this subject, students should be able to:-

1. Use simple processing tools.
2. Explain the principles behind food formulations.
3. Understand the effects of certain food operations and processes on shelf lives of food products.

Syllabus:

Practical demonstrations of the principles of mass and heat balances. Measurement of specific heat capacity, water absorption and physical properties

of food systems. Working principles of selected processing machines; filter press, homogeniser, jacketed vessel. Good manufacturing practice.

Assessment:

Continuous Assessment - 100%

FT 281: FOOD ANALYSIS

Hours per week: 4 (0/4)

Prerequisite: AS 122

Objectives:

On completion of this subject, students should be able to:-

1. Describe quantitative and qualitative analysis of food constituents.
2. Identify standard procedures and methods for food analysis.
3. Operate certain food analysis instruments.

Syllabus:

Analysis of food products for moisture, fat, protein, ash and fibre (proximate analysis). Food colours, additives, trace metals, contaminants. Instrumentation.

Textbook:

Pomeranz, Y. and Meloan, C.E., Food Analysis (Academic Press, New York, 1985).

References:

Joslyn, M., Methods in Food Analysis (Academic Press, New York, 1970).

Stewart, K.K. and Whitaker, J.R., Modern Methods of Food Analysis (AVI, Westport, Conn., 1984).

Assessment:

Continuous Assessment - 100%

FT 212: UNIT OPERATIONS I

Hours per week: 3 (3/0)

Prerequisite: FT 211

Objectives:

On completion of this subject, students should be able to:-

1. Relate the principles of heat transfer to food processing.
2. Describe the preliminary steps in food processing.
3. Understand the theories behind some food processing operations.

Syllabus:

Heat transfer mechanism. Conduction, convection, radiation. Thermal conductivity, thermal diffusivity, specific heat capacity. Unsteady state heat transfer. Radiation between two bodies. Natural convection equations. Preparatory operations in food processing. Raw material selection techniques, cleaning, sorting, and grading. Mixing, size reduction and emulsification; their principles, theories and equipment.

Textbook:

Brennan, J.G., Butters, J.R., Cowell, N.D. and Lilly, A.E.V., Food Engineering Operations, 3rd edition (Applied Science, London, 1988).

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1x3 hrs)

FT 252: INTRODUCTION TO FOOD BIOCHEMISTRY

Hours per week: 2

Prerequisite: FT 291, FT 241

Objectives

On completion of this subject, students should be able to:-

1. Describe the chemical reactions involved in the storage and use of food molecules with an emphasis on those pertaining to sugars and fats.
2. Explain the overall strategy of energy generation from the three main classes of food molecules: sugars, lipids and proteins.
3. Describe the various biochemical pathways.
4. Describe the synthesis of fats, glucose and amino acids.

5. Understand the way in which the two main energy metabolizing systems based on sugars and fats are controlled and co-ordinated at the enzyme level when there is excess food available, when food is not available and in emergencies when energy is needed as fast as possible.
6. Describe the structure and use of nucleotides.
7. Describe the structure and arrangement of DNA in cells.

Syllabus:

Glucose, amino acid, fat and cholesterol traffic in the body. Energy production from glucose, fat and amino acids. Synthesis of glucose, fat and amino acids. Nucleotide metabolism. DNA structure and arrangement in cells. Basic biochemical pathways with special reference to foods.

Textbook:

Stryer, L., Biochemistry, W. H. Freeman and Company, San Francisco, 1991.

Reference:

Devlin, T. M., Text book of Biochemistry with Clinical Correlations, Jacaranda Wiley Ltd, New York, 1993.

Voet, D., Voet, J. G., Biochemistry, Jacaranda Wiley Ltd, New York, 1993.

Assessment:

Continuous Assessment - 40%
Written examination - 60% (1 x 3hrs)

FT 291: FOOD CHEMISTRY 1

Hours per week: 3 (3/0)

Prerequisite: AS 122

Objectives:

On completion of this subject, students should be able to:-

1. Name and identify the structure of food constituents.
2. Understand the chemistry of the major food constituents.
3. Explain certain chemical reactions in food.

Syllabus:

Naturally occurring constituents of foods. Their structure, chemical and physical properties and significance. Properties and uses of pectins, alginates, gums, starches and other hydrocolloids.

Textbook:

Lee, F.A., Basic Food Chemistry (AVI, Westport, Conn., 1983).

References:

Ihekoronye, A.I. and Ngoddy, P.O., Integrated Food Science and Technology for the Tropics (Macmillan, London and Basingstoke, 1985).

Berk, Z., Introduction to Biochemistry of Foods (Elsevier, Amsterdam, 1976).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

FT 252: INTRODUCTION TO FOOD BIOCHEMISTRY

Hours per week: 2

Prerequisite: FT 291, FT 241

Objectives:

On completion of this subject, students should be able to:-

1. Describe the chemical reactions involved in the storage and use of food molecules with an emphasis on those pertaining to sugars and fats.
2. Explain the overall strategy of energy generation from the three main classes of food molecules: sugars, lipids and proteins.
3. Describe the various biochemical pathways.
4. Describe the synthesis of fats, glucose and amino acids.
5. Understand the way in which the two main energy metabolizing systems based on sugars and fats are controlled and co-ordinated at the enzyme level when there is excess food available, when food is not available and in emergencies when energy is needed as fast as possible.
6. Describe the structure and use of nucleotides.
7. Describe the structure and arrangement of

DNA in cells.

Syllabus:

Glucose, amino acid, fat and cholesterol traffic in the body. Energy production from glucose, fat and amino acids. Synthesis of glucose, fat and amino acids. Nucleotide metabolism. DNA structure and arrangement in cells. Basic biochemical pathways with special reference to foods.

Textbook:

Stryer, L., Biochemistry, W. H. Freeman and Company, San Francisco, 1991.

Reference:

Devlin, T. M., Text book of Biochemistry with Clinical Correlations, Jacaranda Wiley Ltd, New York, 1993.
Voet, D., Voet, J. G., Biochemistry, Jacaranda Wiley Ltd, New York, 1993.

Assessment:

Continuous Assessment - 40%
Written examination - 60% (1 x 3hrs)

FT 262: GENERAL MICROBIOLOGY

Hours per week: 5 (2/3)

Prerequisites: FR 111, AG 112

Objectives:

On completion of this subject, students should be able to:-

1. Differentiate between the major groups of microorganisms: viruses, bacteria, yeasts and moulds.
2. Demonstrate the roles and activities of these organisms in food and food production.
3. Explain the different characteristics associated with different groups of microorganisms.

Syllabus:

History of microorganisms. Introduction to the biology of viruses, bacteria and fungi. Microbial cell morphology, growth, reproduction and enumeration of microorganisms. Diversity of microorganisms and their environment. The effect of physical and chemical environment on growth.

Introduction to microscopy, preparation of microbial samples, identification procedure. General application of microorganisms to life. Methods in general microbiology. A practical programme will complement lecture course and will involve microscopy, isolation and identification methods.

Textbook:

Pelczar, M.J., Kreig, N.R. and Chan, E.C.S., Microbiology: Concepts and Applications (McGraw-Hill, New York, 1993).

References:

Carpenter, P.L., Microbiology (W.B. Saunders, Philadelphia, 1977).
Norton, C.F., Microbiology (Addison-Wesley, Boston, MA, 1986).
Kiss, I., Testing Methods in Food Microbiology (Elsevier, Amsterdam, 1984).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

FT 311: PROCESS TECHNOLOGY

Hours per week: 4 (2/2)

Prerequisite: FT 212

Objectives:

On completion of this subject, students should be able to:-

1. Describe fluid flow in food processing.
2. Explain the principles of different heat exchangers in the process industry.
3. Understand the various behaviour of food systems upon application of force (stirring, pumping, etc).

Syllabus:

Fluid dynamics, Reynolds number, Streamline and turbulent flow. Bernoulli's equation. Orifice, venturi, pitot tube. Energy losses. Pump equation, selection of pumps for food processing, piping system. Sedimentation. Food rheology; Newtonian and non-Newtonian fluids. Application of heat transfer in heat exchangers. Types of heat exchangers for the food industry. There is a

practical component of the syllabus to emphasise fluid flow and heat transfer.

Textbook:

Earle, R.L., Unit Operations in Food Processing (Pergamon Press, Oxford, 1983).

References:

Muller, H.G., An Introduction to Food Rheology (William Heineman, London, 1973).

Lewis, M.J., Physical Properties of Foods and Food Processing Systems (Ellis Horwood, Chichester, 1987).

Fryer, P.J., Pyle, D.L. and Rielly, C.D., Chemical Engineering for the Food Industry (Blackie Academic & Professional, London, 1997).

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1x3 hrs)

FT 321: FOOD CANNING AND PACKAGING

Hours per week: 4 (3/1)

Prerequisites: FT 211, FT 262

Corequisite: FT 311

Objectives:

On completion of this subject, students should be able to:-

1. Explain the application of canning as a preservative technique.
2. Discuss the properties of foods for canning.
3. Design a canning program for locally available foods.
4. Recommend packaging materials for different foods.

Syllabus:

Heat processing. Canning operations. Thermal process evaluation. Retorts. Equipment used for thermal processing. Definition and function of packaging. Packaging materials used for food products considering their physical, chemical and functional characteristics. Metal, plastic, paper and wood as packaging materials. Traditional packaging materials in PNG. There is a practical

component of the syllabus to emphasise thermocouple assembly, pre-canning operations, thermal process evaluation, permeability of packaging materials, and traditional packaging techniques as well as field trips to relevant food processing/handling companies.

Textbooks:

Brennan, J.G., Butters, J.R., Cowell, N.D. and Lilly, A.E.V., Food Engineering Operations (Applied Science, London, 1988).

Paine, F.A. and Paine, H.Y., Fundamentals of Food Packaging (Leonard Hill, London, 1983).

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1x3 hrs)

FT 331: FOOD CHEMISTRY II

Hours per week: 4 (3/1)

Prerequisite: FT 222

Objectives:

On completion of this subject, students should be able to:-

1. Explain the role and functionality of food ingredients; their synthesis, modification and extraction.
2. Discuss the use of food flavours, food additives and enzymes.
3. Describe interactions between food components.

Syllabus:

Browning reactions - enzymatic and non-enzymatic, colloidal systems and emulsions. The role and functionality of food ingredients such as acidulants, phosphates, modified starches, gums, emulsifiers, food additives and other functional components in relation to the formulation of food products; food enzymes.

Textbook:

Fennema, O.R., Food Chemistry, 3rd edition (Marcell Dekker, New York, 1996).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

FT 351: FOOD MICROBIOLOGY

Hours per week: 5 (2/3)

Prerequisite: FT 241

Objectives:

On completion of this subject, students should be able to:-

1. Identify microorganisms associated with different food.
2. Describe methods of isolation and identification of pathogenic microbes.
3. Discuss hazard analysis and critical control points in food processing.
4. Apply basic food hygiene and sanitation.

Syllabus:

General food hygiene and sanitation techniques, cleaning and sanitation. Microbiology of food; meat, fish, poultry and egg, canned foods, fermented foods. Water analysis. Review of foodborne pathogenic microorganisms, i.e. food poisoning and food spoilage organisms. Microbiological Standard and testing programme. Hazard analysis and critical control point. Control of food microorganisms-irradiation, freezing, etc. Practical programme will include detailed study of food fermentation, microbial analysis of different types of foods. Spoilage of canned food. Commodity project.

Textbooks:

Jay, M.J., Modern Food Microbiology, 4th edition (Van-Nostrand Reinhold, New York, 1996).
Frazier, W.C. and Westhoff, D.C., Food Microbiology, 4th edition (McGraw Hill, New Delhi, 1988).

References:

Troller, J.A., Sanitation in Food Processing (Academic Press, New York, 1983).
Alcock, P.A., Food Hygiene Manual (H.K. Lewis, London, 1980).

Kiss, I., Testing Methods in Food Microbiology (Elsevier, Amsterdam, 1984).

Assessment:

Continuous Assessment - 40%
Written Examination - 30% (1x3 hrs)
Commodity Project - 30%

FT 371: INTRODUCTION TO TROPICAL CROPS

Hours per week: 2 (2/0)

Prerequisite: FT 201

Objectives:

On completion of this subject, students should be able to:-

1. Identify crops that are peculiar to tropical climate.
2. Understand the composition and anti-nutritional constituents of tropical food crops.

Syllabus:

Kinds of tropical crops: cereals, grasses, root and tuber crops, fibre crops, legumes (grain and forage), horticultural crops including tree crops (cocoa, oil palm, coconut palm, rubber, coffee, and citrus). Health risk of toxic components and effects of processing on them.

Assessment:

Continuous Assessment - 100%

FT 391: QUALITY CONTROL AND SENSORY EVALUATION

Hours per week: 4 (2/2)

Prerequisite: FT 281

Objectives:

On completion of this subject, students should be able to:-

1. Explain the major principles and organization of quality control in the food industry.
2. Describe the various standards and legislation of food quality.

3. Discuss the formulation and analysis of sensory evaluation data.

Syllabus:

Definitions, principles and purpose of food quality control and quality assurance, quality planning and organization - setting quality objectives. Importance of food standards and legislation. Review of characteristics of food quality. Sensory assessment of foods. Practical aspects of sensory assessment such as experimental design, outline of test methods and choosing one, result analysis, consumer testing methodology, correlation of subjective and objective methods. Role of sensory assessment in PNG.

Textbook:

Ihekoronye, A.I. and Ngoddy, P.O., Integrated Food Science and Technology for the Tropics (Macmillan, London, 1985).

References:

Brennan, J.G., Birch, G.G. and Parker, K.J., Sensory Properties of Foods (Applied Science, London, 1977).
Kramer A. and Twigg, B.A., Quality Control for the Food Industry, Vols. 1 and 2 (AVI, Westport, Conn., 1972).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

FT 312: ADVANCED NUTRITION

Hours per week: 5 (2/3)

Prerequisite: FT 241

Objectives:

On completion of this subject, students should be able to:-

1. Describe a variety of food habits in PNG, including kinds of foods consumed and ways of processing, packaging and cooking.
2. Understand that nutrient losses occur through processing and packaging.
3. Explain the particular nutritional requirements of different stages in a human's life.

4. Give details of the laws of food product labelling in PNG and world-wide and critically consider the importance of nutritional labelling.
5. State what the main nutritional problems are in PNG and understand the multifactorial causes of malnutrition.
6. Indicate the occurrence and importance of protein-energy malnutrition (PEM) in PNG.
7. Use international anthropometric standards and appreciate why they may not be applicable to Papua New Guineans.
8. Plot and interpret weight-for-age charts.
9. Select methods used in nutritional research and design and participate in a useful nutrition survey.
10. Outline intervention techniques operating at different levels (National, Provincial and Community) within PNG.
11. Apply the multisectorial approach needed in nutrition intervention programmes.
12. Give details of the contribution to nutrition interventions by policy development, planning and education.

Syllabus:

Chemical, physical and biochemical changes that occur in foods during processing and storage. Effects of processing, packaging, and cooking on food nutrient composition. Labelling of food products, laws in PNG and world-wide. Nutrifaction of foods by enrichment and fortification.

Nutritional requirements through the life-cycle, particularly during periods of physiological stress: infancy, adolescence, pregnancy, lactation (Breast-feeding vs. Bottle-feeding: Baby Food Supplies (Control) Act (1977), old age, sports.

Methods of assessment of nutritional status: indirect and direct - clinical, biochemical, anthropometric and epidemiological studies. Nutrition surveys - cross sectional versus longitudinal. National nutrition surveys - 1978 and 1983.

Multi-factorial causes of nutritional problems and disorders in PNG. Protein-energy malnutrition. Stunting/wasting. Weight-for-age charts. General anthropometric standards. Field methods of anthropometric measurement.

Nutrition interventions to improve nutritional status- policy, planning and education. National Food and Nutrition policies in PNG. Food security.

References:

Whitney, E.N., Hamilton, E.M.R. and Sharon, R., Understanding Nutrition, 5th edition (West Publishing Company, New York, 1990).
Jelliffe, D.B., The Assessment of the Nutrition Status of the Community, WHO monograph series No. 53 (WHO, Geneva, 1956).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

FT 332: CEREAL TECHNOLOGY AND LEGUME PROCESSING

Hours per week: 3 (3/0)

Objectives:

On completion of this subject, students should be able to:-

1. Understand different milling practices that are used in the processing and preservation of cereal grains and grain legumes.
2. Explain the complementary nature of cereals and grains.
3. Discuss the technology of baking and composite flour.
4. Describe the various uses of cereal and legume flours, and by-products of milling.

Syllabus:

World production of cereals. Grain morphology and components. Cereal quality and nutritional importance. Milling of wheat, maize, rice, and other cereal crops. Flour types, testing and suitability for different purposes. Baking technology. Protein-enriched cereal products. Use of non-wheat flours in bread and baked goods. Other uses of cereals. Legumes; availability, quality and nutritional importance. Legume processing. Legume-cereal blends. Peanut butter. Roasting. Soybean. Cowpea.

Textbook:

Ihekoronye, A.I. and Ngoddy, P.O., Integrated

Food Science and Technology for the Tropics (Macmillan, London and Basingstoke, 1985).

Reference:

Salunkhe, D.K., Chavan, J.K. and Kadam, S.S., Postharvest Biotechnology of Cereals (CRC Press, Boca Raton, Florida, 1985).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

FT 352: POST-HARVEST PHYSIOLOGY AND STORAGE TECHNOLOGY

Hours per week: 3 (3/0)

Prerequisites: FT 201, FT 371

Objectives:

On completion of this subject, students should be able to:-

1. Describe the pre-harvest physiology of horticultural commodities.
2. Discuss the susceptibility of foods to storage losses.
3. Explain the various sources of and mechanisms for controlling post-harvest losses.

Syllabus:

Pre- and post-harvest chemistry and physiology of horticultural food commodities, handling methods, pre- and post-harvest principles and practices in cooling, storage, transportation and packaging. Temperature measurement and importance in food storage. Building and other structures for food storage.

Textbook:

Wills, R.B.H., McGlasson, W.B., Graham, D. Lee, T.H. and Hall, E.G., Postharvest: An Introduction to the Physiology and Handling of Fruit and Vegetables (BSP Professional Books, Melbourne, 1989).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

FT 362: UNIT OPERATIONS II

Hours per week: 4 (3/1)

Prerequisites: FT 212, ME 292

Objectives:

On completion of this subject, students should be able to:-

1. Explain the behaviour of food systems in environment of different humidity.
2. Discuss the techniques of drying as an important preservative operation.
3. Describe two widely-used separation techniques in the food industry.

Syllabus:

This is a continuation of the study on unit operations in food processing. Sorption phenomenon in foods; adsorption, desorption, sorption isotherms, hysteresis, sorption models. Dehydration; types, drying cycles, equipment. Filtration; equipment, design and application. Centrifugation; theory and principles, equipment. A practical component of the syllabus is to demonstrate pilot plant equipment for dehydration and centrifugation.

Textbook:

Brennan, J.G., Butters, J.R., Cowell, N.D. and Lilly, A.E.V., Food Engineering Operations (Applied Science, London, 1988).
Earle, R.L., Unit Operations in Food Processing (Pergamon Press, Oxford, 1983).

Assessment:

Continuous Assessment - 100%

FT 372: FOOD PROCESSING PRACTICAL II

Hours per week: 5 (0/5)

Prerequisites: FT 251, ME 234, ME 274

Objectives:

On completion of this subject, students should be able to:-

1. Explain how to process selected food products.

2. Describe the working principles of some food processing machines and equipment.

Syllabus:

Characteristics of sago starch. Textural analysis of food systems. Meat preservation; beef jerky. Processing of shelf stable products from taro, yams, sago, potatoes, oil palm, sugar cane, fruits, vegetables and bananas/plantains.

Assessment:

Continuous Assessment - 100%

FT 392: FOOD PROCESS ENGINEERING I

Hours per week: 4 (3/1)

Prerequisites: FT 212, ME 292

Objectives:

On completion of this subject, students should be able to:-

1. Describe the role of refrigeration in food processing.
2. Identify the various refrigeration cycles.
3. Explain certain unit operations in the food industry.

Syllabus:

A continuation of the knowledge of unit operations. Extraction and expression. Crystallization. Freezing, Refrigeration and Thawing. The approach is to introduce the principles and the theoretical basis. Relevant equipment. There is a practical component to back up the principles of chilling and freezing.

Textbook:

Lewis, M.J., Physical Properties of Foods and Processing Systems (Ellis Horwood, Chichester, 1986).

Reference:

Brennan, J.G., Butters, J.R., Cowell, N.D. and Lilly, A.E.V., Food Engineering Operations (Applied Science, London, 1988).

Assessment:

Continuous Assessment - 100%

FT 302: INDUSTRIAL TRAINING

Hours per week: 40

Objectives:

On completion of this subject, students should be able to:-

1. Describe the products, structure and role of an organisation in a food-related industry or nutrition organisation in PNG.
2. Consistently perform a task within the disciplined structure of an industrial organisation.
3. Prepare written reports on their activities.

Syllabus:

Students will undertake 10 weeks of work experience in a suitable establishment, which will be chosen so that both breadth and depth of experience are offered. Students will be treated as trainee employees in that they will receive training and supervision from their hosts and will be expected to undertake responsible tasks in the latter stages of their placement.

Students will submit a written review of the structure and activities of their host establishment, keep a diary of their activities and submit a written report on their experiences.

Students will be supervised by a nominated employee of the host establishment who will assess their performance. They will be visited by a member of staff of the university who will assure himself of their well-being and progress and who will assess their written reports.

Assessment:

Continuous Assessment - 100%

FT 401: RESEARCH PROJECT

Hours per week: 4 (0/4)

Objectives:

On completion of this subject, students should be able to:-

1. Conduct literature surveys.
2. Write research proposals.
3. Make presentations of simple research investigations.

Syllabus:

Students are to undertake a substantial project relevant to Food Technology and Nutrition. The topic should be so chosen that it draws together the different facets of the course and provides experience in research procedures and data handling.

Students select a topic under the supervision of a member of staff who provides guidance throughout the duration of the project.

Students will conduct a literature search, write a proposal, plan the programme of work and give a research seminar on their projects and/or as directed by the supervisor.

Assessment:

Continuous Assessment - 100%

FT 411: INDUSTRIAL MICROBIOLOGY AND FOOD BIOTECHNOLOGY

Hours per week: 5 (2/3)

Prerequisite: FT 351

Objectives:

On completion of this subject, students should be able to:-

1. Explain the role of microorganisms in food industries.
2. Understand the application of biotechnology in food processing and preservation.

Syllabus:

Different types of fermentation and micro-organisms involved: Malting, brewing technology and their biochemistry. Immobilised enzymes as food processing aid and their use as analytical tools in food. Nature and variety of biotechnological processes involving micro-organisms. Traditional techniques of fermentation. Brewing industries in PNG. Tissue culture development and techniques. Methods in biotechnology. A practical programme will complement the lecture course and will involve fermentation and enzyme activities.

Textbook:

Higgins, I.J., Best, D.J. and Jones, J.,

Biotechnology Principles and Applications
(Blackwell, Oxford, 1985)

References:

Mittal, G.S., Food Biotechnology (Technomic, Lancaster, 1992).
Kiss, I., Testing Methods in Food Microbiology (Elsevier, Amsterdam, 1984).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

FT 431: MEAT TECHNOLOGY

Hours per week: 3 (3/0)

Objectives:

On completion of this subject, students should be able to:-

1. Explain the different compositions of meat.
2. Discuss methods of processing and preservation of different types of meat.

Syllabus:

Introduction to animal breeds. Conversion of muscle to meat. Introduction to rigor mortis. Meat composition, structure and quality factors. Processing meat, fish, sea foods, poultry and eggs. Ageing, tenderizing and curing of meat. Manufacture of sausages and other table meats. Meat preservation: Smoking, dehydration. Traditional meat products and processing in PNG.

Textbook:

Lawrie, L.A., Meat Science (Pergamon Press, Oxford, 1984).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

**FT 471: FOOD PROCESSING
PRACTICAL III**

Hours per week: 5 (0/5)

Prerequisite: FT 372

Objectives:

On completion of this subject, students should be able to:-

1. Produce shelf-stable, wholesome and acceptable food products.
2. Explain the various uses to which tropical food crops can be put.
3. Understand the significance of Good Manufacturing Practice in food processing.

Syllabus:

Development of food products based on fruits and vegetables, cereal grains and grain legumes, root and tuber crops, flesh foods, etc. Flours, baked goods, composite products, fish smoking. Osmotic dehydration. Use of simple tools in food processing. Traditional PNG foods. Extrusion.

Assessment:

Continuous Assessment - 100%

FT 491: MILK AND DAIRY TECHNOLOGY

Hours per week: 3 (3/0)

Objectives:

On completion of this subject, students should be able to:-

1. Describe the properties of milk and milk based products.
2. Explain the processing techniques for various dairy products.
3. Discuss the reasons behind imitation dairy technology.

Syllabus:

Technology of milk and milk products; liquid milk, milking, dried milk, condensed milk, filled milk, ice-cream, cheese, cultured milk, butter. Milk processing. Imitation dairy technology. Dairy waste management and processing. Dairy plant sanitation.

Textbook:

Marshall, R.I. and Arbuckle, W.S., Ice Cream, 5th edition (Chapman and Hall, London, 1996).

References:

Harper, W.J. and Hall, C.W., Dairy Technology

and Engineering (AVI, Westport, Conn., 1984).
Henderson, J.L., The Fluid-Milk Industry (AVI, Westport, Conn., 1984).

Scott, R., Cheesemaking Practice (Applied Science, Essex, UK, 1981).

Webb, C., Johnson, A. and Alford, R.C., Fundamentals of Dairy Chemistry (AVI, Westport, Conn., 1974).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

FT 402: RESEARCH PROJECT

Hours per week: 4 (0/4)

Objectives:

On completion of this subject, students should be able to:-

1. Conduct a simple research investigations.
2. Report and interpret their results.

Syllabus:

Students will conduct research on the project proposed in Semester 1, report their findings to fellow students and staff in the form of a 10 to 15 min seminar presentation and a full written report on the project shall be submitted for assessment.

Assessment:

Continuous Assessment - 100%

FT 422: FRUITS AND VEGETABLE PROCESSING

Hours per week: 3 (3/0)

Prerequisites: FT 352, FT 372

Objectives:

On completion of this subject, students should be able to:-

1. Understand the importance of fruits and vegetables in human nutrition.
2. Describe and distinguish between the different products from fruits and vegetables.

3. Explain techniques to upgrade traditional handling of fruits and vegetables in PNG.

Syllabus:

Significance of fruits and vegetables in world nutrition. Preservation. Harvesting and pre-processing operations. Use of chemicals to control enzymatic and non-enzymatic changes in processed fruits and vegetables. Technology of juice, jam and marmalade production. Different fruits and vegetables in PNG, the traditional processing and storage techniques.

Textbook:

Ihekoronye, A.I. and Ngoddy, P.O., Integrated Food Science and Technology for the Tropics (Macmillan, London and Basingstoke, 1985).

Reference:

Wills, R.B.H., McGlasson, W.B., Graham, D. Lee, T.H. and Hall, E.G., Postharvest: An Introduction to the Physiology and Handling of Fruit and Vegetables (BSP Professional Books, Melbourne, 1989).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

FT 452: PROCESSING OF ROOTS AND TUBERS

Hours per week: 3 (3/0)

Prerequisite: FT 371

Objectives:

On completion of this subject, students should be able to:-

1. Differentiate between various roots and tubers.
2. Explain the available technologies for processing and preservation of roots and tubers.
3. Discuss the reduction of anti-nutritional factors in roots and tubers through processing.

Syllabus:

Yam, taro (cocoyam), cassava, potatoes, banana,

and plantain. Elimination of anti-nutritional factors. Processing; flours, chips, etc. Various products from roots and tubers. Traditional products from roots and tubers, and uses in PNG. Recent uses of roots and tubers for human foods.

Textbook:

Ihekoronye, A.I. and Ngoddy, P.O., Integrated Food Science and Technology for the Tropics (Macmillan, London and Basingstoke, 1985).

Reference:

Bouwkamp, J.C., Sweet Potato Products: A Natural Resource for the Tropics (CRC Press, Boca Raton, Florida, 1985).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

**FT 462: PROCESSING OF
MISCELLANEOUS FOOD
COMMODITIES**

Hours per week: 3 (3/0)

Prerequisite: FT 371

Objectives:

On completion of this subject, students should be able to:-

1. Explain the methods used in processing and preservation of such crops as cocoa, tea, coffee, coconut, palm fruit, and sugar cane.
2. Identify some non-conventional PNG fruit and tree crops and plan their processing.

Syllabus:

Processing of cocoa, tea, coffee, sugar, confectionery, soft drinks. Other traditional foods in PNG. By-product utilization.

Textbook:

Ihekoronye, A.I. and Ngoddy, P.O., Integrated Food Science and Technology for the Tropics (Macmillan, London and Basingstoke, 1985).

Assessment:

Continuous Assessment - 100%

**FT 472: FOOD PROCESSING PRACTICAL
IV**

Hours per week: 5 (0/5)

Prerequisite: FT 471

Objectives:

On completion of this subject, students should be able to:-

1. Understand product and process developments in food processing.
2. Plan and investigate processing problems in the food industry.

Syllabus:

This subject deals mainly with product development from fruits and vegetables, confections, etc. Recipe formulations, process design and optimisation, shelf-life, microbiological evaluation, consumer acceptance, and packaging.

Assessment:

Continuous Assessment - 100%

FT 482: FOOD PROCESS ENGINEERING II

Hours per week: 2 (2/0)

Objectives:

On completion of this subject, students should be able to:-

1. Explain the various concentration operations in the food industry.
2. Describe and formulate water and waste water treatments in the food industry.
3. Discuss process control as an integral part of food processing.

Syllabus:

This subject concludes unit operations and processes in food processing. Evaporation. Irradiation. Extrusion cooking; principles, theories and equipment. Hygienic design, cleaning, sanitation, water treatment, waste treatment, Process control in food processing.

Textbook:

Charm, E.S., The Fundamentals of Food Engineering (AVI, Westport, Conn., 1992).

References:

Brennan, J.G., Butters, J.R., Cowell, N.D. and Lilly, A.E.V., Food Engineering Operations (Applied Science, London, 1988).
Perry, R.H. and Chilton, C.H., Chemical Engineers' Handbook (McGraw Hill, New York, 1983).
Fryer, P.J., Pyle, D.L. and Rielly, C.D., Chemical Engineering for the Food Industry (Blackie Academic & Professional, London, 1997).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

FT 231: BIOCHEMISTRY

Hours per week: 4 (3/1)

Prerequisites: AS 122, FR 111, FR 112

Objectives:

On completion of this subject, students should be able to:-

1. Explain the structure and functions of body proteins, carbohydrates and lipids.
2. Describe the various biochemical pathways.
3. Understand the integration of protein, carbohydrate and lipid metabolism.
4. Describe synthesis of amino acids, structure and function of membranes.
5. Explain nucleic acid replication, translocation and transcription.
6. Understand storage, transmission and expression of genetic information.

Syllabus:

Protein structures and functions including haemoglobin, enzymes, immunoglobulins and connective tissue proteins. Carbohydrate and lipid structures and functions. Basic concepts and design in metabolism. Basic biochemical pathways; carbohydrate, lipid and protein metabolism, integration of metabolism. Synthesis of amino acids, structure and function of membranes;

cholesterol and derivatives. Nucleic acids replication, translation and transcription and protein synthesis, storage, transmission and expression of genetic material.

Textbook:

Stryer, L., Biochemistry (W.H. Freeman and Company, San Francisco, 1991).

References:

Devlin, T.M., Textbook of Biochemistry with Clinical Correlations (Jacaranda Wiley Ltd, New York, 1993).
Voet, D. and Voet, J.G., Biochemistry (Jacaranda Wiley Ltd, New York, 1990).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

FT 252: HUMAN ANATOMY AND PHYSIOLOGY

Hours per week: 4 (4/0)

Prerequisite: FT 231

Objectives:

On completion of this subject, students should be able to:-

1. Describe cell structure and its functions and activity of cell membrane.
2. Explain the role of hormones in body metabolism.
3. Describe the various stages of foetal development.
4. Describe the main body structures and their functions e.g. vascular, reproductive, respiratory and renal systems.

Syllabus:

Introduction to anatomical terms, concepts of homeostasis and the role of hormones. Structure of basic tissues and cell physiology, mechanism of membrane transport and membrane potential, basic embryology and foetal development; structure, function and control of nerves, skeletal, gastrointestinal, reproductive, respiratory, renal, and urinary, endocrine and vascular systems.

Textbook:

Solom, E., Schmidt, R. and Adragna, P., Human Anatomy and Physiology, 2nd edition (Saunders, Philadelphia, 1990).

Reference:

Landau, B.R., Essential Human Anatomy and Physiology (Scott, Foresman and Company, Glenview, Illinois, 1990).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

**FT 341: FOOD CULTURE AND NUTRITION
INTERFACE**

Hours per week: 4 (4/0)

Prerequisite: FT 241

Objectives:

On completion of this subject, students should be able to:-

1. Recognise the factors influencing the patterning of food habits.
2. Explain the factors influencing food preferences.
3. Explain food beliefs and practices and their nutritional implications.
4. Investigate, analyse and suggest ways of improving food habits.
5. Describe and analyse food and nutrition systems in PNG.
6. Identify and explain the significance of agriculture, health and socio-economic factors in understanding nutrition.
7. Explain the need to adapt nutrition programmes to changing social, economic and technical circumstances.

Syllabus:

Socio-cultural factors in nutrition - consumption patterns and food habits and their influence on nutrition, health and disease, changes in food consumption, food ideology systems and nutrient intake, food habit modification.

The effects of social change and development on nutrition, past and present (introduction to world

economy and the position of PNG and South Pacific countries in the economy).

Food resources, interaction of nutrition, food and agriculture.

Reference:

Fieldhouse, P., Food and Nutrition, Customs and Culture (N.H. Coom Helm, London, 1986).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

FT 342: PATHOLOGY

Hours per week: 4 (3/1)

Prerequisites: FT 252, FT 351

Objectives:

On completion of this subject, students should be able to:-

1. Define the relevant terminologies used in pathology.
2. Indicate the agents and patterns of disease - infectious or non infectious, system by system and the body change in disease.
3. Outline the different types of these diseases from point of view of body system.
4. Describe how the body defends itself against assault - internal or external.
5. Demonstrate the basic diagnostic procedures in pathology.

Syllabus:

Terminology relating to body systems, classification of common diseases. Defence system mechanism and tissue repair. Agents of infection and routes of infection into the body. Dysfunction of the cardiovascular, gastrointestinal, reproductive, urinary, endocrine and nervous system. Common tests in diagnostic pathology.

Textbook:

Gilbert, E.F. and Huntington, R.W., Introduction to Pathology (Oxford University Press, Oxford, 1989).

References:

Rubin, E. and Farber, J.L., Pathology (Lippincott, Philadelphia, 1990).
Delaart, A.W.C., Microbiology for Allied Health Profession (Lee and Fabager, Philadelphia, 1994).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

FT 382: NUTRIENT NEEDS

Hours per week: 5 (2/3)

Prerequisites: FT 281, FT 231, FT 241

Objectives:

On completion of this subject, students should be able to:-

1. Use chemical, biological and microbiological methods to determine nutrient needs and nutritive value of diets.
2. Carry out biochemical tests for assessment of protein-energy malnutrition.

Syllabus:

Methods of determination of nutrient needs; proteins, amino acids, vitamins and minerals needs. Trace elements in nutrition. Biochemical assessment of protein-energy malnutrition.

References:

AOAC, Official Methods of Analysis (AOAC, Virginia, 1990).
FAO Food and Nutrition Paper 51. Protein Quality Evaluation (FAO, Rome, 1989).

Assessment:

Continuous Assessment - 100%

FT421: COMMUNITY NUTRITION I

Hours per week: 5 (1/4)

Prerequisites: FT 312, FT 341

Corequisite: FT 441

Objectives:

On completion of this subject, students should be able to:-

1. Plan for a field survey to assess nutritional status of a community.
2. Carry out the survey using direct and indirect assessment methods.
3. Collect information concerning ecological factors during the survey.
4. Analyse and interpret the data collected.

Syllabus:

Field survey of a selected community using various assessment methods. Analysis of survey data. Interpretation and presentation of survey data.

Reference:

Jelliffe, D.B., The Assessment of the Nutrition Status of the Community, WHO monograph series No. 53 (WHO, Geneva, 1956).

Assessment:

Continuous Assessment - 100%

FT 441: BIOSTATISTICS AND EPIDEMIOLOGY I

Hours per week: 4 (4/0)

Prerequisites: MA 272, AS 282

Objectives:

On completion of this subject, students should be able to:-

1. Differentiate between descriptive and inferential statistics.
2. Create an appropriate distribution from data and interpret results.
3. Identify and demonstrate the measures used to quantify the relative frequency of disease occurrence in a population.
4. Assess validity.

Syllabus:

Calculation and interpretation of summary descriptive statistical measures. Methods - descriptive and inferential. Introduction to microcomputer software and basic data manipulations and analysis.

Definitions and calculations of basic epidemiologic measures such as measures of rates, disease occurrence, relative risks, odds-ratio and specificity and sensitivity. Bias and precision in surveys.

Textbook:

Griew, A., Basic Biostatistics for the Developing World (Community Medicine Department, University of Papua New Guinea, 1981).

References:

Rosner, B., Fundamentals of Biostatistics, 3rd edition (Plos Kenk Publishing, Boston, MA, 1990).

Kleinbaum, D.G., Epidemiologic Research (Van Nostrand Reinhold, New York, 1990).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

FT 432: COMMUNITY NUTRITION II

Hours per week: 3 (1.5/1.5)

Prerequisite: FT 312

Objectives:

On completion of this subject, students should be able to:-

1. Plan, formulate, direct, participate in and evaluate community nutrition education programmes.
2. Investigate and critically analyse particular nutrition problems of vulnerable groups within the community.

Syllabus:

Methods of assessment of community nutrition needs. Nutritional needs of vulnerable groups in the community. Nutrition education programmes, planning, implementation, advantages and disadvantages, situations where they are likely to be most successful.

References:

McLaren D.S., editor, Nutrition in the Community. A Critical Look at Nutrition Policy, Planning and

Programmes (John Wiley and Sons, New York, 1987).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

**FT 492: BIOSTATISTICS AND
EPIDEMIOLOGY II**

Hours per week: 4 (4/0)

Prerequisite: FT 441

Objectives:

On completion of this subject, students should be able to:-

1. Design questionnaires.
2. Carry out epidemiological and demographic surveys.
3. Analyse and interpret survey results.

Syllabus:

Survey design and sampling methods. Questionnaire design, epidemiology study design, basic demographic measures, conduction and interpretation of students tests and published data, relation of demographic concepts to health care planning; interview and survey technique.

Reference:

Margetts, B.M. and Nelson, M., Design Concepts in Nutritional Epidemiology (Oxford University Press, Oxford, 1991).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

CH 181: CHEMISTRY FOR ENGINEERS I

Hours per week: 2 (1.5 lectures, 0.5 tutorial)

Objectives:

On completion of this course, the student should be able to:-

1. Name and write formulae of elements and compounds

2. Write balanced chemical, ionic and net ionic equations for chemical reactions including oxidation-reduction reactions.
3. Discuss the properties of elements and compounds in terms of their position in the periodic table and electronic configuration.
4. Discuss chemical bonding and draw Lewis diagrams for different types of bonding.
5. Do calculations involving moles, molarity concentration, dilutions and limiting reagent.
6. Discuss corrosion and methods of prevention.
7. Describe the basic parameters of water quality.

Syllabus:

Naming, Formulae, Equations: chemical, ionic and net ionic. Atomic structure, isotope, calculation of average atomic mass. Electronic configurations and electromagnetic radiation. Chemical bonding: ionic covalent, polar covalent, Lewis structures. Periodicity: size, electronegativity, ionisation energy, metals, non-metals, metalloids. Stoichiometry moles, molarity, dilution and limiting reagent. Water Chemistry: pH, hardness, gas solubility. Oxidation-Reduction: oxidation number and electronic transfer, half-reactions, balancing redox equations, corrosion. Colloids and coagulation.

Textbook:

Hill, G.C and Holman, J.S. Chemistry in Context. 3rd Ed (ELBS 1989)

Assessment: (Whole Course)

Continuous Assessment - 40%
Written Examination - 60% (1 x 3hrs)

CH 182: CHEMISTRY FOR ENGINEERS II

Hours per week: 3 (1.5 lectures, 0.5 tutorial, 1 practical)

Objectives:

On completion of this course, the student should be able to:-

1. Name, draw the structure, and be able to predict the simple reactions of organic compounds and functional groups.

2. Describe the structure, properties and uses of polymers.
3. Discuss the difference between static and dynamic equilibrium.
4. Calculate product distributions at the equilibrium in acid-base and ionic solubility systems.
5. Describe basic thermodynamic principles of chemical reactions.
6. Describe common chemical, biological and physical parameters in water.
7. Define pollution and detail examples of terrestrial, aquatic and atmospheric pollution.

Syllabus:

Equilibrium: static and dynamic equilibrium systems, equilibrium constant expressions, K_c calculations including sparingly soluble salts, strong and weak acids and bases, buffers and chemical reactions. Le Chatelier's Principle, Energy changes in chemical reactions, First law of thermodynamics, Hess's Law. Atmospheric composition and pollutants. Water Chemistry: BOD and COD.

Organic Chemistry: Systematic naming, structure and elementary reaction chemistry of alkanes, alkenes, alkynes, aromatics, alcohols, aldehydes, ketones, carboxylic acids and their derivatives. Polymers and resins. Common organic pollutants: natural and synthetic.

Textbook:

Hill, G.C; Holman, J.S; Chemistry in Context, 3rd Ed (ELBS 1989)

Assessment: (Whole Course)

Continuous Assessment - 40%
Written Examination - 60% (1 x 3hrs)

DEPARTMENT OF ARCHITECTURE AND BUILDING

Head of Department: Professor Gonduan. C. K., PhD Arch (AITA) James Cook Uni, M. Infra. Plan. & Eng. Stuttgart Uni), PG Cert. MLF Eng. US ETI, (Washington), PGDipl. T&CP (Sydney Uni), BArch(PNGUT), PNGIA, Reg. Architect

Deputy Head of Department:

Polin. C. K., MSc Const Mgt(NSW), PGDipl. Const. Project Mgt (Manchester), BBldg & Dipl.Bldg Tech(PNGUT), MPNGIB.

Director of Architecture Course:

Senior Lecturers:

Sariman C.A., PhD Arch Sc(AITA) James Cook Uni., MSc Const Mgt(Heriot Watt), PGDipl. BldgSc (Sydney), BArch&Bldg (PNGUT), MPNGIA, Registered Architect

Director of Building Course:

Wasi. D., Masters of Project Management (MPM) QUT., BArch. & Bldg (PNGUT, Member PNGIA,

Lecturers:

Bou A., BArch. in Architecture(PNGUT)

Felde M., BArtsDesign, (Clemson Uni), MScArch (Uni of Minnesota)

Dobunaba, C. Dipl.Arch; BArch. (PNGUT); MURban Plan (UTS) Sydney

Walliah J.J., DBldg, BBldg (PNGUT)

Polin K.A., Dipl.Arch, BArch. (PNGUT)

Elisha A.G. PETT Cert. POMTech. Cert.Join&Carp. Gka.Tech. Dipl. Bldg; BBldg (PNGUT)

Architectural Heritage Centre:

Principal Technical Officer:

Owen S., BA Applied Science (Curtin University Perth, WA), PGDipl. in Library Sci. (Canberra University).

Technical Staff:

Nohowan C., PETT Cert. in Cabinet Making Joinery(Mt. Hagen Tech), Cert. Arch. Drafting (LaeTech), Dip. Arch. Drafting(Lae Tech), Cert. in Bldg(Lae Tech), Dipl.in Bldg(Lae Tech)

Administrative Officer:

Michael V., Cert. Library & InfoSc (PNGAdmin College), Cert InfoTech, Cert Office Mgt & Cert Debt Recovery (PNGUT)

Secretaries:

Kami A., Cert. Secretarial Studies (Lae Tech)

Karimu A., Cert. Secretarial Studies(Lae Tech)

DEPARTMENT OF ARCHITECTURE AND BUILDING

GENERAL INFORMATION

The mission of the Department of Architecture and Building at the Papua New Guinea University of Technology is to serve as the regional centre for:

- Training qualified architects and building managers with an emphasis on developing design skills in architecture, problem solving design skills in building, and a commitment to the concepts of professionalism and intellectual endeavour.

- Conducting research and development work to promote environmentally, culturally and economically sustainable forms of tropical architecture and building, conservation of architectural heritages, beneficial utilisation of local natural resources, and advance the creative, technical and entrepreneurial talents of indigenous architects and building managers.

The educational philosophy balances academic with professional learning and the Department's staff training and localisation policy is designed to reinforce this philosophy by providing opportunities for staff to develop their professional skills in tandem with their academic interests. Research priorities are closely aligned with the Department's mission with a major effort being centred on the preparation of a comprehensive survey of traditional architecture under the auspices of The Papua New Guinea Architectural Heritage Centre. Other research projects focus on the development and promotion of contemporary architectural forms in response to local cultures and climatic conditions; locally produced building materials; grass roots tourist accommodation; management procedures for national building contractors; and investigations of appropriate housing solutions for the poor. Consulting work is undertaken by staff to realise the Department's mission and educational aims in the professional world by enabling staff to engage in consulting work through the University's consulting arm

Unitech Development & Consultancy Ltd and its subsidiary UDC Architects Ltd. The Department runs undergraduate courses in architecture and building and a post-graduate course in physical planning, the latter in conjunction with the University of Papua New Guinea. Tuition in all courses is by means of lectures and studios and examination is by continuous assessment or written examination or a combination of both. Entry into the undergraduate courses requires:

- a PNG Higher School Certificate with C passes or higher in English, Physics, and Maths A [or, alternatively, a B pass or higher in Maths B]*; or
- equivalent overseas matriculation certificate; or
- a PNG Certificate of Higher Technical Education in Building, Architectural Drafting, or Civil Engineering.

Note [*]: for architecture, a high pass in Expressive Arts may substitute for an inadequate grade in one of the required Grade 12 subjects. Entry into the post graduate course requires an appropriate first degree and professional experience.

STRUCTURE OF COURSES

Entry into both architecture and building courses is through a common first semester:

DIPLOMA OF ARCHITECTURE AND DIPLOMA OF BUILDING

Code	Subject	Weekly Hours
Year 1 First Semester		
AR101	Introduction to Arch & Bldg	8
AR161	Vernacular Building Traditions	2
AR171	Building Science	4
AR181	Communication for Arch & Bldg	3
LA121	English Composition I	2
MA121	Mathematics 1 AR	<u>4</u>
		<u>23</u>

DIPLOMA OF ARCHITECTURE (DARC)

Towards the end of the first semester of the first year, students may opt, with the guidance and approval of the Department, to pursue an

architectural vocation and, after a further two and a half years study, graduate with a Diploma of Architecture.

Year 1 Second Semester

AR102	Architectural Design I	8
AR132	Building Systems I	4
AR162	History of Architecture I	3
AR172	Architectural Science	2
LA122	English Composition II	2
		<u>19</u>

Year 2 First Semester

AR201	Architectural Design II	8
AR221	Visual Art	2
AR231	Building Systems II	4
AR241	Structures I	2
AR261	History of Architecture II	<u>3</u>
		<u>19</u>

Year 2 Second Semester

AR202	Architectural Design III	8
AR262	Modern Architecture	3
AR232	Building Systems III	4
AR242	Structures II	2
AR282	Computer Applications	<u>2</u>
		<u>19</u>

Year 3 First Semester

AR301	Architectural Design IV	8
AR321	Architectural Presentation	2
AR331	Building Systems IV	4
AR341	Structures III	2
AR361	Theory of Architecture	<u>2</u>
		<u>18</u>

Year 3 Second Semester

AR302	Architectural Design V	8
AR342	Structures IV	2
AR372	Ecologically Sustainable Design	2
AR382	Computer-Aided Design	5
BL342	Building Economics II	<u>2</u>
		<u>19</u>

DIPLOMA OF BUILDING [DBLD]

Alternatively, towards the end of the first semester of the first year, students may opt, with the guidance and approval of the Department, to

pursue a building vocation and, after a further two and a half years study, graduate with a Diploma of Building.

Year 1 Second Semester

LA122	English Composition II	2
BL102	Quantities & Estimating I	4
AR132	Building Systems I	4
BL112	Building Technology Studio I	4
BL162	Construction Surveying I	<u>3</u>
		<u>17</u>

Year 2 First Semester

AR231	Building Systems II	4
AR241	Structures I	2
BL211	Building Technology Studio II	6
BL221	Construction Management I	3
BL241	Building Economics I	2
BL281	Building Law I	<u>2</u>
		<u>19</u>

Year 2 Second Semester

AR232	Building Systems III	4
AR242	Structures II	2
AR282	Computer Applications	2
BL202	Quantities & Estimating II	5
BL222	Construction Management II	4
BL282	Building Law II	<u>2</u>
		<u>19</u>

Year 3 First Semester

AR331	Building Systems IV	4
AR341	Structures III	2
BL301	Quantities & Estimating III	4
BL311	Building Technology Studio III	4
BL321	Construction Management III	<u>4</u>
		<u>18</u>

Year 3 Second Semester

AR342	Structures IV	2
AR382	Computer Aided Design	5
BL322	Construction Management IV	3
BL332	Building Systems V	4
BL342	Building Economics II	2
BL362	Construction Surveying II	<u>3</u>
		<u>19</u>

BACHELOR OF ARCHITECTURE (BARC)

For continuing architecture students, entry into the fourth-year of the degree course requires a weighted average of 65% for the previous four semesters and a C pass or higher in AR 302 Architecture Design V. Students who do not achieve these requirements may become eligible for entry into the degree course by fulfilling the Department's alternative admission requirements. Students in architecture spend their fourth and fifth years studying the following program on a full-time basis.

Year 4 First Semester

AR401	Architectural Design VI	8
AR411	Architecture Design Theory	2
AR451	Urban Development	2
AR491	Special Study	3
various	External Elective	<u>2</u>
		<u>17</u>

Year 4 Second Semester

AR402	Architectural Design VII	8
AR432	Site Design	2
AR462	Urban Design Theory	2
AR492	Special Study	3
various	External Elective	<u>2</u>
		<u>17</u>

Year 5 First Semester

AR501	Architectural Design VIII	8
AR561	Urban Design I	2
AR591	Research Project	2
BL581	Professional Practice	<u>4</u>
		<u>16</u>

Year 5 Second Semester

AR502	Design Thesis	9
AR562	Urban Design II	2
BL532	Project Management	3
various	External Elective	<u>3</u>
		<u>17</u>

BACHELOR OF BUILDING (BBLD)

For continuing building students, entry into the fourth-year of the degree course requires a weighted average of 65% for the previous four semesters. Students who do not achieve these

requirements may become eligible for entry into the degree course by fulfilling the Department's alternative admission requirements. Students in building spend their fourth year undertaking an approved program in BL 470 Industrial Training before returning to the campus full-time for their fifth year of study. The hours provided for this subject cover staff administration and supervision time.

Year 4 First Semester

BL471 Industrial Training I [16 weeks minimum]

Year 4 Second Semester

BL472 Industrial Training II
[16 weeks minimum]

Year 5 First Semester

AR591	Research Project	2
BL501	Quantities and Estimating IV	5
BL511	Building Technology Studio IV	4
BL541	Building Economics III	3
BL581	Professional Practice	4
		<u>18</u>

Year 5 Second Semester

BL502	Quantities and Estimating V	5
BL522	Construction Management V	4
BL532	Project Management	3
BL542	Building Economics IV	3
BL582	Contract Administration	4
		<u>19</u>

SUBJECTS TAUGHT BY THE DEPARTMENT:

Subjects marked with an * are common to both courses.

AR101	Introduction to Architecture & Building *
AR102	Architectural Design I
AR161	Vernacular Building Traditions*
AR162	History of Architecture I
AR132	Building Systems I *
AR171	Building Science
AR172	Architectural Science
AR181	Communication for Architecture & Building*
AR201	Architectural Design II

AR202	Architectural Design III
AR261	History of Architecture II
AR262	Modern Architecture
AR221	Visual Arts
AR231	Building Systems II *
AR232	Building Systems III *
AR241	Structures I *
AR242	Structures II *
AR282	Computer Applications I *
AR301	Architectural Design IV
AR302	Architectural Design V
AR321	Architectural Presentation
AR331	Building Systems IV *
AR372	Ecologically Sustainable Design
AR341	Structures III *
AR342	Structures IV *
AR361	Theory of Architecture
AR382	Computer-Aided Design*
AR401	Architectural Design VI
AR402	Architectural Design VII
AR411	Architectural Design Theory
AR432	Site Design
AR451	Urban Development
AR462	Urban Design Theory
AR491	Special Study I
AR492	Special Study II
AR501	Architectural Design VIII
AR502	Design Thesis
AR 561	Urban Design I
AR 562	Urban Design II
AR591	Research Project *
AR592	Dissertation
BL102	Quantities & Estimating I
BL112	Building Technology Studio I
BL162	Construction Surveying I
BL202	Quantities & Estimating II
BL211	Building Technology Studio II
BL221	Construction Management I
BL222	Construction Management II
BL231	Building Construction for Land Managers I
BL232	Building Construction for Land Managers II
BL241	Building Economics I
BL242	Building Economics II *
BL281	Building Law I
BL282	Building Law II
BL301	Quantities and Estimating III
BL311	Building Tech Studio III
BL321	Construction Management III

BL322 Construction Management IV
BL332 Building Systems V
BL342 Building Economics II
BL362 Construction Surveying II
BL471 Industrial Training I
BL472 Industrial Training II
BL501 Quantities and Estimating IV
BL502 Quantities and Estimating V
BL511 Building Technology IV
BL521 Construction Management IV
BL522 Construction Management V
BL532 Project Management *
BL541 Building Economics III
BL542 Building Economics IV
BL581 Professional Practice *
BL582 Contract Administration

ELECTIVE SUBJECTS:

AR420 The Art of Composition
AR430 Photographic Composition

**RECOMMENDED ELECTIVE SUBJECTS
TAUGHT BY OTHER DEPARTMENTS**

FIRST SEMESTER

LC131 Negotiating Skills (3 hours)
LA201 Advanced Academic and Research
Skills (2 hours)
LC211 Language in Society (3 hours)
LC231 Conflict: Origins and resolution (3 hours)
LC233 Critical Thinking (3 hours)
LC311 Developing Communication and
Communicating Development (3 hours)
LC321 Environmental and Social Impact
Monitoring (2 hours)
LC341 Technology and Society (3 hours)
LC361 Development Studies 1 (3 hours)

SECOND SEMESTER

LC112 PNG Languages and Communication
(4 hours)
LC151 Melanesian Society and Politics (4 hours)
LC202 Media Studies (3 hours)
LC212 Principles of Translation (4 hours)
LC232 Public and Community Relations
(4 hours)
LC212 Land Disputes Settlement (2 hours)
LC322 Social Change

LC352 Special Projects (2 hours)
LC362 Development Studies 2 (3 hours)

**AR 101: INTRODUCTION TO
ARCHITECTURE AND BUILDING**

Hours per week: 8

Objective:

To provide an orientation for beginners into the disciplines of architecture and building. On completing the subject the student should be able to:

Demonstrate foundation skills in drawing, surveying and measuring, and designing and making practical things;
Show an aptitude for either architecture or building;
Make an informed choice for the preferred vocation.

Syllabus:

Introductory lectures on the role of architects and builders in design and construction accompanied by visits to a construction site and to the offices of an architect and a contractor followed by project modules covering foundation skills, including:

(a) Architectural Drawing:

Line work; dimensioning; scales, lettering; orthographic, isometric and axonometric projection.

(b) Survey Techniques [optional]:

Surveying and recording of a settlement and preparing measured drawings of existing buildings.

(c) Practical Building:

Working with tools; workshop practice; making useful things; setting-out a building [optional].
Elementary Design: Introductory exercises in creative design.

Participation in scheduled Architecture Seminars as required by Department.

Assessment:

Continuous Assessment & Submission of Portfolio - 100%

AR 102: ARCHITECTURAL DESIGN I

Hours per week: 8

Pre-requisite: AR 101

Objective:

To bring forth and reinforce individual talent for self-expression through creative explorations of the fundamental elements of form. On completing the subject the student should be able to:

Engage the creative impulse with confidence and vigour;

Use a variety of graphic and model making media;

Delineate simple perspectives.

Syllabus:

A series of creative exercises on designing with solids, voids, planes, frames, textures, and colours using a variety of graphic, craft, sculptural and model-making media in combination with an introduction to drawing and perspective. Participation in scheduled Architecture Seminars and Masterclass when offered.

Assessment:

Continuous Assessment & submission of portfolio with interview - 100%

AR 132: BUILDING SYSTEMS I

Hours per week: 4

Objective:

To introduce timber, masonry, and lightweight steel building systems commonly used in domestic-scale construction. On completing the subject the student should be able to:

Describe the various domestic-scale construction systems;

Prepare construction drawings showing how the materials are placed and fixed into position;

Explain the function of written technical specifications and write sample clauses.

Syllabus:

Common building materials: properties and use in construction. Substructure: excavation, foundations,

and ground floor construction. Superstructure: external walls, internal partitions, joinery items including doors, windows, wardrobes, cupboards, staircases. Roofs: types of roof construction, covering material, storm water drainage. Finishing trades: plastering, fair face blockwork, proprietary boards, painting and tiling. Services: water, electricity, gas, telephone, surface water drainage. External works: landscaping, drives, footpaths, fencing.

Textbooks:

Chudley R., Building Construction Handbook, Newnes, Oxford. PNG Department of Works: Architectural Technical Specification, reprint. Chapter 301: Building Act, PNG Government Printer. PNG Structural Manual for Domestic Buildings.

Reference:

Selected readings related to subject topics.

Assessment:

Continuous Assessment - 60%

Written Examination - 40% (1x2hrs)

AR 161: VERNACULAR BUILDING TRADITIONS

Hours per week: 2

Objective:

Firstly, to develop an awareness and appreciation of the special universal aesthetical and technical qualities of vernacularism and its place in built environment education, professional development and practice.

Secondly, to develop an awareness and appreciation of Melanesian Vernacular Architecture and its Building Practices and Traditions in the context of its socio-cultural and socio-economical parameters. On completing this subject, the students should be able to;

Describe the environmental and cultural forces, which shape vernacular architecture and building practices.

Appreciate the importance of conservation of

vernacular building traditions. Appreciate the traditional forms and methods of building process and construction.

Articulate the potential for adaptation of re-interpretation of vernacular traditions in the design of forms, structures and ornamentation of contemporary buildings. Understand the symbolic, social and cultural relationship and user-setting transactional relationships of place and place-making.

Syllabus:

A survey of vernacular architecture and building traditions of the Melanesian region with respects to their environmental, social, cultural and technological context with special emphasis on Papua New Guinea and the neighboring countries in the Asia-Pacific region. Assignments and projects based on researching selected buildings and making investigations aided with scaled drawings and models where appropriate.

References:

Reading material referred throughout the course. Selected readings related to assigned projects.

Assessment:

Continuous Assessment - 100%

AR 162: HISTORY OF ARCHITECTURE I

Hours per week: 3

Prerequisite: AR161, or, a basic understanding of architecture and building terms and essay writing and referencing conventions.

Objectives:

To introduce some western traditions whereby architecture is seen to arise when urbanity develops and people start to live in cities, and that cities and urbanity have taken root in this region, and that universally cities are the context for most current architectural developments.

Outcomes: On completion of the subject students must demonstrate an understanding of the role of architecture in society and the complimentary role of social, technological and geographic influences

of the production of architecture, as well as an increased competency in analyzing, discussing, and documenting architectural issues.

Syllabus:

Cross cultural survey from ancient to modern times, but based on settlements and cities as the generators and the contexts for architecture, culture, art, technology and man-environment relationships. Architecture as the shaper of city form and its evolving 'genius loci', and architects-designers as the shapers of that built fabric. Contextual factors that shaped cities over time: materials and technology, customs and beliefs, resources, power, knowledge, and so on.

A range of cities, over time and across cultures, and in varying geographic situations, is presented to display the dynamic relationships of factors interacting to produce distinctive cities, and to introduce key architectures of various civilizations.

Textbook: Students are required to read widely in books on cities, architecture and building in various cultures and through time.

References:

Kostof: A History of Architecture: settings and rituals. Bill Riseboro: The Story of Western Architecture. FDK Ching: Architecture: Form, Space, and Order

Assessment:

Continuous - 70%

Examination - 30% (2 hour written)

AR 171: BUILDING SCIENCE

Hours per week: 4

Objective:

Introduce the student to the crucial relationship that exists between climate, human beings, and buildings. More importantly, explain the function of building materials as physical barriers between the macro and micro climates of a building. On completing the subject, the student should be able to:

Define the major climate types that exist in the

world, especially those of the tropical regions, Explain the need for human beings to adapt to their climates in order to survive and sustain their livelihood,

Explain the influence of climate on the architecture of different regions of the world,

Explain the importance of understanding the nature of various available building materials and how these may be used to advantage in the design and construction of buildings.

Syllabus:

Introductory lectures on the crucial relationship between climate, human beings, and buildings are to be conducted, emphasizing the principles of passive building design. The concept of thermal performance and thermal comfort must be advocated with emphasis given on the understanding of all available building materials such as: timber, concrete, steel, masonry, glass, hardboards, and Hardware.

General properties of building materials, which need to be covered include: density and specific gravity, strength, optical properties, electrical properties, thermal properties and insulation, acoustic properties, deformations, deterioration, fire-resistant, appearance, and health aspects, etc.

References:

Allen, E & Iano, J (1990) Fundamentals of Building Construction: Materials and Methods, 2 Ed, John Wiley & Sons, New York
Everett, A (1994) Materials 5th Ed, Longman, London
Koenigsberger, O.H, Ingersoll, T.G, Mayhew, A, & Szokolay, S.V (1980) Manual of Tropical Housing and Building, Part 1: Climatic Design, Longman, London
Smith, R.C & Andress, C.K (1998) Materials of Construction 4th Ed, McGraw-Hill Book, Singapore

Assessment:

Continuous Assessment - 60%
Written Examination - 40% (1 x 2hrs)

AR 172: ARCHITECTURAL SCIENCE

Hours per week: 2

Prerequisite: AR 171 Building Science

Objective:

Introduce the student to the concepts of indoor environmental quality and how these contribute to healthier, safer, and productive living by the occupants and users of buildings. The following environmental aspects need to be covered:

Architectural acoustics, indoor & outdoor lighting, thermal performance of buildings. On completing the subject, the student should be able to:

Understand the concepts of architectural acoustics, lighting, heating, and cooling.

Undertake simple calculations in order to reinforce theoretical knowledge indicated in (1.0) above.

Apply this knowledge in his/her building design work.

Syllabus:

Lectures to cover crucial concepts in the following areas:

Architectural Acoustics – Room acoustics, noise control, etc.

Lighting – Photometric concepts & units, vision, visual performance, glare, comfort, electric lamps, light control, lighting design consideration, lumen method, etc.

Thermal Performance of Buildings – Heat loss, heat gain, sunshading devices, tropical building design principles, passive design strategies, etc

References:

CIRIA (1986) Sound Control for Homes – A Design Manual. Construction Industry Research and Information Association, London.
Egan, M.D.(1998) Architectural Acoustics. McGraw-Hill. New York
Koenigsberger, O.H, Ingersoll, T.G, Mayhew, A, & Szokolay, S.V (1980) Manual of Tropical Housing and Building, Part 1: Climatic Design, Longman, London.
Stein, B & Reynolds, J.S (1992) Mechanical and Electrical Equipment for Buildings, 8th Ed, John Wiley & Sons, Inc, New York.
Warren, J (1983) Lighting: Basic Concepts. Dept

of Architectural Science, University of Sydney, Australia.

Assessment:

Continuous Assessment - 60%
Written Examination - 40% (1 x2hrs)

AR 181: COMMUNICATION FOR ARCH & BLDG

Hours per week: 3

Objective:

To provide professional communication skills to beginners in architecture and building. On completing the subject the student should be able to:

Demonstrate skills in computing for word processing and spread sheets;
Demonstrate skills in using internet and simple computer graphic programmes;
Demonstrate research in skills in using the library and styles of referencing;
Develop an attitude towards effective self directed learning in architecture and building.

Syllabus:

Introduce basic computing for word processing and spreadsheets. The use of internet and surfing the web as a research tool, use of library and referencing using various styles. Introduce oral presentation skills and the use of computer programmes such as power point presentation. Mentoring of students learning to develop professional attitudes in their education as well as among peers. Promote self directed attitudes in students.

References:

Reading as directed.

Assessment:

Continuous assessment - 100%

AR 201: ARCHITECTURAL DESIGN II

Hours per week: 8

Prerequisite: AR 102

Objective:

To develop skills for designing basic architectural forms for human use. On completing the subject the student should be able to:

Apply elementary rules of design to resolve simple architectural problems;
Design architectural forms to suit human dimensions;
Present design concepts both orally and by means of a range of graphic and modelling media.

Syllabus:

A series exercises exploring each step of the design process including problem statement, analysis and creative synthesis using the elementary rules of design. Human dimensions and their application to common building elements. Introduction to oral communication skills and graphic presentation techniques. Participation in scheduled Architecture Seminars and masterclass when offered.

Textbook:

Tutt P. and Alder D., New Metric Handbook, Butterworth, Oxford.

Reference:

Grillo P. J., Form, Function and Design, Dover Publications, New York. Tilley A., The Measure of Man and Woman, Human Factors in Design, The Whitney Library of Design, New York.

Assessment:

Continuous Assessment & submission of portfolio - 100%

AR 202: ARCHITECTURAL DESIGN III

Hours per week: 8

Prerequisite: AR 201

Objective:

To develop skills for designing simple buildings by applying the social, environmental and cultural principles involved in designing the traditional

buildings of PNG. On completing the subject the student should be able to:

1. Analyse simple building programs;
2. Resolve the spatial layout, form and structure of simple buildings;
3. Adapt traditional architectural forms for contemporary use.
4. Resolve major connection details of one of the Projects.

Syllabus:

A series of design projects for simple buildings based on outline programs and involving the simultaneous resolution of plan, form and structure using traditional architecture for inspiration. Participation in scheduled Architecture Seminars and Master class when offered.

Textbook:

Tutt P. and Alder D., New Metric Handbook, Butterworth, Oxford.

Reference:

Selected readings related to assigned projects.

Assessment:

Continuous Assessment, Project Examination by jury & submission of portfolio with interview -100%

AR 221: VISUAL ART

Hours per week: 2

Objective:

To develop perception and drawing skills as a means to understanding natural form and structure and to enhance the student's ability to graphically communicate that understanding. On completing the subject the student should be able to:

Record a range of common images using a variety of graphic media;

Use a variety of graphic media for presentation of architectural designs;

Syllabus:

Multiple free-hand drawing exercises using commonly available media such as soft pencil, pen

and ink, colour pencils, marking pens, and collage.

Drawing subjects will include a variety of natural - plant, animal and human - as well as manufactured and built forms. Exercises challenge preconceptions and require the student to see objects as they actually are.

Textbook:

Cooper, D. 'Drawing and Perceiving 2nd edition' Van Nostrand Reinhold, New York.

Reference:

Reekie, F. 'Reekie's Architectural Drawing' Edward Arnold, London, Sydney, Auckland

Assessment:

Continuous Assessment - 100%

AR 231: BUILDING SYSTEMS II

Hours per week: 4

Prerequisite: AR 132

Objective:

To introduce construction systems commonly used for low-rise commercial and industrial applications. On completing the subject the student should be able to:

Describe the concepts of common commercial and industrial construction systems;

Prepare construction drawings to show the placement and fixing of materials;

Prepare simple technical specifications.

Syllabus:

Materials and methods of construction in the following categories. Substructure: excavation, footings and ground floor construction. Superstructure: main frames in steel, concrete and timber, cladding systems, fire requirements, glazed areas, common stairways. Roofs: types of roof construction, covering material, water drainage and collection. Finishes: various trade works, specialist contractors, security applications, proprietary partitioning. Services: integration of services into the building fabric, special requirements for industrial waste. External works:

hard landscaping, delivery and storage requirements, parking, lighting and security systems.

Textbooks:

Chudley R., Building Construction Handbook, Newnes, Oxford. PNG Department of Works: Architectural Technical Specification., reprint. Chapter 301: Building Act, PNG Government Printer.

Reference:

Selected readings relating to subject topics.

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x2hrs)

AR 232: BUILDING SYSTEMS III

Hours per week: 4

Prerequisite: AR 231

Objective:

To introduce the basic concepts relating to the various types of building services. On completing the subject the student should be able to:
Define the terminology relating to various building services;

Identify the type, range and functions of the various external and internal building;
Make appropriate choices and recommendations for the various supply and distribution systems based on economics and efficiency.

Syllabus:

External services: water sources and supply, drainage, external lighting, alternative energy sources. Internal services: sanitary plumbing (fixtures & fittings), heating, cooling and ventilation, electrical supply and distribution, communication and security systems, fire warning and control systems, lifts and escalators, artificial lighting and acoustics. Inter-relationship between structure, services and finishes, incorporation of plant and accessories into the building fabric. Implications of new technologies and the changing

nature of work. Life-cycle cost considerations of various service systems.

Textbooks:

Reid E., Understanding Buildings, Longman Scientific and Technical, UK.
Burbury P., Environment & Services, Mitchell's Building Series, Longman, Essex.

Reference:

Selected reading related to subject topics.

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x2hrs)

AR 241: STRUCTURES I

Hours per week: 2

Objective:

To appreciate basic structural mechanics. On completing the subject the student should be able to:
Determine the axial forces in plane pin-connected trusses and frames;
Understand the internal forces in statically determinate beams and properties of areas.

Syllabus:

Determination of moment of forces; forces at supports; shear forces and bending moments; centre of gravity; centroid; second moment of area; section modulus.

Textbooks:

K.J. Wyatt, Principles of Structure, UNSW School of Architecture, Sydney.
Departmental Modules

Assessment:

Continuous Assessment - 100%

AR 242: STRUCTURES II

Hours per week: 2

Prerequisite: AR 241

Objective:

To understand the considerations for selection of structural sizes in timber, steel and reinforced concrete. On completing the subject the student should be able to:

Determine design loads for buildings

Understand elements of lateral stability for structural frames

Calculate bending and shear stresses and deflection of structural elements

Syllabus:

Determination of loading of buildings; lateral stability; bending and shear stresses; deflection of beams, slabs and columns.

Textbooks:

K.J. Wyatt, Principles of Structure, UNSW School of Architecture, Sydney.

Departmental Modules

Assessment:

Continuous Assessment - 100%

AR 242: STRUCTURES II

Hours per week: 2

Prerequisite: AR 241

Objective:

To understand the considerations for selection of structural sizes in timber, steel and reinforced concrete. On completing the subject the student should be able to:

Determine design loads for buildings

Understand elements of lateral stability for structural frames

Calculate bending and shear stresses and deflection of structural elements

Syllabus:

Determination of loading of buildings; lateral stability; bending and shear stresses; deflection of beams, slabs and columns.

Textbooks:

K.J. Wyatt, Principles of Structure, UNSW School of Architecture, Sydney.

Departmental Modules

Assessment:

Continuous Assessment - 100%

AR 261: HISTORY OF ARCHITECTURE II

Hours per week: 3

Prerequisites: AR 162, or, an understanding of architecture and building terms, and familiarity with essay writing and referencing conventions.

Objectives:

This subject assumes students have a basic understanding of architecture and building terms and proceeds to use architecture, building, and landscape to examine the development of architecture in the surrounding region.

On completion of the subject students should have an understanding of historic and contemporary influences on architectural production in the region, mainly in historic times. They should demonstrate critical analytical, representational and documentation skills in the area of discourse.

Syllabus:

An examination of the imposition of empires and colonies, of architectural productions and their influences, of issues of nationalism and identity, hybridity is undertaken. Modern regionalism, and local and global practices are raised in terms of the practice of contemporary architecture in the region.

References:

K Frampton : *Modern Architecture: a critical history*

References

Lampugnani ed, *The Thames and Hudson Dictionary of 20th-Century Architecture*, Tzonis and Lefaivre : *Tropical Architecture*. Taschen series (Art, Architecture, Design) especially Kahn ed: *Contemporary Asian Architects*, ... *Contemporary Japanese Architects* ...

Students are required to read widely in books and recent journals.

Assessment:

Continuous - 70%

Examination - 30% (2 hour written)

Checklist :

Knowledge-Literacy Understanding and application Skill development

Detail Guidelines:

Two 1 hour lectures, and one 1 hour tutorial per week

Activities:

Class Papers (group work),

Model (group work), Illustrated essays, class tests, review of subject folio

Detailed syllabus suggestions — a reader based on Asia Architecture A — uni Melbourne would be useful as a text.

Lectures

Prehistory:

Ideas of migration and transfer and transformation in the SW Pacific

Japanese, Indian, Chinese architecture

Empires and colonies and their remains

Modernity in the tropics

The Bungalow as a global production and as empire building

Tropical modern as a global production and as technological hegemony

Identity and power

Bawa, local identity, and Resorts

Ken Yeang, Tay Keng Soon etc

AR 262: MODERN ARCHITECTURE

Hours per week: 3

Prerequisite: AR 261

Objectives:

To explore theoretical, technological, social and other factors involved in the development of modern architecture. To develop an awareness of current issues that shape the various forms of contemporary architecture and the discourses that

surround it. The subject recognizes PNG's regional context.

Outcomes:

On completing this subject the student should be able to:

Identify and discuss the major canonical movements, works and figures in modern architecture.

Explain the principles employed and the influences on the making of the architecture of a number of key designers of modern architecture.

Analyze, discuss and communicate architectural issues pertinent to the design and practice of contemporary architecture in the region including aesthetic and cultural aspects.

Syllabus:

An overview of the key canonical figures and works making up Modern Architecture and the issues of modernity driving the making of this architecture. An examination of: some specific manifestations of modern architecture in the region; the origins and influences that shape(d) this architecture; the debates that surround such modern, colonial and postcolonial, and regional, design practice.

Textbooks:

Thames and Hudson Dictionary of 20th Century Architecture 1996

Frampton K. 'Modern Architecture: A Critical History' rev. 1985

References:

Students are required to read widely from a number of sources including:

Curtis W. 'Modern Architecture since 1900' 1996.

Venturi R. 'Complexity and Contradiction in Architecture' 1966.

Conrads U ed. Programs and Manifestos on 20th-century architecture 1964.

Bhatt, V & P Scriver. After the Masters. Vol. 1, Contemporary Indian Architecture 1990.

Beng, Tan Hock. Tropical architecture and interiors: Tradition-based design of Indonesia, Malaysia, Singapore, Thailand 1994.

Khan, Hasan-Uddin. Contemporary Asian

Architects 1995.

Yeang, K. The Skyscraper Bioclimatically Considered: a design primer 1996.

Lim, William S. The New Asian Architecture : vernacular traditions and contemporary style, 1998.

Rogers, Richard 'Cities for a Small Planet' 2000?

Assessment:

Continuous - 100%. Diary Journal - Class papers and presentations - 20%. Short Essay or Concept Analysis Work - 25%. Major Essay or Detailed Analysis Work - which may include study models and graphic analysis 35%. Class Tests 20%

AR 282: COMPUTER APPLICATIONS

Hours per week: 2

Objective:

To introduce computer technology and develop skills in the use of computer software. On completing the subject the student should be able to:

Undertake basic computer operations and troubleshooting routines;

Deal with computer viruses;

Use basic word-processing, spreadsheets and simple graphics software.

Syllabus:

Computer Basics: computer terminology, introduction to computer languages, computer operations, information processing, disk operating systems, DOS commands. Computer Systems: types, hardware, software, input/output and communication devices. Computer Viruses: types, detection, removal and protection of system against computer viruses. Introduction to utilities, anti-virus, word-processing, spreadsheets and graphics software.

Reference:

Spencer, D., Computers: An Introduction, Merrill Publishing Company, Ohio.

Capron, H. L., Computers: Tools for an Information Age, 2nd edition, The Benjamin/Cummings Publishing Company, Inc., California.

Solomon, A., PC Viruses: Detection Analysis and Cure, S & S International Limited, Great Britain.

Selected software manuals related to subject topics.

Assessment:

Continuous Assessment - 60%

Written Examination - 40% (1x2hrs)

AR 301: ARCHITECTURAL DESIGN IV

Hours per week: 8

Prerequisite: AR 202

Objective:

To develop skills for designing moderately complex and contextually responsive buildings. On completing the subject the student should be able to:

Prepare preliminary designs for low-rise, single-purpose buildings;

Lay out buildings and associated site works to fit well in the landscape and in relation to other buildings;

Make appropriate responses to local environmental, cultural and economic factors when designing buildings.

Resolve major construction details of one of the projects.

Syllabus:

A series of design projects based on low-rise, single-purpose buildings in both urban and rural settings with an emphasis on environmental, cultural and economic responsiveness and including an introduction to the basic principles and practice of site planning and grading. Participation in scheduled Architecture Seminars and Masterclass when offered.

Textbook:

Ching F., Architecture: Form, Space, and Order, Van Nostrand Reinhold.

Reference:

Tutt P. and Alder D., New Metric Handbook, Butterworth, Oxford.

Selected readings related to assigned projects

Assessment:

Continuous Assessment & submission of portfolio - 100%

AR 302: ARCHITECTURAL DESIGN V

Hours per week: 8

Prerequisite: AR 301

Objective:

To develop skills for designing in detail, the exterior and interior spaces of moderately complex buildings using computer software. On completing the subject the student should be able to:

Prepare detailed designs for exterior and interior spaces of low rise, single and multi-purpose buildings;

Utilise computer software to make orthographic and three-dimensional drawings;

Demonstrate fitness to undertake architectural design at the degree level.

Show structural plans & major construction details of one of the project.

Syllabus:

A series of design projects based on low-rise, single- and multi-purpose buildings with an emphasis on detailed resolution of exterior and interior spaces and introducing, in the second half of the semester, the application of computer-aided design and presentation techniques. Participation in scheduled Architecture Seminars and Master class when offered.

Textbook:

Ching F., Architecture: Form, Space, and Order, Van Nostrand Reinhold.

Reference:

Tutt P. and Alder D., New Metric Handbook, Butterworth, Oxford. Selected readings related to assigned projects.

Assessment:

Continuous Assessment with final portfolio examination and interview by jury - 100%

AR 321: ARCHITECTURAL PRESENTATION

Hours per week: 2

Prerequisite: AR221

Objective:

To develop visualization and representation skills required for the professional communication of architectural concepts and project proposals.

On completion of this subject the student should be able to:

Demonstrate skills in a variety of media for the representation of architectural designs, and evaluate effectiveness of architectural representations.

Syllabus:

Advanced free-hand and drafted problems in perspective, using such commonly available media as soft pencil, pen and ink, coloured pencils, collage, as well as digital rendering in 3D CAD Photoshop. A collection of exercises in architectural analysis, composition and representation.

References:

Latest issues of architectural journals
Yearbooks of final year Architecture students' work at overseas universities

Monographs by architectural practices renowned for their presentation skills
Websites of architectural practices

Assessment:

Continuous Assessment - 100%

AR 331: BUILDING SYSTEMS IV

Hours per week: 4

Prerequisite: AR 232

Objective:

To introduce the basic concepts of high rise construction. On completing the subject the student should be able to:

Describe advanced construction systems;
Evaluate the economic use of construction systems and components;
Make considered judgements on the selection and specification of construction systems and components with regard to future maintenance requirements.

Syllabus:

The principles of high rise construction including consideration of fire protection and seismic design. Substructure: deep excavation, piled footing, basements, underpinning, retaining structures, ground water control. Superstructure: main frames in steel, reinforced concrete, composite floor systems, curtain walling, in-situ concrete finishes. Roofs: roofing systems suitable for high rise buildings, access systems for maintenance. Finishes: selection of finishes for various grades of building, quality control of the construction process. Services: consideration of specialised services in high rise construction and integration into the construction process, fire code of practice. External works: access to the building, waste disposal, general landscaping and security.

Textbooks:

Chudley R., Building Construction Handbook, Newnes, Oxford.
PNG Department of Works: National Building Specification., reprint.
Chapter 301: Building Act, PNG Government Printer.

Reference:

Selected readings related to subject topics.

Assessment:

Continuous Assessment - 60%
Written Examination - 40%(1x2hrs)

AR341 STRUCTURES III

Hours per week: 2

Prerequisite: AR242

Objective:

To introduce the theory and design of structural

elements in timber. On completing the subject the student should be able to:

Understand the constituents and properties of structural timber;
Describe the various strength, durability and quality tests applicable to structural timber;
Expound on basic structural theory as related to the design of structural timber members;
Use relevant structural tables to evaluate the forces acting on typical structural timber members and calculate sizes;
Detail structural timber members and connections.

Syllabus:

Structural timber technology. Timber testing. Analysis, design and detailing of structural timber flooring, bearers, joists, beams, posts and footings.

Textbook:

Hough, R., Structures Design Package, UNSW Press, Sydney.
PNG Structural Manual for Domestic Buildings.
Departmental Modules

Assessment:

Continuous Assessment - 100%

AR342 STRUCTURES IV

Hours per week: 2

Prerequisite: AR341

Objective:

To introduce the theory and design of structural elements in reinforced concrete and structural steel. On completing the subject the student should be able to:

Understand the constituents and properties of reinforced concrete and structural steel;
Describe the various strength, durability and quality tests applicable to reinforced concrete and structural steel;
Expound on basic structural theory as related to the design of reinforced concrete and structural steel elements;
Use relevant structural tables to evaluate the forces acting on typical reinforced concrete and structural steel elements and calculate sizes;

Detail reinforced concrete and structural steel members and connections.

Syllabus:

Structural steel and reinforced concrete technology. Structural steel and reinforced concrete testing. Analysis, design and detailing of structural steel and reinforced concrete elements.

Textbook:

Hough, R., Structures Design Package, UNSW Press, Sydney.
Departmental Modules

Reference:

Australian Institute of Steel Construction, Safe Loads for Structural Steel. PNG Standard 1002.
PNG Standard, Reinforced Concrete Structures, Makowski, Z. S, Steel Space Structures, Michael Joseph, London. Lin, T.Y. Statesbury, S.D., Structural Concepts and Systems for Architects and Engineers, John Wiley & Sons, New York.

Assessment:

Continuous Assessment – 100%

AR 361: THEORIES OF ARCHITECTURE

Hours per week: 3

Prerequisites: AR262 and AR202, or, a comprehensive understanding of architecture terms and a familiarity with the key canons and figures of modern architecture, and preferably done some design subjects.

Objectives:

To develop literacy and understanding of theory as it affects the design and meaning of architectural production. To understand the key areas of theory which have been identified as important in architectural design, and designing as a cultural activity.

On completion of the subject student must display an understanding of how theories of architecture can affect their own self-awareness in design. They must demonstrate an ability to analyse designs presented in discourse (such as in recent journals) and be able to critically analyse critiques in

discourse, and to engage meaningfully in informed discussion and writing.

Syllabus:

An overview of the areas of theory applied to architecture is undertaken. There is an emphasis on key theoretical critiques and theoretical propositions that influenced and changed the directions of modern architecture. An introduction to the idea of crises in modernity and architecture, and to the issues of 'progress', 'utopia', and 'development'.

References:

Subject Reader, or, Bryan Lawson: *Design in Mind*
References

Rowe: *Design Thinking*, Ulrich: *Programs and Manifestos of Twentieth Century Architecture*
Clark and Pause: *Precedents in Architecture*
Students are required to read widely in books and recent journals.

Assessment:

Continuous Assessment - 100%

Checklist: Knowledge-Literacy Understanding and application Skill development

Two 1 hour lectures, and one 1 hour tutorial per week Research and class presentations. Essay writing. Drawing in analysis and as representation. Seminar papers and debates. Visual diary of drawn analysis. Class tests. Review of subject folio

A SUBJECT READER should be prepared — e.g. Uni Melbourne, Theories subject

Detailed syllabus guidelines

Representation and meaning: as fundamental attributes of architecture —the debate

The design problem or the design opportunity

Science, mathematics, and design thinking

Design thinking as a science, design thinking as culture

Architecture and utopia (ethical aspirations), architecture and ideology (power aspirations), architecture in the real world

Architecture and art (aesthetic and spiritual aspirations), architecture, science and technology

Time and design, Types and Archetypes

Typology, pattern languages, and traditional architecture as resources for analysis in forming culture based design tactics.

AR 372: ECOLOGICALLY SUSTAINABLE DEVELOPMENT

Hours per week: 2

Prerequisite: AR172 Architectural Science

Objective:

To introduce the student to the concepts of ecologically sustainable development, and energy conscious building design. Buildings consume great quantities of materials, energy and other resources in their design, construction, operation and eventual demolition. At each stage, the consumption of these resources may have significant environmental impact at the global, local and personal levels. By ensuring that any undesirable impact is minimized and the benefits maximized, architects and other building design professionals can play a major role in energy conservation and responsible resource usage. On completing the subject, the student should be able to:

understand the role of architects in shaping the physical environment which surrounds and supports human existence,
appreciate that designers need to be sensitive to the environment in a balanced way – that many are not aware of the long term environmental implications of their building design decisions,
be aware of the source of materials that they specify and the energy consumed in the manufacture of these materials of the source of that energy.

Syllabus:

Review sustainable strategies outlined in the RAIA BDP Environment Guide 2001. Lectures to cover the following important concepts (RAIA BDP Environment Guide 2001 p.5):

Biodiversity – protect and restore ecological diversity, health and functionality,
Resources – optimize their use, especially non-renewable resources,
Pollution – minimize pollution of soil, air and water,
Quality of Life – improve the health, safety, and comfort of building users.

References:

Lawson, B (1996) **Building Materials Energy and the Environment: Towards Ecologically Sustainable**

Development: Solarch, School of Architecture, The University of New South Wales. RAIA, Canberra.

RAIA (2000) **Building Design Professions Environment Design Guide**, RAIA, Melbourne, Australia.

Assessment:

Continuous Assessment - 60%
Written Examination - 40% (1 x 2hrs)

AR 382: COMPUTER-AIDED DESIGN

Hours per week: 5

Prerequisite: AR282

Objective:

To develop skills in the use of architectural design and drafting software. On completing the subject the student should be able to:

Work with architectural design and drafting software;
Produce 2D architectural presentation and technical drawings.

Syllabus:

Introduction to CAD software for orthographic drawing and basic customising of CAD programs.

Reference:

Selected software manuals.

Assessment:

Continuous Assessment - 100%

AR401 ARCHITECTURAL DESIGN VI

Hours per week: 8

Prerequisite: AR302

Objective:

To develop skills for designing complex buildings in tropical settings. On completing the subject the student should be able to:

Demonstrate a mature approach to complex architectural problems;

Design buildings, and spaces within buildings, to suit given parameters of thermal, lighting, acoustic and materials performance.

Resolve major construction details of one of the project.

Syllabus:

A series of design projects based on complex buildings for sites in both coastal and highlands situations and covering, in varying depth, all stages of the design process, including: brief preparation and analysis, site investigation, research and data collection relating to

project type, preparation and evaluation of alternative spatial configurations and structural proposals, refinement of proposed solutions to developed design stage, and execution of high-quality presentation [with the option of using CAD software]. Participation in scheduled Architecture Seminars. Participation in scheduled Architecture Seminars and Masterclass when offered.

References:

Selected readings related to assigned projects.

Assessment:

Continuous Assessment & submission of portfolio - 100%

AR402 ARCHITECTURAL DESIGN VII

Hours per week: 8

Prerequisite: AR401

Objective:

To develop skills for designing complex buildings on challenging sites. On completing the subject the student should be able to:

Resolve architectural problems involving multiple functions;

Design using sound site planning, grading and landscaping practices suited to tropical

environments.

Propose structural framing and resolve construction details of one of the project.

Syllabus:

A series of design projects based on complex programs involving the resolution of multiple functions and practical problems of site planning, grading and landscaping and covering, in varying depth, all stages of the design process, including: brief preparation and analysis, site investigation, research and data collection relating to project type, preparation and evaluation of alternative spatial configurations and structural

proposals, refinement of proposed solutions to developed design stage, and execution of high-quality

presentation [with the option using CAD software]. Participation in scheduled Architecture Seminars and Masterclass when offered.

References:

Readings related to selected topics.

Assessment:

Continuous Assessment with final portfolio examination & interview by jury - 100%

AR 411: ARCHITECTURAL DESIGN THEORY

Hours per week: 2

Prerequisites: AR 361, or, a comprehensive understanding of architecture terms, a familiarity with the key canons and figures of modern architecture, and design subject to AR 302.

Objective:

To develop a deeper understanding of theories of architecture and their application and manifestation in design practice, and requires students to examine a range of examples of contemporary theory and architecture in depth, and to meaningfully participate in seminar discussions.

On completion of the subject students must demonstrate the ability to make serious, well informed, and articulate critiques of architecture

and design issues productions in their own societies, nation, the region and internationally. They must display skill in the writing of well-informed and well-argued illustrated critical essays, including the ability to articulate their own architectural position for design projects.

Syllabus:

An analysis in depth of areas of theory applied to personal practice of design in architecture, with an emphasis on key theoretical critiques and theoretical propositions influencing current directions of contemporary and regional architecture. An examination is undertaken of issues in contemporary practice and discourse, particularly concepts of post-modernity, and post-colonialism and critical regionalism and as they are manifested in the region.

References:

Subject Reader, or, Rowe: *Design Thinking*
References

Donald Schön : *The Reflective Practitioner*,
Students are required to read widely in books and themed issues of AD and recent journals.

Assessment:

Continuous 100% 2 hour
contact.

Checklist: Knowledge-Literacy Understanding
and application Skill development

One 1 hour lecture and one 1 hour seminar per week.

Research, seminar papers and debates. Analysis and essay writing, including drawn analysis and representation and specifically related to the students design work. Visual diary and subject folio.

Detailed syllabus guidelines
Recent philosophy and the aesthetics of chaos, smooth and striated, folding etc
Global and the local:
Hi tech and natural efficiency
Classical vernacular
Architecture for the people issues
Modernity and architecture
Post modernity

Deconstruction —and constructivism—
Postcolonial issues

Personal philosophies, individual architectural positions, and design tactics to achieve them: viewed through current issues, and key practitioners, with investigation to be carried out on a number of regional and local architects or firms.

AR 432: SITE DESIGN

Hours per week: 2

Objectives:

To develop a critical awareness of the potential of 'place' and 'nature', as well as 'cultural constructs' of urbanism and landscape.

To understand advanced ways that site analysis and planning can be understood and utilized for site master planning and for design.

To develop specific and detailed knowledge and skill in the application of key landscape design elements in urbanism, landscape and architecture.

Outcomes: On completing this subject the student should:

Have a working and contextual knowledge of the cultural and critical issues of society, polis, architecture, 'place' and 'nature.'

Be able to meaningfully utilize advanced, culturally conscious and ecologically sensitive, approaches to landscaping, urban space manipulation, architecture, and ecology.

Be able to produce imaginative and credible landscape proposals. Be aware and display skills in integrating architectural designs (such as a nominated known building, or, a suitable studio design project) and landscape concepts, including the detailing of key landscape elements.

Syllabus:

A pluralist overview of some key concepts and techniques of landscape architecture: sitting and setting, nature and context. A review of different and their built landscapes with an emphasis on regional and tropical examples. Site planning and manipulation, utilization of topographic and natural features, principles of plant selection and placement,

sculpture-art and hard elements of landscape, landscape composition and expression.

Text: Moore C. et al 'The Poetics of Gardens' 1993

References:

Kevin Lynch and Gary Hack, 'Site Planning' 3rd ed, 1984

Students are required to read widely in the Landscape and gardens books including: Bardi, Pietro Maria. 1964. The tropical gardens of Burle Marx. Spiro Kostof: A History of Architecture: Settings and Rituals Sigfried Gideon: Space, Time and Architecture

Equipment:

Led pencils with HB, B, 2B, 4B, scale rule, tape measure, masking tape, eraser. Watercolor pencils/paint. Model making materials.

Assessment:

Continuous Assessment and review of folio of Class papers, submissions and subject diary 20 % Design project No 1. 25 % No. 2 40% Essay, Poster or Model 15%

AR 451: URBAN DEVELOPMENT

Hours per week: 2

Objective:

Firstly, to understand the principles and background of to the development of human settlements, the phenomenon of urbanization, the principles and practice of urban planning and the understanding of the forces that contributes towards urbanization and urban growth.

Secondly, to develop the knowledge base required in urban planning as tool to enhance and appreciate urban grown and people participation at the local context within a greater global community perspective.

On completing this subject the student should be able to:

Develop an understanding of the essence of human settlement development.

Relate urban development to relative urban developmental forces.

Read the urban profile using various urban development and control instruments.

Identify different urban growth patterns in the global and local context to primary urban growth theories and models

Carryout simple to complex urban planning and development assessments and projects related to urban growth development.

Integrate urban planning principles in urban architectural projects and developments.

Appreciate urban planning as a tool for developing urban quality living.

Syllabus:

Part One: An overview of the historical developmental and growth patterns of settlements and the forces shaping urbanization both in the global and the local context. The understanding of the origins and development of modern town planning practice and the formulation of policies to police and govern systemized urban growth.

Part Two: Through projects and assignments relate urban growth and developmental patterns to local experiences. Use urban planning instruments and regulatory controls in projects and assignments to appreciate urban planning.

References:

Assessment:

100% continuous assessment

AR462 URBAN DESIGN THEORY

Hours per week: 2

Objective:

Firstly, to understand the principles of urban design and to develop an awareness of the field of Urban Design and its input in urban architectural and other built environment developments those in one way or another contribute to social, cultural and physical urban quality enhancing human livability.

Secondly, to develop the knowledge required utilizing urban design as a tool to enhance and appreciate urban architecture and engineering within the context of the total built environment.

On completing this subject the student should be able to:

1. understand the technical underlying theory and bases in which urban design relationships enable quality urban characterization and architecture.
2. carryout simple to complex urban design assessments and projects related to urban quality development.
systematically understand their architectural project developments with a more informed urban design understanding.
Integrate urban design principles in urban architectural projects and developments.
appreciate urban design as enhancing to for developing urban quality living.

Syllabus:

A series of leading lectures will be presented throughout the semester in addressing urban design theory with selective illustrations from simple to complex urban design experiences throughout the world. The aim will be generate student interest and motivation to appreciate the need to create qualitative and livable urban built environments.

References:

Moughtin Cliff (1995) Urban Design, Streets and Square Butterworth-Heinemann Singapore.

Assessment:

100% continuous assessment

AR 491: SPECIAL STUDY I

Hours per week: 3

Objective:

To develop research and presentation skills in specialised study area of interest to the *staff and the student*. On completing the subject the student

should be able to:

Pursue a program of supervised study;
Present oral and written discourses on the selected study topic.

Syllabus:

Elective topics be developed with selected specialist staff on the following currently available optional areas of study . . .
3D-CAD modelling, rendering and slide presentation, introduction to macro-programming;
Traditional architectural and settlement patterns through the Architecture Heritage Centre;
Contemporary studies in urban settlements and low cost housing solutions;
Advanced problems in tropical architecture;
Problems in architectural psychology.

Assignments and reports as directed by the examiner.

Reference:

As advised by the examiner.

Assessment:

Continuous Assessment - 100%

AR 492: SPECIAL STUDY II

Hours per week: 3

Objective:

To develop research and presentation skills in specialised study area of interest to the student.
On completing the subject the student should be able to:

Pursue a program of supervised study;

Present oral and written discourses on the selected study topic.

Syllabus:

Elective topic from AR 491 continued or new topic to be developed with selected specialist staff from one of
the following currently available optional areas of study.
3D-CAD modelling, rendering and slide

presentation, introduction to macro-programming;
Traditional architectural and settlement patterns through the Architecture Heritage Centre;
Contemporary studies in urban settlements and low cost housing solutions;
Advanced problems in tropical architecture;
Problems in architectural psychology.

Assignments and reports as directed by the examiner.

Reference:

As advised by the examiner.

Assessment:

Continuous Assessment - 100%

AR 501: ARCHITECTURAL DESIGN VIII

Hours per week: 8

Prerequisite: AR402

Objective:

To develop skills for designing complex and multiple buildings for urban settings. On completing the subject the student should be able to:

Resolve architectural problems involving multi-storey, mixed-use developments;
Develop architectural solutions based on sound urban design practice.
Propose construction materials and typical construction details of one of the projects.

Syllabus:

Projects involving multi-storey, mixed-use buildings on urban sites and covering, in varying depth, all stages of the design process, including: brief preparation and analysis, site investigation, research and data collection relating to project type, preparation and evaluation of alternative spatial configurations and structural proposals, refinement of proposed solutions to developed design stage, and execution of high-quality presentation [with the option using CAD software]. Participation in scheduled Architecture Seminars and Master class when offered.

Reference:

Selected readings related to assigned projects.

Assessment:

Continuous Assessment and submission of portfolio - 100%

AR 502: DESIGN THESIS

Hours per week: 9

Prerequisite: AR501

Objective:

To develop the skills to research, define and resolve an advanced architectural problem. On completing the thesis the student should be able to:
Independently research and report on all aspects of an architectural problem;

Utilise a broad range of design tools and knowledge to create an elegant design response; and

Demonstrate fitness to graduate as an architect.

Syllabus:

The subject is administered by the Design Thesis Committee in accordance with a set of published guidelines. Approved topics will involve the design of a single large-scale project carried out in four stages:

Preparation of a 5,000 word illustrated Design Thesis Report to include detailed brief preparation and analysis, site investigation, research and data collection relating to project type.

Conceptual Design Stage involving the preparation and evaluation of alternative spatial configurations and structural proposals, and selection and refinement of preliminary design proposal.

Design Development Stage to refine spatial configuration and structural solution.

Final Design Stage and preparation of comprehensive presentation [using CAD software if desired].

Participation in scheduled Architecture Seminars and Masterclass when offered.

Reference:

Selected readings related to thesis topics.

Assessment:

Assessment by jury - 100%

AR 561: URBAN DESIGN I

Hours per week: 3

Prerequisite: AR462

Objective:

To introduce the discipline and explore the goals of urban design in relation to architecture, town planning and community expectations in the international and

PNG context. On completing the subject the student should be able to:

Understand and use common survey and information gathering techniques;

Draw reference to historic and contemporary example of urban design;

Apply criteria derived from good theory and practice to urban design problems;

Discuss political, historical, sociological, geographical and economic factors influencing decision-making in the realm of urban design.

Syllabus:

Lectures, seminars and studio projects based on model urban design projects of relevance to the development and redevelopment of selected residential neighbourhoods, industrial areas and commercial centres of towns in PNG.

Textbooks:

Moughton, C. Urban Design, Street and Square, Butterworth Architecture.

PNG Department of Physical Planning, Physical Planning Manual.

PNG Planning Act and Regulations, No 32.

Reference:

Hall, P. Cities of Tomorrow: An Intellectual History of Urban Planning and Design in 20th Century, Blackwells, Oxford.

Selected readings related to subject topics.

Assessment:

Continuous Assessment - 100%

AR 562: URBAN DESIGN II

Hours per week: 2

Prerequisite: AR561

Objectives:

To apply the understanding gained in AR 551 to the urban design aspects of AR 502 Design Thesis. On completing the subject the student should be able to

relate the principles and practice of urban design theory to practical problems.

Syllabus:

Weekly seminars on urban design issues and reviews of reports, drawings and models.

Textbooks:

Hayward, S. and McGlyn, S eds., Making Better Places, Urban Design Now, Butterworth Architecture.

PNG Department of Physical Planning, Physical Planning Manual.

PNG Planning Act and Regulations, No 32.

Reference:

Hall, P. Cities of Tomorrow: An Intellectual History of Urban Planning and Design in 20th Century, Blackwells, Oxford.

Selected readings related to subject topics.

Assessment:

Continuous Assessment - 100%

AR 591: RESEARCH PROJECT

Hours per week: 3

Objective:

To provide training for independent research in the fields of architecture, building, or physical planning. On completing the subject the student should be able to:

Explain the role of research in academic and

professional life;

Use research and analytical tools to prepare a substantial research report on a selected topic.

Syllabus:

The subject is administered by the Research Project Coordinator in accordance with a set of published guidelines. Approved topics will involve the preparation of a 7-10,000 word illustrated report, or an approved combination of descriptive material and original measured drawings.

Advice from Research Project Advisers includes: orientation and guidance on undertaking structured research including carrying out literature surveys and field work in a systematic manner and using questionnaires and basic statistical methods and assessing their accuracy and reliability.

Advice from the Department of Language and Communication Studies includes: writing research reports using clear, concise language, logical exposition, and proper methods of attributing and documenting sources and reviewing of drafts on an as required basis.

References:

Babbie E. R., The Practice of Social Research, University of Hawaii. Moser C.A. and Kalton G., Survey Methods in Social Investigation, Gower, Aldershot.

Flynn R.R., An Introduction to Information Science, Marcel Dekker, New York.

Assessment:

Continuous Assessment - 100%
(with interim and final assessments by jury)

AR 592: DISSERTATION

Hours per week: 2

Prerequisite: AR591

Objective:

To apply the skills gained in AR 591 for researching and writing an individual research project relating to a chosen area of specialist planning concern. On completing the subject the student should be able to:

Formulate a research proposal;

Conduct independent research on a selected planning topic;

Prepare a comprehensive report on the outcome of the research.

Syllabus:

Research study program relating to one of the following areas of physical planning: Urban or Rural Development, Environmental Planning, Residential Area Planning and Transport Planning. Techniques for data collection, analysis and evaluation from primary and secondary sources. Preparation of 15,000 word illustrated paper.

Assessment:

Continuous Assessment - 40%

Final Examination - 60%

(with assessment by jury)

BL 102: QUANTITIES & ESTIMATING I

Hours per week: 4

Prerequisite: MA121

Objective:

To introduce the basic principles of measuring and estimating building works. On completing the subject the student should be able to:

1. Explain the main processes of preparing bills of quantities;
2. Use the standard method of measurement of building works;
3. Describe items of building work in accordance with the standard method of measurement;
4. Apply the principles of taking off.

Syllabus:

Introduction to quantity surveying and estimating. Principles of measurement. Use of the current edition of the Australian Standard Method of Measurement of Building Works. Project work in taking-off and

calculating quantities based on simple buildings in masonry, timber and concrete.

Textbooks:

Australian Institute of Quantity Surveyors and The Master Builders Federation of Australia, Australian Standard Method of Measurement of Building Works, 5th edition.
Marsden P.K., Basic Building Measurement, University of NSW Press, Sydney.
Departmental Notes

Reference:

Seeley I.H., Building Quantities Explained, 4th edition, Macmillan, London.

Assessment:

Continuous Assessment - 60%
Written Examination - 40% (1 x 2hrs)

**BL 112: BUILDING TECHNOLOGY
STUDIO I**

Hours per week: 4

Prerequisite: AR101

Objective:

To develop a practical understanding of building systems used in domestic-scale construction. On completing the subject the student should be able to:

1. Appreciate the various building systems associated with domestic construction;
2. Apply the fundamental drawings skills developed, by preparing construction drawings, from information gathered from surveys of completed buildings;
3. Understand the compatibility of the materials and components used in the construction process;
4. Prepare scale models from construction drawings.

Syllabus:

A range of studio projects designed to develop the student's basic understanding of architecture and building, from theoretical concepts to practical application. Evaluation of the design and specification of existing and new domestic-scale buildings and their durability. Surveying and

drawing up existing building structures in preparation for the construction of models. Site visits to selected materials manufactures/suppliers, to observe and report on the range and properties of construction materials currently on the market.

Assessment:

Continuous Assessment - 100%

BL 162: CONSTRUCTION SURVEYING I

Hours per week: 3

Objective:

To introduce the basic concepts of surveying and levelling. On completing the subject the student should be able to undertake:
Surveys of small areas and simple buildings using chain, linear and theodolite surveying techniques;
Contouring of construction sites for computation of quantities for earthworks.

Syllabus:

Instruments, principles and operational methods for chain surveying, levelling surveying and theodolite surveying. Calculation of areas and volumes of earthworks from survey data.

Textbooks:

Whyte W. and Paul R., Basic Metric Surveying, 3rd edition, Newness-Butterworth, Oxford.

Reference:

Muskett J., Site Surveying, BSP Professional Books, Oxford.

Assessment:

Continuous Assessment - 60%
Written Examination - 40%(1x2hrs)

BL 202: QUANTITIES & ESTIMATING II

Hours per week: 5

Prerequisite: BL102

Objective:

To introduce the preparation of bills of quantities

and the calculation of unit rates for building work. On completing the subject the student should be able to:

1. Work up and prepare a simple draft bill from quantities taken off by others;
2. Calculate all-in costs of labour, plant and materials.

Syllabus:

Project work in calculating quantities and preparing bills for different work sections of the ASMM based on buildings in masonry, reinforced concrete and timber.

Textbooks:

Australian Institute of Quantity Surveyors and The Master Builders Federation of Australia, Australian Standard Method of Measurement of Building Works, 5th edition.
Marsden P.K., Basic Building Measurement, University of NSW Press, Sydney.

Reference:

Seeley I.H., Building Quantities Explained, 4th Edition, Macmillan, London.

Assessment:

Continuous Assessment - 60%
Written Examination - 40% (1 x 2hrs)

**BL 211: BUILDING TECHNOLOGY
STUDIO II**

Hours per week: 6

Prerequisite: BL112

Objective:

To develop a practical understanding of building systems relevant to light industrial and commercial construction. On completing the subject the student should be able to:

1. Appreciate the various building systems associated with industrial and commercial construction;
Consider the appropriate use of materials and the quality of finishes achieved;

3. Understand the range of basic plant and equipment used during the construction process;

4. Prepare schedules of materials from given drawings.

Syllabus:

A range of studio projects designed to develop the student's basic understanding of the construction of commercial and industrial buildings from theoretical concepts to practical application. Visits to construction sites for the evaluation of designs and specifications in term of user requirements and maintenance of the building fabric. Consideration of resource implications of the various construction systems under review. The process of scheduling materials and other building components.

Textbook:

Bond, G., Civil Engineering Drafting, Department of Civil Engineering, PNGUT

Assessment:

Continuous Assessment - 100%

BL 221: CONSTRUCTION MANAGEMENT I

Hours per week: 3

Objective:

To introduce the nature and principles of management and provide an understanding of the role of management in construction. On completing the subject the student should be able to:

1. Understand the structure of the construction industry;
2. Prepare and interpret organisation charts for small and medium businesses;
3. Explain and comment on the fundamental statutes regulating the formation and running of construction businesses.

Syllabus:

Introduction to the nature of construction industry. The types of clients who require construction services. The internal structure of various

construction organisations and levels of responsibility within them. Elementary business practices.

Textbook:

Forster G., Construction Site Studies Production, Administration and Personnel, Longman, Essex.

Reference:

Calvert R. E., Introduction to Building Management, 5th edition, Butterworth Heinemann, Boston.

Assessment:

Continuous Assessment - 60%
Written Examination - 40% (1 x 2hrs)

BL 222: CONSTRUCTION MANAGEMENT II

Hours per week: 4

Prerequisite: BL221

Objective:

To provide an understanding of the principles of resource allocation and coordination in construction. On completing the subject the student should be able to:

Lay out and organise a site for simple construction projects;

Prepare construction programs for simple projects;

Analyse and determine labour plant and materials requirements for various construction operations.

Syllabus:

Statutory requirements for building works in PNG. Preparation of construction strategies, planning and programming using basic planning techniques. Basic layout and organisation of the construction sites. Resources and their capabilities. Delivery and storage of materials. Consideration of wastage during the construction process.

Textbook:

Forster G., Construction Site Studies Production, Administration and Personnel, Longman, Essex.

Reference:

Calvert, R. E., Introduction to Building Management, 5th edition, Butterworth-Heinemann, Boston.

Assessment:

Continuous Assessment - 60%
Written Examination - 40% (1x2hrs)

BL 231: BUILDING CONSTRUCTION FOR LAND MANAGERS I

Hours per week: 2

Objective:

To develop awareness of building design determinants, common building materials, building elements and construction systems and introduce various construction trade classifications. On completing the subject the student should be able to:

Describe the factors affecting the design of buildings;

Explain the physical characteristics of building materials;

Identify basic building elements and construction systems;

Recognise common building defects;

Describe the work of various construction trades.

Syllabus:

General factors affecting design of buildings in the tropics. Properties of timber, masonry, concrete, steel and other building materials and characteristics of construction systems based on elements made from these materials. Survey of common building defects. Description of construction trades and scope of work covered by each trade.

Textbook:

Everett, T., Materials, Mitchell's Building Series, 5th edition, Longman Scientific and Technical, Essex.

Reference:

Richardson, B. A., Remedial Treatment of Buildings, The Construction Press, London.

Ching F., Building Construction Illustrated, Van Nostrand Reinhold, New York.

Assessment:

Continuous Assessment - 60%
Written Examination - 40% (1x2hrs)

BL 232: BUILDING CONSTRUCTION FOR LAND MANAGERS II

Hours per week: 2

Prerequisite: BL231

Objective:

To develop an ability to read architectural drawings and specifications, an awareness of the bye-laws governing construction and an understanding of the various types of services within buildings. On completing the subject the student should be able to:

Comprehend architectural drawings and specifications;
Make reference to building and health ordinances;
Explain the layout and constituent parts of various types of building services.

Syllabus:

Introduction to architectural drawings and specifications. Review of building and health ordinances related to buildings. Introduction to hydraulic, electrical, telecommunication, mechanical building service systems.

Textbooks:

Everett, T., Materials, Mitchell's Building Series, 5th edition, Longman Scientific and Technical, Essex.
Burbury P., Environment & Services, Mitchell's Building Series, Longman, Essex.

Reference:

Richardson, B. A., Remedial Treatment of Buildings, The Construction Press, London.
Ching F., Building Construction Illustrated, Van Nostrand Reinhold . Nominated Building and Health Bye-Laws.

Assessment:

Continuous Assessment - 60%
Written Examination - 40%(1x2hrs)

BL 241: BUILDING ECONOMICS I

Hours per week: 2

Objective:

The nature of economics and the economic environment in which construction activities take place. On completing the subject the student should be able to:

Construct a basic economic model;
Explain the concept of planning for the efficient allocation of resources;
Describe how economic modelling can predict the present and future pattern of economic growth, inflation and unemployment;
Expound on the principles and procedures of international trade.

Syllabus:

Introduction to general economics, opportunity cost, supply and demand, marginal analysis, market intervention. Price floors and price ceilings and their effects. Examples of the foregoing concepts as applied to the building industry. The national income account, gross national product. Unemployment and inflation: statistical price indices. Money and the banking system, the Central Bank and Commercial banks, monetary policy and the national economy. Budget deficits, interest rates and inflation, monetary and fiscal measures: government control methods. Productivity and growth in national wealth. International economics, international trade, exchange rates, balance of payments. Payment for imports, letters of credit, telegraphic transfers, bills of exchange. Forward cover, import duties, taxes. of the foregoing concepts as applied to the building industry. Imported equipment, duties, exchange rates, risks, contracts with foreign firms.

Textbook:

Harcourt S. V., Commerce and Development in Papua New Guinea, 2nd edition Longman, Melbourne.

Reference:

Cairncross Sinclair, Introduction to Economics, 6th Edition, Butterworth, Boston.

Assessment:

Continuous Assessment - 60%
Written Examination - 40%(1x2hrs)

BL 281: BUILDING LAW I

Hours per week: 2

Objective:

To introduce the legal system of Papua New Guinea and provide an appreciation of the basic concepts of the laws of tort and contract. On completing the subject the student should be able to:

Describe the historical development of the legal system and the place of precedence, statute, and local custom and practice in legal processes;

Explain the legal system operating in PNG and the structure of the judicial system;

Expound on the basic concepts of the laws of tort and contract.

Syllabus:

The origin of law in contemporary PNG. The PNG constitution and legal system. Legal bodies and authorities. The principles of law of contract. The essentials of a valid contract: offer and acceptance, intention, capacity, consideration, legality, possibility of performance, genuineness of consent, voidance, unenforceable and illegal contracts. Remedies for breach of contract. The nature of tort and general defences.

Textbook:

Padfield C.F. and Barker D.L.A, Law made Simple, Butterworth-Heinemann, Oxford.

Reference:

Selected readings related to subject topics.

Assessment:

Continuous Assessment - 60%
Written Examination - 40% (1x2hrs)

BL 282: BUILDING LAW II

Hours per week: 2

Prerequisite: BL281

Objective:

To expand on the legal aspects of contract and tort, and employment and insurance with particular respect to the construction industry. On completing the subject the student should be able to:

Understand the basic statutory controls relating to building works in PNG;

Explain the general principles of the law with regard to contracts and tort as applied to construction;

Explain the general principles of the law with regard to various forms of business organisation, employment and insurance;

Understand how the above legal concepts are applied in day to day operations within the building industry.

Syllabus:

Laws of contract and tort in relation to construction. Legal differences between various forms of business organisation within the construction industry. Laws regulating employment. Introduction to insurance law, basic concepts underlying insurance law, procedures for effecting insurance, classes of insurance, fire insurance, insurance of construction work, accident insurance, employers liability, public liability, professional liability insurance.

Textbook:

Wilkie M. Practical Building Law, Batsford, London.

Reference:

Vermeesch R. B. and Lindgren K. E, Business Law of Australia, 4th Edition Butterworth, Sydney.

Assessment:

Continuous Assessment - 60%
Written Examination - 40%(1x2hrs)

BL 301: QUANTITIES & ESTIMATING III

Hours per week: 4

Prerequisite: BL202

Objective:

To consolidate knowledge of the principles of taking off and to introduce methods of calculating unit rates for building work. On completing the subject the student should be able to:

1. Work up and prepare draft bills for a complete project.
2. Build-up rates for building work;
3. Prepare schedules of materials.

Syllabus:

Measuring, calculating quantities and preparing bills for different work sections of complete buildings. Calculation and build-up of unit rates. Preparation of schedules of materials for building projects.

Textbooks:

Australian Institute of Quantity Surveyors and The Master Builders Federation of Australia, Australian

Standard Method of Measurement of Building Works, 5th edition.

Buchan R.D, Fleming F W and Kelly J. R., Estimating for Builders and Quantity Surveyors, Butterworth-Heinemann, UK.

Assessment:

Continuous Assessment	- 60%
Written Examination	- 40%(1 x2hrs)

BL 311: BUILDING TECHNOLOGY STUDIO III

Hours per week: 4

Prerequisite: BL211

Objective:

To develop a practical understanding of building services and their integration within the

construction

process. On completing the subject the student should be able to:

1. Identify the range of services expected to be incorporated into modern buildings and understand the basic terminology;
2. Define the basic terminology of building services and describe the materials and components used for them;
3. Appreciate the spatial requirements of building services within a structure;
4. Interpret construction and coordination requirements from building services drawings;

Syllabus:

Studio projects designed to provide the practical application of building services. Industrial visits to materials suppliers and specialist contractors. Practical assessments of building services installed in existing structures. Consideration of the storage, security and movement of materials, components and equipment involved in building services, during the construction process.

Assessment:

Continuous Assessment - 100%

BL 321: CONSTRUCTION MANAGEMENT III

Hours per week: 4

Prerequisite: BL222

Objective:

To introduce management theory, the concepts of motivation, and the importance of efficient and effective communications within the context of management. On completion of the subject the student should be able to:

1. Explain the various schools of management thinking;
2. Appreciate motivation theory and its relevance to the construction industry;
3. Understand the importance of good industrial

relations policies;

4. Describe the forms of communication which take place and their effects on management practice.

Syllabus:

Introduction to management theory, understanding and applying motivation theory to the construction process. A review of the industrial relations policies relevant to construction. Forms of communication, the importance of clear communication in management practice, procedures for formal meetings, providing correct documentation.

Textbook:

Forster G., Construction Site Studies Production, Administration and Personnel, Longman, Essex.

Reference:

Calvert R. E., Introduction to Building Management, 5th edition, Butterworth-Heinemann, Boston.

Assessment:

Continuous Assessment - 60%
Written Examination - 40% (1 x 2hrs)

BL 322: CONSTRUCTION MANAGEMENT IV

Hours per week: 3

Prerequisite: BL321

Objective:

To develop further knowledge of management as applied to building projects. On completing the subject the student should be able to:
Prepare overall and short-term management programs using more advanced planning techniques;
Explain how to procure and coordinate the resources needed for efficient site management;
Prepare cash flow forecasts and monitor and control site costs of building projects;
Develop procedures for the efficient and effective utilisation of plant and equipment.

Syllabus:

Project planning and scheduling using more advanced planning techniques. Mobilising onto a job. Purchasing, hire plant, subcontracting. Contractor's cash flow forecasting: defining, approving, monitoring and recording of reimbursable site costs. Monitoring and controlling site costs. Plant management, maintenance and depreciation.

Textbook:

Fellows, Langford, Newcombe & Urry, Construction Management in Practice, Longman Scientific and Technical, London.

Reference:

Calvert R. E., Introduction to Building Management, 5th edition, Butterworth-Heinemann, Boston.

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x2hrs)

BL 332: BUILDING SYSTEMS V

Hours per week: 4

Prerequisite: AR331

Objective:

To provide an understanding of the principles of production taking into consideration the use of plant and equipment and the issues of productivity, health and safety and quality control. On completing the subject the student should be able to:
Critically examine various forms and methods of construction;
Assess methods of construction in the context of efficient and effective production;
Evaluate and promote methods of construction to promote health and safety;
Identify ways and methods of controlling quality of workmanship.

Syllabus:

Expansion and development of building systems previously studied with an emphasis on urban

situations and poor ground conditions. Temporary supports for deep excavations, and soil stabilisation. Plant and equipment used for construction. Transportation and storage of materials during construction. Access for plant and equipment. Temporary works including scaffolding, formwork and false work, methods of shoring. Health and safety issues. Quality control in construction.

Textbooks:

Chudley R., Building Construction Handbook, Newnes, Oxford.

PNG Department of Works: National Building Specification., reprint
Chapter 301: Building Act, PNG Government Printer.

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x2hrs)

BL 342: BUILDING ECONOMICS II

Hours per week: 2

Objective:

To introduce basic concepts about various types of business organisations and their establishment and management. On completing the subject the student should be able to:

Select forms of businesses to suit various circumstances;

Prepare basic financial statements for small and medium-size construction and other related businesses;

Comment on the solvency and profitability of construction and related businesses.

Syllabus:

Forms of business organisation, establishing and running a business, directors' responsibilities.

Financial structure of construction and related businesses, financial management: assets and liabilities, working and fixed capital; sources of capital, useful financial ratios, profit, taxation, depreciation, dividends, general reserve. Market planning. Introduction to basic accounting and

financial statements: profit and loss statements, analysis and interpretation of balance sheets, annual business returns, general office and project overheads, trading mark-ups, charge-out rates, basic office systems. Financial planning and control in construction, causes and prevention of financial instability and business failure.

Textbooks:

Calvert, R.E., Introduction to Building Management, 5th edition, Butterworth-Heinemann, Boston.

Harris F. and McCaffer, M. Modern Construction Management, 3rd edition, BSP Professional Books, Oxford.

Reference:

Tashjian P., Business Organisations in Papua New Guinea, Law Book Company, Sydney.

Upson A., Financial Management for Contractors, BSP Professional Books, Oxford.

Assessment:

Continuous Assessment - 60%
Written Examination - 40% (1x2hrs)

BL 362: CONSTRUCTION SURVEYING II

Hours per week: 3

Prerequisite: BL162

Objective:

To learn the application of advanced site survey and levelling techniques. On completing the subject the student should be able to:

Survey complex sites using linear level and theodolite;

Set out and level building and civil works.

Syllabus:

Levelling surveys: linear levelling, longitudinal sections, cross sections. Theodolite surveys: angular measurements, distance measurements. Setting out building works: coordinates, grids horizontal and vertical dimensional control. Setting out civil works: works profiles, traverses, curves, roads, drains, excavations. Field exercise involving the application of the foregoing

techniques.

Textbook:

Whyte W. and Paul R., Basic Metric Surveying, 3rd edition, Newness-Butterworth, Oxford.

Reference:

Muskett J., Site Surveying, BSP Professional Books, Oxford.

Assessment:

Continuous Assessment - 100%

BL 471: INDUSTRIAL TRAINING I

Duration: 16 weeks minimum

Prerequisite: Diploma of Building (DBLD)

Objective:

To expose students to real work situations and provide a firm and more mature base for the subsequent course work. On completing the program the student should be able to apply the experience to enhance understanding of all the subjects comprising two semesters of the degree course.

Syllabus:

A minimum of 16 weeks of supervised industrial experience from employers approved by the Department of Architecture and Building and including but not limited to building contractors, private professional practices, government and statutory organisations. The following areas of experience are recommended:

Contracting Organisations:

Preparing bills of quantities. Estimating and preparing tender packages. Project planning for construction work. Preparing project budgets and cash flow forecasts. Levelling of construction sites and/or setting out construction work. Setting up site cost control systems and monitoring site costs. Preparing materials schedules. Purchasing, hiring plant and subcontracting procedures. Supervising and administering contracts including engaging in site meetings, dealing with superintendent's instructions, preparing weekly or monthly programs for on-going projects, reviewing

progress against programs, and re-scheduling to allow

for delays, changes in resources. Monitoring and recording site reimbursable costs. Preparing interim valuations for progress payments. Managing subcontractors' progress payments. Attending to contractual matters. Preparing and agreeing to statements of final project accounts. Engaging in construction on site.

Professional Practices and Public Bodies:

Preparing and presenting bills of quantities. Preparing and editing schedules of rates. Advising on selection of tenderers, checking and evaluating tenders, preparing tender reports. Engaging in cost control of the construction. Preparing and reporting on interim valuations. Supervising and administering contracts.

Preparing and agreeing to statements of final account. Visiting construction sites.

General:

Organising and managing business or public sector organisations and initiating and drafting contractual and related correspondences.

Assessment:

Continuous Assessment - 100%

For the purpose of assessment 'experience' means carrying out duties on the student's own initiative in the capacity as an assistant or member of a group or as an observer of others carrying out relevant duties. Students are required to keep and maintain, according to rules to be set, a diary of work experience to be forwarded to the subject examiner at the end of each month. Assessment will comprise review of monthly diary reports and interviews with employers.

BL 472: INDUSTRIAL TRAINING II

Duration: 16 weeks minimum

Prerequisite: BL471

Objective:

To expose students to real work situations and provide a firm and more mature base for the

subsequent course work. On completing the program the student should be able to apply the experience to enhance understanding of all the subjects comprising two semesters of the degree course.

Syllabus:

A minimum of 16 weeks of supervised industrial experience from employers approved by the Department of Architecture and Building and including but not limited to building contractors, private professional practices, government and statutory organisations. The following areas of experience are recommended:

Contracting Organisations:

Preparing bills of quantities. Estimating and preparing tender packages. Project planning for construction work. Preparing project budgets and cash flow forecasts. Levelling of construction sites and/or setting out construction work. Setting up site cost control systems and monitoring site costs. Preparing materials schedules. Purchasing, hiring plant and subcontracting procedures. Supervising and administering contracts including engaging in site meetings, dealing with superintendent's instructions, preparing weekly or monthly programs for on-going projects, reviewing progress against programs, and re-scheduling to allow for delays, changes in resources. Monitoring and recording site reimbursable costs. Preparing interim valuations for progress payments. Managing subcontractors' progress payments. Attending to contractual matters. Preparing and agreeing to statements of final project accounts. Engaging in construction on site.

Professional Practices and Public Bodies:

Preparing and presenting bills of quantities. Preparing and editing schedules of rates. Advising on selection of tenderers, checking and evaluating tenders, preparing tender reports. Engaging in cost control of the construction. Preparing and reporting on interim valuations. Supervising and administering contracts. Preparing and agreeing to statements of final account. Visiting construction sites.

General:

Organising and managing business or public sector organisations and initiating and drafting

contractual and related correspondences.

Assessment:

Continuous Assessment - 100%

For the purpose of assessment 'experience' means carrying out duties on the student's own initiative in the capacity as an assistant or member of a group or as an observer of others carrying out relevant duties. Students are required to keep and maintain, according to rules to be set, a diary of work experience to be forwarded to the subject examiner at the end of each month. Assessment will review of monthly diary reports, interviews with employers and, at the conclusion of the period of industrial training, examination of a Report on Industrial Training to be submitted by the 1st November of the year in which the training is undertaken.

BL 501: QUANTITIES AND ESTIMATING IV

Hours per week: 5

Prerequisite: BL302

Objective:

To consolidate knowledge of measuring, estimating and tendering for building works. On completing the subject the student should be able to:

Take-off quantities for the foundations and structure of reinforced concrete, steel-framed and timber buildings;

Build-up unit rates for all sections and trades involved in a building;

Prepare a tender package.

Syllabus:

Taking-off quantities of foundations and structure of buildings constructed of reinforced concrete, steel framing and timber. Build-up of unit rates including the pricing of preliminaries and site overheads. Preparation of tenders, calculation of off-site overheads and profit margins, allowance for firm prices.

Textbooks:

Australian Institute of Quantity Surveyors and The

Master Builders Federation of Australia, Australian Standard Method of Measurement of Building Works, 5th edition.

Marsden P.K., Basic Building Measurement, University of NSW Press, Sydney.

Buchan R.D, Fleming F W and Kelly J. R., Estimating for Builders and Quantity Surveyors, Butterworth-Heinemann, UK.

Reference:

Seeley I. H., Building Quantities Explained, 4th edition, Macmillan, London. Kwakye A. A., Understanding Tendering and Estimating, Gower Publishing, UK.

Assessment:

Continuous Assessment - 60%

Written Examination - 40%(1x2hrs)

BL 502: QUANTITIES AND ESTIMATING V

Hours per week: 5

Prerequisite: BL501

Objective:

To consolidate knowledge of the procedures involved in preparing bills of quantities for a complete building project and analysing tenders. On completing the subject the student should be able to:

Take-off and prepare bill of quantities for a complete building project;

Prepare estimates and tender package for complete building project;

Analyse tenders and quotations and prepare tender reports;

Use computer to perform the above tasks.

Syllabus:

Project work in advanced quantity surveying. Taking-off quantities for complete buildings. Writing specifications and preambles. Producing estimates and bills of quantities by computer. Analysing tenders and quotations. Selecting contractors, subcontractors and suppliers.

Textbooks:

Australian Institute of Quantity Surveyors and The Master Builders Federation of Australia, Australian Standard Method of Measurement of Building Works, 5th edition.

Cooke A. E., Construction Tendering, BT Batsford in association with the CIOB, UK.

Reference:

Kwakye A. A., Understanding Tendering and Estimating, Gower Publishing, UK.

Assessment:

Continuous Assessment - 60%

Written Examination - 40% (1x2hrs)

**BL 511: BUILDING TECHNOLOGY
STUDIO IV**

Hours per week: 4

Prerequisite: BL332

Objective:

To develop practical understanding of building systems applied to large scale residential, commercial and high rise construction. On completing the subject the student should be able to:

Critically examine various construction methods and discuss their relative merits;

Make assessments about efficient and effective use of resources;

Prepare construction programs;

Use programming techniques to prepare cash flow forecasts and monitor and control site costs;

Develop procedures to make efficient and effective use of plant and equipment;

Evaluate design and specification effects on future maintenance costs.

Syllabus:

Studio projects designed to effect an understanding of building systems and their implications on the production process. Site visits to consider practical applications of building design on construction. Construction details and evaluation of various

alternative solutions. Application of programming technique to control progress and expenditure.

Assessment:

Continuous Assessment - 100%

BL 522: CONSTRUCTION MANAGEMENT V

Hours per week: 4

Prerequisite: BL322

Objective:

To provide an insight into the management techniques used to improve productivity in construction. On completing the subject the student should be able to:

Describe the characteristics, organisation and control of labour in the construction industry;
Apply the principles of work study to construction operations;

Employ the principles and procedures of negotiation;
Prepare a plan for marketing construction services.

Syllabus:

Introduction to work study, method study, work measurement and the application in construction management. Development of human resources and labour analysis for construction firms. Marketing construction services and cost effective methods for winning work. Negotiating techniques. Implementation of quality assurance procedures. Managing safety. Maintenance management.

Textbook:

Calvert, R.E., Introduction to Building Management, 5th edition, Butterworth-Heinemann, Oxford.

Reference:

Fellows, Langford, Newcombe & Urry, Construction Management in Practice, Longman Scientific and Technical, UK.

Assessment:

Continuous Assessment - 100%

BL 532: PROJECT MANAGEMENT

Hours per week: 3

Objective:

To introduce the basic principles of managing construction projects on behalf of a client. On completing the subject the student should be able to:

Explain the role of the project manager in the construction process;

Identify the types of projects for which Project Management may be required;

Describe the basic techniques used to manage design and construction of projects;

Use computers as a key project management tool.

Syllabus:

Introduction to project management concept involved in running a project from inception to handover. The project management team and its responsibilities. Contractual arrangements for the provision of project management services. Project feasibility studies. Project planning and scheduling. Project budgets and cash flow Analysis. Project monitoring and cost control. Introduction to cost engineering. Introduction to value engineering. Introduction to facilities management. Project Safety management. Project quality management.

Textbooks:

The Acqua Group, Contract Administration for the Building Team, 7th edition, BSP Professional Books, Oxford. Cooke, B., Contract Planning Case Studies, 3rd edition, Basingstoke.

Reference:

Selected readings related to subject topics.

Assessment:

Continuous Assessment - 100%

BL541 BUILDING ECONOMICS III

Hours per week: 3

Prerequisite: BL342

Objective:

To provide an understanding of the principles used in assessing the economic viability of investments in the construction industry. On completing the subject the student should be able to:

Explain the methods used to establish estimates of the initial costs of proposed construction projects;
Calculate the costs of proposed projects in terms of initial, annual and periodic costs;
Apply various appraisal techniques in making investment decisions.

Syllabus:

Time value of money, compound interest formulae and tables. Project costs: initial costs, running costs, operating and maintenance costs. Introduction to life-cycle costing. Investment appraisal techniques: payback, average return, net present value, internal rate of return, break-even analysis, cost-benefit analysis. Approximate estimating techniques and building costs indices: their compilation and uses. Economics of building development and the concept of a developer's budget. Introduction to valuation processes and determinants of land values.

Textbooks:

Seeley I.H., Building Economics, 3rd edition, Macmillan, UK.

Ferry D.J. and Brandon P.S., Cost Planning of Buildings, 6th edition, BSP Professional Books, Oxford.

Reference:

Selected readings related to subject topics.

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x2hrs)

BL 542: BUILDING ECONOMICS IV

Hours per week: 3

Prerequisite: BL541

Objective:

To identify the design, locational and economic factors affecting the construction costs of

buildings. On completing the student should be able to:

Determine the extent to which various design decisions change the cost of construction;
Advise on aspects of design that may be adjusted in order to get estimated cost within realistic limits;
Analyse building costs by elements;
Apply cost planning techniques in preliminary estimating of project costs.

Syllabus:

Effects of design variables, construction methods, site and market conditions on construction costs. Elemental cost analysis, cost planning techniques, cost control in building design.

Textbook:

Seeley I.H., Building Economics, 3rd edition, Macmillan, UK.

Reference:

Ferry D.J. and Brandon P.S., Cost Planning of Buildings, 6th edition, BSP Professional Books, Oxford.

Assessment:

Continuous Assessment - 50%
Written Examination - 50%(1x2hrs)

BL 581: PROFESSIONAL PRACTICE

Hours per week: 4

Objective:

To define the nature of professional practice, forms of building contracts, terms and clauses used in the administration of building contracts, and the procedures for dispute resolution. On completing the subject the student should be able to:

Explain the key concepts and terms encountered in professional life;

Define the nature, types and components of building contracts;

Be familiar with the meaning of common terms and constituent clauses which typically comprise the general conditions of a contract; and

Know the options and steps for resolving

contractual disputes.

Syllabus:

The Professional Practitioner: professionalism in society and duty of care; professional societies; ethics; conditions and terms of engagement and fees for service; employment of other consultants; professional liability and indemnification.

Building Contracts: legal constituents of a contract; types of contracts; tendering process; negotiated

contracts; contract preliminaries; and components of contract documents, including correspondences, drawings, specifications, and schedules.

General Conditions of Contract: comprehensive review of clauses comprising a standard set of conditions.

Disputes Resolution: definition and comparison of mediation, arbitration, litigation; appointment, powers and duties of an arbitrator; arbitration procedures, submissions, hearings, awards, costs, rules of evidence.

Textbooks:

PNGIA Members Handbook.

Reference Scale of Professional Charges and Conditions of Engagement of the AIQS.

Australian Standard AS 2124. General Conditions of Contract with AS 2125 and AS 2127.

Departmental and selected RAIA Practice Notes.

Reference:

NSW Public Works, Contracts Manual: Construction Procedures and Precedents.

Assessment:

Continuous Assessment - 60%

Written Examination - 40%(1x2hrs)

BL 582: CONTRACT ADMINISTRATION

Hours per week: 4

Prerequisite: BL501, BL581

Objective:

To introduce the principles and practice of administering building construction contracts with

an emphasis on the financial calculations and adjustments to be made to the contract sum in accordance with the conditions of contract. On completing the subject students should be able to:

Assess the effects of variation orders, nominated works and supplies, rise and fall, and extension of time on the Contract Sum;

Prepare interim valuations for progress payments;

Prepare simple financial statements and reports forecasting the probable final cost of the project;

Set out a statement of final account.

Syllabus:

The make-up of the contract sum. Variation orders, measurement and valuation of variations, the variations account, dayworks account, measurement and adjustment of provisional quantities. Adjustment of prime cost and provisional sums. Rise and fall

[fluctuations]: the traditional method of valuing and the use of indices. Valuation for interim certificates,

certificates and payments, retentions and the pattern of release, retention security. Progress and site meetings, delays and extension of time, assessing the cost of delays, contractual claims. Financial statements and financial reports. Completion, defects and the preparation of statements of final account.

Textbooks:

The Aqua Group, Contract Administration for the Building Team, 7th edition, BSP Professional Books, Oxford.

Australian Standard: AS 2124. General Conditions of Contract with AS 2125 and AS 2127.

Reference:

Selected readings related to subject topics.

Assessment:

Continuous Assessment - 60%

Written Examination - 40%(1x2hrs)

DEPARTMENT OF BUSINESS STUDIES

DEPARTMENT OF BUSINESS STUDIES

Acting Head of Department

Kuusa M., M.Com.(Hons) (Wollongong), B.Tech. (PNGUOT)

Deputy Head of Department

Sengi S., M.Ed, B.Ed. (Hons), B.Ed. (UPNG), Cert. TESL (Singapore), LLB(Hons) (UPNG)

Senior Lecturer

Sylvano C. C., Dip. Accounting (ITM, Mzumbe – Tanzania), Req. Industrial Accountant (Allogoquin College, Ontario, Canada), MBA(Finance) (Dar-es-Salaam - Tanzania)

Lecturers

Kuusa M., M.Com (Hon) (Wollongong), B.Tech (PNGUOT)

Gipe G.J., M.Com (Hon) Wollongong, B.Econ.(Hon)(UPNG)

Siaguru F., MBA (JCU), B.Com (Mgmt) (PNGUOT)

Pinjik P., MIT (CSU), Cert. Comp. Syst Analysis (Okinawa-Jpn), PGDE (UOG), BSCS (PNGUOT)

Sengi S., M.Ed, B.Ed (Hons), B.Ed (UPNG), Cert. TESL (Singapore), LLB (Hons) (UPNG)

Kui K., MBA (USP), B.Com (Acctng) (PNGUOT), Dip (UOG)

Moorower P., MSc Ag. Dev. Econ (Reading UK), PGDE (UOG), BSc.Ag (PNGUOT)

Konafo K., M.Com (Wollongong), B.Com (Mgmt) (PNGUOT)

Sauna R., B.Com(Mgmt) (PNGUOT), M.Mktg (Griffith)

Senior Technical Instructors:

Langtry G., LLB (UPNG)

Ramasamy R., M.Com, M.Phil, B.Com, B.Ed (Annamalai)

Pambel F., B.Com (MIS) (PNGUOT)

Technical Instructors:

Inore I., B.Com (Econ) (PNGUOT)

Iwais A., B.Econ(UPNG), Post Grad Dip (Educ) (UOG)

Daniel R., B.Com (Mgmt) (PNGUOT)

Tiki S., B.Com (Acctng) (PNGUOT)

Gesa J. Jr., B.Sc (Comp Sc) (PNGUOT)

DEPARTMENTAL RULES GOVERNING SCHOOL LEAVER APPLICATIONS

DIPC YEAR I INTAKE

All students are selected through the School Leaver application and the students selected must have met the qualifications outlined below. If the pool of students who meet the minimum qualifications exceed the number of spaces allocated for **scholarship** a further selection is done from the pool of candidates and is done strictly according to GPA ranking calculated by the Measurement Services Unit of the Department of Education.

Minimum qualifications

All students are required to have done a minimum of five subjects (THREE compulsory and TWO others from those listed as electives) with minimum grades as outlined below:

Compulsory	GRADE	
Mathematics A	C or above	or
Mathematics B	B or above	
English	B or above	
Economics	C or above	

Electives

2 other subjects at grade C or above, the subjects being any 2 of the following

Business Studies
History
Geography
Physics
Chemistry
Biology
Information Technology

The Department of Business Studies offers a four-year program leading to a Bachelor of Commerce. The program has a 2 + 2 structure. Students enter a two-year Diploma course and upon successful completion of the Diploma, and having met the selection criteria the students may proceed to the Bachelor's degree course, which will involve another two years of full-time study.

The courses offered are designed to allow,

“streaming” into four areas of study as follows:

1. A two-year course leading to a Diploma in Commerce (Accountancy)
2. A two-year course leading to a Diploma in Commerce (Management)
3. A two-year course leading to a Diploma in Commerce (Applied Economics)
4. A two-year course leading to a Diploma in Commerce (Information Technology)

Students may then proceed to two additional years in the four areas so that in total they complete:

5. A four-year course leading to a Bachelor of Commerce in Accountancy
7. A four-year course leading to a Bachelor of Commerce in Management
8. A four year course leading to a Bachelor of Commerce in Applied Economics
9. A four-year course leading to a Bachelor of Commerce in Information Technology

The Department also offers, on request, a Certificate in Supervisory Management. This course consists of 10 modules (designated herein as BAC, of 15 hours each, constituting a total duration of approximately 3 months. The Department also provides service courses teaching in Architecture and Building, Engineering, Surveying and Land Studies, Applied Science, Mathematics and Computer Science and Mechanical Engineering.

Students make use of well-equipped laboratories where they learn the capabilities, advantages and limitations of equipment for the needs of the community. Students also apply their knowledge of theory by producing and processing data for different types of businesses.

Research forms a continuing and important role within the Department as both staff and students concern themselves with activities related to specific problems in Papua New Guinea, particularly in the areas of small business development, accounting, financial management, accounting standards, macroeconomics and economic development in Papua New Guinea. In these areas the Department liaises closely with the

other departments within the university as well as other tertiary institutions, government departments and the private sector.

STRUCTURE OF COURSES

Code	Subjects	Average Weekly Hours

DIPLOMA IN COMMERCE

Year 1 First Semester

BA111	Basic Accounting I	6
BA161	Basic Economics I (Microeconomics)	3
BA131	Introduction to Business	3
BA141	Introduction to Law	3
CS145	Introduction to Information Technology	3
LA101	Learning & communication Skills	3
MA111	Quantitative Methods I	3
		24

Year 1 Second Semester

BA112	Basic Accounting II	6
BA162	Basic Economics II (Macroeconomics)	3
BA132	Introduction to Management	3
IS126	Business Information Systems	3
LA102	Study and Academic Skills	3
MA112	Quantitative Methods II	3
BA164	Introduction to Business Mathematics and Statistics	3
		24

DIPLOMA IN COMMERCE (Accountancy)

Year 2 First Semester

Core Subjects

BA211	Financial Accounting I	4
BA213	Cost Accounting I	4

Elective Subjects (Select any four)

BA215	Introduction to Taxation	3
BA217	Corporate Finance	3
BA221	Principles of Macroeconomics	3
BA231	Principles of Marketing	3
BA243	Commercial Law I	3
BA271	Business Ethics	3
LA201	Advanced Academic and Research Skills	2
		19-20

Year 2 Second Semester

Core Subjects

BA212	Financial Accounting II	4
BA214	Cost Accounting II	4

Elective Subjects (Select any four)

BA232	Human Resources Management	3
BA244	Commercial Law II	3
BA252	Computer Applications in Accounting	3
LA204	Advanced Communication Skills for Commerce	2
MA212	Quantitative Methods III	3

19-20

Please Note that the Section Head will determine electives available to the students.

DIPLOMA IN COMMERCE (Management)

Year 2 First Semester

Core Subjects

BA231	Principles of Marketing	3
BA271	Business Ethics	3

Elective Courses (Select any four)

BA213	Cost Accounting I	4
BA 262	Macroeconomics (Theory & Applic)	3
BA233	Consumer Behavior	3
BA237	Tourism and Hospitality Management	3
BA243	Commercial Law I	3
BA265	Business Statistics I	3
LA201	Advanced Academic and Research Skills	2

17-19

Year 2 Second Semester

Core Subjects

BA232	Human Resource Management	3
BA234	Small Business Management	3

Elective Subjects (Select any four)

BA214	Cost Accounting II	4
BA238	Salesmanship	3
BA244	Commercial Law II	3
BA264	Computer Applications For Business & Econ	2

BA266	Business Statistics II	3
LA204	Advanced Communication Skills for Commerce	2

16-19

Please note that the Section Head will determine electives available to the students.

DIPLOMA IN COMMERCE (Applied Economics)

Year 2 First Semester

Core Subjects

BA261	Microeconomics (Theory & Applic)	3
BA265	Business Statistics I	3
BA267	Quantitative Economics I	5

Elective Subjects (Select any three)

BA213	Cost Accounting I	4
BA217	Corporate Finance	3
BA231	Principles of Marketing	3
BA243	Commercial Law I	3
BA233	Consumer Behavior	3
BA271	Business Ethics	3
LA201	Advanced Academic and Research Skills	2

14-15

Year 2 Second Semester

Core Subjects

BA262	Macroeconomics (Theory & Applic)	3
BA266	Business Statistics II	3
BA268	Quantitative Economics II	5

Elective Subjects (Select any four)

BA 264	Computer Applications (Business & Economics)	
BA214	Cost Accounting II	4
BA232	Human Resources Management	3
BA234	Small Business Management	3
BA244	Commercial Law II	3
LA204	Advanced Communication Skills for Commerce	2

13-19

Please note that the Section Head will determine electives available to the students.

**DIPLOMA IN COMMERCE
(Information Technology)**

Year 2 First Semester

IS211	End User Computing Technology	3
IS213	Database Processing	3
IS215	Accounting Information Systems	3
MA267	Networking and Communications	4
LA201	Advanced Academic & Research Skills	2
IS217	Introduction to Programming using C++	3
		18

Year 2 Second Semester

IS222	End User Computing applications	4
IS226	Systems Analysis & Design	4
IS242	Systems Implementation A	5
LA204	Advanced Communication Skills for Commerce	2
IS229	Web Design	4
		19

**BACHELOR OF COMMERCE
(Accountancy)**

Year 3 First Semester

BA351	Issues in Financial Accounting	6
BA353	Managerial Accounting I	4
BA391	Problem Solving & Self Reliance in Learning	2

(Elective Subjects - one to be selected)

BA333	Organization Behavior	3
BA335	Public Administration	3
BA343	Company Law in PNG	3
BA377	Data Processing	5
MA315	Quantitative Methods IV	4
		15-17

Year 3 Second Semester

BA312	Government Accounting	4
BA316	Advanced Company Accounting	4
BA354	Managerial Accounting II	4

Elective Subjects - one to be selected)

BA334	Industrial Relations	3
BA338	Management of Financial Institutions	3
MA316	Quantitative Methods V	4
		15-16

**BACHELOR OF COMMERCE
(Accountancy)**

Year 4 First Semester

BA411	Auditing	6
BA413	Financial Management	6
BA443	Advanced Taxation	4
		16

Year 4 Second Semester

BA412	Accounting Theory	6
IS422	Information Systems Management	3

(Elective Subjects - one to be selected)

BA334	Industrial Relations	3
BA338	Management of Financial Institutions	4
BA418	Project in Accounting	4
MA316	Quantitative Methods V	4
		12-13

**BACHELOR OF COMMERCE
(Management)**

Year 3 First Semester

BA333	Organization Behavior	3
BA335	Public Administration	3
BA337	Operations Management	3
BA339	Business Research Methods	3
		12

Year 3 Second Semester

BA332	Marketing Research	3

(Elective Subjects - three to be selected)

BA322	The Economy of PNG	4
BA330	Marketing Communications	3
BA334	Industrial Relations	3
BA338	Management of Financial Institutions	3
BA342	Legal Aspects of Business Organizations in PNG	3
		12-13

**BACHELOR OF COMMERCE
(Management)**

Year 4 First Semester

BA431	Marketing Management	3
BA433	Training and Development	3
BA435	Management Science	3
BA437	International Business	3
		12

Year 4	Second Semester	
BA432	International Marketing	3
BA434	Strategic Management	3
BA438	Project in Management	4
(Elective Subjects - one to be selected)		
BA436	Management of Not for Profit Organizations	3
BA447	Administrative Law	<u>4</u>
		13-14

**BACHELOR OF COMMERCE
(Applied Economics)**

Year 3	First Semester	
BA321	Commercial Banking	4
BA323	Industrial economics	4
BA367	Development Economics	4
(Elective Subjects - one to be selected)		
BA333	Organizational Behavior	3
BA335	Public Administration	3
BA341	Business Organizations in PNG	<u>3</u>
		15

Year 3	Second Semester	
BA322	The Economy of PNG	4
BA326	Monetary Economics	4
BA368	Economic Planning	4
BA388	Environmental Economics	4

(Elective Subjects - one to be selected)		
BA334	Industrial Relations	3
BA338	Management of Financial Institutions	3
BA342	Legal Aspects of Business Organizations in PNG	<u>3</u>
		19

**BACHELOR OF COMMERCE
(Applied Economics)**

Year 4	First Semester	
BA421	Natural Resource Economics	4
BA425	Public Finance	4
BA427	Research Methodology	4

(Elective Subjects - two to be selected)		
BA423	Risk Analysis & Management	4
BA435	Management Science	3
BA437	International Business	<u>3</u>
		15-16

Year 4	Second Semester	
BA422	Research Project in Economics	4
BA424	Managerial Economics	4
BA426	Operations Research for Business & Economics	4
BA428	International Trade and Finance	4
		16

**BACHELOR OF COMMERCE
(Information Technology)**

Year 3	First Semester	
IS313	Object Oriented Programming using Java	4
IS315	Information Systems Design Project	6
IS343	Windows Applications with Visual Basic	3
BA333	Organizational Behavior	3
IS314	Windows Network Administration	<u>3</u>
		19

Year 3	Second Semester	
MA484	Industrial Database and ORACLE	4
IS326	Project Management	4
IS342	Systems Implementation B	6
IS328	Electronic Commerce	3
		17

Year 4	First Semester	
IS411	Business Computing Experience	40

Year 4	Second Semester (from 1999)	
IS422	Information Systems Management	3
IS426	Information Systems Development Project	4
IS466	Operating Systems	5

(Elective Subjects - one to be selected)		
MA483	Advanced Networking and the Internet	5
MA486	Multimedia Publishing and World Wide Web	<u>4</u>
		16-17

SUBJECTS TAUGHT BY DEPARTMENT

BA111	Basic Accounting I
BA112	Basic Accounting II
BA121	Economic Framework

BA122	Principles of Microeconomics	BA334	Industrial Relations
BA131	Introduction to Business	BA335	Public Administration
BA132	Principles of Management	BA337	Production and Operations Management
BA141	Introduction to Law	BA338	Management of Financial Institutions
BA161	Basic Economics I (Microeconomics)	BA339	Business Research Methods
BA162	Basic Economics II (Macroeconomics)	BA341	Business Organizations in PNG
BA164	Introduction to Business Mathematics & Statistics	BA342	Legal Aspects of Business Organizations in PNG
BA182	Financial Management & Accounting	BA343	Company Law in PNG
BA211	Financial Accounting I	BA351	Issues in Financial Accounting
BA212	Financial Accounting II	BA353	Managerial Accounting I
BA213	Cost Accounting I	BA354	Managerial Accounting II
BA214	Cost Accounting II	BA367	Development Economics
BA215	Introduction to Taxation	BA368	Economic Planning
BA217	Corporate Finance	BA377	Data Processing
BA221	Principles of Macroeconomics	BA386	Principles of Economics
BA231	Principles of Marketing	BA388	Environmental Economics
BA232	Human Resources Management	BA391	Problem Solving and Self Reliance in Learning
BA233	Consumer Behavior	BA418	Research Project in Accounting
BA234	Small Business Management	BA411	Auditing
BA235	Personal Financial Management	BA412	Accounting Theory
BA236	Advertising	BA413	Financial Management
BA237	Tourism and Hospitality Management	BA421	Natural Resource Economics
BA238	Salesmanship	BA422	Research Project in Economics
BA243	Commercial Law I (Law of Contract)	BA423	Risk Analysis & Management
BA244	Commercial Law II	BA424	Managerial Economics
BA252	Computer Applications in Accounting	BA425	Public Finance
BA261	Microeconomics I (Theory & Applications)	BA426	Operations Research for Business & Economics
BA262	Macroeconomics I (Theory & Applications)	BA427	Research Methodology
BA264	Computer Applications for Business & Economics	BA428	International Trade and Finance
BA265	Business Statistics I	BA431	Marketing Management
BA266	Business Statistics II	BA432	International Marketing
BA267	Quantitative Economics I	BA433	Training and Development
BA268	Quantitative Economics II	BA434	Strategic Management
BA271	Business Ethics	BA435	Management Science
BA311	Financial Accounting for Business Structures in PNG (Renamed in 2006 see BA351)	BA436	Management of Non-Profit Making Organizations
BA312	Government Accounting	BA437	International Business
BA316	Advanced Company Accounting	BA438	Project in Management
BA321	Commercial Banking	BA443	Advanced Taxation
BA322	The Economy of Papua New Guinea	BA447	Administrative Law
BA323	Industrial Economics	BA476	Management Information Systems
BA326	Monetary Economics	BA482	Management for Engineers II
BA330	Marketing Communications	BA484	Marketing for Engineers
BA332	Marketing Research	BA485	Accounting for Engineers
BA333	Organizational Behavior	BA486	Finance for Engineers
		IS126	Business Information Systems
		IS211	End User Computing Technology

IS213	Database Management Systems
IS215	Accounting Information Systems
IS222	End User Computing Applications
IS226	Systems Analysis & Design
IS311	Business Applications with COBOL
IS232	Introduction to Programming with Pascal
IS242	Systems Implementation A
IS315	Information Systems Design Project
IS322	Static Data Structures with COBOL
IS324	Data Communications
IS326	Project Management
IS328	Electronic Commerce
IS341	Object Oriented Systems Design (replaced in 2005 with IS343)
IS342	Systems Implementation B
IS343	Windows Applications with Visual Basic
IS411	Business Computing Experience
IS422	Information Systems Management
IS424	Dynamic Data Structure with Pascal
IS426	Information Systems Development Project
IS466	Operating Systems

the meaning of assets, liabilities, proprietorship, revenues, expenses; the Accounting Equation; preparation of simple Profit and Loss Statements and Balance Sheets.

Internal Control and documentary evidence.

Analysis of transactions and the use of the General Journal.

Ledger Accounts - posting from the general Journal, recording transactions, balancing accounts.

The Trial Balance - preparing the trial balance; finding and correcting errors.

Balance Day adjustments - the need for adjustments and the preparation and treatment of adjustments.

Final Reports - the Profit and Loss Statement and the balance Sheet.

Worksheets - another approach for preparing balance day adjustments and final reports.

Trading Enterprises - the concept of Gross Profit and the bookkeeping processes used for trading businesses.

Special Journal - the advantages of special journals, and preparation and use of them.

Cash versus Accrual accounting, and Incomplete records.

BA 111: BASIC ACCOUNTING I

Hours per week: 6 (includes 2 hours laboratory)

Objectives:

To develop an understanding of the basic bookkeeping process. At the end of this subject, the student should be able to:

1. Discuss the basic assumptions underlying accounting.
2. Explain the basic bookkeeping process, from initial transaction and related documentary evidence, through to final accounts.
3. Analyze and record business transactions into the appropriate accounting records, using the double-entry system.
4. Explain the need for, and prepare, adjusting journals on balance day.
5. Prepare end-of-year financial statements from given information.

Syllabus:

The basic concepts of bookkeeping - assumptions underlying accounting; the nature of transactions;

Textbook:

Marley S. Pedersen J., et al "Accounting for Business System Fundamentals", Pitman (1991)

Assessment:

Continuous assessment: - 50%
Written examination: - 50% (1 x 3 hours).

BA 112: BASIC ACCOUNTING PART II

Hours per week: 6 (includes 2 hours laboratory)

Prerequisite: BA 111

Objectives:

To further develop an understanding of the basic bookkeeping process. At the end of this subject, the students will be able to:-

1. Maintain Control accounts, and Subsidiary Ledgers, for Accounts Receivable and Payable.
2. Maintain records for Petty Cash.

3. Prepare Bank Reconciliation Statements.
4. Keep records of inventory, using both the periodic and the perpetual inventory systems.
5. Calculate depreciation changes and maintain records for fixed assets.
6. Prepare payroll records.
7. Calculate various ratios in order to analyze Financial Statements in terms of liquidity, profitability, and financial stability.

Syllabus:

Control accounts and subsidiary ledgers for Accounts receivable and Accounts Payable - recording transactions in both the General ledger and the subsidiary ledgers; and reconciling Control accounts with the subsidiary ledgers. Petty Cash records. Bank Reconciliation statements, and the need for monthly bank reconciliations, and the preparation of the statements. Inventory records - determining the cost of stock; the "lower of cost or market rule"; assigning cost to closing stock and COGS (specific identification, UFO, FIFO, weighted average methods); costs under a periodic inventory system; costs under a perpetual inventory system; incomplete records.

Depreciation and fixed asset records - determining the cost of fixed assets; calculating depreciation charges using various methods; depreciation schedules; revaluation and disposal of depreciable assets.

Payroll records - maintaining Employee History cards; calculating hours worked, gross and net wages; and taxation payable; preparing Wages sheets, Cash Analysis, and wage cheques; and maintaining Employee Earnings records. Interpretation and analysis of Financial Statements - calculations of various ratios to measure liquidity, profitability, and financial stability, and the interpretation of these ratios.

Textbook:

Marley J., Pedersen J., et al, 'Accounting for Business System and Reports' Pitman (1991).

Assessment:

Continuous assessment: 50%
Written examination: 50% (1 x 3 hours).

BA 131: INTRODUCTION TO BUSINESS

Hours per week: 3

Objectives:

To introduce students to the world of business and give them an overview of major activities involved in modern business organizations. On completion of this subject the students will be able to:-

1. Explain the economic and social importance of business organizations.
2. Explain the major functions involved in any business enterprise; and their inter-relationships.
3. Make a knowledgeable decision as to the selection of study options within the Business Studies curriculum.

Syllabus:

Today's business and its challenges: Economic, political, legal, social, cultural and competitive environment.

Understanding private enterprise as distinct from public.

Forms of business ownership: sole proprietorship, partnership and company type of organization.

Small business - What is special about them? Success and failure rates, starting a small business for your own, Franchising.

Management functions and decision making levels of management; the management process.

Human relations approach; basics of motivation.

Organizing the firm; principles and types of organization, span of control, delegation.

Human resources management; planning for human resources, recruitment, selection, training and development.

Labor relations; trade unions and collective bargaining processes.

Production and Operation Management; Inputs and outputs of production. The marketing function and its dignity. Product planning, pricing, promotion and distribution.

International business, Tariffs and non-tariff barrier.

Textbook:

Reinecke J.A., Schoel W.F., Introduction to Business, Boston, Allyn and Bocon, (1991)

Assessment:

Continuous assessment - 40%
Final examination - 60% (1 x 3 hours).

BA 132: PRINCIPLES OF MANAGEMENT

Hours per week: 3

Prerequisite: BA 131

Objectives:

To give an overview of the Nature and Significance of Management and its environment. Upon completion of this subject the students will be able to:-

1. Explain the Management Functions of Planning, Organizing, Directing and Controlling, and their applications to practical business and societal problems as they relate to PNG.
2. Explain the influence and relationship of the Management process to other behavioral sciences and the humanities in general.
3. Explain the concept of Management and why managers are needed.
4. Describe how organizations can benefit from acquiring personnel with Management education and explain why managers need to be continuously learning to maintain full effectiveness.

Syllabus:

Managing & Managers Behavior.
The Evolution of Management Theory.
The External Environments of Organization.
Social Responsibilities & Ethic.
Effective Planning.
Problem Solving & Decision Making.
Strategic Planning and Management.
Division of work, organizational structure and co-ordination.
Authority, Delegation, & Decentralization. Human Resource Management.
Managing Organizational change and Development. Organizational Conflicts & creativity.
Motivation, Performance & Satisfaction. Leadership Theories.
Groups & Committees.

Effective Controlling.

Textbook:

Stoner, J.F., and Freeman, 'Management', 5th Edition, Prentice-Hall Inc., New Jersey, (1992).

Assessment:

Continuous assessment: 40%
Written examination: 60% (1 x 3 hours).

BA 141: INTRODUCTION TO LAW

Hours per week: 3

Objectives

To introduce students to the legal system and laws in PNG:-

1. To acquaint students with the historical growth of the law and its institution, thereby awakening a feeling for the law and an interest in its study which will inspire them to greater things.
2. On completion the student will be able to: explain the basic principles of the law study other law courses

Syllabus:

The nature of Law and the Legal System:
Definition
Origins and sources of law
The Legal Sources of law:
Constitutional law or the constitution
Legislation
Functions of legislation
Forms of legislation
The operation of statutes
Interpretation and construction of statutes organs of the state.
Classification of Law and Legal Terminology: (Classifications)
Usual classification
Double liability for wrongdoing (Legal Terminology)
Contract
Tort
Trust
Crime
Criminal law and proceeding
Civil

The Courts and Dispute Settlement
History
The supreme court of PNG
The national court
District and local courts
Village and land courts
Other courts and tribunals
The Legal Profession in PNG
Lawyers and laymen
The Legal Services in PNG

Textbook:

Chalmers, D.R.C., and Paliwala, A.H., An Introduction to Law in Papua New Guinea, The Law Book Company, (1984).
The Constitution of Papua New Guinea.

Assessment:

Continuous assessment - 40%
Final examination - 60% (1 x 3 hours).

**BA 161: BASIC ECONOMICS 1
(MICROECONOMICS)**

Hours per week: 3

Objectives

The subject introduces students to fundamental principles of microeconomic theory and aims to provide students with a thorough understanding of the environment in which businesses function and their activities. On completion of the subject, the student will be able to:-Understand the behaviour of business organizations; Calculate the profit maximizing price and output for a particular firm; Identify equilibrium conditions under different market conditions.

Syllabus:

Markets and Trade, Specialization and Gains from Trade, Opportunity Costs, Demand and supply, Market Equilibrium and Determination of Prices, Price Elasticity of Demand, Revenue and elasticity, Elasticity of Supply, Government Intervention in Markets, The Labour Market and the minimum Wage, Taxes and government Revenue, Output and costs in the short run and long run, Perfect competition, Monopoly, Monopolistic Competition & Oligopoly.

Textbook:

McTaggart et al, Microeconomics, Addison-Wesley, 2003

OTHER USEFUL REFERENCES

John Sloman, Economics, Addison-Wesley, 6th Edition, 2006.

Gipe G J Principles of Macroeconomics with applications for PNG economy, Department of Business studies, First edition 2002.

Assessment:

Continuous assessment: 50%
Written examination: 50% (1 x 3 hours)

**BA 162: BASIC ECONOMICS II
(MACROECONOMICS)**

Course objectives:

The subject is Basic Economics (Macroeconomics).

After studying the subject the student will be able to understand the basic macroeconomic framework, the macroeconomic model, calculate the macroeconomic model, use a macroeconomic model to explain various macroeconomic variables, understand the roles money banks and interest rates, employment, unemployment; inflation, international trade, exchange rate, and other areas.

Syllabus:

The syllabus of the course is as follows; Circular flow of National income; Injections and withdrawals; National income accounting; measuring macroeconomic performance; Employment and unemployment; Calculating macroeconomic model; The multiplier; Money banking and interest rate; International trade and exchange rate; International trade and development; Structural problems in LDCs; The problems of debts.

Textbook:

Dornbusch R and Fischer S, Macroeconomics, McGraw-hill International Edition, 1990.

OTHER USEFUL REFERENCES

John Sloman, Economics, Addison-Wesley, 6th Edition, 2006.

Gipe G J Principles of Macroeconomics with applications for PNG economy, Department of Business studies, First edition 2002.

Assessment:

Continuous Assessment: 50%

Written examination (3 hours): 50%

BA164: INTRODUCTION TO BUSINESS MATHEMATICS AND STATICS

Hours per week: 3

Prerequisite: Nil

Course objective

The subject introduces students to basic statistics and basic mathematics that are used in a business. It provides students with a sound understanding of statistics and mathematics used in business.

On completion of the subject the students will be able to understand the use of information in decision-making; sources of information (primary, secondary and tertiary); use and abuse of statistics; summary of information for decision-making; accuracy of information; methods used in collection of information; vocabulary of mathematics; symbols of mathematics; symbols of statistics; basic arithmetic; basic statistics mean, mode, median.

Syllabus:

Why we need mathematics and statistics in business and industrial; the aim of a statistical presentation; tabulation; classification; frequency distribution; reports; histograms; frequency polygons; frequency curves; bar charts; pie charts; comparative pie charts; pictograms; comparative pictograms; cartograms or map charts; strata charts; graphs; semi-logarithm graphs; straight line graphs; Gantt chart; break-even charts; Z-chart; Lorenz curve; gini-coefficient curve; introduction to measures of central tendency; introduction to

measures of dispersion; introduction to statistical regression model.

Textbook:

1. Jonatha D Cryer, Rober B Miller, (1994) Statistics for Business: Data analysis and modeling, Duxbury press, Wadsworth Inc, Belmont California, ISBN 0-534-20388-4.
2. Hannagan T J, (1990) Mastering Statistics, Macmillan Education Ltd, London, ISBN 0-333-42114-0 (Export version).

Assessment:

Continuous assessment: 50%

Written examination: 50% (1x3 hours)

BA 182: FINANCIAL MANAGEMENT AND ACCOUNTING

Hours per week: 4

Objectives

On completion of this subject students will be able to:-

1. State the basic tenets and principles associated with the theory of accounting as it exists in the business community.
2. Perform elementary procedures relating to the recording of accounting transactions.
3. Understand the purpose and intent of financial information and appreciate the fundamentals of analysis of accounting reports.
4. Undertake calculations and analysis of management information which forms the basis of many business decisions within the community.

Syllabus:

Fundamental accounting principles and transaction analysis. Introduction to bookkeeping. End of year transactions and preparation of financial statements.

Analysis of financial statements. Managerial accounting concepts such as cost-volume-profit relationships, cash budget and budgeted income statements, and long term investment decisions.

Textbook:

Martin C. Introduction to Accounting, 3rd Edition (1990).

Assessment:

Course assignments and in semester tests - 100%.

BA 211: PRINCIPLES OF FINANCIAL ACCOUNTING

Hours per week: 4

Objectives:

At the end of this subject students will be able to:-

1. Explain the specific accounting requirements of various forms of business entities;
2. Present accounting reports for the various business entities and describe relevant accounting systems associated therewith; and
3. Explain important conventional accounting principles and practices underpinning the various actions taken.

Syllabus:

Review the preparation of Income Statements and Balance Sheets, including relevant balance date adjustments.

Prepare accounting documents and reports relevant to departments, branch office systems and pastoral entities.

Account for the formation of partnerships; changes in partners' interests, retirements, dissolutions and conversion to other forms. Introduction to company accounting, in particular: company formation, profit determination and appropriation and conversion of a non-incorporated entity into a corporate business. Introduce accounting for extractive industries.

Textbook:

Smyth, E.B., and Kerley W.J., 'Accounting Fundamentals' 9th Edition, Law book Co. (1991).

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hours)

BA 212: FINANCIAL ACCOUNTING APPLICATIONS

Hours per week: 4

Prerequisite: BA 211

Objectives:

To provide the students with basic corporate accounting techniques in respect of long-term debt finance, external reporting, evaluation of corporate performance and to develop the students' abilities to employ these techniques. On completion of this subject, the students will be able to:-

1. Demonstrate an awareness and understanding of compounding and discounting techniques;
2. Demonstrate an understanding of long-term finance and its effect on corporate performance;
3. Prepare corporate accrual accounts (excluding group accounts) to comply with the disclosure requirements of the Companies Code and Accounting Standards;
4. Demonstrate an awareness of the principles of corporate performance evaluation.

Syllabus:

Introduction to the concept of time value of money - simple interest; compounded values, annuities. Sources of business finance and related accounting procedures. Instruments of long term debt financing and accounting treatment - secured and unsecured notes; mortgage payable; hire purchase agreements; lease financing. The role of institutional investors - accounting for short-term and long-term investments. Principles of dividend policy; corporate annual accounts (not including holding company and group accounts); disclosure requirements with reference to the PNG Companies Act and pronouncement of professional bodies. The Cash Flow Statement; ratio analysis and interpretation of financial statements; investment analysis.

Textbooks:

Hoggett, J. and Edwards, L., Financial Accounting in Australia 2nd edition, John Wiley and Sons, (1992).

Assessment:

Continuous assessment: 50%
Written examination: 50% (1 x 3 hours)

BA 213: COST ACCOUNTING I

Hours per week: 4

Prerequisite: BA 112

Objectives

To introduce Cost Accounting to students.

To provide students with the knowledge of the purpose of Cost Accounting and routine operations of Cost Accounting with emphasis on Planning and Control in Management.

On the completion of this subject the students will be able to:-

1. Understand the role and the significant characteristics of financial Accounting, Managerial Accounting and Cost Accounting in Business.
2. Describe how the management process, with focus on decision-making, is used for Planning, Organizing, Directing and controlling manufacturing operations.
3. Establish a foundation on which to build an understanding of procedures, issues and applications of cost accounting that will be encountered in study of new areas.
4. Recognize the importance of product costing, prepare and maintain the records of Job Order Costing, and Process costing.
5. Prepare and maintain records of material inventories, Payroll, Factory Ledger and General Ledger.

Syllabus:

The fundamental principles and objectives of cost accounting; The nature of Financial Accounting, Managerial Accounting and Cost Accounting; Corporate Organizations and Organization Charts; Planning and Control; Decision Process — decision analysis and implementation; functions of Cost Accounting officers — Controller and treasurer and Line and staff relationship.

Cost Accounting concepts, Classifications and Statements: Cost Objects, Cost, Expenses and loss; Cost Accounting information system;

Classification of Costs; Flow of Costs in manufacturing firms; Cost of Goods and manufactured statement.

Planning and control of material, Labor and factory overheads; Definitions and classification; Accounting for Materials, Labor and Factory Overheads; Methods of costing materials and valuation of inventory; Quantitative models for material planning and control; Methods of costing labor; Learning Curve; Accounting for payroll; Estimated factory overheads; Determination of Factory Overheads rates; Applied and Actual factory overhead; Allocation of Service Department costs to producing Departments.

Cost accumulation systems: Objectives; Period cost accumulation system; Introduction to Perpetual Cost accumulation system; The Factory Ledger and General Ledger; Job — Order Costing, Process costing.

Textbooks:

Most & Lewis, Cost Accounting, Grid, (1982)

Reference:

Horngren & Foster, Cost Accounting, Prentice-Hall, (1991).

Usry M.F., Hammer L.H., Cost Accounting, Planning and Control, 10th Edition, South-Western (1991).

Assessment:

Continuous assessment: 50%
Written examination: 50% (1 x 3 hours)

BA 214: COST ACCOUNTING II

Hours per week: 4

Prerequisite: BA 213

Objectives

To provide students with an understanding of the practical application of cost accounting in the context of the managerial function of planning and control.

On completion of this subject the students will be able to:-

1. Understand the costing procedures and accounting for Joint Products and By-

- Products.
2. Prepare income statements using absorption costing or direct costing methods and explain the advantages and disadvantages of the two costing methods.
 3. Understand how various costs behave in response to changes in level of business activities and cost estimation methods.
 4. Explain advantages and disadvantages of centralized and decentralized structures of business organizations.
 5. Assist in preparing Master Budgets.
 6. Understand the importance of using standard costs in preparing budgets for manufacturing firms.

Syllabus:

Cost Accumulation System: Joint Product and By-product Costing - Nature of joint product; joint cost and split-off point; joint cost allocation procedures - physical basis, relative sales value, net realizable value; Cost beyond split-off point; Accounting for joint product; Accounting for By-Product; treatment for spoiled goods, defective goods, scrap and waste materials.

Direct and Absorption Costing: Meaning of Direct costing and Absorption costing; Income statement format; Advantages and disadvantages Converting from one costing method to the other; journal entries for adjustments.

Cost Behavior and Cost Estimation Methods: Relevant range; Linearity and cost functions; non-linearity and cost function; estimating methods - Linear equations; Account analysis, engineering approach, high - low approach and linear regression.

Decentralized Operations and Responsibility Accounting: Concepts of organization; Grouping of activities, organization structure and responsibility reporting; Centralization versus decentralization; Responsibility accounting; Essentials of good performance reporting; controllable costs; cost of service departments.

Cost - Volume - Profit Analysis: Importance of CVP analysis; Assumptions underlying CVP analysis; Profit Planning - break-even point, margin of safety, graphical approach, Evaluating changes; Contribution margin and CM ratio; Effects on sales mix; CVP analysis and taxes; Evaluation of fixed cost utilization with operating

leverage.

Standard Costing: Purposes and benefits of standard costing; Establishing standard costs - methods for establishing standards, Developing standards for direct materials, direct labor; standard cost variance for direct materials and direct labor; Variance analysis; Standard cost accounting procedure for materials and labor. Standard cost for factory overhead and related variances - setting the standards. Variance analysis - one variance, two variance, three variance and four variance; Standard cost accounting procedures for factory overhead; Disposal of variance;

Process costing - Standard Costing: Usefulness of standards; Computations under standard costing.

Importance of goal congruence in an organization; The purpose and benefits of budget; Limitations of budgeting; Structure of master budget; Developing the master budget; Control aspects of budgeting; basic considerations for non-manufacturing firms budget preparations.

Forecast Statements: Cash budget; Budgeted income statement; Budget balance sheet and budgeted statement of cash flow.

Textbook:

Most and Lewis, Cost Accounting, Grid, (1982)

Recommended Reading

Hornigren and Foster, Cost Accounting, Prentice-Hall, (1991)

Usry, Hammer and Matz, Cost Accounting, South-Western, (1988)

Assessment:

Continuous assessment - 50%

Written examination - 50% (1 x 3 hours)

BA 215: INTRODUCTION TO TAXATION

Hours per week: 3

Prerequisites: BA 112

Course Objective:

To explain the income tax laws applicable to all the sources of income derived by individual residents or non-residents of PNG with specific emphasis on the taxation of wages & salary

income and non-salary income, employment related benefits and allowances, termination payment, annual leave, long service leave, gratuity and superannuation.

Syllabus:

Liability to Income Tax, Taxation of individuals, Assessable Income & Allowable Deductions, Rebates & Credits Available to Taxpayers (Individuals), Sole Trader & Partnership Taxation, Provisional Tax, and Returns, Assessments, Objections & Appeals of Tax Assessments.

Textbooks:

Income Tax Act 1959 (as Amended)
O'Neil, E. 1995, *A Guide to PNG Income Tax*, Universal Press

Assessment:

Continuous assessment: 50%
Written examination: 50% (1 x 3 Hours)

BA 217: CORPORATE FINANCE

Hours per week: 3

Objectives:

To instill, an understanding of finance by emphasizing the financial and economic environment that underlies financial management, and, an appreciation of the application of corporate finance concepts in the decision making process to maximize the market value of owner's equity.

Syllabus:

Financial statement analysis, time value of money, valuation of bonds and shares, capital budgeting, working capital management, long term finance, cost of capital, capital structure. dividend policy and stock exchange normally regarded as investment, finance and dividend decisions.

Textbook:

Beal, D., Goyen, M., Gibson, B., & Shamsuddin, A. Introduction to Corporate Finance, Wiley, 2004

Assessment:

Continuous assessment: - 50%
Written examination - 50% (1 x 3 Hours)

BA 231: PRINCIPLES OF MARKETING

Hours per week: 3

Objectives:

On completion of this subject the students will be able to:

1. Apply marketing thinking to products and services, consumer and industrial markets, profit and non-profit organization, domestic and foreign markets, small and large firms.
2. Explain important marketing principles and concepts that are supported by research and evidence from economics, the behavioral sciences and modern management theory.
3. Apply decision models that marketing managers need to employ to balance the organization's objectives and resources against needs and opportunities in the market places.

Syllabus:

Introduction: Definition, goods and process of marketing.

The marketing environment.

The spread of innovations.

Strategic Marketing Planning.

Consumer Behavior & Marketing Information Systems.

Market Segmentation & targeting.

Demand forecasting.

Product Planning.

Product Services Pricing.

Distribution of Product and Services.

Promotion.

Industrial Marketing.

International Marketing.

Textbooks:

Kolter, P., Principles of Marketing, Prentice-Hall (1989).

Assessment:

Continuous assessment: 40%
Written examination: 60% (1 x 3 hours).

BA 232: HUMAN RESOURCES MANAGEMENT

Hours per week: 3

Objectives:

This subject is designed to provide the students with an outline of the contemporary thinking and practice in the area of human resources management with specific reference to profit making organizations.

On completion of this subject the students will be able to deal effectively and manage issues and solve problems relating to the use of human resources and employer-employee relationship.

Syllabus:

Nature, definition and the role of personnel management; Challenges of modern personnel management.

Organizational aspects and Job Design; functions, relationships, structure, formal and informal organizations.

Human resource planning, recruitment and selection; external and internal recruitment, sources of recruitment, selection process.

Training and Development of personnel; types of training, management needs and development programmes.

Performance appraisal and Management by Objectives, traditional performance appraisal systems.

Base compensation; factors affecting compensation policy, job evaluation, and point systems.

The Fringe Benefits, the major categories, goals and benefits.

Introduction to Human Relations, nature of human needs, motivation and motivators.

The Collective Bargaining process, union bargaining pressures.

Safety and Health: The safety programmes, the health programmes.

The Separation processes, turnover retirement, layoffs discharge.

Textbook:

Flippo, E.B., Principles of Personnel Management, Sydney, McGraw-Hill, (1984)

Assessment

Continuous assessment - 40%

Written examination - 60% (1 x 3 hours).

BA 233: CONSUMER BEHAVIOUR

Hours per week: 3

Corequisite: BA 231

Objectives:

To give an overview of consumer behavior theories/practices and their applications to Marketing Strategies.

On completion of this subject the students will be able to:-

1. Explain the contributions and applications of psychology, sociology and social anthropology in the study of buyer behavior for effective marketing.
2. Analyze the information gathering and decision-making processes involved in purchasing.
3. Analyze stimuli external to consumers that influence how they think, feel, and act.
4. Discuss the marketing strategies by which marketing stimuli are created and placed in consumer environments in order to influence consumer impressions, cognition and behavior.

Syllabus:

Introduction to consumer behavior.

Marketers' and consumers' views of CB.

Perspective of CB (The marketing place).

Market segmentation.

Understanding consumer motivation.

Consumer values and involvements.

Perception and interpretation.

Attitudes and learning.

Decision making process.

Cultural and cross-cultural factors.

Social and situational factors.

Pre-purchase and post purchase decisions.

Textbook:

Assael H., Consumer Behavior and Marketing Action: PWS-Kent (1992).

Assessment:

Continuous assessment - 40%
Written examination - 60% (1 x 3 hours).

BA 234: SMALL BUSINESS MANAGEMENT

Hours per week: 3

Prerequisite: BA 131

Objectives:

This subject is designed to provide participants with a background of the management of small businesses and aspects of coping with the survival and growth of small businesses.

At the end of this subject, students will be able to:-

1. identify opportunities, assemble resources, draw and implement a practical action plan for the setting up and managing a small business.
2. evaluate and contribute the concepts introduced in the course in the context of small business management in Papua New Guinea.
3. give professional advice to prospective entrepreneurs on setting up small business and managing their growth.

Syllabus:

Definition: Exploration of definitions of small business, the role of small business in the economy.

Small Business Development: Starting a small business, getting into small business with emphasis on buying an on-going business, operating a franchise and starting a new small business.

Small Business Management: Finance and small business, growth and problems in managing a small business.

Special Topic: Small business development and management in Papua New Guinea - problems and sources and role of financial institution and the government.

Textbooks:

Meredith, G.G., Small Business Management in Australia, Sydney, McGraw-Hill, 3rd edition, (1988)

Assessment:

Continuous assessment - 40%
Written examination - 60% (1 x 3 hours).

BA 235: PERSONAL FINANCIAL MANAGEMENT

Hours per week: 3

Objectives:

To provide an understanding of investment management principles and practices, with special reference to personal investment.

On completion of this subject the students will be able to:-

1. Distinguish between various types of investments, and associated risks and their relationships.
2. Interpret investment variables and differentiate between good and bad investment.

Syllabus:

General investment concepts. Principles of investment. Obtaining and using credit. Major financial institutions. Taxation principles. Your home as an investment. Real Estate as an investment. Investing in equities. Options and future markets. Investment in collectible items. Investing in education. Property insurance. Personal insurance.

Textbook:

Ball, R.J., et. al., Personal Finance in Australia: Using your money wisely, Sydney, McGraw-Hill, (1985)

Skully, M.T., Financial Institutions and Markets in PNG, Australian National University, Canberra, (1985)

Assessment:

Continuous assessment: 40%
Written examination: 60% (1 x 3 hours).

BA 236: ADVERTISING

Hours per week: 3

Prerequisite: BA 231

Objectives:

To provide a background knowledge of the contemporary thinking and practice in the field of advertising.

On the successful completion of this subject the students will be able to design effective advertisements for the mass media, particularly T.V., radio and newspapers.

Syllabus:

The place of advertising in company promotional efforts.

Environment and positioning.

Consumer Perceptions, Attitudes, and psychological factors.

Marketing Research and Information systems: the linkage with advertising.

Selling and communicating to and through Retailers.

The advertising department.

Advertising in Newspapers, magazines and outdoors.

Direct response Advertising, mail and others, image and sales oriented advertisements.

Broadcast Advertising, Radio and Television.

Comparing and Selecting Advertising Media.

Visual Merchandizing.

Strategic Communications planning.

Total advertising system:

How the type of business affects advertising?

How customers affect advertising.

Advertising budgeting: When the expenditures should be made?

The media choice

The message: Attention — Interest — desire

Action approach (A.I.D.A.)

Controlling the advertising effectiveness, strategic communications planning.

Textbook:

Mendell, M., Advertising, Prentice-Hall, (1984)

Assessment:

Continuous assessment - 40%

Written examination - 60% (1 x 3 hours).

BA 237: TOURISM AND HOSPITALITY MANAGEMENT

Hours per week: 3

Corequisite: BA 231

Objectives:

This subject will give students a broad introduction to the services industry in PNG with particular emphasis on tourism and Hotel Management and Administration.

On completion, students will be able to:-

1. Explain the roles of Marketing and Management in the Hospitality Services Industry.
2. Explain the economic impact of Tourism on the PNG Society.

Syllabus:

Hospitality Service Products (An Introduction)

Management and Personnel Functions as they relate to the Hospitality Industry.

Skills necessary in managing financial resources in the industry.

The influence of Labor Environments on the Hospitality Services Industry.

Concepts and design of Information Systems and role of computers in hotels, restaurants and travel related business.

Textbooks:

Lundbergh, D.E., The Tourist Business, CBI Publishing, Boston, (1976).

Axler, Bruce, The Management of Hospitality Operations, Bobbs, Merrill Co., (1976)

Assessment:

Continuous assessment: 40%

Written examination: 60% (1 x 3 hours)

BA 238: SALESMANSHIP

Hours per week: 3

Objectives:

To explain the personal preparation necessary for the salespersons and the areas of development and understanding basic to success in selling.
On successful completion of this subject the students will be able to undertake selling responsibilities efficiently and effectively.

Syllabus:

The nature of selling the concept, its rules and its rewards, duties and responsibilities of sale representatives.

The sales process; prospecting and getting the right start, planning and delivering the sales presentation, overcoming objections, closing the sales.

Independent sales representative, managing yourself, your time and your territory.

Retail selling Vs industrial selling.

Organisation of sales force, recruitment and hiring of sales people, sales planning control and compensation persuasion and persuasion techniques, motivation and sales training.

Textbook:

Shorholm, G., and Kaufman, L., 'Principles of Selling', Prentice-Hall (1985)

Assessment:

Continuous assessment - 40%
Written examination - 60% (1 x 3 hours)

**BA 243: COMMERCIAL LAW 1
(Law of Contract)**

Hours per week: 3

Prerequisite: BA 141

Objectives:

To provide students with a basic knowledge of contract law and to prepare them for the study of other commercial transactions.

On the completion of this subject, the students will be able to:

Explain the general principles of the law with regards to contracts and be able to apply these principles of contracts to day to day operations.

Syllabus:

Tying the bond: offer and acceptance, consideration, intention to contract.

What is within the bond: express terms, implied terms, exception clauses.

Who is within the bond: privity, assignments.

Defects in the bond: absence of required formality, misrepresentation, duress and undue influence, mistake, illegality, incapacity.

Untying the bond: agreement, frustration, breach, remedies.

Textbooks:

Yorston, Fortescue and Turner, Australian Mercantile law, Sydney, The Law Book Company, (1985).

Assessment:

Continuous assessment: 40%
Written examination: 60% (1 x 3 hours).

BA 244: COMMERCIAL LAW II

Hours per week: 4

Prerequisite: BA 243

Objectives:

To provide the students with an understanding and "jargon free" explanations of the changing legal framework within which modern business organizations must operate.

To acquaint the students with such matters as the requirements that must be observed to start a business venture, the rights and duties which arise from business transactions and the consequences of business failure.

On completion, the students will be able to:

Explain the operation of the legal framework as it applies to organizations, and apply this knowledge to business both in PNG and elsewhere.

Syllabus:

Partnership: nature of partnership, relationship of partners amongst themselves, liability of partners, dissolution of partnership, limited partnership.

Agency: capacity to act as Agent, capacity to act as Principal, creation of Agency, effects of Agency, ratification of Agency, termination of

Agency.

Sale of Goods: the agreement, passing of property and risk, performance of the contract, remedies of seller and buyer.

Negotiable Instruments: bills of exchange, cheques.

Hire Purchase: agreement, payment, transfer of ownership, possession and use default.

Textbook:

Yorston, Fortescue and Turner Australian Mercantile Law, Sydney, The Law Book Company, 17th Edition, (1985)

Selected Statutes in Business Law (Unitech Print Shop, 1986)

Partnership Act, (As Amended) Bills of Exchange Act (As Amended) (1951) Hire Purchase Act (As Amended) (1951)

Assessment:

Continuous assessment - 40%

Written examination - 60% (1 x 3 hours).

BA 252: COMPUTER APPLICATIONS IN ACCOUNTING

Hours per week: 3

Prerequisite: BA 111

Objective:

To provide students with an understanding as to how accounting software packages can be utilized as a tool for book keeping and other accounting information. On the completion of this subject the students will be able to do the following using an accounting software package:-

1. Set up a Company
2. Maintain Control accounts in the General Ledger, and Subsidiary Ledgers, for Accounts Receivable and Payable, and set up Sales and Purchases journals.
3. Prepare petty cash and Bank Reconciliation,
4. Keep records of Inventory, using both the periodic and the perpetual inventory systems,
5. Calculate Depreciation and other Charges and maintain records of fixed assets,
6. Prepare payroll records,
7. Prepare adjusting journals on Balance day and

- prepare end-of-year financial statements,
8. Calculate various ratios in order to analyze Financial Statements in terms of liquidity, profitability, and financial stability.

Syllabus:

Set up a company using the Easy Setup Assistant (ESA), set up the general Ledger and create chart of accounts. Create the Accounts Payable system, including system files entering company data required, and data for all vendors. Create an Accounts Receivable System including the sales tax codes. Create an integrated inventory system. This will involve sales, purchases and inventory modules. Process cash transactions and perform bank reconciliation. Set up Payroll using the Payroll Program. Create an integrated Accounting system for General Ledger, Accounts Payable, Accounts Receivable and Inventory. Set up Fixed Asset Manager and preparation of Depreciation Schedules. Use MYOB program to do adjusting journal entries on balance day, prepare Financial Statements and calculate various ratios in order to analyze financial statements in terms of liquidity, profitability, and financial stability

Textbook:

Ring J. and Cheetham C. Introductory Computer Accounting– A Live Approach (Latest Edition)

Assessment:

Continuous assessment: 60 %

Written examination: 40%

**BA 261: MICROECONOMICS I:
(THEORY AND APPLICATIONS)**

Hours per week: 3

Pre-requisite: BA 161

Objectives:

This subject provides the students with an understanding of how to apply their knowledge of microeconomic theory and relate it to consumer behaviour and market demand, the firm, its technology and costs to help solve real problems faced by actual decision makers in industry and government. On completion of this course,

students should be able to:

Relate the theories of consumer behaviour and the firm to decisions made in the home, the factory and the voting booth;

Use a variety of microeconomic tools and concepts to analyse these decisions;

Demonstrate using actual data on how microeconomic theory can and has been applied.

Syllabus:

Review of the nature of microeconomics, demand, supply and the pricing policy, analysing the effects of an excise tax, VAT, price ceilings, price floors. The impact of imperfect information. The tastes and preferences of the consumers, indifference curves, the concept of utility, the budget line and consumer equilibrium, corner solutions. Consumer behaviour and individual demand, market demand. The firm its technology and inputs, the production function including two variable inputs, measurement of production functions. Optimal input combinations. Cost functions in the short-run, cost functions in the long-run. Measurement of cost-functions. Application of the theory to specific industries, the impact of government regulation on its application. Market structure price and output, game theory and strategic behaviour.

Textbook:

Mansfield, E. Microeconomics 11th Edition, W.W. Norton, 2004

McTaggart et al, Economics, 4th Edition Addison Wesley, 2003

Assessment:

Continuous assessment: 50%

Written Examination: 50% (3 hours)

**BA 262: MACROECONOMICS I:
(THEORY AND APPLICATIONS)**

Hours per week: 3

Pre-requisite: BA162

Objectives:

This subject leads the students to a deeper understanding of macroeconomic theory and

provides students with tools to analyse the responses of an economy to various economic forces. On successful completion of this subject, students will be able to:

1. Develop and use a complete model to explain how the economy responds to economic forces.
2. Analyse the impact of fiscal and monetary policies on the economy.
3. Analyse the performance of the economy in response to shocks and suggest appropriate policies.

Syllabus:

Introduction to Fiscal policy, government budgets, policy instruments and multipliers. Fiscal policy in PNG. Money and interest rates. The Central Bank, the creation of money, financial intermediaries, Financial regulation. The Central Bank and Monetary policy. Exchange rate Determination. Fiscal and monetary policy and the exchange rate. Foreign Exchange markets and the Kina. Introduction to the IS LM model Interaction of fiscal and Monetary policies. The effectiveness of Fiscal and monetary policies.

Textbooks:

Dornbusch, Rudiger et al, Macroeconomics, 9th Edition McGraw-Hill, 2004.

Other useful texts

McTaggart et al, Economics, 4th Edition Addison Wesley, 2003.

Gipe G J Principles of Macroeconomics with applications for PNG economy, Department of Business studies, First edition 2002.

Assessment:

Continuous assessment: 50%

Written examination(3 hours): 50% (1 x 3 hours)

**BA 264: COMPUTER APPLICATIONS FOR
BUSINESS AND ECONOMICS**

Hours per week: 2

Prerequisite: BA 265

Objectives:

This subject will provide students with an

understanding of using software for the purpose of statistical analysis and econometric analysis. Having completed the course the students will be prepared for effective research from coding, entering and undertaking appropriate analysis to creating meaningful data output.

Syllabus:

Introduction to tool bar menus and dialogue boxes for statistical procedures. Preparation of data files. Data screening and transformation – errors in data entry, assessing normality, data selection. Descriptive statistics- frequency distribution and measures of central tendency and variability. Correlation, hypothesis testing, t-tests. Simple regression.

Textbook:

Coakes, Sheridan J. SPSS12.0 for windows. Analysis without Anguish. 2005. John Wiley.

Assessment:

Continuous assessment - 100%

BA 265: BUSINESS STATISTICS I

Hours per week: 3

Prerequisites: MA 111, MA 112 BA 161, BA162

Objectives:

The course is designed to provide the students with the basic knowledge of statistical techniques of economic and business analysis.

On completion of the course, students will be able to:-

1. Organize statistical data into frequency distribution.
2. Use frequency distribution to construct charts like histogram, frequency polygon and cumulative frequency polygon.
3. Compute measures of central tendency such as mean, median and mode.
4. Calculate measures of dispersion.
5. Conduct surveys.
6. Carry out sampling techniques.
7. Provide simple correlation and regression analysis.

Syllabus:

What is statistics? Quantitative data presentation. Construction of frequency distribution. Frequency distribution charts like histogram, frequency polygon, cumulative frequency polygon Measures of central tendency such as the mean, the median and the mode. Measures of dispersion like the range, the quartile, the inter- quartile range, the standard deviation. Sampling techniques. Sampling Errors, Normal Distribution, Probability. Estimation. Properties of a good estimator. Simple regression and Correlation analysis.

Textbooks:

1Doing Statistics for Business, Second Edition by Marilyn K. Pelosi, Western New England College & Theresa M. Sandifer, Southern Connecticut State University 2002.

Introductory Statistics, Fourth Edition by Prem S. Mann, Connecticut State University 2001.

Assessment:

Continuous assessment: 50%
Written examination: 50% (3 hours)

**BA 266: BUSINESS STATISTICS II
(ECONOMIC MODELLING)**

Hours per week: 5

Pre-requisites: BA 265

Objectives:

This course builds in BA265. It strengthens the students already acquired theoretical knowledge of the fundamentals of statistics. It applies that knowledge to economic and business analysis for decision-makers.

Syllabus:

- Part 1: Introduction to data analysis and model building, Plotting process data, Plotting distributions, summarizing continuous data, describing categorical variables, Relating continuous variables.
- Part 11: Elements of modeling, Straight line models, normal distributions, control charts for continuous variables, Binomial distribution, and Control

- charts for binary variables.
- Part III: Data collection and inferences, Fundamental concepts of surveying, Survey designs, Interpreting results of survey, Significance tests, confidence intervals.
- Completely randomized experimental designs and analysis of variance.
- Part IV: Modeling and inference, Inference in regression models, Regression diagnostics and transformation, Regression model selection, Time series data and analysis.

Textbooks:

J.B. Cryer, R.B. Miller, Statistics for Business: data analysis and modeling, International Thompson Publishing, 1994.

Assessment:

Continuous assessment: 50%
Written examination (3 hours): 50%.

BA267: QUANTITATIVE ECONOMICS I

Hours per week: 5

Pre- requisite: MA111 and MA112

Objectives:

This subject leads the students to a deeper understanding basic mathematical tools in economic analysis. It provides students with tools to analyze the responses of an economy to various economic forces. On successful completion of the subject the students should be able to: understand the various mathematical tools in analysis of economic problems; Work with mathematical tools in economic problems; Solve economic problems using mathematics.

Syllabus:

1. What are econometric models? Principles and procedures of econometric models; Algebraic functions and economic relationships; Representations of simple functions; Models based on linear functions; Non-linear economic relationships.
2. Calculus in economics, Derivative of a

function; Economic significance of a derivative; Maximization and minimization; Use of simple derivative in simple economic optimization problems.

3. Functions of several variable in economics: Functions of several variables; Partial derivatives; Homogeneous functions and Euler's theorem; Optimization of functions of several variable.
4. Linear economic models and matrix algebra: Linear models in matrix form; Simple matrix multiplication; An introduction to economic equilibrium and matrix inverse; An Introduction to multiplier analysis; An Introduction to input-output analysis.

Textbook:

Thomas RI, Using Mathematics in economics, Longman, United Kingdom, Latest edition.

Other Useful texts

Henry S.G.B, Elementary mathematics in economics, Routledge and Kegan Paul, 1969, 1969.

Peston, HN, Elementary matrices in economics, Routledge, Kegan Paul, 1969.

Mabbett A.J., Mathematics for economists, Macmillan College work out series, Macmillan, Hampshire, 1990 ISBN 0-333-38817-8

Assessment:

Continuous Assessment: 50%
Written Examination (1x3 hours): 50%

BA 268: QUANTITATIVE ECONOMICS II (Econometrics & Inferential statistics) (New subject, Applied economics)

Hours per week: 5 (2 hours of Lectures & 3 hours of laboratory work)

Prerequisite: Quantitative Methods 1, Quantitative Methods 2, BA 265, and BA 267.

Objectives:

This subject leads the students to a deeper understanding basic modern econometrics and

Inferential statistics, including hypothesis formulation and testing

On successful completion of the subject the student should be able to; Understand the various modern econometrics, inferential statistics. The student will be able to understand applications of the concepts in business and economics.

Syllabus:

Part I: The nature of econometric regression analysis, Two variable regression analysis, The normality assumption, Classical normal and linear regression model, Interval estimation and hypothesis testing for two variable model, The problem of estimation for Multiple regression analysis, The problem of inferences for Multiple regression.

Part II: Relaxing the assumption of the Classical model, Multicollinearity and micro numerosity, heteroscedasticity, Autocorrelation, Econometric methodology, Traditional econometric modeling, Alternative econometric modeling.

Textbooks:

Gujarati D N, Basic Econometrics, McGraw-Hill Inc, New York, latest edition.

Assessment:

Continuous Assessment: 50%.

Written examination: 3 (1 X 3 hours) 50%.

BA 271: BUSINESS ETHICS

Hours per week: 3

Pre-requisite: BA 131, BA 132

Objective:

The objective of this subject is to:

1. Enable students to develop their critical thinking skills.
2. Provide students with the ability to analyse the different controversial issues in business and management.
3. Provide students with the ability to examine the accepted practice of business in light of justice, right and human dignity.
4. Enable student to consider what moral

imperatives and values should be at work in the conduct of business.

Syllabus:

Introduction to ethics and business. Principal approaches to ethical thinking. Distributive Justice. Ethical issues and considerations in business functions (accounting, marketing, etc). Professional ethics and whistleblowing. Rights and Obligations of employers and employees. Justice and fair practice. Ethics and Management. Corporate social responsibility. Ethics and Legal Compliance. Ethical conduct in International Business Environment.

Textbook:

Ferrell et al. Business Ethics 6th Edition Houghton Mifflin Co 2005.

Selected readings:

1. Trevino, K & Nelson, L (2004) Managing Business Ethics: Straight Talk About How To Do It Right (3rd Edition.) John Wiley & Sons.
2. Newton. L H & Ford M. M (1998) Taking Sides: Clashing Views on Controversial Issues in Business Ethics and Society. 5th Edition. McGraw-Hill

Assessment:

Continuous assessment - 50%

Written Examination - 50% (1 x 3 hours)

BA 312: GOVERNMENT ACCOUNTING

Hours per week: 4

Prerequisite: BA 214

Objective:

At the conclusion of this subject, the students will be able to:-

1. Understand and appreciate the Fund Accounting System which is in use in the public sector.
2. To demonstrate knowledge of the various budgetary systems and to show how the legal and institutional provisions within the budgetary system affect the constituent funds

and account groups.

3. Understand the requirements of financial control and management that result from the differences imposed by a non-profit government unit as compared to a commercial accounting entity.

Syllabus:

Introduction to the Government Sector and the differences between the government and the private business in relation to the principles of accounting.

The budget infra structure and its importance to the government sector. Components of the budget - taxation and expenditure. Systems for controlling expenditure.

The history of the budget and its development through the traditional type of budget to programme budgets and zero-based budgets.

An examination of the budget for financial management and control. The role of the auditor-general, public accounts committee of the parliament and measures of efficiency and effectiveness in providing government goods and services.

Cost benefit analysis applied to government capital budgeting including the social benefits and social costs of an investment decision.

Fund accounting - basis and the idea of a fund entity, examination of an expendable fund, encumbrance accounting, other types of funds such as capital project fund, the general fixed asset account group and general long-term obligation account group and enterprise funds.

The role of depreciation and the cash basis in fund accounting.

Textbook:

Course Reader

Assessment:

Continuous assessment - 50%

Written examination - 50%

BA 316: ADVANCED COMPANY ACCOUNTING

Hours per week: 4

Prerequisite: BA 311

Objectives:

To provide the students with an understanding of accounting practices employed in corporate financial reporting, an awareness of their limitations, and to develop the students' abilities to employ these practices.

On completion of this subject the students will be able to:-

1. Prepare financial statements for publication to comply with the Companies Code, Chapter 146, International Accounting standards and Papua New Guinea Accounting Standards.
2. Demonstrate an understanding of a preparation of Consolidated Financial Statements and an appreciation of the underlying theoretical underpinnings.
3. Apply the purchase and pooling as means of accounting for business combinations.
4. Demonstrate an awareness of the principles of corporate reconstruction and the documentation for corporate liquidations.
5. Apply the techniques of and purposes of valuation of the business enterprise.

Syllabus:

Presentation of company reports for publication; The legal requirements of the Companies Act — Professional requirements of International Accounting Standards and Papua New Guinea Standards; Sample Company Reports.

The preparation of consolidated financial statements for a Group, Parent/subsidiary relationship and Associated companies.

Segmental reporting as an enhancement of the financial information needs of users.

Foreign currency transactions and translation of foreign operations for incorporation into consolidated financial statements.

Accounting for business combinations under the purchase and pooling methods.

Corporate reconstructions and liquidations. valuation of Companies and Goodwill.

Textbooks:

Leo and Hoggett, Company Accounting in Australia, 2nd Edition, Wiley, (1987)

Ma R. Parket R.H. and Whittred, G., Consolidation Accounting in Australia: Concepts and Practice,

Longman Cheshire (1991).

Assessment:

Continuous assessment: 40%
Written examination: 60% (1 x 3 hours)

BA 321: COMMERCIAL BANKING

Hours per week: 4

Prerequisites: BA 261

Objectives:

To provide students with an understanding of the organization and the operations of the commercial banking sector.

On successful completion of the course the students will be able to:-

1. Participate in the management decision making in the commercial banking sector.
2. Carry out the functions of the commercial banking sector smoothly.
3. Solve a variety of commercial banking problems relating to bankers and customers.

Syllabus:

The role and functions of banks and the credit creation process, the impact of deregulation on bank activities, reserve bank control of banking, non-callable deposits, prime assets ratio, open market operations, structure of the banking sector in PNG, organizational and cost structure of banks, overview of bank risks, overview of bank capital - functions, composition, capital adequacy and prudential regulation, impact of securitization, the nature of commercial banking, bank liquidity management, bank lending procedures and policies, loan authorization procedures, financial statement analysis, loan security, monitoring of lending performance, cash flow lending and asset based financing, strategic objectives and the planning process, human resource development in the banking sector, emerging technology and electronic banking, bank customer relationships, the law relating banking with particular reference to the relationship of banker and customer and the bankers duty to the third parties.

Textbook:

Timothy Koch ,Bank Management, Third edition, (1987)

Assessment:

Continuous Assessment: 50%
Final Examination: 50%

**BA 322: THE ECONOMY OF
PAPUA NEW GUINEA**

Hours per week: 4

Prerequisite: BA 121, BA122 or BA 161, BA162

Objectives:

The subject will provide the students with the basic, knowledge on the functioning of the PNG economy within the international context.

On completion of this subject students will be able to:-

1. Estimate the levels of GDP, unemployment, interest rates and balance of payments in Papua New Guinea.
2. Analyze and evaluate the past and present economic situation of Papua New Guinea.
3. Forecast the probable outcomes that are emerging from the current economic problems and suggest appropriate monetary and fiscal policy measures to overcome these problems.
4. Suggest suitable methods for economic development in Papua New Guinea and comment on present policy perspective.
5. Prepare and project plans.

Syllabus:

A basic profile of the PNG economy, Economic structure, Natural resources, Financial Institutions, Public sector financing, Foreign investment, trade and aid, Population, Employment and unemployment, The rural economy Development and the role of the government.

Textbook:

AIDAB, The role of Government in Economic Development, AIDAB, (1994).

Assessment:

Continuous assessment: 50%
Final examination: 50% (1 x 3 hours)

BA 323: INDUSTRIAL ECONOMICS

Hours per week: 3

Prerequisite: BA 262

Objectives:

The subject will provide the students with an understanding of the functioning of industry. Further it equips the students with the necessary theoretical and analytical capabilities to solve a wide variety of problems associated with an industry. These include decisions on pricing and the level of output cost minimization methods, appropriate levels of advertising as well as the choice of industrialization strategies. Therefore, on completion of this subject they will be able to:-

1. To calculate the profit levels, degree of industrial concentration, and determine the approximate growth path for a given industry.
2. Estimate the inter-industry linkages using an input-output model.
3. Provide guidelines to pricing strategies, levels of output and cost minimization strategies.
4. Critically evaluate the functioning of the firms in an industry and distinguish the level of concentration, innovation capabilities, monopoly power, price and no-price competition and the need for government intervention.

Syllabus:

Analysis of structure of industries, Size and distribution of plants and firms, Industry concentration, Vertical integration, specialization and diversification, Conditions and barriers to entry, Pricing decisions, Advertising, Sales promotion and technology, Market structure, Industrial location, foreign Investment and Government intervention.

Textbook:

Hay, D. and Morris, J. Industrial Economics, and

Organizations Theory and Evidence, Oxford University Press, (1991).

Assessment:

Continuous assessment: 50%
Written examination: 50%

BA 326: MONETARY ECONOMICS

Hours per week: 4

Prerequisite: BA 261

Objectives:

The subject introduces students to the mechanics of money creation, banking and monetary policy and show that the financial institutions, money and monetary policy are inextricably linked to each other.

On completion of this subject students will be able to:-

1. Calculate the interest rate and real interest rates for the economy,
2. Determine the minimum lending rates and appropriate level of money supply for an economy.
3. Comment on the relationships between balance of payment adjustments, flexible and fixed exchange rate systems.
4. Assess the effectiveness of the monetary policy tools in reaching desired objectives,
5. Estimate the appropriate levels of inflation and unemployment.

Syllabus:

Characteristics of money. Demand for and supply of money. Keynesian and monetarist theories on money, Influences on economic activity. Monetary policy and the role of the Reserve bank, Financial market, Public sector debt and management of the economy through monetary policy.

Textbook:

Hubbard, R. Glenn Money the Financial System and the Economy, Addison Wesley 1994.

Assessment:

Continuous assessment: 50%
Written examination: 50% (1 x 3 hours)

BA388: ENVIRONMENTAL ECONOMICS

Hours per week: 4

Pre-requisite: BA367

Objective:

The subject provides students with understanding of the physical and tangible environments in which the economies of the world exist and operate in, and relates them to the philosophies of capitalism and 'economic development' and assesses causes and impacts of the environments, for all flora and fauna, including the human species. On completion of the subject the students should be able to:

1. Understand and link the philosophy of capitalism to the relatively modern idea of 'economic development' and impacts thereof;
2. Theory of environmental economics;
3. Rationale for economics dissatisfaction with the conventional measurement of Gross Domestic Product and Gross National Income;
4. Alternative measures of Gross Domestic Product and economic welfare;
5. Examine the theory behind "Sustainable Economic welfare"
6. Impacts of the large scale mining and development projects on the physical environments and mitigating factor if any;
7. Examples of environmental damages in countries around the world, including Papua New Guinea;
8. Alternative economic development strategies and approaches that are environment-friendly;
9. Understand and apply Reports of expertise groups such as the 'Club of Rome' and their ramifications for earth.

Syllabus:

Historical understanding of growth of capitalism commencing with the industrial revolution in England in 16th and 17th hundred with growth of heavy industry and impacts on environment and the spread of industrialization to other countries and to less developed countries; Theory of environment economics; Dissatisfaction with measurement of economic development and economic welfare; New or innovative measures of

economic development; The value of world's ecosystem and natural capital; Methods for valuing the natural economic system; Depletion of natural resources; Pollution and environmental damages; Supply and demand and price natural resources; Principles of optimum resource allocations; Alternatives theories of sustainable economic development.

Textbook:

Todara M, Economic Development, Addison-Wesley, 2000;
Eatwell J, Milgate M, Newman P, Economic Development, Macmillan, 1989.

Assessment:

Continuous assessment:	50%
Final Examination (1x3 hours):	50%

BA 330: MARKETING COMMUNICATIONS

Hours per week: 3

Prerequisite: BA 231

Objectives:

To outline contemporary principles and practices in promotional efforts of different organizations with particular reference to business.

On the successful completion of this subject the students will be able to discuss and decide on the factors that affect the design of the promotion mix in business as well as non-business organizations.

Syllabus:

Introduction to Marketing Communication. The advertising department.

Steps in developing effective communication, identifying the target audience, determining the response sought, choosing a message, choosing media, selecting the message source, collecting feedback.

Print/press advertising, direct response advertising, broadcast advertising.

Sales promotion: setting objectives, selecting tools; developing the sales promotion programme, presenting, implementing and evaluating the results.

Public relations; major tools and decisions

involved.

Personal selling: sales force strategy, sales force size, sales force structure and compensation.

Recruitment, selection, training, development and evaluation of sales force and their performance.

Planning and budgeting: setting the total promotion budget.

Integrated marketing communication: planning and communication mix strategies.

Textbook:

Anderson, P. and Rubin, L., Marketing Communications, Prentice-Hall, Englewood Cliffs, New Jersey, (1986).

Assessment:

Continuous assessment: 50%

Written examination: 60% (1 x 3 hours)

BA 332: MARKETING RESEARCH

Hours per week: 3

Prerequisite: BA 231

Objectives:

The major aim of this subject is to introduce students to scientific method in solving marketing problems.

At the end of the subject students will be able to:-

1. Define marketing information needs.
2. Employ effective strategies for gathering information.
3. Organize information in marketing decision making context.

Syllabus:

Introduction: Purpose of marketing research, planning and formulating research projects, and research design.

Data collection: Sampling techniques, primary and secondary sources of information, and modes of data collection.

Data analysis (including statistical techniques), attitude research, test marketing, forecasting and the research report.

Textbook:

Churchill, Marketing Research: Methodological

Foundation, Dryden (1993).

Assessment:

Continuous assessment: 40%

Final examination: 60% (1 x 3 hours)

BA 333: ORGANISATIONAL BEHAVIOUR

Hours per week: 3

Prerequisite: BA 132

Objectives:

This subject will introduce students to the basic skills required for understanding behavioral situations in organizations.

Upon completion of the subject the students will be able to:-

1. Explain how Management Principles and Practices affect human behavior in organizations.
2. Predict the influence of individuals' and groups' psychology on the forms and functions of organizations.
3. Apply interpersonal skills necessary to operate as an effective manager.

Syllabus:

Development of Organizational Behavior, Models of Organizational Behavior, Technology and Structure, Job Satisfaction, Personality, Perception and Communication, Motivation, Group Dynamics, Leadership and Change, Learning, Job Enrichment, Organizational Development.

Textbook:

Robin and Stephen P., Organizational Behavior Concepts, Controversies and Application, Prentice Hall, (1994).

Assessment:

Continuous assessment: 40%

Written examination: 60% (1 x 3 hours)

BA 334: INDUSTRIAL RELATIONS

Hours per week: 3

Prerequisite: BA 232, BA 132

Objectives:

To provide an understanding of the theoretical developments pertaining to, and the practice of industrial relations.

Upon completion of the subject the students will be able to:

1. Articulate the various theories necessary for providing a general explanation for social behavior in modern organizations.
2. Identify the variables that are capable of influencing industrial relations systems, predict their impact and devise strategies for their control.

Syllabus:

The systems of Industrial relations; the rise and growth of labor unions; legal environment of industrial relations; employees, union and management rights; collective bargaining process; union and management organization for collective bargaining; disputes and strikes handling; grievance, procedures and arbitration; wages and benefits administration; productivity and employment security; industrial relations in the public sector; current trends in industrial relations.

Textbook:

Sacamow M., 'Industrial Relations: Theory and Practice, "Prentice Hall International (1992).

Assessment:

Continuous assessment: 40%
Written examination: 60% (1 x 3 hours)

BA 335: PUBLIC ADMINISTRATION

Hours per week: 3

Prerequisite: BA 32

Objectives:

This subject is intended to introduce students to the basic concepts, issues and approaches in the study of Public Administration.

Students will also be introduced to the structures, behavior, procedure and process of public Administration in the context of developing

countries.

At the end of the subject, students will be able to:-

1. Effectively apply those concepts and methodologies of public administration learnt in the course, in the public service and public institutions of Papua New Guinea.
2. Identify administrative problems in the public sector and public institutions, analyze and proffer solutions to them.

Syllabus:

The three schools of administrative theory: classical, neoclassical and modern administrative theory.

The main features and principles of public service systems.

Public personnel administration: their recruitment, training, and organization.

Planning and budgeting, legislative-administrative relations, and administrative reform and reorganization.

Textbook:

To be advised.

Assessment:

Continuous assessment: 40%
Written examination: 60% (1 x 3 hours)

BA 337: PRODUCTION AND OPERATIONS MANAGEMENT

Hours per week: 3

Objectives:

This subject aims at introducing the students to the functional areas of production and operations in business organizations. The broad decision levels that are related to the above functions are the major focus and objective of the course. On completion of the course the students will be able to design, plan, operate and control systems for converting inputs to outputs.

Syllabus:

Introduction to P.O.M.

The relationship of the POM to the rest of the enterprise, especially marketing

Basic P.O.M. terminology — Input output ratio

(Productivity)

Introduction of systems concept

Cost and capital analysis

Resource allocation.

Policy decision: objectives, strategies and tactics.

Product decisions: product life cycle - how the management of production and operations differ in various stages of P.L.C., A brief review of network programming.

Process decision product analysis, make or buy, job decision, work measurement.

Plant decisions: Plant location, plant layout, materials handling.

Operation decisions: Forecasting and market analysis, production planning and master scheduling. Materials requirement planning, production control, inventory control, purchasing and procurement, quality control, maintenance.

Textbook:

Operations Management: An Integrated Approach; Reid, Dan and Sander, Nada; 2nd edition; John Wiley 2005

Assessment:

Continuous assessment: 40%

Written examination: 60% (1 x 3 hours)

BA 338: MANAGEMENT OF FINANCIAL INSTITUTIONS

Hours per week: 3

Prerequisite: BA 131, BA132

Objectives:

The aim of the subject is to equip students with those management techniques and concepts that help managers meet the challenging requirements for effective and efficient management in the financial services sector.

At the end of the subject, students will be able to:-

1. Develop objectives and strategies for managing small-scale financial organizations.
2. Identify and analyze internal factors and external elements that influence the process and techniques of managing financial institutions.

Syllabus:

Types and functions of financial institutions: Banks, Insurance companies, Savings and loan societies, Superannuation and pension funds, investment companies, etc.

Management issues and techniques in commercial banks, development and merchant banks, insurance companies, savings and loans societies, superannuation and pension funds, investment companies, commodity exchange markets, security and stock exchange.

Textbook:

Skully, M.T., Financial Institutions and Markets in Papua New Guinea, Australian National University, Canberra, (1985)

Assessment:

Continuous assessment - 40%

Written examination - 60% (1 x 3 hours)

BA 339: BUSINESS RESEARCH METHODS

Hours per week: 3

Prerequisites: BA 131, BA 132

Objectives:

The aim of this subject is to provide students with an understanding of the issues underlying the conduct of business related research.

At the end of the subject students are expected to be able to design research proposals, collect qualitative and quantitative data using a variety of collection techniques, analyze qualitative data, and, using statistical techniques, analyze quantitative data.

Syllabus:

The nature of business research: What is research in Business, functional areas of business research, who does the research, and the need for better research.

Data analysis: Data preparation, descriptive analysis, causal analysis, statistical analysis, and report communication.

Textbook:

Sekaran V., 'Research Methods for Business: A

Skill Building Approach' 2nd Edition, Wiley (1992).

Assessment

Continuous assessment - 40%
Written examination - 60% (1 x 3 hours)

**BA 341: BUSINESS ORGANISATIONS
IN PAPUA NEW GUINEA**

Hours per week: 3

Prerequisites: BA 244

Objectives:

To provide students with an understanding of the various statutory and common law as they apply to corporations and businesses of Papua New Guinea, and to familiarize them with the operative and clinical aspects of the corporate/business laws with which they will have to deal in their professional careers.

On completion of the subject, the students will be able to:

1. Demonstrate knowledge of the legal requirements of the Partnership Act, and with the case laws developed by the courts, in such a way as to be able to advise clients of the essential provisions of those requirements.
2. Demonstrate knowledge of the provisions of the Lands Groups Act and the Business Groups Act to such an extent as to be able to render independent professional advice to those seeking such assistance.
3. Demonstrate understanding of the statutory provisions of the laws relating to incorporated and unincorporated associations, savings and loans societies, charitable organizations, and co-operative societies, their aims and objectives, and the legislative purpose underlying their formations.
4. Apply provisions of the Companies Act in the commercial/business sector of Papua New Guinea.

Syllabus:

An analysis of selected provisions of the Partnership Act, and the evolution of common law as developed by the courts in relation to those

provisions.

Social and economic motivation behind the creation of the Business Group and Land Groups Act, their advantages and disadvantages.

Legislation concerning the non-profit and profit making institutions, their advantages, disadvantages, and relevance to the commercial and economic realities of Papua New Guinea.

The statutory and common law position of the Companies Act, with close emphasis on the legal doctrines of the corporate personality, insider trading, duties and responsibilities of directors and company officials, rights of the majority and minority shareholders, the extent of the rescue provisions provided by the legislature to save companies in trouble, the laws on liquidation, the rights, duties, and obligation of the liquidation, the power of the courts in winding-up proceedings, the types of shares and their legal implications, liabilities of companies in their dealings with outsiders, liabilities under the law of torts and the criminal law. Aspects of white collar crimes.

Textbooks:

Tomasic R., Jackson, J., and Woollren "Corporations Law, Principles Policy and Process" 2nd edition Butterworths, (1992).

Lipton and Herzberg, Understanding Company Law, 2nd Edition, Law Book Company, Sydney, (1986).

The Papua New Guinea Companies Act.

Revised Laws of Papua New Guinea: The Associations Incorporation Act.

The Land Groups Act.

Savings & Loan Societies Act, NIDA Act.

Assessment:

Continuous assessment - 60%
Written examination - 40% (1 x 3 hours)

**BA 342: LEGAL ASPECTS OF BUSINESS
ORGANISATIONS IN PNG**

Hours per week: 3

Objectives:

The students will have a working knowledge and understanding of the laws as well as the legislative scheme relating to the various forms of business

organizations in Papua New Guinea and the legal and/or commercial principles governing existence, operation, liabilities and dissolution.

They will acquire the ability to competently and innovatively apply the law to a variety of situations in the business workplace, in advising clients in business and helping to manage the same as viable legal entities. and going concerns.

Suggestions for policy and legislative shifts to cater for changes in the business environment will also be a skill the student will learn. And acquire.

Syllabus:

A study of the historical and circumstantial origins of sole traders, partnerships, credit unions (savings & loans societies), co-operative societies, associations, business groups and land groups. The PNG legislative scheme will be canvassed; incorporation, management, dissolution and their respective advantages and disadvantages, as well as their respective criminal and civil liabilities, as opposed to members' liabilities.

The ways in which legislative enactments are passed in order to meet changing commercial and societal needs will be a skill taught and acquired.

Textbooks:

Kimuli MA, HA Amankwa & JT Mugambwa, "Introduction to The Law of Business Associations in Papua New Guinea," 2nd ed., Pacific Law Press, Hobart, 1990.

Co-operative Societies Act; Savings & Loans Societies Act.

Business Groups (Inc.) Act.

Land Groups (Inc) Act.

Partnership Act.

Business Names Act.

Assessment:

Continuous assessment: 40%

Written Examination: 60% (1x3 Hours)

BA 343: COMPANY LAW IN PNG

Hours per week: 3

Pre-requisite: BA 141, BA 244 and BA 244

Objective:

To provide students with an understanding of the law, both statutory and case law, that relate to their incorporation and operation in PNG and to familiarize them with the legal framework within which the company as well as its human agents must operate in order that their activities stay within the ambit of the law and to allow them to fully utilize the advantages that this "vehicle" of business brings to Papua New Guineans. On completion, the student will be able to:-

1. Incorporate a company with the attendant understanding of the creation of a corporation.
2. Identify the different types of companies and their respective advantages and disadvantages to different business situations.
3. Apply the principles of common law, as well as the provisions of the *Companies Act*, 1997, to business and related issues affecting the daily life of both national and multi-national corporations operating inside and outside PNG.
4. Give advice on, and assist, in matters relating to the day to day running of a company.
5. Manage or assist in the management of a company according to law.
6. Keep proper accounts and records of a company in line with the requirements and standards set by the law.

Syllabus:

Historical background to the growth of the company and its nature, its advantages and disadvantages as a business organization. The common law rules that were developed by the courts at common law relating to the company. Incorporating a company; requirements, method and separate legal personality. Capacity, powers and validity of a company's actions. Names and constitutions of companies. Shares; nature of, issue of, distribution to shareholders, acquisition by company, redemption.. cross-holdings, transfer, register, certificates and exemptions from transfer.. Shareholders; their rights and obligations. Enforcement of provisions of the *Companies Act*. Administration of companies. Financial reporting, accounting, records and audit of books of the company. Disclosures by company; to shareholders and others. Registration of charges. Amalgamation of companies, compromise with

creditors, approval of arrangements, amalgamation. And compromises, by the court. Receiverships, liquidation and removal from the registry.

Textbooks:

Lipton & Herxberg, "*Understanding Company Law*" 2nd ed., Law Book Company, 6th ed., Law Book Company, Sydney, 1995.

Reference Book: Tomasic, Jackson & Woeller, "*Corporations Law: Principles, Policy & Process*" 2nd ed., Butterworths, Sydney, 1992.

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1 x 3 hours).

BA 351: ISSUES IN FINANCIAL ACCOUNTING

Hours per week: 6

Prerequisite: BA 212

Objectives:

To identify the needs for financial information in developing economies, with particular reference to the economic environment in Papua New Guinea, and to provide an understanding of financial accounting practices necessary to generate the appropriate information in a timely manner.

On completion of this subject the students will be able to:

1. Demonstrate an awareness of the strengths and limitations of conventional financial reporting problems.
2. Construct financial reports that comply with:-
 - i. International Accounting Standards, and Papua New Guinea Accounting Standards, and
 - ii. Generally accepted accounting practices for all forms of business enterprises.
3. Construct financial reports that comply with specific legislation for Business Groups, and Co-operatives, in Papua New Guinea.
4. Construct financial reports which are specific to:
 - i. the construction industry,
 - ii. extractive industries,

iii. farming enterprises.

5. Apply the accounting techniques appropriate for recording the financing arrangements employed by organizations in Papua New Guinea.
6. Undertake an analysis of published financial reports with a view to making an assessment of an organization's financial standing.

Syllabus:

User groups of financial reports and their needs. An evaluation of how users' needs

Are met by general purpose financial reports. Criticisms of conventional accounting practices. The use of Cash Accounting, Replacement Cost Accounting alternatives.

The construction of financial reports, with specific reference to International Accounting Standard No. 5, "Information to be Disclosed in Financial Statements, The Business Group Incorporation Act 1974, Co-operatives Societies Act 1981.

The construction of financial reports for the construction industry, with specific reference to IAS 11 "Accounting for Construction Contracts, for the extractive industries, with specific reference to Australian Accounting Standard No. 7 "Accounting for the Extractive Industries", and for farming enterprises, with particular reference to Papua New Guinea Accounting Standard No. 3 "Accounting for Plantations".

The methodology of Accounting for hire purchase transactions, for lease transactions with particular reference to International Accounting standard 17 "Accounting for Leases", and Taxation, with particular reference to International Accounting Standard 12 "Accounting for Taxes on Income".

Textbook:

Henderson, S and Peirson, G (2000) *Issues in Financial Accounting*
Readings in Financial Accounting for Business Structures in Papua New Guinea.

Assessment:

Continuous assessment - 40%

Written examination - 60% (1 x 3 hours).

BA 353: MANAGERIAL ACCOUNTING I

Hours per week: 4 (2 Lecture 2 Tutorial)

Prerequisite: BA 214 Cost Accounting II

Objective:

To provide the students with an understanding as to how accounting information can be employed to facilitate efficient management with regard to decision-making, planning and control within an organization.

On completion of this subject the students will be able to:-

1. Prepare and analyze accounting information;
2. Apply accounting information in a range of planning, control and decision making situations;
3. Assess the relevance, strengths and weaknesses of accounting information.

Syllabus:

The role of the management accountant in the business organization.

The nature and behavior of costs. Cost-volume-profit analysis: applications and limitations.

The determination of standard costs.

Budgeting: definition and structure, sales budgeting, functional budgeting, cash budget, master budgets. Fixed and flexible budgeting for planning and control.

Variance analysis: variance analysis for multi input and multi product firms, fixed cost variance analysis criticisms of variance analysis, application of variance analysis for reactive planning, investigation of variances.

Textbook:

Cost Accounting A Managerial Emphasis, Horngren C. T., et al., Prentice-Hall, latest edition

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1 x 3 hours)

BA 354: MANAGERIAL ACCOUNTING II

Hours per week: 4 (2 Lecture 2 Tutorial)

Prerequisite: BA 214 Cost Accounting II

Objective:

To provide the students with an understanding as to how accounting information can be employed to facilitate efficient management with regard to decision-making, planning and control within an organisation.

On completion of this subject the students will be able to:-

1. Prepare and analyse accounting information;
2. Apply accounting information in a range of planning, control and decision making situations;
3. Assess the relevance, strengths and weaknesses of accounting information.

Syllabus:

Responsibility accounting: control, planning. Short term business decisions: identifying relevant costs for decisions, decision-making in the context of market and resource constraints – application of linear programming, pricing decision, decisions in the context of uncertainty.

Long term business decisions: capital expenditure budgets, capital investment appraisal techniques, introduction to risk and uncertainty in long term business decisions.

Divisional performance reporting. Transfer pricing. Measurement of return on investment. Divisional income and divisional residual income.

Textbook:

Cost Accounting A Managerial Emphasis, Horngren C. T., et al., Prentice-Hall, latest edition

Assessment:

Continuous Assessment: 50%
Written Examination: 50%

BA 367: DEVELOPMENT ECONOMICS

Hours per week: 4

Pre-requisite: BA 261, BA 262

Objectives:

This subject will provide students with:-
A solid understanding of the theories of economic

development.

The problems related to agricultural development.
The skills necessary to apply these theories within the context of the PNG economy.

The ability to analyse changes within various sectors of the PNG economy over the last two decades of independence.

Critically evaluate the role of agriculture within the PNG economy.

Syllabus:

Principles and concepts of development. Domestic problem and policies – growth, poverty and income distribution, unemployment issues, rural-urban migration, education and development. Agriculture or industry the development continuum. The role of agriculture in economic development. Types of Agriculture – subsistence, commercial and mixed farming. Forms of tropical agriculture. Transforming traditional Agriculture. Agricultural Policy. Planning, markets and the role of the state.

Textbook:

Todaro, Michael P, Economic Development 7th Edition Addison Wesley, 2000.

Assessment

Continuous assessment: 50%

Written Examination: 50% (1 x 3 hours)

BA 368: ECONOMIC PLANNING

Hours per week: 4

Pre-requisite: BA 261, BA 262, BA 367

Objectives:

This subject will provide students with:-

1. A solid understanding of the principles of Economic Planning. The ability to apply Cost benefit Analysis in the selection of projects to create a positive environment for economic development.

Syllabus:

A review of concepts, analytical approaches, policies and practice in the field of economic development policy and planning; Economic

impact analysis; Terms in Cost Benefit Analysis; Calculation of NPV, IRR etc; Theoretical and applied aspects of the use of cost-benefit techniques in the evaluation of investment projects and public policies.; Cost benefit analysis and state and local development incentives for economic development; As an application of planning manual of the government, design and plan a small local community project, such a school building, a farm, transport problems, or infrastructure problems.

Textbook:

Perkins, Frances C, Practical Cost Benefit Analysis: Basic Concepts and Applications. Melbourne. Macmillan Education Australia, Latest edition.

Assessment:

Continuous assessment: 50%

Written examination: 50% (1 x 3 hours)

BA 377: DATA PROCESSING

Hours per week: 5

Objectives:

To expose the students to the way in which computer technology has changed the role and work of the Accountant.

On successful completion of this subject the students will be able to:-

1. Make use of an integrated computer accounting package suitable for small and medium scale business organizations.
2. Utilize a spreadsheet package for routine financial accounting purposes.
3. Apply a spreadsheet package for management accounting purposes.

Syllabus:

The operation of a computer system within the accounting function of an organization. Evaluation of hardware, and software. Tailor made and off the peg packages.

Application of computer systems in financial and management accounting activities. Establishment of routine accounting operations with a standard accounting software package. Computer applica-

tions to generate templates for sales budgets, selected fixed functional budgets, flexible budgets, cost-volume-profit analysis and decision making for capital equipment purchases.

Assessment:

Continuous assessment: 50%
Written examination: 50%

BA 386: PRINCIPLES OF ECONOMICS

Hours per week: 2

Prerequisite: None

Objectives:

Course is designed for Engineering students. To introduce students to the concepts of micro and macroeconomic principles. On completion of the subject, students should be able to:-

1. Understand the basic economic framework
2. Understand demand and supply characteristics and price determination,
3. Understand how industries are organized and the competitive environment,
4. Understand national income models and how income is distributed,
5. Understand fiscal and monetary policies; relation between inflation and unemployment,
6. Understand how world economy works.

Syllabus:

Microeconomics:

Economic concepts, issues and tools; an overview of economics; demand and supply; price determination; economics efficiency; organization of industries; public goods and externality; income distribution; international sector.

Macroeconomics:

Potential and actual output; circular flow of income; model of income distribution; fiscal policy; inflation and unemployment; the world economy.

Textbook:

McTaggart et al Economics, 1993, Addison – Wesley Publishing Company – Sydney – Wokingham, England.

Assessments:

Continuous assessment: 60%
Final Examination: 40% (1x3 hrs)

BA 391: PROBLEM SOLVING AND SELF RELIANCE IN LEARNING

Hours per week: 2

Objectives:

To foster the abilities of course participants to efficiently compile and utilize information in order to make and communicate sound managerial decision.

On completion of this subject the students will be able to:-

1. Evaluate business problems on an analytically rigorous basis.
2. Compile information such that will facilitate good business decisions.
3. Present rational and balanced arguments both orally and in writing, on issues relating to the body of knowledge they have mastered, in other subjects.

Syllabus:

Applications of the case study method in the context of business studies, to analyze business problem and lead to rational decision.

The methodology of library research.

The science of report writing. Polemics. Effective oral presentation including the use of visual aids.

Textbooks:

Turabian, K., A Manual for Writers, 5th edition, Chicago (1987).

Assessment:

Continuous assessment - 100%

BA 418: RESEARCH PROJECT IN ACCOUNTING

Hours per week: 4

Prerequisites: BA 336, BA 391

Objectives:

To provide the student with the opportunity to study in depth a topic that relates specifically to his/her particular interest. Such topics are usually encountered in the taught subjects in the accounting programme.

On completion of this subject the students will be able to:-

1. Utilize a frame of reference/set of criteria to evaluate and assimilate accounting theories and concepts.
2. Effectively research, to some extent, a given problem/topic.
3. Develop a range of alternative approaches or solutions and present reasoned conclusions.

Syllabus:

Field and library research into a certain aspect or aspects of accounting operations, approved by the Business Studies Department. Evaluation of the appropriate accounting theory and practices, employing the relevant research methodology and submission of a written report.

Assessment:

Research report: 100%

An oral examination on the report may be required.

BA 411: AUDITING

Hours per week: 6

Prerequisite: BA 311

Objectives:

On completion of this subject students will be able to:-

1. Uphold the professional ethics and meet the legal requirements bearing upon the performance of the attest function.
2. Apply the principles, guidelines and techniques of modern auditing.
3. Use statistical sampling in performing both substantive and compliance tests as well as appreciating the impact of the computer on auditing.
4. Complete simulation audit tests using computer aided models.

Syllabus:

The subject will develop the theory of auditing and examine audit reports, ethics, legal liability and move in an integrated fashion towards the establishment of an audit model.

Students study the setting up of audit objectives; the methods by which evidence is gathered; plan the audit and determine levels of materiality and risk.

The desired audit risk is determined using various assessment techniques and a plan and programme of audit derived. An examination of compliance and substantive audit procedures is completed.

Sampling techniques and the effects of computers on auditing are covered. An overview of internal auditing and operational auditing is undertaken.

Some applications studies are completed in association with the development of the theory.

Textbook:

Gill G.S. and Cosserat G., "Modern Auditing in Australia 3rd Edition, Wiley (1992).

Assessment:

Continuous assessment - 50%

Written Examination - 50% (1 x 3hr)

BA 412: ACCOUNTING THEORY

Hours per week: 6

Prerequisite: BA 131

Objectives:

To impart an understanding of the conceptual framework and theoretical constructs that provide the rationale and basis for contemporary accounting practice, and the source of reference for the critical evaluation of the practice.

On the completion of this subject the students will be able to:-

1. Demonstrate knowledge of the historical development of accounting practice, identify where current practices are theoretically deficient, and critically evaluate proposals for reform.
2. Demonstrate knowledge of significant practical initiatives that have been undertaken to reform accounting practice since the

- inception of the International Accounting Standards Steering Committee.
3. Construct financial reports on the basis of
 - (i) Unified Cash Flows,
 - (ii) Current Purchasing Power Accounting
 - (iii) Current Cost Accounting,
 - (iv) Continuously Contemporary Accounting.
 4. Incorporate transactions involving currency conversions and currency translations into accounts.
 5. Identify and quantify in financial terms revenues, expenses, assets and liabilities on the basis of contemporary accounting practices.

Syllabus:

The foundations of accounting theory. The inductive and deductive approaches to theory formulation. Normative and positive theories. The agency theory explanation of the historical development of accounting practice.

Practical initiatives to improve accounting practices, with specific reference to International Accounting Standards, and the International Accounting Standards Steering Committee Conceptual framework programme.

Alternative forms of financial reporting to conventional practices, based on concepts of real and physical capital maintenance and income. Specifically, Unified Cash Flow Accounting, Current Purchasing Power Accounting, Current Cost Accounting, Continuously Contemporary Accounting.

Problems in financial reporting of currency conversions and translations in an international economy with exchange rates subject to material change.

Recognition of revenues and expenses, and associated allocation problems. the nature and financial measurement of assets and liabilities.

Textbook:

Godfrey, J., Holmes, S., Hodgson G., and Kam, V., Accounting Theory, 2nd Edition Wiley, (1994).

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hours)

BA 413: FINANCIAL MANAGEMENT

Hours per week: 6

Prerequisite: BA 314

Objectives:

To provide the students with a critical understanding of the theories and models developed to facilitate the financial management of organisations, and to assess the efficiency of such models, constructed in the first world, in the environment of a developing economy.

To consider the role of institutions in the management of finance as in a developing economy.

On the completion of this subject the students will be able to:-

1. Employ the current practical methods used in making financial management decisions;
2. Assess the relevance of developments in financial management theory to an enterprise; and employ theoretical models to make appropriate financial management decisions;
3. Select the techniques most appropriate to optimise the employment of resources including the most effective method of financing the acquisition of fixed assets;
4. Explain the operation of the financial systems, with particular reference to Papua New Guinea, and evaluate alternative sources of finance and assess investment opportunities;
5. Communicate the consequences of financial management decisions to accountants or non-accountants.

Syllabus:

Short term financial management for the firm: current Asset Management — Overview, Inventory Management, The Management of Accounts Receivable, Short-term financial management, Cash Management, International Finance Management.

Fixed assets investment decisions: distortions to the free Market Optimal Investment Decision, inflation, taxation, risk and uncertainty in the investment decision, Capital Rationing, Takeovers and Mergers.

Management of finance for the small business.

The role of institutions in Management Finance: Development Banks, Leases.
Management of finance for the corporate entity;
Cost of Capital Theory, Division Policy.

Textbook:

Weston J.F. and Brigham E.F., "Essentials of Managerial Finance", 10th Edition, Dryden (1992).

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hours)

BA 421: NATURAL RESOURCE ECONOMICS

Hours per week: 4

Prerequisite: BA 261, BA 262

Objectives:

To provide an understanding of the principles of Natural Resource Economics, and introduce appropriate methods for planning the utilization of different types of resources. This will provide students with an understanding of the natural resource problems and a global perspective.
On completion of the subject they should be able to:-

1. Calculate appropriate resource prices and identify projects which maximize the efficiency of resources.
2. Prepare a resource utilization plan for PNG giving due consideration to the economic use.
- 3.1 Calculate appropriate resource prices and identify projects which maximize the efficiency of resources.
- 3.2 Prepare a resource utilization plan for PNG,
- 3.3 Prepare a project document which maximizes the local resource use giving due accounting values to social costs.
- 3.4 Prepare guidelines to utilize the natural resources economically and provide analytical treatments to a wide variety of environmental and resource related issues.

Syllabus:

Overview of natural resource economics, natural resources, Availability, Stock, Scarcity, Manage-

ment and Planning of natural resources which includes resources such as Energy, Forests, Minerals, Fisheries, Water and Ecosystems, Natural resource policies, Global and those of Papua New Guinea.

Textbook:

Pience and Turner, Economics of the natural resources and environment, (1994).

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hours)

BA 422: RESEARCH PROJECT IN BUSINESS ECONOMICS

Hours per week: 4

Objective:

On completion of this subject they should be able to:-

1. To acquire and utilize relevant information with in a specific area of investigation related to their studies
 2. To analyze and evaluate real life data and information
 3. To plan and carry out a program of independent research with minimum supervision
 4. To draw conclusions and communicate their finding effectively
- The project work will provide an opportunity for students to demonstrate their capability to solve empirical problems in their discipline utilizing their knowledge and skills.

Syllabus:

The topic must be approved by the Head, Economics Section and it should meet the following criteria:

It should be related to a problem in Business Economics.

It should be restricted in scope so as to make possible treatment in depth, subject to availability of data, information and knowledge of techniques where appropriate.

It should be of interest to the student and value to his personal development.

Assessment:

Written report: 80%
Written report and oral examination: 20%

BA 423: RISK ANALYSIS & MANAGEMENT

Hours per week: 4

Pre-requisites: BA 321, BA 326

Objectives:

This subject will provide students with an understanding of:-

1. New realities in the banking industry.
2. Current practices on how to manage and control risk.

Syllabus:

Overview of Bank Risks, Techniques of Asset and Liability Management, Pricing Securities, Managing Interest Rate Risk, Investment Management, Managing Cash Assets, Liquidity Planning, Managing Capital Risk, Liabilities Management, Off Balance Sheet Activities

Textbook:

Gup, B. E & Kolari, J. W., Commercial Banking: The Management of Risk, 3rd Edition, Wiley, 2005.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hours)

BA 424: MANAGERIAL ECONOMICS

Hours per week: 4

Prerequisite: BA 261, BA 262

Objectives:

This course provides the students with an understanding of economic decision making by managers.

On successful completion of the subject the students will be able to:-

1. Participate in the management decision making process.

2. Solve a variety of administrative and managerial problems.
3. Design activity charts, functional hierarchies and decision tree models of private and public sector organizations.
4. Conduct feasibility surveys for new products, calculate market margins, levels of advertising etc. for market related decision making.
5. Use the computer software for decision analysis and project management.

Syllabus:

Management decisions, role of economics and business objectives, Market surveys, marketing decisions, theories of cost and production, pricing transportation, queuing, inventory problems, capital budgeting, location decisions, project management, government policies, computer applications for managerial decision making.

Textbook:

Patterson and Lewis, Managerial Economics, (1994).

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hours)

BA 425: PUBLIC FINANCE

Hours per week: 4

Prerequisite: BA 262

Objectives:

To provide students with an understanding of:-

1. The operation of the public sector
2. It's role in the economy

On the successful completion of the subject the students will be able to:

1. Identify, plan, monitor and evaluate large scale development projects
2. Calculate the social rate of return on public sector projects
3. Prepare a government budget report
4. Critically evaluate the current policies on debt management and fiscal policy.

Syllabus:

The principles behind the allocation of functions between private and public sectors, The theory of public goods, externalities and cost-benefit analysis, Analysis of the allocative and distribution effects of taxes on income value added and wealth, Analysis of fiscal and debt management, Problems of control of the economy, Central and non-central government financial relationships.

Textbook:

Groenowegan P, Public Finance In Australia, 3rd Edition, Prentice Hall, (1990)

Assessment:

Continuous assessment: 50%

Written examination: 50% (1 x 3 hours)

BA 426: OPERATIONS RESEARCH FOR BUSINESS AND ECONOMICS

Hours per week: 4

Prerequisite: BA 261, BA 262, BA 265, BA 266, MA 212

Objectives:

To provide an understanding of the methods of management

Science and their applications to management decision making and economic problems.

On successful completion of the subject students will be able to:-

1. Use computers to analyse business and management decisions using operation research techniques
2. Apply linear and non-linear programming techniques to solve decision making problems in a multitude of environments (in instances of risk and uncertainty) and to formulate economic plans
Identify and co-ordinate business activities that embrace several subject areas.

Syllabus:

Major business decisions, Applications of operations research techniques for business decisions, Linear programming, Game theory and non-linear programme, Applications of these methods, Use of computer software for operations

research applications.

Textbooks:

Anderson et al, Statistics for Business and Economics, Australian Edition, (1994).

Assessment:

Continuous assessment - 50%

Written examination - 50% (1 x 3 hours)

BA427: RESEARCH METHODOLOGY

Hours per week: 4

Pre-requisite: BA265, BA266, BA267, BA268

Objective:

To provide understanding of research modern methodology. On completion of the subject the student should be able to:

1. State the relationship between economic model, economic theory, the complex economy and how they are linked by assumptions;
2. Build an economic model, including different forms of econometric models;
3. Distinguish between good and bad hypothesis;
4. Appropriate research methodology for an economic or business problem on hand;
5. Inferential statistics, including hypothesis testing of economic or business problems;
6. Design a good questionnaire;
7. Carry out a sample survey which is technically correct;
8. Prepare a demand-driven, cutting-edge research proposal;
9. Carry out sound literature reviews.

Syllabus:

Relationship between economic model, economic theory, and complex economy linked by appropriate assumptions; Construction of sound economic models; Formulation of hypothesis and testing of hypothesis; What is meant by research methodology; Designing good questionnaire; Sampling techniques and sample surveys; Difference between confidence level and confidence interval; Skills of participant

observation as a researcher; Preparation of research proposals; Principles of literature review; Scientific principles of citations and referencing of a research paper; Principles of preparation for a Bibliography; Outlining the write-up a research paper; Preparations of oral examination; handling tricky questions in oral examination.

Textbook:

Gujarati DN, Basic Econometrics, McGraw-Hill Inc, Latest edition.

Other useful texts:

Gipe G J, How to prepare a Thesis (Basic steps and hints about writing a thesis for PNG students), PNG University of Technology, August 2007. Students material.

Gipe G J, Demand theory and Estimation, PNG University of Technology, August 2008. Students material.

Gipe G J, Basic Statistical models defined, PNG University of Technology, September 2009. Students material.

Gipe G J, Basic econometrics regression, (Applied Computation in PNG contexts), Department of Business studies, August 2010, Students materials.

Assessment:

Continuous Assessment: 50%
Written Examination (3 hours): 50%

BA 428: INTERNATIONAL TRADE AND FINANCE

Hours per week: 4

Prerequisite: BA 261, BA 262

Objectives:

To provide students with an understanding of:-

1. The functioning of the international economy
2. It's significance for Papua New Guinea

On completion of the subject the students should be able to:-

1. Identify imports and exports according to the principle of comparative advantage
2. Analyze the problems relating to foreign

investment and aid

3. Calculate the balance of payment account for PNG and identify factors affecting the negative balance
4. Critically evaluate the advantages and disadvantages of current international trade policies and formulate a new set of policies.

Syllabus:

Theory of comparative costs, Tariff theory, customs unions and free trade areas, The benefits and costs of foreign investment and aid, exchange rates, The balance of payments, interpretation of balance of payments accounts, analysis of the factors determining the current balance, overseas investment and other capital flows, aims and methods of affecting these by official policy, The international monetary system.

Textbook:

Brown and Hedgedon, International Economics, (1994).

Assessment:

Continuous assessment: 50%
Written examination: 50% (1 x 3 hours)

BA 431: MARKETING MANAGEMENT

Hours per week: 3

Prerequisites: BA 231, BA 132

Objectives:

To critically examine the administrative side of Marketing, namely, how firms organize, implement, and control marketing efforts.

Understand the major decision areas confronting the Marketing Manager's efforts to harmonize the objectives and resources of the organization with the needs and opportunities in the market place.

On completion of the subject the students will be able to:-

1. Discuss knowledgeably the strategic factors of Marketing.
2. Apply marketing theory to real world situations in markets that confront commercial entities.

Syllabus:

Understanding Marketing Management, Analyzing Marketing Opportunities, Research and selecting target markets, Designing Marketing strategies, Planning Marketing programmes, Organizing Marketing programmes, Implementing Marketing programmes, Controlling Marketing programmes, Issues in Marketing Management.

Textbook:

Kotler, P., Marketing Management: Analysis, Planning, Implementing, and Control, 7th edition (1991).

Assessment:

Continuous assessment: 40%
Written examination: 60%

BA 432: INTERNATIONAL MARKETING

Hours per week: 3

Prerequisite: BA 231

Objectives:

This subject seeks to provide the students with an understanding of principles and practices of international marketing.

On completion of this subject the students will be able to be involved effectively in the international marketing of goods and services and liaise with the export markets important to Papua New Guinea exporters in matters pertaining to marketing and export.

Syllabus:

Introduction to international marketing, reasons for international marketing, foreign market entry strategies.

Economic analysis of multinational trade and business, specialization and comparative advantage, tariff and non-tariff barriers, General Agreement on tariffs and trade.

International monetary system, Bretton Wood conference, International Monetary Fund, Foreign exchange factors affecting supply and demand of currencies.

Regional market agreements, SPARTECA PATCRA, G.S.P., A.C.P. Lome III, STABES,

ASEAN: Types of market agreements.

Economic considerations of international marketing, macro Vs Micro environment, population and income, concept of economic advancement, economic indicators, demand and competition.

Political and Legal considerations, how political legal matters affect exports, and classification of factors.

International marketing research, how international and domestic marketing research differ, steps in international marketing research, barriers to research, information that is required.

Product policy and planning for export markets, product adoption and diffusion process, factors affecting product adoption.

International pricing strategy, pricing objectives, factors impacting on international pricing, cost, competition, price escalation, export price quotation.

International channels of distribution, the channel theory, international channel members, selection of intermediaries, wholesaling and retailing.

International advertising and promotion, expenditure and strategy, international advertising and promotion programmes.

Highlights of factors affecting successful international marketing by Papua New Guinean companies.

Textbook:

Jain S.C., International Marketing Management, P.W.S. Kent, (1990).

Assessment:

Continuous assessment: 40%
Written examination: 60%

BA 433: TRAINING AND DEVELOPMENT

Hours per week: 3

Prerequisite: BA 232

Corequisite: BA 132

Objectives:

To understand and appreciate the roles of Training. Development and Education in Human Resource

Development in a dynamic organization.

On completion of the subject the students will be able to:-

1. Identify and explain the basic ways and methods of assessing training needs, establishing Training and Development objectives, Human Resources planning and record keeping requirements for Training and Development operations.
2. Explain the influence of Management systems, cost and organizational change factors on Training and Development efforts.

Syllabus:

The relationships of Training, Development and Education. Assessing Training Needs and setting objectives. Human Resource Requirements and Planning. Instruction Methods. Individual and Organisation Development. Operative Training. Management Developments. Manager Needs and Developments. Developmental Programmes. Management Development Evaluation. H.R. Record and Management Systems. Organization Development: Planned Change. Cost Effective Training. Training and Development analysis.

Textbook:

Delahaye, Brian; Human Resource Development; John Wiley, Brisbane, 2001

Assessment:

Continuous assessment	- 40%
Written examination	- 60%

BA 434: STRATEGIC MANAGEMENT

Hours per week: 3

Prerequisites: BA 132, BA 231, BA 232.

Objectives:

The aim of this subject is to introduce students to the techniques concerned with establishing the long term direction of an organization, setting specific operational and performance objectives, developing effective and efficient strategies to achieve these objectives, and executing relevant action plans.

At the end of this subject, students will be able to:-

1. Use resources from all functional areas of business to analyze the trend and current position of a company and establish future objectives.
2. Understand from internal variables, subject to external influence, what policies a business should follow for profitable operation, and
3. Analytically understand and resolve problems for an enterprise.

Syllabus:

Introduction to Business Policy and Strategic Management: The concept of strategic planning, General management process, Functions of General management, and General management techniques.

Corporate Planning: Aims of corporate planning. The process of corporate planning, and the benefits of corporate planning. Defining major policies in sales, production, finance, marketing, R & D, and personnel.

Corporate planning appraisal techniques: Internal appraisal techniques, external appraisal techniques. Long-range forecasting and strategic planning: Methods of long-range forecasting, contents of strategic plans, evaluating strategies, strategic alternatives, and choice of strategies for implementing of acting plans.

Implementing strategy: The implementation process, resource allocation, organisational structure, and monitoring and control.

Textbook:

Hill' Charles., and Jones G.R., "Strategic Management: An Integrated Approach" 6th Edition, Houghton Mifflin Co.(2004).

Assessment:

Continuous assessment	- 40%
Written examination	- 60%

BA 435: MANAGEMENT SCIENCE

Hours per week: 3

Prerequisite: MA 111, MA 112

Objectives:

To provide the students with an understanding of

the theoretical framework of Management Science necessary to make optimal business decisions. On the completion of the subject the students will be able to apply mathematical theories and concepts to solve many managerial problems in business organizations.

Syllabus:

Introduction to Management Science: Brief history, Definition, development and approach to management science, simple models.

Algebra and Probability: Maxima and minima using graphs, Simultaneous Equations, Matrix Algebra. Laws and probability distribution; Expected values, variance and standard deviation; Distribution, confidence interval.

Linear programming: LP models - maximization and minimization, graphical solutions, word problems. Simplex method.

CPM/Pert: Constructing the network. Finding the critical path and crashing PERT.

Decision Analysis: Matrix form of decision Model. Other decision models, Principles of choice optimal act; expectation and breakeven. Decision Trees.

Decision Analysis - Additional information and utility: Expected value of Perfect Information, expected opportunity loss and Expected Value of Perfect Information (EVPI), utility curve.

Transportation and Assignment models: The transportation model, North West Corner rule, stepping Stone Technique, the assignment model.

Forecasting Techniques: Scattergraph and Regression line, Time series.

Textbook:

Lawrence; John Jr and Pasternack, Barry; "Applied Management Science: A Computer-Integrated Approach To Decision Making" John Wiley, 1998.

Assessment:

Continuous assessment: 40%
Written examination: 60% (1 x 3 hours)

BA 436: MANAGEMENT OF NON-PROFIT MAKING ORGANISATIONS

Hours per week: 3

Prerequisite: BA 132, BA 335

Objectives:

The aim of this subject is to equip students with the techniques of managing non-profit making organizations, and the tools for identifying and dealing with managerial problems in such organizations, especially in the context of Papua New Guinea.

At the end of the subject students will be able to:-

1. Apply the tools and concepts learnt in this course in defining, setting and implementing objectives for non-profit making organizations operating in Papua New Guinea.
2. Identify and analyze possible problems and/or opportunities existing in a non-profit-making organization and design and implement strategies that can correct the problems or take advantage of the opportunities.
3. Participate intelligently in any discussion pertaining to the problems of non-profit making organizations in Papua New Guinea.

Syllabus:

The topic to be treated in this course include the formation and financing of non-profit making enterprises, problems of accountability and public control, internal management and control, pricing, capital budgeting and evaluation of effectiveness of the enterprise.

Assessment:

Continuous assessment: 40%
Written examination: 60% (1 x 3 hours)

BA 437: INTERNATIONAL BUSINESS

Hours per week: 3

Prerequisite: BA 338

Objectives:

This subject is designed to provide students the framework for understanding the environment where international business takes place.

At the end of the subject, students will possess the tools necessary for the understanding, appreciation and participation in the application of international

finance.

After successful completion of this course, students should be able:-

1. To design financial strategies for multi-national organizations or companies in partnership with multi national organizations.
2. To conduct foreign exchange dealings in banks and other financial institutions.

Syllabus:

Back group: International financial system. Foreign exchange rate determination, Nature of international financial risks.

Foreign exchange market: The mechanics of foreign exchange dealing. The major sub-markets, their operations and interaction.

International banking and trade financing: financing techniques and source of financing, international portfolio theory.

Forecasting exchange rate, multi-national capital budgeting. Multi-national working capital management.

Textbook:

To be advised

Assessment

Continuous assessment : 40%

Written examination: 60% (1 x 3hours)

BA 438: PROJECT IN MANAGEMENT

Hours per week: 3

Prerequisites:

Approval of the topic and the candidates ability to undertake such a research effectively by the Head of Management Stream.

Objectives:

To provide the students with the ability to successfully undertake and execute a research exercise primarily on personal responsibility.

On the completion of this project the students will be familiar with the step by step and accurate methodology involved in undertaking research work particularly in the area of management.

Assessment

Written report: 80%

Oral examination: 20%

BA 443: ADVANCED TAXATION

Hours per week: 4

Prerequisite: BA 311

Objectives:

To provide the students with an understanding of the general principles of income taxation as applied to different business organizational forms in a federal system of government and to develop the students' abilities to use these principles.

On completion of this subject the students will be able to:-

1. Explain Fiscal federalism and its implications for Papua New Guinea.
2. Evaluate a tax system using Adam Smith's cannons of taxation and other criteria.
3. Explain the concept of income as used in taxation and allowable deductions under the Income Tax Act.
4. Compute income tax for individuals and various forms of taxable entities.
5. Explain how taxation can be applied as a policy tool to channel development into desired areas of the economy.
6. Understand tax Administration in terms of Returns, Assessments, Collection, Objections and Appeals.

Syllabus:

Fiscal federalism-the distribution of tax powers between local, regional and the central governments.

The evaluation of the tax system using Adam Smith's cannons of taxation and other criteria.

Income-accountants' and economists' concepts, Gross income, Assessable income, Exempt income and Taxable income.

Allowable Deductions-the general provision and specific provisions found in the Income Tax Act.

Computation of income tax for salary and wage earners, individuals, companies and other taxable entities.

Tax concessions to promote economic develop-

ment in Papua New Guinea-an evaluation.

Tax Administration-organizational structure of the tax office, Returns, Assessments, Collection of Tax, Objections and Appeals. The role played by Tax, Tax Planning.

Textbook: Yet to be announced.

Assessment

Continuous assessment: 50%

Written examination: 50%

BA 447: ADMINISTRATIVE LAW

Hours per week: 4

Objectives:

To provide the students with an understanding of the legal duties, obligations, and responsibilities vested in the national and the provincial executives (governments), local governments, statutory bodies, public corporations, and other institutions of state in the performance of their administrative duties, and in the exercise of their decision-making process.

On completion of this subject, the students will be able to:-

1. Articulate legal, social, and historical foundation of Administrative law as it operates within the general ambit of the common law; and also to explain how Administrative Laws militate against unconstitutionality (dictatorship).
2. Explain the constitutional and legal principles of accountability on the part of the decision-makers, and the general political implications arising therefrom;
3. Demonstrate an awareness of the extent to which the judiciary can exercise jurisdiction in the review of administrative decisions; and tensions that may exist between the judiciary and the executive in this area;
4. Explain the techniques employed by lawyers and judges in dealing with the principles of Administrative law.

Syllabus:

A full survey of the areas of government activities failing within the principles of Administrative law.

A full Analysis of the Administrative law cases handled by Lord Denning in England both as a judge of the English High Court and as the Master of Rolls of the English court of Appeals, and how his decisions have hastened the development of the law in this area.

An assessment of the powers of government ministers and the others in the making of delegated legislation. State of PNG as Prem Das.

An evaluation of administrative jurisdictions of the courts, judicial control of public authorities, liabilities and legal remedies available to the ordinary PNG resident.

An assessment of the special historical position of the State (the Crown), at common law, and how legal changes have been made for the accountability of the State to the courts.

Textbooks:

Joseph, P.A., "Constitutional and Administrative Law in New Zealand" Law Book Company.

Assessment:

Continuous assessment: 40%

Written examination: 60%

BA 482: MANAGEMENT FOR ENGINEERS II

Hours per week: 4

Objectives:

To have an understanding of the accounting information flow necessary for management decision making and control in manufacturing companies, with particular references to Papua New Guinea companies.

On completion of the subject the students will be able to:-

1. Identify costs, cost behaviors and cost structures in a manufacturing company.
2. Employ product costing methods applicable to manufacturing companies, viz. job order costing, process costing and standard costing.
3. Apply basic management tools necessary for management decision making.
4. Compile basic financial reports for manufacturing companies and employ and utilize the information in management decision

making and control.

Syllabus:

Role of accounting in management decision making. Users of accounting information and users needs. Role of management in an organization. Difference between a manufacturing and merchandising company. Classification of cost and cost structures. Product costing methods: Cost accumulation procedures and forms. Management production reports. Budgeting or cost estimating in a manufacturing company. Cost-benefit analysis. Financial Reporting in a manufacturing Company. Performance evaluation, project evaluation and analysis.

Textbook:

Martin, C., An Introduction to Accounting, 3rd Edition, (1990)

Assessment:

Continuous assessment: 50%
Written examination: 50%

BA 484: MARKETING FOR ENGINEERS

Hours per week: 2

Objectives:

To introduce students to the principles of marketing. On completion of the subject, students should be able to:-

1. Understand the basics of marketing principles,
2. Analyze the macro-environment,
3. Understand Consumer behavior,
4. Segment markets and adopt appropriate marketing strategies,
5. Formulate marketing strategies for growth,
6. Understand how global market works,
7. Evaluate and control marketing program.

Syllabus:

An overview of marketing management; analyzing macroenvironments; consumer behavior; market segmentation; competitor analysis; product and service decisions; pricing decisions; promoting mix decisions; distribution decisions;

strategies for growth, mature and declining markets; global markets; monitoring and controlling marketing programs. Planning and budgeting. Forecasting techniques.

Textbook:

KOTLER P. and GARY Armstrong, Principles of Marketing, Prentice-Hall, International, Inc, Eight Edition, 1999

Assessments:

Continuous Assessment: 60%
Final examination: 40% (1x3 hours)

BA 485: ACCOUNTING FOR ENGINEERS

Hours per week: 2

Objectives:

To introduce students to the concepts of accounting principles. On completion of the subject, students should be able to:-

1. Understand the basic accounting framework,
2. Understand profit and loss accounting, balance sheet and cash flow statements,
3. Understand how accounting information could be used for management decisions,
4. Plan and interpret budgets,
5. Appreciate new developments in management accounting.

Syllabus:

An overview of accounting; principles and practices; profit and loss account; balance sheet and cash flow statements; interpretation of financial statements; cost and management accounting, cost estimation methods; allocating costs to job and processes; costs for decision making; budgeting; new developments in management accounting.

Textbook:

Symth, E.B., and Kerley W.J., Accounting Fundamentals, 9th Edition, Law Book Company, 1991.

Assessments:

Continuous Assessment: 60%
Final Examination: 40%

BA 486: FINANCE FOR ENGINEERS

Hours per week: 2

Objectives:

To introduce students to the concepts and theories of finance. On completion of the subject, students should be able to:-

1. Understand the basics of finance,
2. Carry out the company investment and analysis,
3. Plan company capital structure and working capital management,
4. Understand how international financial management works.

Syllabus:

An overview of finance; earnings, profit and cash flow; application of company investment analysis; risk analysis in investment decisions; company capital structure; working capital management; international financial management; the world economy.

Textbook:

Money the Financial system and the Economy. R. Glenn.

Reference:

Hubbard – Addison – Wesley Publishing Company, 1994.

Assessment:

Continuous Assessment - 60%
Final Examination - 40%

IS 126: BUSINESS INFORMATION SYSTEMS

Hours per week: 3 (1/2)

Prerequisite: CS 145

Objectives:

To provide the student with a practical understanding of the structure of business documents and tasks and to improve their skills with word processing, spreadsheet, accounting and management applications.

On completion of this course, students should be able to :-

1. Recognise the need for high-quality documents in a modern business,
2. Produce business documents using the appropriate combination of applications,
3. Use business technologies for effective communication (phone, copy, fax, email),
4. Perform simple accounting tasks using a spreadsheet,
5. Perform simple management tasks using scheduling applications.

Syllabus:

Preparing and formatting common business documents. Using and creating document templates for form letters. Mail merge. Combining documents from different applications. Introduction to modern business communication methods: computer networks, fax and modem communication, electronic mail. Simple accounting tasks using a spreadsheet. Spreadsheet macros and advanced functions. Presenting information using business graphics. Making a presentation on computer. Use of a scheduling tool to manage tasks, appointments and meetings.

Textbook:

Department of Business Studies course notes.

Assessment:

Continuous assessment - 100%

IS 211: END USER COMPUTING TECHNOLOGY

Hours per week: 3

Pre-requisite: IS 126

Objectives:

To introduce the concepts of Computer architecture and system softwares.

On completion of the subject the students will be able to:-

1. Describe the main differences between the main, mini, and personal computer.
2. Describe the architecture of internal units: busses, co-processors etc.

3. Evaluate the use of computer memory.
4. Diagnose the major problems of the Personal Computer.
5. Explain the principle of Operating Systems.
6. Describe the value of Networked Systems to the end user.

Syllabus:

Types of personal computers. Selection criteria. Microprocessors and co-processors. Busses. Random access memory. Read only memory. Expansion boards. Power supplies. Types of displays. Printers. Net work systems. Scanners, Voice technology. Layered operating systems. Memory utilisation. Interrupt processing. Systems software. Windows.

Textbook:

Meh P., "Introduction to Computing", MacMillan (1990)

Assessment:

Continuous assessment: 40%
Written examination: 60%

IS 213: DATABASE MANAGEMENT SYSTEMS (DATABASE PROCESSING)

Hours per week: 3 (1/3)

Objectives:

To introduce the Database Management System. On completion of the subject the students will be able to:-

1. Construct Database files.
2. Create Query and View files demonstrate their uses.
3. Apply the normalization approach to developing data models.
4. Create database reports.
5. Demonstrate the use of a microcomputer Database Management System.
6. Design and write programs using the database.

Syllabus:

What is a database? Entities and Attributes. Designing and Creating a Database. Relational

Database structure. Changing Database. Database Queries and Views. Normalization of databases. Editing and Update Queries and Forms. Creating Reports. Database Administrator and his role. Indexing Database. Integrity and Security of the Database. What is Structured Query Language?

Textbook:

Students will be directed to the appropriate reference materials.

Assessment:

Continuous assessment: 100%

IS 215: ACCOUNTING INFORMATION SYSTEMS

Hours per week: 3 (2/3)

Prerequisites: IS 122, IS 124

Objectives:

To expose the students to the way in which computer technology has changed the role and work of the Accountant.

On successful completion of this subject the students will be able to:-

1. Make use of an integrated computer accounting package suitable for small and medium scale business organizations.
2. Utilize a spreadsheet package for routine financial accounting purposes.
3. Apply a spreadsheet package for management accounting purposes.

Syllabus:

The operation of a computer system within the accounting function of an organization. Evaluation of hardware and software. Tailor made and off the peg packages.

Application of computer systems in financial and management accounting activities. Establishment of routine accounting operations with a standard accounting software package. Computer applications to generate templates for sales budgets, selected fixed functional budgets, flexible budgets, cost-volume-profit analysis and decision making for capital equipment purchases.

Textbooks:

Dac Easy Accounting, Dallas, Texas, Dac Software, (1985)

Simon, G., Choosing Accounting Software for your Microcomputer, London, Collins, (1985)

Assessment:

Continuous assessment - 50%

Written examination - 50%

IS 217: INTRODUCTION TO PROGRAMMING USING C++

Hours per week: 3

Objectives:

This subject is introduced to students who are with little or no previous programming background or math beyond algebra. It features a conversational tone and a simplified learn-by-example approach that stresses top-down design and modular structured programming-with an emphasis on business applications.

On completion of this subject students should be able to:

1. Write simple programs by using C++
2. Understand and develop user defined functions and structures
3. Define and incorporate objects & classes with functions in business applications

Syllabus:

Basic Concepts, C++ Structure, Library functions and Loops, Branching, Arrays and Sorting, Multidimensional Arrays, Functions & Structures, Class and Objects.

Textbook:

.Stanley B. Lippman: C++ *Primer*, 2nd Edition, Addison-Wesley (2001)

.Herbert Schild: C++ *The Complete Reference*, Osborne McGraw-Hill C++ - How to Program, P.J. Detal, H.M. Detal, 5th Edition, Prentice Hall (2007).

Assessment:

Continuous Assessment: 50%

Written Examination: 50%

IS 222: END-USER COMPUTING APPLICATIONS

Hours per week: 4 (1/3)

Prerequisites: IS 211

Objectives:

To provide the students with a broad range of practical skills in a variety of typical applications of microcomputers in the business community. On completion of this subject, the students will be able to:-

1. Evaluate the background on issues of managing computer usage in an end-user environment
2. Manage the end-user interface
3. Make models with a spreadsheet package and apply human communication with a word processing and publishing package.
4. Demonstrate the use of graphics and share data among different applications,
5. Select software packages based on various criteria of software evaluation.

Syllabus:

Overview of end-user computing applications: the end-user explosion, changing user needs, computer as a tool, current computing technology.

Managing the end-user interface: Introduction to operating systems, basic concepts of disk organization, review of MSDOS commands, batch commands, DOS shell and Norton Utilities, basic networking concepts.

Software evaluation. Reviewing features of a package. Choosing a package to fit user needs. Training and installation issues.

Advanced spreadsheets : macros and how to create them. Business graphics : creating the 5 basic types of graph, adding options to a graph and printing a graph.

Desktop publishing : elements of design, steps in executing a design, producing publications.

Sharing data among different applications. Methods of sharing data among Windows applications. Creating, linking and embedding objects. Exporting and importing data to/from databases, word-processors and spreadsheets.

Textbook:

Department of Business Studies course notes.

References:

Students will be referred to the appropriate documentation for the various software packages.

Assessment:

Continuous assessment: 50%
Written examination (3 hours): 50%

IS 226: SYSTEMS ANALYSIS AND DESIGN

Hours per week: 4 (2/2)

Objectives:

To introduce the student to the importance of Systems Analysis and Design in building a Management Information Systems.

On completion of the subject the students will be able to:-

1. Compare and contrast the traditional systems development life cycle to the structured systems development cycle approach.
2. Demonstrate the use of systems analysis tools such as flowcharts and data flow diagrams.
3. Demonstrate the value of documentation during the systems life cycle.
4. Evaluate different testing routines used in Management Information Systems.

Syllabus:

The systems life cycle - initial investigation, feasibility study, analysis, design, implementation, testing and evaluation.

Tools used in Systems analysis and design - flowcharts, pseudocode, data flow diagrams, input-process-output analysis, Gantt charts, PERT diagrams.

Investigate the concept of top-down design in the systems life cycle. Documentation and standards. Evaluating the organization structure and its importance in developing a Management Information System.

Textbook:

Kendall K., and Kendall, J., "Systems Analysis and Design" Prentice Hall (1992).

Assessment:

Continuous assessment - 40%
Written examination - 60%

IS 229: WEB DESIGN

Hours per week: 4

Prerequisite: IS 126

Objectives:

The objective of this course is to teach the skills required to publish information on an Intranet/Internet for private or public access using HTML (Hypertext Markup Language). By course completion, students should have a comprehensive knowledge and skill of web design.

On completion of this course students should be able to:

1. Design web pages to publish information in text and multi-media format (e.g. graphic, video, audio, etc.)
2. Learn a particular web design language such as Dreamweaver and its features and functions
3. Have the ability to develop a web site that targets a particular audience.

Syllabus:

History and development of the HTML language and standards, Web publishing rules and guidelines, Formatting and controlling links to different sections of the website, Updating and archiving information on a web site. Promoting your website through search engines and other advertising means.

Textbook:

Dick Oliver and Michael Morrison: SAMS Teach Yourself HTML and XHTML in 24 hours, 6th Edition (2003)

Ned Snell SAMS Teach Yourself to Create Web Pages in 24 hours 3rd Edition (2001)

Assessment:

Continuous Assessment - 50%
Written Examination - 50%

IS 242: SYSTEMS IMPLEMENTATION A

Hours per week: 5 (2/3)

Corequisite: IS 226

This subject will act as an introduction to systems development, giving students a chance to practice the techniques they are learning through systems analysis. The subject will concentrate on problem-solving and application of structured techniques to systems development. Practical work will be undertaken using either a database development environment or an integrated development environment.

Objectives:

To demonstrate the application of techniques of Systems Analysis and Design and to introduce systems development environments. On completion of this subject, students will be able to:-

1. Apply problem-solving skills to implement a solution to specific problems,
2. Apply structured techniques in systems analysis and design,
3. Develop simple, structured computer applications using a program development environment.

Syllabus:

Developing problem-solving skills through fact-finding and problem analysis, brainstorming and group discussion. Choosing the correct techniques for analysis. Structuring a solution.

Applying structured design techniques using the principles of top-down design, structured programming techniques. Expressing a design using appropriate diagrams: flowcharts, organization charts, structure charts, data flow diagrams etc.

Introduction to a program development environment. Developing simple interactive applications. Designing and sequencing forms for user interaction. Fundamentals of human interface design.

Programming techniques : control structures, variables and data types, procedures and functions, event handling. Handling interactive input and output. Simple data structures, strings and arrays.

Textbook:

Dept. of Business Studies course notes.

References:

Students will be referred to the appropriate software documentation for the program development environment to be used.

Assessment:

Continuous assessment: 100%

IS 313: OBJECT ORIENTED PROGRAMMING USING JAVA

Hours per week: 4

Prerequisite: IS 217

Objectives:

The objective of this course is to teach the skills required to learn OOP concept using the Java programming language. By course completion, students should have a comprehensive knowledge of the OOPs.

On completion of this subject students should be able to:

1. Write, compile and execute Java programs
2. Build robust applications using Java's object-oriented features & class libraries
3. Have the ability to develop a medium-sized enterprise application using Java and the J2EE libraries

Syllabus:

History and development of the Java programming, Java Vs C++, Data types, control statements, functions, classes and objects, Java application – using JDK and RAD windows Java environments, Introduction to Java applets and Java beans. Server and client side applications on the internet.

Textbook:

Elliot B. Koffman and Ursula Wolz: Problem Solving With Java, 3rd Edition (2003)

David M. Arnow and Gerald Weiss: Introduction to Programming Using Java: An Object-Oriented Approach 2nd Edition (2003)

Assessment:

Continuous Assessment:	50%
Written Examination:	50%

**IS 314: WINDOWS NETWORK
ADMINISTRATION**

Hours per week: 3

Prerequisite: CS 145

Objectives:

This subject covers the concepts and tasks required to support and manage a network of users and Windows computers. It will also provide you with the knowledge and skills necessary to implement and administer Windows Active Directory in an enterprise environment. It describes the key decision points for naming, delegation of authority, and domain design. The implementation will be Microsoft Windows 2003 Server and Windows XP.

On completion of this subject students should be able to:

1. Install a Windows XP system and Windows 2003 server and configure to operate in a network environment
2. Troubleshooting and Manage a Windows based network environment running Windows Server 2003 and Windows XP clients
3. Understand and troubleshooting security issues in a Windows Network Environment.

Syllabus:

Basic Concepts, History of Active Directory, Planning and Installing Active Directory, Group Policy, Active Directory Infrastructure, DNS and Active Directory, Active Directory Security, naming, delegation of authority, and domain designs, Managing Groups and Users in Windows XP, Managing Disks in Windows XP, Configure, manage, and troubleshoot Encrypting File System (EFS).

Textbook:

MSCE Guide to Microsoft Windows 2000 Active Directory Course Technology, Boston Massachusetts, Willis Strahan Watts

Shilmover

MCSA/MCSE: Windows XP Professional Study Guide, Second Edition, Lisa Donald with James Chellis

Assessment:

Continuous Assessment	- 50%
Written Examination	- 50%

**IS 315: INFORMATION SYSTEMS DESIGN
PROJECT**

Hours per week: 6

Prerequisite: IS 225

Objectives:

To provide the student with an understanding and appreciation of the role of the Systems Analyst within a business organization.

On completion of the course the student should be able to:

1. Put the Systems Analysis skills learned in IS 226 to practical use in a business environment.
2. Understand the role of the Systems Analyst in the Information Technology Industry.
3. Develop a computerized solution to a business problem from the ground up.
4. Work with the non-technical staff within a business organization in order to properly define the business problem under investigation.
5. Make oral and written presentations to senior management in a clear, concise and organized fashion.

Syllabus:

A case study involving the analysis of a small business, design of a computer system for the small business, documentation of the system, and oral presentation of the proposed system. Each student should do an independent study.

Reference:

Kendall K., and Kendall, J., "Systems Analysis and Design" Prentice Hall, (1992)

Assessment:

Continuous assessment - 100%

**IS 322: STATIC DATA STRUCTURES
WITH COBOL**

Hours per week: 6 (2/4)

Prerequisite: IS 311

Objectives:

To extend the basic understanding and working knowledge of the COBOL language which students gained in IS 311, and make more complicated commercial programs which can be used for the business community.

On the completion of this subject the students will be able to:-

1. Describe the methods of disk organisation such as sequential, indexed, and relative files.
2. Create and access indexed files, and process them randomly.
3. Examine how relative files are created, updated, and used for reporting, and methods used for organising relative files.
4. Sort and merge files within a COBOL program.
5. Define, access, and use multiple level arrays and tables.
6. Manipulate text with the STRING and UNSTRING statements.
7. Interact with a computer at a terminal and use the ACCEPT and DISPLAY verb to handle input and output in interactive mode.
8. Investigate debugging facilities, detect syntax and logic error and debug them with e facilities.

Syllabus:

Indexed-sequential files: creating an indexed file, updating an indexed file randomly, reading from an indexed file for reporting purposes, updating an indexed file with multiple transaction records for each master record, and additional options for file processing, including the ALTERNATIVE RECORD key, the START statement, the FILE STATUS clause and exception handling with the USE statement.

Relative files: what is a relative file? creating

relative files, sequential and random reading of relative files and random updating of relative files, and converting a key field to a RELATIVE KEY.

Sorting and Merging: how files may be sorted within a COBOL program, how to process a file during SORT procedure before or after it is actually sorted, and how to use the MERGE verb for merging files.

Multiple-level arrays and tables: defining, accessing, and using multiple-level array and tables, using double level array for accumulated totals, performing a look-up of tables, and using triple-level arrays and tables.

Text manipulation with the STRING and UNSTRING statements: basic formats of two statements, the OVERFLOW and POINTER options, and general rules for using these two statements.

Report writer module: benefits of the report writer feature such as detail and summary printing, control break processing and printing headings and footings, the REPORT SECTION in the DATA DIVISION.

Designing screen layouts: limitations of the DISPLAY and ACCEPT verbs, the SCREEN SECTION for defining screen layouts, the enhancements to the COBOL standard for the verbs.

Debugging facilities: types of errors, the techniques used to detect and trace errors, and facilities provided in the COBOL compiler.

Textbook:

Stern, N., and Stern, R.A., Structured COBOL Programming, fifth edition, (New York, Wiley, 1988)

Assessment:

Continuous assessment: 40%

Written examination: 60%

IS 324: DATA COMMUNICATIONS

Hours per week: 4 (2/2)

Prerequisite: IS 211

Objectives:

To provide the student with an understanding and

appreciation of the various methods of data communication available within the industry, and to enable the student to apply the principles involved in the operation of data communications equipment to the effective solution of common business data communications problems.

On completion of the subject the students will be able to:-

1. Apply the basic theories of data communications and select appropriate technology to solve common business communications problems.
2. Effectively utilize the various forms of data communications available within the industry.
3. Effectively combine the various major components within an operational data communications network.

Syllabus:

Networking and communication standards; networking product options; communication software; types of communication interfaces; modems; multiplexers; protocol converters; reliability, cost, and organisational considerations for the centralization-decentralization decision.

Textbook:

Sherman, K., Data Communications: A Users Guide, second edition, Reston, Virginia, Reston Publishing, (1985)

Reference:

Panko, R.R. End User Computing: Management, Applications, and Technology, New York, Wiley, (1988).

Assessment:

Continuous assessment - 40%
Written examination - 60%

IS 326: PROJECT MANAGEMENT

Hours per week: 4 (2/2)

Objectives:

On successful completion of this subject, students will be able to:-

1. Manage simple projects, including planning, budgeting, scheduling and monitoring,

2. Analyze project requirements and to organize and plan a project using available resources,
3. Use computer-based tools to assist with the tasks of project planning and management.

Syllabus:

Introduction to project management. Models of project management. Tools and techniques for project management.

Organising a project. Defining project scope, objectives and purpose. Defining the work breakdown structure. Communicating the aims of the project. Structuring a project plan.

Managing a project. Controlling quality, cost, time and risk. Monitoring a project. Team dynamics.

Introduction to computer tools for project management. Defining tasks and resources and assigning responsibility. Understanding GANNT and PERT charts. Monitoring and marking off progress.

Textbook:

Turner, J. R. *Handbook of Project-Based Management*. McGraw-Hill, 1993.

Assessment:

Continuous assessment: 40%
Written examination: 60% (3 hours)

IS 328: ELECTRONIC COMMERCE

Hours per week: 3 (1/2)

Pre-requisite: MA 267

Objectives:

On successful completion of this subject, students will be able to:-

1. Design networks using contemporary network hardware and operating systems.
2. Describe the basis of a network operating system and the Internet.
3. Discuss the issues of electronic data exchange across the Internet and the potential benefits for an IT organization.
4. Apply appropriate technology for sales and marketing activities and information exchange.

Syllabus:

Review of networking concepts : network operating systems and network models.

Introduction to the Internet. Fundamental Internet technologies. Structure of commercial Internet services in PNG. Review of Internet services for information exchange. Maintaining network security to protect against computer crime and fraud.

Commercial activities on the Internet for advertising on the Web, promotional material. Electronic cash and payment for services. Appropriate use of the network. Estimating costs and benefits. Database marketing, mail and fax merge operations.

Textbook:

Komenar, M.

Electronic Marketing. Wiley, 1997.

Assessment:

Continuous assessment - 50%.

Written examination - 50% (3 hours)

IS 342: SYSTEMS IMPLEMENTATION B

Hours per week: 6 (2/4)

Pre-requisite: IS 242

Objectives:

On successful completion of this subject, the student will be able to:-

1. Use a contemporary development environment to develop interactive computer applications.
2. Apply structured analysis and design techniques.
3. Design and implement systems using modern development techniques.
4. Design database systems and applications and connect to external databases,

Syllabus:

Review of modern systems development. The importance of structured techniques in analysis, design and programming. Object-oriented analysis and design. Interactive and event-based applications.

Review of modern development environments. Integrated applications to support developers. Database connectivity technologies and the client/server model. Interpreters and compilers, code-generators and 4th generation languages.

Developing interactive applications with forms and controls. Object-oriented and component-based software development. Developing database applications by linking applications to external databases. Using Standard Query Language for data processing tasks.

Students taking this subject will undertake a major individual project.

Textbook:

Dept. of Business Studies course notes.

References:

Students will be referred to the appropriate documentation for the program development environments used in their projects.

Assessment:

Continuous assessment: 100%.

IS 343: WINDOWS APPLICATIONS WITH VISUAL BASIC

Hours per week: 3 (2/2)

Pre-requisite: IS 232

Objectives:

On successful completion of this course the students will be able to:-

1. Identify the components of the Visual Basic development environment.
2. Demonstrate the use of debugging techniques.
3. Describe the steps involved in the design, development and implementation of software application projects.
4. Identify basic properties of controls used in designing Windows visual desktop forms and interfaces.
5. Write, test, debug and document Visual Basic event procedure coding.
6. Demonstrate the use of menus, forms and dialog boxes in a Visual Basic program.
7. Determine the event procedure required to

- develop a Windows application after the visual interfaces have been developed.
8. Complete procedural design documentation necessary to code Visual Basic programs.
 9. Demonstrate the use of graphics in menus and forms.
 10. Demonstrate the complete testing and user verification procedure required to validate Visual Basic programs.
 11. Demonstrate the use of data files for the saving and retrieving of data to a secondary storage device.
 12. Create and demonstrate the conversion of programs into executable and/or web-enabled applications.
 13. Understand the principles of objects: abstraction, encapsulation, inheritance and polymorphism.

Syllabus:

Visual Basic is an object-based/event driven general purpose language that affords a simplified approach to programming. This is an introductory course in Windows programming using Microsoft Visual BASIC. This course covers the fundamentals of Event Oriented Programming in the Windows environment. The course includes the use and programming of the mouse, windows, forms, menus, dialog boxes, icons, buttons, text fields, files, graphics, and other components of the Windows environment. It includes the analysis of user needs and requirements, design of the user interface, assignment of properties to objects in the user interface, coding of event procedures, testing and debugging of completed programs and applications, and completion of final user documentation.

Textbook:

Sheriff, Paul, Paul Sheriff Teaches Visual Basic 6. Que Publishing, 1999

Assessment:

Continuous assessment: 40%
Written Examination: 60%

**IS 411: BUSINESS COMPUTING
EXPERIENCE**

Hours per week: 40

Objectives:

To introduce the student to Business Computing within a commercial environment.

On completion of the subject the students will be able to:

1. Perform a project either individually or as part of a team.
2. Apply programming skills and/or system analysis techniques.
3. Demonstrate the ability to work effectively as part of a team in his/her organization.
4. Evaluate the work carried out and write progress reports.

Syllabus:

A variety of programming, systems analysis, and software/hardware support tasks to be decided by senior data processing staff at the organization which the student is assigned to.

Assessment:

Continuous assessment: 100%

On the basis of reports from employers and lecturer's visits in their place of work.

**IS 422: INFORMATION SYSTEMS
MANAGEMENT**

Hours per week: 3 (2/1)

Pre-requisite: IS 215 / BA 377

Objectives:

To introduce the concepts of Management Information Systems. On completion of the subject, the student will be able to:-

1. Describe the conceptual foundations of information systems
2. Evaluate the use of decision support and expert systems
3. State the importance of security in information systems to reduce computer crime
4. Discuss management issues for a networked computer system.

Syllabus:

Fundamentals of information systems. The nature of management. Information needs of management at the strategic, tactical and operational levels. Conceptual models of data in organizations. Capturing data analysis with entity-relationship models. Designing a relational database. The end-user computer revolution. Personal computing and end-user development. Management of end-user technology; fourth-generation languages. Project management. Decision Support Systems and Management Information Systems. The concept of an Information Centre. Positions in an information centre. Co-ordinating the information centre with other parts of the organization. Security, control and computer crime. Management of computer networks and system administration. Students will undertake a major research project and produce a written report.

Textbook:

J. O. Hicks, 1987. Management Information Systems : A User Perspective. West Publishing, Minnesota.
Department of Business Studies course notes.

Assessment:

Continuous assessment - 40%
Written examination - 60% (3 hours)

**IS 424: DYNAMIC DATA STRUCTURES
WITH PASCAL**

Hours per week: 4 (2/2)

Prerequisite: IS 313

Objectives:

To extend the basic understanding and introduce the new types of data structures.
On completion of the subject the students will be able to:-

1. Evaluate types of data structures and algorithms with the concepts derived from both software engineering practices and computer science theory; including

modularization, data encapsulation, information hiding, data abstraction.

2. Describe the top-down design of algorithms and data structures in parallel and analysis of algorithms.
3. Use advanced data structure to write Pascal programs.

Syllabus:

Introduction to Turbo Pascal 5.5: The Turbo Pascal 5.5. environment, built-in functions and procedures.

Revision: Revision of Pascal programming structures.

Stacks: Specifications for a stack, the implementation of stacks as an array, stack operation with the array implementation.

Queues: Introduce the FIFO (first in first out) queue. The implementation and operations on FIFO queues.

Linked List:

Abstract view of a linked list, simple linked implementation of lists using pointer variables, operations on single linked list, Linked stack, linked queues, circular linked list, doubly linked list, implementation of a linked list as an array of records.

Binary Trees: Definitions, traversal of binary trees, linked implementation of binary trees, searching the tree, insert and delete operation on the binary search tree.

Sorting: Revision of some sorting techniques, introduce quicksort and headsrt, analyse the sorting techniques and other efficiency consideration.

Hashing Tables: Collisions, hash and search, rehashing, has functions.

Textbook:

R. Kruse "Programming with Data Structures - Pascal Version" Prentice Hall (1994).

Assessment:

Continuous assessment: 40%
Written examination: 60%

**IS 426: INFORMATION SYSTEMS
DEVELOPMENT PROJECT**

Hours per week: 4 (0/4)

Prerequisite: IS 315

Objectives:

To provide practical experience in systems development and programming by utilizing knowledge and skills obtained in prerequisite subjects in a realistic project environment.

On completion of the subject the students will be able to:-

1. Develop and implement a computerized solution to a business problem from the ground up.
2. Work effectively within a group during the development of a computer system.
3. Develop schedules and budgets and work within the constraints imposed by them.

Syllabus:

A case study involving the analysis of a major business, design of a computer system for the business, documentation of the system, and implementation of the system, and implementation of the system using an appropriate programming language. This case study should be done by project teams. Each team should set up a schedule and budget for the project and report weekly on progress.

Assessment:

Continuous assessment: 100%

IS 466: OPERATING SYSTEMS CONCEPTS

Hours per week: 4(2/2)

**Prerequisite: IS 211 End User Computing
Technology**

Objectives:

To introduce operating systems concepts.

On completion of the subject the students will be able to:-

1. Differentiate between operating systems used on main, mini, and Personal Computers.

2. Describe the operation of computer systems.
3. Explain the principles of process management allocation.
4. Detail the problems of Deadlock.
5. Differentiate between paging and segmentation techniques.

Syllabus:

Introduction to operating systems; hardware; software; firmware; process management concepts; synchronous concurrent processes; concurrent programming; deadlock; storage management concepts; real storage; virtual storage; processor management concepts; job and processor scheduling; multiprocessing; auxiliary storage management; performance; networks and security; case studies using a variety of operating systems.

Textbook:

Deitel, H.M. An Introduction to Operating Systems, 2nd Edition, Reading,, Massachusetts, Addison Wesley, (1990).

Assessment:

Continuous assessment: 60%
Written examination: 40%

BAC 10: ROLE OF SUPERVISOR I

Hours per week: 12 Lecture, 3 Tutorials

Objectives:

Examine the role of a Supervisor in the company from job descriptions, organization charts and scope of authority. To develop congruence between expectations of this role from the company's and individual's points of view.

Upon completion of the subject, the student will be able to:

1. Understand the expectations of the supervisor's role and identify areas of accountability in the context of the company's philosophies and goals.
2. Evaluate the necessity for planning, leading, controlling and coordinating the resources within the supervisor's organization.
3. Identify methods to measure and improve their performance in the supervisor's area of accountability.

Syllabus:

INTRODUCTION

Examining expectations of the supervisor.
Supervisor's role in terms of authority, accountability.

ORGANISATION STRUCTURE - THEORY SESSION.

Purpose and function of organization chart.
Hierarchy of authority and chain of command.

EXPECTATIONS OF SUPERVISOR

Job analysis and description
Skills requirements

MANAGEMENT OF RESOURCES

Defining management
Guidelines for management behavior
Applying management theory to group activity

Management functions

MAJOR ASSIGNMENT - "MANAGEMENT IMPROVEMENT".

Main features of major assignments
Using management techniques

Textbooks:

George, C.S. Jr. et al, Supervision in Action.
Sydney, Prentice Hall.
Samuelson, M., Supervision in Australia,
Jacaranda/Wiley, (1985).

Assessment:

Continuous assessments: 40%
Examination (3 hours): 60%

BAC 11: COMMUNICATION I

Hours per week: 12 Lecture, 3 Tutorials

Objectives:

This subject will examine the role of the Supervisor in the communication process within the company to help understand its importance in day to day tasks of conveying message messages, discussing, and issuing replies/instructions in an effective manner.

The student will be able to:-

1. Identify the supervisor's role in the communication process.
2. Recall the theory of communication and the barriers and facilitators to effective communication.

3. Relate three communication flows to his/her supervisory position in the mining industry.
4. Communicate effectively through sound verbal and written skills and develop reading skills for both work application and further study.

Syllabus:

INTRODUCTION

Role of supervisor in communication process.
Understanding the importance of day to day tasks.
Ensuring communication effectiveness.

PURPOSE OF COMMUNICATION

Group input
Communication process
Structure of communication
Seven steps of communication process

BARRIERS TO EFFECTIVE COMMUNICATION

Problems to communication process
Group discussions
Effective communication guideline.

ACTIVE LISTENING

Listening differences and remedies.

ROLE OF SUPERVISOR IN COMMUNICATION.

Organizational charts and flow communication.
Guidelines for overcoming problems.

ORAL COMMUNICATION - CLARIFYING AND QUESTIONING.

Questioning and oral communication
Group differences

Documenting communication
READING/Writing REPLY

Benefits of written communication
Documentation and standardized messages

Letter formats and Memorandum

DELIVERING WRITTEN INSTRUCTIONS

Approaches on giving written instructions.
Communicating with subordinates.
Planning and writing a memorandum

Textbook:

Bolton, R. - People Skills - How to Assert Yourself, Listen to Others and Resolve Conflicts.
Brookvale, Simon and Schuster, (1987).

Assessment:

Continuous assessment: 40%
Final examination: 60%

BAC 12: PLANNING

Hours per week: 12 Lecture, 3 Tutorial

Objectives:

This subject is generally designed to examine the importance and need for planning in the achievement of objectives. This involves defining and explaining planning hierarchy and using students' actual experience to apply the techniques.

At the end of this subject students are expected to be able to:-

1. Define and distinguish strategic, operational, and domestic planning and outline the supervisor's role and responsibilities in each case for harmonious employee relations.
2. Apply planning techniques which are useful for the supervisor, and explain the concepts of those techniques.
3. Develop, implement, monitor and evaluate a plan to achieve effective outcomes related to the supervisor's normal workplace.

Syllabus:

Introduction: Definition of planning, the nature of plans and planning, characteristics of planning, importance of planning and benefits of planning.

Types of planning: Strategic planning, operational planning, domestic planning.

Process of planning: Defining objectives, breakdown of targets, analyzing tasks for resource requirements, developing alternatives, selecting the best alternative, implementation, feedback and control.

Making planning effective: Advantages and disadvantages of planning, limits to planning, why planning fails, and overcoming barriers to planning.

Applying the planning framework: Exercises.

Assessment:

Assignment	1 - 10 marks,
Assignment	2 - 15marks,
Case Study	15 marks,
Exercise	60 marks

BAC 13: LEADERSHIP

Hours per week: 12 Lecture, 3 Tutorial

Objectives:

On completion of the subject the student will be able to:

1. Influence the behavior of employees using the theories and concepts of leadership in achieving results whilst maintaining and fostering harmonious employee relations.
2. Demonstrate situational factors that influence the results of their sections as leaders.
3. Apply an appropriate leadership style which is most likely to produce the desired results in given situations in their organization.
4. Identify leadership strategies for supervising staff who are or are not performing as desired.

Syllabus:

Meaning and definition, characteristics of effective leader, Leadership process, variables of leader, follower, situation, Theories of leadership: Autocratic, Democratic, Laissez-faire, Continuum of/leadership behavior: Boss centred v subordinate centred leadership, Managerial Grid: Task vs. Employee oriented leadership: Is there one best leadership situation?, The Path-goal Theory of Leadership, high v low leader direction, Factors that influence leadership, Company and sectional structures, power and authority: how they differ from one another, position v personal power, use of power, How different power bases are used and which type of power is best? Styles in leadership: Directive versus supportive.

How individual values, needs and attitudes affect group decision making? Adapting style to suit worker development and performance.

References:

Adair, J. "Training for Leadership" Gower Publishing Company, 1980 Westmead.
Hersey, P. K.H. Blanchard. "Organizational Change Through Effective Leadership".

Assessment:

Self-analysis exercise:	20%
Linking leadership style with employee:	30%
Major assignment:	
Report on three leadership styles:	50%

BAC 14: TEAMWORK

Hours per week: 12 lectures, 3 Tutorial

Objectives:

Upon completion of this subject the student should be able to:

1. Understand the concept of groups as a basic social unit.
2. Identify and understand the role of supervisor in maintaining effective work groups.
3. Indicate the extent of group influence over individual behavior through norms, sanctions, and social pressures.
4. Identify “synergy” as an outcome of group decision making.
5. Identify and discuss the managerial implications of working with groups.

Syllabus:

The topics that will be examined include: Group behavior, factors that influence group behavior, supervisor’s role in moulding effective teamwork, leadership styles, methods in selecting a leadership style, promoting team morale, setting and achieving goals, Management By Objectives (MBO), effective communication, supervisor’s communication role, Defining teamwork, stages of team development; underdeveloped, experimenting team, consolidating team, mature team, roles of team players, roles and responsibilities of supervisor, influences on team building.

Textbook:

Material to be provided by Tutor.

Assessment:

Cases:	20%
Exercise 1 - Team Meeting:	20%
Exercise 2 - Analysis of own team:	20%
Report on team-building:	40%

BAC 15: MOTIVATION

Hours per week: 12 Lectures, 3 Tutorials

Objectives:

To enable the student to understand and appreciate the process of motivation and its relationship to

performance and job satisfaction, and how these motivational concepts can be applied to organizational settings and organizational behavior.

On completion of this subject the student should be able to:

1. Define motivation and the three main approaches to the study of motivation as well as the differences between the three.
2. Confidently describe the following theories of motivation; Needs hierarchy theory, Dual-Factor theory, ERG Theory, Equity Theory, Expectancy theory, Goal Setting theory, Reinforcement Theory, and Achievement Theory.
3. Discuss the roles of individuals needs in the motivational process.
4. Identify factors that are associated with intrinsic motivation, and those that play a role in extrinsic motivation.
5. Identify and discuss the major managerial applications of motivational theory.

Syllabus:

Motivation and Productivity: why motivation, motives, definition of motivation, the individual as a starting point.

Early theories of Motivation: Maslow’s Hierarchy of Needs, Herzberg’s Dual-factor theory, McGregor’s Theory X and Theory Y, Contemporary theories of Motivation, ERG Theory, Three Needs Theory, Goal-setting theory, equity theory, expectancy theory, reinforcement theory.

Motivation and Purposeful Behavior: Motivation Process, motivation and work, incentives, motivators, the work, job satisfaction, intrinsic and extrinsic motivation, behavior modification, operant conditioning.

Textbook:

Robbins, Stephen P., Organizational Behavior: Concepts, controversies, and Applications, 4th edition, Prentice-Hall Inc., Englewood Cliffs, N.J., (1988).

Assessment:

Project:	25%
Case studies:	15%
Assignments:	60%

BAC 16: POLICY AND PROCEDURES

Hours per week: 12 Lectures, 3 Tutorial

Objectives:

This subject defines and clarifies the concepts of “policy” and “procedures”. It is designed principally to enable students to be able to:-

1. Clarify the role of supervisors’ with regard to company policy and procedures.
2. Explain company policies and procedure in relation to specific job tasks.
3. Apply procedures in conformity with company policies to ensure consistent standards of performance in carrying out supervisory duties/responsibilities.

Syllabus:

Policy: Definition, the need for a policy, advantages of policy, the relationship between policies and plans, and the difference between policies and rules.

Level of policies in the organizations: Top level (broad) policies, and supervisory level policies. Policy to fulfill outside requirements and to meet internal operational requirements.

Procedure: Definition, the difference between procedure and policy, the relationship between plan and procedure, and the relationship between procedure and policy.

Level of procedures in the organization:

Company procedure, department and section procedures.

Textbooks:

Materials to be provided by Tutor

Assessment:

Assignment: 100%

BAC 17: INDUSTRIAL RELATIONS AND GRIEVANCE HANDLING PROCEDURES

Hours per week: 12 Lectures, 3 Tutorial

Objective:

Provides supervisors a legal framework for handling grievance and discipline in accordance

with company procedures. The background to the common law and statutory provision provide validity to company procedures.

On completion of the subject the course participants will be able to:-

1. Briefly outline the Industrial Relation system and Process in PNG.
2. Define and give example of awards and agreements which apply to the mineral industry.
3. Define roles and responsibilities of Management, Supervisors Union representatives and employees under awards which apply to their employers’ organization.
4. Demonstrate competence in applying grievance handling procedure in accordance with their employers procedure and policies and explain the reasoning for those policies and procedures.

State what records are required for Industrial Relations purposes and what part the supervisor is responsible for in their particular organization.

Syllabus:

To look at in detail the nature and purpose of Industrial Relations, history of Industrial Relation in PNG. Focus on the main regulation governing Industrial Relation the Industrial Relation Process and Settlement Mechanism. The supervisor’s role as representative of employer, his authority, grievance handling/discipline handling according to the company policies and procedures.

Textbooks:

Course Material to be provided by Tutor.

Assessment:

Project:	25%,
Case Studies:	25%
Assignment:	50%

BAC 18: LEGISLATION

Hours per week: 12 Lectures, 3 Tutorial

Objective:

To develop a general awareness of the existence of statutory and common law provisions that would

assist the supervisor to make informed decision. On completion of the subject, the course participants will be able to:-

1. Identify the various relevant statutory and common law provisions as they relate to the operations and procedures within the Mining Industry, particularly as these relate to the supervisors' duties and responsibilities within an organization.
2. Comply with administrative procedures (including of forms) which are required by statute and associate regulation schedules, particularly as these types of task are within the ambit of the supervisor's duties and responsibilities within the organization.

Syllabus:

In the course of this module the superior will look at the difference between 'common law' and 'statute law' with reference the principles of 'duty of call' and 'contract of employment'.

A review of statutory legislation as they affect supervisor's role. A brief session outlining differences: equal opportunity and affirmative action. Workers compensation, company policy and procedures for lodgment of claims under workers compensation action.

Textbook:

Course material to be provided by the Tutor.

Assessment:

Project:	25%,
Case Studies:	25%
Assignments:	50%

**BAC 19: PROBLEM SOLVING AND
DECISION MAKING**

Hours per week: 12 lectures, 3 tutorial

Objectives:

On completion of the subject the student will be able to:-

1. Develop problem solving skills as a supervisor by using a range of techniques and processes individually or with their work group.
2. Identify techniques for redefining and

analyzing problems to establish a decision making process.

3. In a given work situation consider on the job implications of adopting a particular decision making style and establish a monitoring system to assist that decision.
4. Identify and analyze options for getting collaboration on-the-job, using the skills of decision making.

Syllabus:

What is decision making? Steps in decision making, power vs. authority-what is the difference? The relevance to a supervisor's job, Types of authority: Line, Staff and Functional Authority, Types of Power: Formal vs. informal power, Sources of power: Legitimate power, Reward power, Coercive power, Expert power, Connection power Referent power, Information power, The Concept of "Chain of Command", How the concept works effectively? Delegation of Authority: a) Assigning duties b) Granting authority and defining its limits c) Creating accountability, identifying responsibility: Right to carry out tasks, Obligations to be held accountable, Span of Control: Wide vs. narrow span of control, Factors affecting the choice, Management by Exceptions (MBX): A management system for more effective use of time, Routine vs. Non-Routine decisions: skills for making non-routine decisions. The decision making process: Define the problem, Collect and analyze the data, Develop and evaluate alternatives, Select a course of action, Sell the decision, follow up, Actions corresponding to the steps in the process.

References:

Kepner, C.N./Tregoe, B.B. The New Rational Manager John Martin Publishing Ltd, London, (1981).
Plunkett, L.C., The Proactive Manager: The complete Book of Problem Solving and decision Making, Wiley-Interscience Publishing, (1982).

Assessment:

Identifying work problem:	10%
Decision making questionnaire:	10%
Problem solving:	10%
Solving problems at work:	20%
Major assignment:	50%

DEPARTMENT OF CIVIL ENGINEERING

Professor and Head of Department:

Telue, Y.K., PhD(QUT), BEng-(Hons-QUT), BEng (PNGUT), MIEPNG. Reg Engr.

Associate Professors:

Senior Lecturers:

Principal Technical Instructor:

Kobal, C.A., ME(Cantab., NZ), MS (Iowa, USA), BEng (Cantab., NZ), BEng(PNGUT), MIEPNG, Reg. Engr.

Lecturers:

Micah, P.V., MPhil, Const.Mang't-GCAL, UK) MSc(Const.Mang't-Lboro,UK), BEng(Civil-PNGUT)

Gampathi, G.A.P., MEng (NUS), BSc Eng (Hons), AMIESL MSES

Senior Technical Instructor:

Konzang, M., BEng (Civil)

Embe, M., BEng. (Civil)

Technical Instructors:

Kasademi, J., BEng (Civil)

Chief Technical Officer:

Isan, P., CertCEng

Principal Technical Officers:

Raku, H., TradeCertBldg,DipTeach,CertCEng (TAFE Aust)

Ialavake, V., Dip.CEng (LaeTech)

Senior Technical Officers:

Yapai, E., CertHydr

Pesaka, G., CertCEng

Bafinu, S., CertCEng

Doaemo, W., BSc (PNGUT)

Technical Officers:

Kafur, H., Dip.CEng(LaeTech)

Laboratory Assistant:

Epa, W.

Secretary:

Kean, S., SecCert.(LaeTech)

Bebe R., SecCert.(LaeTech)

CIVIL ENGINEERING PROFESSION

Civil Engineering is really several engineering professions under one name. At the PNG University of Technology, these various professional disciplines include; Water and Wastewater engineering, Environment engineering, Geotechnical engineering, Pavement and Traffic engineering, Structural engineering and Construction Management. As such, a Civil engineer is trained to perform a broad range of tasks, which include the following:

- Design, plan and construct bridges, roads, buildings, aerodromes, wharves, jetties, water treatment and supply systems, sewage treatment and disposal systems;
- Carry out feasibility studies and ground investigations for engineering structures, design of foundations systems for bridges, buildings, wharves, roads, water and sewage treatment facilities;
- Plan, control, monitor construction operations and their effects on the environment, and management of assets and resources

UNDERGRADUATE COURSE

The course offered leads to the award of the degree of Bachelor of Engineering in Civil Engineering and it takes a minimum of four years to complete.

In the first year, students attend common lectures with students from the other Engineering Departments. In the subsequent three years students learn all aspects of Civil Engineering. However, in the final semester (second semester of fourth year) students choose and study any three fields of Civil Engineering in greater depth.

Being several professions under one name, the students in Civil Engineering learn the basic skills of Surveying, Water & Waste-water Engineering, Environmental Engineering, Geotechnical

Engineering, Transportation Engineering, Structural Engineering and Construction Management.

These broad-based course subjects are taught on an ascending level and are examined on a semester basis. Students are required to satisfy all requirements before proceeding onto the next semester.

ENTRY REQUIREMENTS

For admission into first year Civil Engineering the student must have completed grade 12 education or equivalent and must have scored the following grades (as shown on the original National High School Certificate):

- Grade “A” in Mathematics A
- Grade “A” in Physics, Chemistry and English

The minimum entry requirement for Post-graduate studies in Civil Engineering is an overall grading of “C” in the final year of undergraduate studies.

ADMISSION PROCEDURE

Students seeking admission into Civil Engineering should make their applications in the following modes:

Grade 12 School Leavers should enter Civil Engineering as their choice on the School-Leaver form and submit the form to their Guidance Officer in their School.

Non School-Leavers should write and obtain an Application for Admission Form from the Admissions Officer. The application form should be completed and submitted together with documented evidence of qualifications attained and academic recommendations and other requested references.

All applications for undergraduate study should reach the Registrar by August of each year.

Candidates seeking admission to undertake Post-graduate studies should write to the University Registrar for an application form. For an informal discussion prior to a formal application you may contact the HOD (Tel. 4734601).

POSTGRADUATE STUDIES

The Department also offers Post-graduate programmes leading to PG(Cert.) and PG(Dip.) awards. These courses are in modular form and are administered by the Civil Engineering Professional Services (CEPS) Unit.

M Eng and PhD Programs

Master of Engineering by research and Doctor of Philosophy (PhD) in Civil Engineering programs are offered to candidates who have successfully completed the undergraduate degree in Civil Engineering from PNG Unitech or an equivalent degree from a recognised university and accumulated at least 2 years of industry working experience. Masters of Engineering (in the appropriate field) by Research and PhD will be implemented commencing from 2010.

The entry requirements are as follows: Candidates with a grade point average (GPA) of between 70 to 84 percent for the four year undergraduate degree course are eligible to pursue a Masters of Engineering by research. Those with a GPA of 85 percent or above (i.e 1st Class honours students) can be admitted straight into the Doctor of Philosophy in Engineering by research program and graduates with a GPA from 50 to 69 percent can be admitted to do a post graduate diploma before progressing to a Master’s of Science in Engineering by coursework.

FACILITIES

The Civil Engineering Department is very well equipped for teaching and research and is housed in four main buildings and a separate workshop. Staff from the Departmental, are actively engaged in research in all major aspects of civil engineering covered in the course and maintain close contacts with industry and government departments.

The research subjects being investigated in the Department include Cable Stayed Bridges, Steel Structures, Timber Structures, Sewage Lagoons, Roads Pavement Materials, Earthquake Resistant Structures, Soil Properties, Disaster Research, Accident Analysis, Pavement Design, Cost-Benefit Criteria for Developing countries, Rural Water Supply and Sanitation and Waste Management.

For details of the research and investigation programme, the University's Research Report is available from the Library and published papers are also held in the Report Series.

Staff members are encouraged to act as consultants to industry and the government. The department also operates a laboratory to serve industry. The laboratory calibrates mechanical equipment such as testing machines, pressure and force measuring devices and torque wrenches. It also offers a comprehensive range of material testing for soils, concrete and metals.

EMPLOYMENT OPPORTUNITIES

Graduate Civil Engineers are widely employed in the community and examples of government associated employers are:

- Department of Works & Transport
- Department of Mining & Petroleum
- Department of Rural Development
- Electricity Commission (PNG Pawa)
- National Housing Corporation
- Civil Aviation Authority
- Environment & Conservation
- National Institute of Standards & Industrial Technology (NISIT)
- PNG Ports Authority
- Water Board
- Provincial & Local Level Governments
- Universities and Technical Colleges

In addition they are employed in the private sector in engineering consultancy, construction and contracting organisations, mining and petroleum industries and in manufacturing.

The course is recognized by the Institution of Engineers PNG (IEPNG) as fulfilling the educational requirement towards the Registration as a Professional Engineer

BACHELOR OF ENGINEERING CIVIL ENGINEERING

STRUCTURE OF COURSES

Code	Subject	Average Weekly Hours

HIGHER NATIONAL DIPLOMA IN CIVIL ENGINEERING

Year 1	First Semester	
MA167	Engineering Mathematics 1A	5
PH141	Principles of Physics 1	5
CH181	Chemistry for Engineers	2
LA101	Study Skills	3
ME161	Workshop Technology and Practice	3
CE171	Engineering Drawing 1	3
EE101	Introduction to Computing and Problem Solving 1	2
EE103	Electrical Circuit Theory	2
		25

Year 1	Second Semester	
MA168	Engineering Mathematics IB	5
PH142	Principles of Physics II	5
CH182	Chemistry for Engineers II	2
LA102	Reading and Writing	3
CE102	Civil Engineering Practice	3
CE172	Engineering Drawing II	3
EE102	Introduction to Computing and Problem Solving II	2
		23

Year 2	First Semester	
CE201	Computing I	2
CE211	Engineering Mechanics I	8
CE221	Engineering Materials I	3
CE231	Geotechnics I	3
CE241	Engineering Drawing I	3
SV291	Surveying for Engineers I	3
MA235	Engineering Mathematics II (A)	4
		26

Year 2	Second Semester	
CE202	Computing II	2
CE212	Engineering Mechanics II	8
CE222	Engineering Materials II	3
CE232	Geotechnics II	3
CE242	Engineering Drawing II	3
SV292	Surveying for Engineers II	3
MA236	Engineering Mathematics II (B)	4
		26

CE252	Survey Camp	10 days

Year 3	First Semester	
CE301	Surveying and Computations	4

CE311	Structural Analysis & Design I	4
CE321	Hydraulics & Hydrology	4
CE331	Geotechnics III	2
CE341	Transportation Engineering I	2
CE351	Construction Management I	2
CE371	Civil Engineering Technology	5
MA335	Mathematics III CE	3
		26

Year 3 Second Semester:

CE302	Drawing and Design	7
CE312	Structural Analysis I	4
CE322	Engineering Hydraulics	6
CE332	Geotechnics IV	3
CE342	Transportation Engineering II	3
CE352	Construction Management II	3
		26

CE362	Construction Methods Field Trip 5 days	

Year 4 First Semester

CE401	Structural Design	2
CE411	Structural Analysis II	4
CE421	Environmental Engineering I	5
CE431	Geotechnics V	3
CE441	Transportation Engineering III	3
CE451	Construction Management III	4
CE461	Civil Engineering Project I	3
LA301	Advanced Academic Research Skill	3
		27

CE471	Industrial Field Trip	5 days

Year 4 Second Semester

CE462	Civil Engineering Project II	5

Electives: Three only from the following:

CE412	Structural Analysis & Design II	5
CE422	Environmental Engineering II	5
CE432	Geotechnics & Pavement Design	5
CE442	Transportation Engineering IV	5
CE452	Construction Management IV	5
CE472	Mechanics of Deformable Solids	5
CE482	Coastal Engineering	5
CE492	Bridge Engineering	5
		20

CE400	Civil Engineering Practice1	2 weeks

SUBJECTS TAUGHT BY THE DEPARTMENT

CE171	Engineering Drawing I
CE102	Civil Engineering Practice
CE172	Engineering Drawing II
CE201	Computing I
CE202	Computing II
CE211	Engineering Mechanics I
CE212	Engineering Mechanics II
CE221	Engineering Materials I
CE222	Engineering Materials II
CE231	Geotechnics I
CE232	Geotechnics II
CE241	Engineering Drawing I
CE242	Engineering Drawing II
CE252	Survey Camp
CE301	Surveying and Computations
CE302	Design and Drawing
CE311	Structural Analysis & Design I
CE312	Structural Analysis I
CE321	Hydraulics & Hydrology
CE322	Engineering Hydraulics
CE331	Geotechnics III
CE332	Geotechnics IV
CE341	Transportation Engineering I
CE342	Transportation Engineering II
CE351	Construction Management I
CE352	Construction Management II
CE362	Construction Methods Field Trip
CE371	Civil Engineering Practice
CE400	Civil Engineering Practice
CE401	Structural Design
CE411	Structural Analysis II
CE412	Structural Analysis & Design II
CE421	Environmental Engineering I
CE422	Environmental Engineering II
CE431	Geotechnics V
CE432	Geotechnics & Pavement Design
CE441	Transportation Engineering III
CE442	Transportation Engineering IV
CE451	Construction Management III
CE452	Construction Management IV
CE461	Civil Engineering Project I

CE462	Civil Engineering Project II
CE471	Industrial Field Trip
CE472	Mechanics of Deformable Solids
CE482	Coastal Engineering
CE492	Bridge Engineering

CE 171: ENGINEERING DRAWING I (A)

Hours per week: 3(1/2)

Objectives:

Upon completion of this subject, the student should be able to:

Read, understand and produce simple engineering drawings using engineering standards and conventions;

Read, understand and apply different projections to engineering drawings including orthogonal, oblique and isometric projections;

Make freehand sketches of engineering shapes;

Apply dimensions to views.

Syllabus:

Introduction to engineering drawing; geometry of lines, planes and solids; geometric constructions; tangency, polygons, ellipses; freehand sketching; oblique and isometric drawings; visualisation practice; orthogonal projections in first and third angle; sectioning; dimensioning.

Textbook:

Geotsch, D.L., Nelson, J.A. and Chalk, W.S., (1994), Technical Drawing, 3rd Edition, Delma Publishers Inc.

Assessment:

Continuous Assessment - 100%

CE 172: ENGINEERING DRAWING I (B)

Hours per week: 3(1/2)

Prerequisite: CE 171

Objectives:

Upon completion of this course, the student should be able to:

Understand and apply the concepts of limits, fits and tolerances;

Draw pictorial drawings;

Draw assembly drawings, detail drawings using standards and conventions;

Apply Computer Aided Drafting (CAD) techniques.

Syllabus:

Limits and fits; simple detail and assembly drawings; perspective drawing; welding symbols; pipe and structural drawings; electrical and electronic drafting symbols, circuit diagrams, printed circuit diagrams; standard and conventions; introduction to computer aided drafting.

Textbook:

Geotsch, D.L., Nelson, J.A. and Chalk, W.S., (1994), Technical Drawing, 3rd Edition, Delma Publishers Inc.

Assessment:

Continuous Assessment - 100%

CE 102: CIVIL ENGINEERING PRACTICE

Hours per week: 3(2/1)

Objectives:

Upon completion of this subject the student should be able to:

1. Understand basic aspects of Civil Engineering

2. Understand different types of loads considered in the construction of simple structures.

3. Understand different materials used in Civil Engineering construction and the importance of form work in construction

4. Understand the importance of shape, size and materials used for different structural elements

5. Understand the main constituents of concrete and its properties

Understand the importance of Structures, Soil, Transportation, Fluid Mechanics and Environmental Engineering.

Syllabus:

Engineer in society:

Nature of Civil Engineering, Social and environmental responsibilities, Project

justification.

Introduction to structural engineering:

Nature of types of loads on structures: dead, live, wind and earthquake loads; distribution of dead and live loads to different elements of simple structures.

Materials used in building construction: timber, steel, concrete and block masonry.

Different types of steel sections: Universal beams, columns and channels (parallel flanges and tapered flanges); purlins, plates, built-up sections, circular and hollow sections.

Types of reinforcing bars: plain and deformed bars, their grades and uses.

Requirements for form work in concrete construction assembly, removal and plumbing.

Introduction to soil engineering:

Importance of foundations, Nature and classification of soils, Soil testing.

Introduction to transportation engineering:

Construction and maintenance of roads, airports and harbours, Introduction to traffic engineering and road safety

Introduction to Fluid Mechanics and Environmental Engineering:

Fluid properties, Hydraulic structures, Environmental pollution and prevention, Public health, Importance of water and waste treatment.

References:

PNGS1001 (1982), Part 1 to Part 4, Design Loadings for Buildings, PNG Standards Council (NISIT).

Jackson, N. and Dhair, R.K. (1996), Civil Engineering Materials, 5th Edition, MacMillan.

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1 x 3 hours)

CE 201: COMPUTING 1

Hours per week: 2

Objectives:

On completion of this subject, the student should be able to:

1. Use of a personal computer;
2. Input and output data;
3. Formulate and program simple engineering problems.

Syllabus:

TruBasic and MS-DOS. The TruBasic Editor Input and Output Sequential Logic Decision Structures. IF..THEN, IF..THEN..ELSE, SELECT CASE Repetition Structures. FOR NEXT loops, DO loops. Projects of increasing complexity.

The course introduces the above features of the TruBasic language and applies them to typical problems confronting the engineer. A "hands on" approach will be adopted and students will be working directly on the computer from the outset. Students are required to provide themselves with two floppy discs for their programs.

Textbook:

Davis, William S. (1986), True Basic Primer, Addison Wesley, California.

Assessment:

Continuous assessment - 100%

CE 202: COMPUTING II

Hours per week: 2

Prerequisite: CE 201

Objectives:

On completion of this subject, the student should be able to:

1. Formulate and program more advanced problems;
2. Build a suite of programs which will be useful in other courses;
3. Model a real engineering problem on the computer.

Syllabus:

Continuation of the work of CE201 and the

following further topics: Functions and Subroutines. Subscripted variables. Matrix manipulation. String variables and string manipulation. Graphics. A major project.

Textbook:

Davis, William S. (1986), True Basic Primer, Addison Wesley, California.

Assessment:

Continuous assessment - 100%

CE 211: ENGINEERING MECHANICS I

Hours per week: 8 (4/4)

Objectives:

The primary purpose of studying engineering mechanics is to develop the capacity to predict the effects of force and motion.

On completion of this subject, the student should be able to:

1. Apply the basic principles and methods of Engineering Mechanics;
2. Solve determinate problems by using the equations of static equilibrium in one, two and three dimensions;
3. Apply concepts learned in the Mathematics courses to the development of formulae and the solution of Engineering problems;
4. Represent Engineering structures as models for the purpose of analysis;
5. Explain the basic concepts of fluid properties;
6. Discuss the theoretical concepts essential to hydraulic engineering;
7. Calculate forces due to fluids at rest and in motion;
8. Analyse simple flow measurement structures.

Syllabus:

Part A - Statics of rigid bodies:

The equations of equilibrium for a rigid body. Types of support. Force analysis of pin-jointed plane and space frames using the method of sections and tension coefficients. Shear force and bending moment. Shear force and bending moment diagrams. Relations between load, shear and

bending moment. Use of singularity functions to express beam loads. Influence lines for shear force and bending moment in beams. The Muller-Breslau Model Principle. The three-pinned arch. Suspension cables.

Part B - Mechanics of Fluids:

Properties of fluids. Hydrostatic pressure. Force on submerged surfaces. Buoyancy and stability of floating objects. Conservation of matter and energy. Ideal fluid. Bernoulli equation. Pressure measurement: piezometers, pitot tubes and manometers.

Flow measurement: venturi meter, orifices, sharp-edged weirs. Momentum equation. Force on a nozzle.

Force on a pipe bend.

Textbooks:

Young, B.W., (1992), Essential Solid Mechanics, 2nd Edition, University of Technology, Lae.

Webber, N.B., (1985), Fluid Mechanics for Civil Engineers, 3rd Edition, Chapman and Hall, London.

Assessment:

Continuous assessment - 50%

Written examination - 50% (1 x 3 hrs)

CE 212: ENGINEERING MECHANICS II

Hours per week: 8(4/4)

Objectives:

The primary purpose of studying engineering mechanics is to develop the capacity to predict the effects of force and displacements.

After completing this subject, the student should be able to:

1. Apply the basic principles and methods of Engineering Mechanics;
2. Solve indeterminate problems by the satisfaction of the requirements of equilibrium and compatibility linked by a knowledge of the material characteristics;

3. Apply concepts learned in the Mathematics courses to the development of formulae and the solution of Engineering problems;
4. Represent Engineering structures as models for the purpose of analysis;
5. Gain an understanding of the relationship between flow regimes, energy losses and stresses in pipes;
6. Design simple pipe systems conveying both Newtonian and non Newtonian fluids;
7. Explain elementary hydrodynamics and appreciate the use of such concepts in hydraulic engineering design.

Syllabus:

Part A - Mechanics of Solids:

Normal stress and strain. Hooke's Law and stress-strain relationship. Young's modulus. Poisson's ratio. Thin cylinders and spheres. Bulk modulus. Relationship between E , K and ν . Statically indeterminate systems. Compatibility and material characteristics. Thermal effects in compound bars. Shear stress. Complementary Shear stress. Shear strain. Torsion of solid and hollow circular shafts. The Bernoulli Euler theory of bending. Second moment of area. Composite beams. Combined bending and direct stress. Deflexion of beams. Solution of the deflection equation by integration of the load function. Mohr's theorems; the moment-area method. superposition. columns. Biaxial stress and strain. Mohr's circle for stress. Maximum shear stress under plane stress conditions. A relationship between E , G and ν .

Part B - Mechanics of Fluids:

Laminar and turbulent flow in pipes. Shear stress in a pipe. Poiseuille's equation for laminar flow in pipe. Darcy's law for head loss in a pipe. Dimensional analysis and similarity of flows. Reynolds number and friction factors. Total head and pressure lines. Head losses in pipe systems. Siphons, cavitation. Boundary layers. Velocity distributions. Momentum correction factor.

Textbook:

Young, B.W., (1992), Essential Solid Mechanics, 2nd Edition, University of Technology, Lae.
Webber, N.B., (1985), Fluid Mechanics for Civil

Engineers, 3rd Edition, Chapman and Hall, London.

Assessment:

Continuous assessment - 50%
Written examinations - 50% (1 x 3 hrs)

CE 221: ENGINEERING MATERIALS I

Hours per week: 3(1/2)

Objectives:

On completion of this subject, the student should be able to:

1. Explain the mechanical properties of Steel, Timber, Aluminium and Composites. This also includes verification by testing program.
2. Discuss the material effects and their evaluation due to fatigue and creep.

Syllabus:

Introduction to properties and applications of engineering materials. Deformation, strength characteristics. Testing methods. In-service behaviour. Steel: Manufacturing process: fabrication; mechanical properties; welding; corrosion and prevention. Timber, Physical and mechanical properties; principles of construction; decay and preservation; plywood. Aluminium: Composite materials.

Textbooks:

Jackson, N., and Dhir, R.K., (Editors) (1996), Civil Engineering Materials, 5th Edition MacMillan,

Assessment:

Continuous assessment - 40%
Written examination - 60% (1 x 3 hrs)

CE 222: ENGINEERING MATERIALS II

Hours per week: 3(1/2)

Objectives:

On completion of this subject, the student should

be able to:

1. Discuss the properties and manufacture of Portland cement, aggregate production and classification. This also includes verification by testing program;
2. Undertake a mix design to manufacture a specified strength concrete;
3. Explain the techniques applied to adequately mature concrete and maintain durability and strength;
4. Carry out a formwork design to sustain wet concrete pressure.

Syllabus:

Cement, Aggregates, and Concrete. Cement: Manufacture of Portland cement, physical and chemical properties of Portland cement. Different types of cement and their chemical composition.

Aggregates: Production methods of different sizes of aggregates. Grading and combination. Moisture content in aggregates.

Concrete: Setting and hardening process. Water cement ratio and strength development. Workability and consistency. Manufacture and field control of concrete. curing of concrete and volume changes.

Permeability and durability. Admixtures.

Textbook:

Jackson, N., and Dhir, R.K., (Editors) (1996), Civil Engineering Materials, 5th Edition, MacMillan.

Assessment:

Continuous assessment - 40%
Written examination - 60% (1 x 3 hrs)

CE 231: GEOTECHNICS I

Hours per week: 3 (1/2)

Objectives:

To provide students with basic knowledge of geology and the geology of Papua New Guinea. On completion of the subject, the student should be able to:

1. Explain the geological history of the earth;
2. Classify various rock formations;

3. Discuss geological structures;
4. Discuss geological maps;
5. Outline the geology of Papua New Guinea.

Syllabus:

Earth materials and processes; introduction to rock forming mineral; identification of hand specimens; identification and classification of igneous, sedimentary and metamorphic rocks; weathering processes and products; plate tectonics; earthquakes and volcanoes; volcanism; structure and history of the earth; fossils and stratigraphic record.

Structural geology and geomorphology; deformation, folding and jointing of rocks; impact of rock type and structure on surface features. Geological mapping techniques. Geology of Papua New Guinea.

Textbooks:

Blyth.F.G.H., and DeFreitas, M.H.,A., (1984), Geology for Engineers, 7th Edition, ELBS with Edward Arnold, London.

Assessment:

Continuous assessment - 40%
Written examination - 60% (1 x 3 hrs)

CE 232: GEOTECHNICS II

Hours per week: 3/(1/2)

Objectives:

Upon completion of this subject, the student should be able to:

1. Identify, describe and classify soils according to the Unified Soil Classification System;
2. Appreciate the concept of plasticity and consistency of fine grained soils;
3. Explain the phase relationships of soil, clay minerals, capillarity and suction in soils;
4. Appreciate density-water content relationships of soils as well as the influence of soil fabric on other soil properties and the concept of soil strength in terms of the California Bearing Ratio (CBR).

Syllabus:

Formation, identification and Description of Soils. Field and laboratory identification procedures. Soil Classification systems. Consistency and grading parameters. The Unified soil classification system. Soil as a three phase medium. Soil-water-air relationships. Introduction to clay minerals. Capillarity and suction in soils. Compaction characteristics, soil fabric and their influence on soil properties. The concept of strength in terms of California Bearing ratio.

Textbook:

Craig R.E., (1992), Soil Mechanics, 5th Edition, ELBS with Chapman and Hall.

Reference:

Smith, M.J. (1992), Soil Mechanics, 6th Edition, ELBS with Longman, Essex.

Assessment:

Continuous assessment - 40%
Written examination - 60% (1 x 3 hrs)

CE 241: ENGINEERING DRAWING I

Hours per week: 3

Objectives:

On completion of this subject, the student should be able to:

1. Discuss solid geometry and development;
2. Explain the concept of auxiliary views;
3. Explain civil engineering codes of practice and detailing drawings;
4. Read and use contour plans for road designs;
5. Produce perspective drawings.

Syllabus:

This subject basically introduces students to the Civil Engineering Drawing practices and principles. subjects covered include:- Review of Solid Geometry and Development. Property of Conics-Circle, Elipse, Parabola & Hyperbola. Auxiliary Views. General Sections and conversion to Civil Section. Codes of Practice for Engineering

drawing and Detailing. Structural engineering Drawings - reinforced Concrete, steel & Timber. Contours - Scales, Cross Sections & Long Sections. basic Perspective - One, Two and Three Point Perspective.

Textbook:

Bond G., (1982), Civil Engineering Drafting, University of Technology, Lae.

Assessment:

Continuous assessment - 100%

CE 242: ENGINEERING DRAWING II

Hours per week: 3(1/2)

Objectives:

On completion of this subject, the student should be able to:

1. Undertake simplified geometric designs of road and also determine earth work quantities;
2. Read and produce basic geological maps;
3. Complete detail structural drawings.

Syllabus:

This part of the course will concentrate on developing students drafting skills mainly through project work involving the following areas; Road Alignment including Longitudinal and Cross Sections from Contours. Geological Mapping and Sections.

Textbook:

Bond, G., (1982), Civil Engineering Drafting, University of Technology, Lae.

Assessment:

Continuous assessment - 100%.

CE 252: SURVEY CAMP

Duration: 10 Days

Objective:

At the completion of this camp, students will be

able to apply surveying techniques in the measurement and setting out of simple civil engineering projects.

Syllabus:

Field work: 5 days, comprising traverse survey, detail survey, contour levelling, levelling for longitudinal profile and cross sections of a road.

Office work: 4 days, calculations and plotting a detail plan, contour plan, longitudinal profile and cross sections.

Assessment of practical and theoretical skills acquired.

Assessment:

Continuous assessment - 100%

CE 301: SURVEYING & COMPUTATIONS

Hours per week: 4

Objectives:

On completion of this subject, the student should be able to:

1. Calculate the components of and setting out details for horizontal and vertical curves;
2. Understand the uses of photogrammetry in civil engineering projects;
3. Explain the types of photogrammetric procedures and products available;
4. Interpret aerial photographs using stereoscopes and determine relative and absolute heights from photographs by stereoscopic parallax measurement and radial displacement;
5. Calculate photo coverage for project flight planning;
6. Explain the various ways in which the spread sheet software; Excel, can be used to solve engineering problems;
7. Write programs using Access to create data bases and also interrogate data;

Syllabus:

Part A - Surveying:

Setting out engineering works with tapes, theodolite and tapes or EDM instruments.

Excavation control.

Calculation and setting out of horizontal and vertical curves.

Photogrammetry for civil engineering works: basic principles, uses in engineering. Taking photographs and dark room procedures. Types of aerial photography. Photo indexes, mosaics, orthophoto-plans. Scale calculations, radial displacement, photo interpretations for civil engineers. Stereoscopic viewing, parallax and height measurements on aerial photographs.

Part B - Computations:

Excel spreadsheet programming for civil engineers - Introduction to spreadsheets, use of transfer and utility functions, production of charts and graphs, Statistical and Matrix Analyses, Macros, Database programming for civil engineers - Introduction to databases, Interrogation of data.

Textbooks:

Liengme, B.V. (1997), A Guide to Microsoft Excel for Scientists and Engineers, Arnold.

Price, W.F., (1978), Surveying for Engineers, Macmillan, London.

Puvanachandran, V.M. and Hossain, A., (1999), Course Notes on Excel and Access for Civil Engineers, PNG Unitech.

Assessment:

Continuous assessment - 100%.

CE 302: DESIGN AND DRAWING

Hours per week: 7(2/5)

Prerequisite: CE 301

Objectives:

On completion of this subject, the student should be able to:

1. Acquire basic understanding of the behaviour of timber steel and concrete structures and to develop necessary skills for the design of structural elements;

2. Acquire basic understanding in the reading and interpretation of structural drawings and to draw simple structural drawings;
3. Develop skills in the use and interpretation of code clauses in structural design.

Syllabus:

Part A - Concrete Design:

Properties of structural concrete and reinforcing steel. Behaviour of reinforced concrete sections - under-reinforced, balanced and over reinforced. Design of singly and doubly reinforced concrete sections including shear, bond and anchorage. Design of one way and two way concrete slabs. Design of axially loaded columns and introduction to load moment interaction curves.

Part B - Steel Design:

Properties and grades of structural steel, steel sections. Design of tension members. Design of axially and eccentrically loaded columns including the load moment interaction equation. Design of beams for bending, shear, stiffeners, web buckling and web crushing etc. Design of built-up sections - plate girders etc. Introduction to bolted and welded joints. Design of axially loaded bolted and welded joints.

Part C - Design and Drawing Projects:

Design and Drawing projects in structural engineering including quantity estimation.

Projects:

Complete design and drawing of a concrete retaining wall and timber weir.
Design and installation of a steel culvert in a stream.
Complete design and drawing of a steel truss.

Textbooks:

Warner, Rangan, Hall and Faulkes (1999 or Latest edition), Concrete Structures, Published by Addison Wesley Longman Australia Pty Ltd, South Melbourne.

Gorenc, B, Tinyou, R and Syam, A. (2005) Steel Designers' Handbook, 7th Edition, UNSW Press, Sydney Australia.

YK Telue (2009), Limit State Design of Steel

Structures in PNG, Department of Civil Engineering, PNG University of Technology ISBN 9980-56-010-X

References:

PNGNISIT, (1983), PNGS1002-1982, Reinforced Concrete Structures, PNGNISIT, Port Moresby.

PNGNISIT, (1983), PNGS1003-1982, Steel Structures, PNGNSC, Port Moresby.

Australian Standard AS 3600-2001 Concrete Structures

Australian Standard AS 4100-1998 Steel Structures

Assessment:

Continuous assessment

Part A: - 13%

Part B: - 13%

Part C: - 30%

Written examination

Parts A: - 22%

Part B: - 22%

CE 311: STRUCTURAL ANALYSIS AND DESIGN I

Hours per week: 4(2/2)

Prerequisite: CE 212

Objectives:

Part (A):

On completion of this subject, the student should be able to:

1. Carry out force and deflexion analysis for a statically indeterminate beams;
2. Carry out force and deflexion analysis for rigidity jointed frames;
3. Acquire basic understanding of load distribution in system favouring structural elements and develop necessary skills to design structural elements in timber.

Syllabus:

Part A - Analysis:

Force analysis of statically indeterminate beams using the moment area method; beams of non-

uniform section. The slope-deflexion method for the analysis of rigid plane frames. Unit operations for rotation and sway. Fixed end moments. The unit operations table. Equilibrium equations. Matrix formulation. Moment distribution.

Part B - Design:

Functions of a structural designer. Load types - D.L., L.L. Wind loads and Earthquake loads and brief introduction to the Codes of Practice. Load paths and distribution of loads to different members.

Design of timber beams, columns, tension members, simple truss and structural connections using the PNG Timber Code. Introduction to lateral load resisting elements in timber structures. Use of plywood and glue-laminated timber in structural construction.

Textbooks:

Coates, Coutie and Kong, (1992), Structural Analysis, 3rd Edition, Chapman and Hall, London.

Russell.C. Hibbeler, (2005), Structural Analysis, SI Edition, Prentice and Hall Pearson Education South Asia Pte Ltd, Singapore.

PNGSC (1985), Draft PNG Timber Structures Code.

Assessment:

Part A

Continuous Assessment - 25%

Written examination - 25% (1 x 3 hrs)

Part B

Continuous Assessment - 50%

CE 312: STRUCTURAL ANALYSIS I

Hours per week: 4(2/2)

Prerequisite: CE 312

Objectives:

On completion of this subject, the student should be able to:

1. Formulate the fundamental equations for force equilibrium, compatibility and material properties using virtual work;
2. Illustrate the power and subtlety of virtual work in structural analysis;
3. Gain an understanding of matrix stiffness analysis based on a virtual work approach.

Syllabus:

Stiffness and flexibility methods of analysis. Application to pin-jointed frames. Virtual work. The Maxwell-Betti theorem. Matrix formulation of the statement of virtual work, compatibility, equilibrium and material characteristics. Stiffness and flexibility methods. The displacement transformation matrix and the system stiffness equation. Application to pin-jointed frames.

Textbook:

Coates, Coutie & Kong, (1992), Structural Analysis, 3rd Edition, Chapman and Hall, London.

Russell.C. Hibbeler, (2005), Structural Analysis, SI Edition, Prentice and Hall Pearson Education South Asia Pte Ltd, Singapore

Assessment:

Continuous assessment - 40%

Written examination - 60% (1 x 3 hrs)

CE 321: HYDRAULICS & HYDROLOGY

Hours per week: 4(2/2)

Objectives:

On completion of this subject the student should be able to analyse and design simple open channels, pumping stations and hydro-power stations.

Explain the hydrological cycle and its influence on water resources.

Syllabus:

Hydrology

Hydrological cycle, meteorological data, evaporation, precipitation, infiltration, ground water flow, hydrographs, flood prediction, flood routing, storm sewerage, flow measurement in

rivers, and drainage design.

Hydraulics

Uniform flow in open channels, Mannings equation. Critical velocity. Broad-crested weirs, venturi flumes. Rapid and tranquil flow, Froude number. Gradually varied flow. Energy and power. Types of pump and turbine. Momentum equation in the design of impellers. Similarity laws, specific speed. Performance of pumps, efficiency. Use of pumps and turbines.

Textbook:

Webber, N.B., (1985), Fluid Mechanics for Civil Engineers, Chapman and Hall, London.
Wilson, E.M., (1983) Engineering Hydrology, 3rd Edition, Macmillan.

Assessment:

Continuous assessment - 40%
Written examinations - 60% (1 x 3 hrs)

CE 322: ENGINEERING HYDRAULICS

Hours per week: 6(3/3)

Objectives:

On completion of this course the student should be able to:

1. Explain basic wave theory;
2. Design for water hammer, hydraulic jumps and ocean waves;
3. Discuss theoretical hydrodynamics, hydraulic modelling and two dimensional flow at an intermediate level;
4. Solve simple problems related to flow through aquifers, drag forces on bridge piers and boundary layers;
5. Analyse water distribution networks.

Syllabus:

Pipe network analysis Hardy Cross method, Branch networks. Least cost design, use of spread sheets in pipe network design. Surge waves. Hydraulic jump. design of culverts. Surge tanks. Water hammer. Stream function and velocity potential functions. Separation of boundary layers,

wakes. Drag forces. Drag coefficients.

Wind forces on structures. Pressure in a liquid subject to acceleration. Free vortex, forced vortex. Waves. Models.

Textbook:

Webber, N. B., (1985), Fluid Mechanics for Civil Engineers, Chapman and Hall, London.

Assessment:

Continuous assessment - 40%
Written examination - 60% (1 x 3 hrs)

CE 331: GEOTECHNICS III

Hours per week: 2(1/1)

Objectives:

The student should be able to perform the following tasks on completion of this subject:

1. Explain the relationship between total, elevation and pressure heads, and solve two dimensional seepage problems including flow across discontinuity's;
2. Discuss the application of seepage to problems related to earth dams;
3. Develop an appreciation of the concept of effective stress and employ this concept to evaluate total and effective stresses within a soil mass;
4. Analyse two dimensional stress problems using Mohr Circle of stresses;
5. Explain the Mohr-Coulomb failure criterion and its application to soils;
6. Discuss the differences in behaviour of normally consolidated and over-consolidated materials;

Syllabus:

Permeability and structural properties of soils. Total head, pressure head and elevation head. The concept of hydraulic gradient and hydraulic conductivity. Two dimensional seepage problems. Application of Darcy's law. Well formulae. Construction of flow nets in homogeneous isotropic soils. Seepage in anisotropic and non-homogeneous soils. Flow nets

in homogeneous earth dams and thin core dams. Piping failure in dams and filter requirements. Control of under seepage in dams. Stress analysis and Mohr circle of stresses. Principal planes, principal stresses and shear stresses. Introduction to stress paths. Pore pressure and the principle of effective stress. Mohr coulomb failure criterion. Pore pressure parameters. Normally consolidated and over consolidated soils. Effect of over consolidation ratio on soil behaviour.

Textbooks:

Smith G.N. and Smith, Ian G.N., (1998), Elements of Soil Mechanics, 7th Edition, Blackwell Science Ltd, Melbourne.

Craig R.F., (1992), Soil Mechanics, 5th Edition, ELBS with Chapman & Hall

Assessment:

Continuous assessment - 40%

Written examination - 60% (1 x 3 hrs)

CE 332: GEOTECHNICS IV

Hours per week: 3(1/2)

Objectives:

On completion of this subject, the student should be able to:

1. Use elastic solutions (in the form of equations and charts) to evaluate stress changes within a soil mass due to the application of an external load;
2. Determine immediate and one dimensional consolidation settlements in a soil;
3. Reduce laboratory data with respect to consolidation tests;
4. Determine active and passive earth pressures on retaining structures using Rankine and Coulomb earth pressure theories and the stability of retaining wall systems.

Syllabus:

Settlement of elastic solids and the coefficient of volume compressibility. Stress transmission in soils. Boussinesq's solution. Newmark's chart, simplified approximations to vertical stress

distribution and the principle of superposition. Drainage, settlement and the theory of consolidation. One dimensional consolidation settlement, degree of consolidation and rate of settlement. The oedometer and laboratory determination of consolidation parameters. Pre consolidation pressure and constitutive behaviour of normally and over consolidated clays. Primary and secondary consolidation.

At rest, active and passive earth pressures. Rankine earth pressure theory. Stability of retaining walls including effects of surcharge and drainage. Retaining walls with sloping backfill. Coulomb's earth pressure theory allowing for friction between wall and backfill. Introduction to soil-structure interaction.

Textbook:

Smith G.N. and Smith, Ian G.N., (1998), Elements of Soil Mechanics, 7th Edition, Blackwell Science Ltd, Melbourne

Craig R.F., (1992), Soil Mechanics, 5th Edition, ELBS with Chapman & Hall

Reference:

Smith M.J., (1992), Soil Mechanics, 5th Edition, ELBS with Longman, Essex,

Assessment:

Continuous assessment - 40%

Written Examination - 60% (1 x 3 hrs)

CE 341: TRANSPORTATION ENGINEERING I

Hours per week: 2(1/1)

Objectives:

On completion of his subject, the student should be able to:

1. Explain the fundamental characteristics of land, water, and air transport systems;
2. Compute road traffic loads for the design of road pavements using Road Note 31;
3. Compute aircraft traffic loading for the design of airstrips and airport pavements;
4. Design airstrips and airport pavements;

5. Discuss engineering characteristics of sub-grade, sub-base, and base materials required for optimal performance of pavements;
6. Measure engineering characteristics of bituminous materials using standard experiments;
7. Design bituminous pavement surfacing using the Marshall method;
8. Explain the effect of water on road materials and the importance of effective drainage;
9. Discuss various methods of pavement maintenance;
10. Explain the concept of stage construction and design pavement overlays using results from a benkleman beam survey;
11. Discuss different methods of constructing low cost roads relevant to Papua New Guinea.

Syllabus:

Introduction to land, sea and air transport. Traffic volumes and Equivalent Standard axles. Granular and bituminous pavement materials. Flexible pavement design. Airstrips and airport pavement. Stage construction and overlays. Highway drainage. Low cost roads. Highway maintenance.

Textbook:

Rao, G.V., (1996), Principles of Transportation and Highway Engineering, Tata McGraw-Hill Publishing, New Delhi.

Transport and Road Research Laboratory, TRRL, (1977), Road Note 31 - A Guide to the Structural Design of Bitumen - Surfaced Roads in Tropical and Sub-tropical Countries, HMSO, London.

Assessment:

Continuous assessment - 40%
Written examination - 60% (1 x 3 hrs)

CE342: TRANSPORTATION ENGINEERING II

Hours per week: 3(1/2)

Objectives:

On completion of this subject, the student should be able to:

1. Discuss the process of locating a new road taking into consideration the impact on established settlements, land uses, and the environment;
2. Undertake the geometrical design of roads in accordance with the PNG Department of Works Design Manual;
3. Produce engineering drawings of the horizontal alignment, vertical alignment, and cross sections for use in road construction;
4. Compute setting out data for vertical and horizontal curves;
5. Compute earthwork volumes;
6. Discuss the three dimensional nature of road design problem;
7. Compile the above information to produce design reports.

Syllabus:

Road classification and function. Land acquisition. Highway location surveys. Horizontal and vertical alignment. Sight distance. Longitudinal and cross sections. Horizontal curves, transition curves, and vertical curves. Super-elevation. Widening. Earthworks and quantities.

Textbook:

Department of Works, (1982), PNG Road Design Manual, DOW, Port Moresby.

Assessment:

Continuous assessment - 100%

CE 351: CONSTRUCTION MANAGEMENT I

Hours per week: 2(1/1)

Objectives:

On completion of this subject, the student should be able to:

1. Discuss a financial management system in the context of construction practices. This includes capabilities to understand and analyse statement of accounts;
2. Explain construction documents, be familiar with construction equipment and site management;

3. Measure site productivity and costing of construction tasks;
4. Apply investment/project appraisals in the light of time value of money.

Syllabus:

Company finance loans and equity. Risk and return. Profit and loss statements, balance sheet. Financial assessment of projects. Time value of money, cost and benefits. Construction documents - contracts, conditions of contract, specifications, bill of quantities. Work costing - cost of labour, plant, materials, overheads and profits.

Textbook:

Harris, H and McCaffer, R., (1989), Modern Construction Management, 3rd Edition, Blackwell Scientific Publications, Oxford.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hrs)

CE 352: CONSTRUCTION MANAGEMENT II

Hours per week: 3(2/1)

Objectives:

On completion of this subject, the student should be able to:

1. Explain and be able to apply planning technique for projects;
2. Prepare project cash flow forecasting;
3. Explain quality control aspects in work practices.

Syllabus:

Project planning - bar charts and net work analysis. Cost and revenue models. Cash flows, continuous planning. Line of balance technique. Records of construction, performance estimation. Quality control - sampling theory. Uncertainty and risk - single and multi stage decision problem. construction equipment. Different types of construction equipment and engine types.

Textbook:

Harris, H and McCaffer, R., (1989), Modern Construction Management, 3rd Edition, Blackwell Scientific Publications, Oxford.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hrs)

CE 362: CONSTRUCTION METHOD FIELD TRIP

Duration: 5 Days

Objective:

To expose students beyond the classroom teaching to practical techniques used in construction and to develop skills necessary for implementation of projects.

Syllabus:

Examination and evaluation of construction methods, the equipment used and the planning method adopted at construction sites in various parts of the country.

Assessment:

Report - 100%

CE 371: CIVIL ENGINEERING TECHNOLOGY

Hours per week: 5(1/4)

Objectives:

On completion of this subject the students should be able to:

1. conduct laboratory and in-situ tests for investigation and quality control monitoring associated with civil engineering works.
2. know and use relevant manuals for specific tests in civil engineering related work
3. carry out simple analysis and design of civil engineering structures
4. appreciate the usefulness of water and its relationship to public health and sanitation.

5. plan, set up, supervise and manage civil engineering construction work.

Syllabus:

Project concept and investigation, preliminary design; application of civil engineering principles drawn from Fluid Mechanics, Solid Mechanics, Geotechnical, Transportation and Structural Engineering

Public Health: Water and public health, Water quality, sources of water, pit latrines, septic tanks

Construction Management and Surveying setting up, and computations; Detailed design and preparation of construction and contract documents; Project planning and implementation including setting out and on-site construction; Quality control monitoring, conduct of relevant field and laboratory tests.

Textbook:

Holmes, R., (1995), Introduction to Civil Engineering Construction, Third Edition, College Estate Management, London.

References:

Laboratory Testing Procedures and Field Testing Manuals on various Civil Engineering disciplines

Assessment:

Continuous assessment - 100%

CE 400: CIVIL ENGINEERING PRACTICE

Duration: 12 weeks

This subject consist of twelve weeks of industrial training which the students undertake during holidays while following the undergraduate course.

Objectives:

On completion of this industrial training, the student should be able to:

1. Discuss the working environment in industry;
2. Explain the process of finding solutions to engineering problems using concepts learned in the classroom.

Syllabus:

Every student is required to obtain at least twelve weeks employment in the area of Civil engineering before graduation.

The students are expected submit a written report giving the details of the employers, nature of training and period of employment. The training programme has to be approved by the Department before Graduation.

Mature students sponsored by Civil engineering consultants/companies may be granted exemption from this course.

Assessment:

Report - 100%

CE 401: STRUCTURAL DESIGN

Hours per week: 2(1/1)

Prerequisite: CE 301, CE 302

Objectives:

On completion of this subject, the student will be able to:

1. Acquire basic understanding of the behaviour of bolted and welded joints in structural steelworks and to develop skills for their design;
2. Explain the behaviour of structural members subjected to unsymmetrical bending and to design roof purlins for flat and inclined roof trusses;
3. Discuss the behaviour of bi-axially loaded concrete columns and to undertake design;
4. Explain the procedure for calculating wind and earthquake loads for simple structures using PNG codes.
5. Discuss the behaviour of isolated column footings and combined footings.

Syllabus:

Design of eccentrically loaded bolted and welded joints. Design roof purlins. Design of biaxially loaded concrete columns, use of load moment interaction curves. Design of footings - axially and eccentrically loaded, combined footings. Brief

introduction to the wind and earthquake loadings code. Design of retaining walls.

Textbooks:

Gorenc, B, Tinyou, R and Syam, A. (2005) Steel Designers' Handbook, 7th Edition, UNSW Press, Sydney Australia.

Warner, Rangan, Hall and Faulkes (1999 or Latest edition), Concrete Structures, Published by Addison Wesley Longman Australia Pty Ltd, South Melbourne.

References:

National Institute of Standards & Industrial Technology of PNG, (1983), PNGS 1001 1982: General Structural Design and Design Loadings for Buildings, Part 3 - Wind Loads, PNGSC, Boroko.

National Institute of Standards & Industrial Technology of PNG, (1983), PNGS 1001- 1982, General Structural design and Design Loadings for Building, Part 4 - Earthquake Loadings, PNGSC, Boroko.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hrs)

CE 411: STRUCTURAL ANALYSIS II

Hours per week: 4(2/2)

Prerequisite: CE 311, CE 302

Objectives:

On completion of this subject, the student will be able to:

1. Explain the behaviour of structures, when they are loaded beyond their elastic limit and into the plastic stage;
2. Discuss the mechanism of collapse of structures, when they are loaded to the plastic limit;
3. Develop intuitive ideas of structural behaviour in the derivation of solutions to simple problems;

4. Explain basic techniques used in the formulation of stiffness matrix for truss and beam elements and solve simple structure using this method.

Syllabus:

Brief review of CE 311 and CE 312 courses. Shear effects in beams. Shear distribution and shear centre. Plastic theory of collapse including effect of shear and axial load on plastic moment. Lower and upper bound theorems. Collapse load of simple beams and portal frame using incremental load analysis and shake down.

Collapse load of beams, continuous beams, rigid frames (1 bay-2 storeys and 1 - storey and 2 bays) using virtual work method.

Formulation of stiffness matrix for beams and frames and solution of simple problems using matrix methods.

Textbook:

Coates, Coutie and Kong, (1992), Structural Analysis, 3rd Edition, Chapman and Hall, London.

Reference:

Horne, M.R., (1971), Plastic Theory of Structures, Thomas Nelson and Sons, London.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hrs)

CE 412: STRUCTURAL ANALYSIS & DESIGN (ELECTIVE)

Hours per week: 5(3/2)

Prerequisite: CE 401, CE 411

Objectives:

On completion of this subject, the student will be able to:

1. Explain the mechanics of structures, particularly with respect to wind and earthquake loading;

2. Discuss basic principles of pre-stressed concrete and to use this technique to design simple beams;
3. Explain the basic principles associated with dynamics of structures;
4. Explain the principle of design for structural elements not covered in core subjects.

Syllabus:

Use of PNG wind load Code. Design of earthquake resistant structures. Use of PNG earthquake loadings code to calculate base shear for simple frames and distribution of base shear. Formulation of equations of motion for single degree of freedom systems. Formulation of equations of motion for multiple degree of freedom system. Formulation of stiffness, mass and inertia matrices for simple portal frames, calculation of frequencies and mode shapes of vibration. Calculation of base shear using modal participation factors. Introduction to prestressed concrete, cable profiles, optimum sections, and losses due to pre-stress. Design of circular slabs, pile caps, overhead water tanks, staircase etc.

Textbook:

National Standards Council of PNG, (1983), PNGS 1001-1982, General Structural Design and Design Loadings for Buildings, Part 3 - Wind Loads, PNGSC, Boroko.
National Standards Council of PNG, (1983), PNGS 1001-1982, General Structural Design and Design Loadings for Buildings, Part 4 - Earthquake Loadings, PNGSC, Boroko.

Warner, Rangan, Hall and Faulkes (1999 or Latest edition), Concrete Structures, Published by Addison Wesley Longman Australia Pty Ltd, South Melbourne.

Reference:

Clough, R.W. and Penzien. J., (1975), Dynamics of Structures, McGraw-Hill, Tokyo.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hrs)

CE 421: ENVIRONMENTAL ENGINEERING I

Hours per week: 5(2/3)

Objectives:

On completion of this subject, the student should be able to:

1. Explain the public health aspect of water supply in relation to supply, quality and treatment;
2. Discuss the importance and treatment of waste water;
3. Discuss the importance of solid waste disposal.

Syllabus:

Sources of water. Capacity of reservoirs. Water treatment. Sedimentation, filtration, aeration, chlorination. Water distribution. Foul sewerage. Sewage treatment. Effluent standards. Stabilisation ponds. Sludge treatment and disposal. Refuse disposal.

Textbook:

Tebbutt, T.H.Y., (1999), Principles of Water Quality Control, 5th Edition, Butterworth Heinemann, Oxford.
Kiely, G., (1997), Environmental Engineering, McGrawHill.

Assessment:

Continuous assessment - 40%
Written examination - 60% (1 x 3 hrs)

CE422: ENVIRONMENTAL ENGINEERING II (Elective)

Hours per week: 5 (3/2)

Objective:

On completion of this subject, the student should be able to:

1. Discuss various sanitation and water supply technologies that may be appropriate for rural areas and small communities;

2. Discuss a wide range of waste water treatment processes and have a knowledge of current solid waste management practice;
3. Explain the affects of pollution on the environment;
4. Create awareness on proper disposal of hazardous waste material;
5. Explain environmental legislation and control;
6. Discuss the role of environmental engineer in society.

Syllabus:

The environmental engineer in consulting, industry, government and the universities. Professional societies, registration. environmental aspects of project management. Environmental legislation and regulations. Air quality standards and control. Water quality standards and control. Water supply. Waste water disposal Storm water management. Disposal of solid and hazardous wastes. Environmental assessment. Monitoring the environment.

References:

Corbitt, R. A. (Editor), (1990), Standard Handbook of Environmental engineering, McGraw-Hill, New York.
Peavy, H.S., Rowe G.C., and Tchobanoglous G., (1990), Environmental engineering, McGraw Hill, New York.
Davis, M.L., and Cornwell, D.A., (1998), Introduction to Environmental Engineering, 3rd Edition, WCB-McGraw Hill.

Assessment:

Continuous assessment - 60%
Written examination - 40% (1 x 3 hrs)

CE 431: GEOTECHNICS V

Hours per week: 3(2/1)

Objectives:

On completion of this unit, the students should be able to:

1. Carry out slope ability analyses presented during the course including short and long term stability problems;
2. Analyse foundation problems in terms of bearing capacity and settlement;
3. Develop appreciation for the importance of investigation.

Syllabus:

Slope stability analysis to include linear and non-linear failure surfaces. Considerations of Culmann's method, friction circle method and methods of slices to include ordinary and simplified Bishop's methods. Stability numbers. Short term and long term stability computations and the effect of pore water pressure.

Foundation engineering and further consideration of soil structure interaction. Long and short term settlement of structures including the Skempton - Bjerrum method of settlement analysis. In-situ tests and settlement computations. Allowable settlement. Bearing capacity theory and modifications to account for footing shape, depth, inclination and eccentricity of loading and water regimes. Shallow foundation design. Introduction to design of deep foundations.

General principles of site investigation. In-situ tests and their interpretation. Foundation installation and ground water control.

Textbook:

Smith, G.N. and Smith, Ian, (1998), Elements of Soil Mechanics, 7th Edition, Blackwell Science, London.

Reference:

Tomlinson, M.D. (1976), Foundation Design and Construction, 5th Edition, ELBS with Longman, Essex.

Assessment:

Continuous assessment - 40%
Written examination - 60% (1 x 3 hrs)

CE 432: GEOTECHNICS & PAVEMENT DESIGN (Elective)

Hours per week: 5(3/2)

Objectives:

On completion this subject, the student should be able to:

1. Develop appreciation for the concepts involved in the settlement analysis of piles as well as the analysis of dynamic and laterally loaded piles;
2. Develop appreciation for the different concepts adopted for raft foundation design;
3. Develop appreciation for the different forms of ground improvement techniques available and ground water control (dewatering);
4. Develop appreciation for the effects of liquefaction in an earthquake event;
5. Solve routine geotechnical problems with the aid of computers;
6. Undertake mechanistic design of road pavements and aircraft runways;
7. Explain fundamental concepts used in maintenance management system;
8. Explain the effect of both chemical mechanical stabilisation techniques on the behaviour of pavement materials under traffic loading;
9. Explain pavement drainage systems for both urban and rural roads;
10. Explain the theoretical aspects of stresses and strains in the pavement structure, carry out analysis using computer software and interpret the results.

Syllabus:

Part A - Geotechnics:

Further consideration of pile foundations to include lateral and dynamic loading and settlement analysis.

Raft foundation design using the conventional rigid and approximation flexible methods. Ground improvement techniques. Seismic liquefaction, Computer applications in geomechanics.

Part B - Pavement Design:

Advanced pavement design including aircraft runways, highway maintenance management, stabilisation, projects on specialist topics covering pavement design, maintenance, drainage or

appropriate technology.

References:

- Poulos, H.G. and Davis, E.H., (1980), *Pile Foundation - Analysis & Design*, Wiley, New York.
- Das, B.M. (1984), *Principles of Foundation Engineering*, PWS-Kent Publishing Company, Boston, USA.
- Tomlinson, M.J. (1986), *Foundation Design & Construction*, 5th Edition, ELBS with Longman, Essex.
- Bowles, J.E. (1988), *Foundation Analysis & Design*, 5th Edition, McGraw Hill, Sydney.
- Desai, C.S. and Christian, J.T. (1977), *Numerical Methods in Geotechnical Engineering*, 4th Edition, New York, McGraw-Hill.
- Prakash, S. (1981), *Soil Dynamics*, McGraw Hill, New York.

Assessment:

- Continuous assessment - 60%
- Written examination - 40% (1 x 3 hrs)

CE441: TRANSPORTATION ENGINEERING III

Hours per week: 3(2/1)

Objectives:

On completion of this subject, the student should be able to:

1. Use different traffic survey techniques to collect data for transport systems design such as the design of road works;
2. Analyse and interpret traffic data to assess the performance of transport systems;
3. Compute traffic flow characteristics such as capacity, volume, space and speed, time mean speed, time and space headway;
4. Apply traffic management systems such as pedestrianisation to resolve traffic flow problems in urban centres;
5. Analyse traffic flow at intersections designs such as; priority intersections, roundabouts, and traffic signals;
6. Undertake computer aided analysis of road accidents and evaluate alternatives to resolve

- causes of accidents;
- 7. Perform incremental cost analysis to evaluate alternative transport project proposals;
- 8. Describe different methods of local area traffic management.

Syllabus:

Traffic studies and surveys. Parking and pedestrian movement. Introduction to capacity and engineering. Intersection design. Channelisation. Local area traffic management. Accident studies. Cost analysis.

Textbook:

National Association of State road Authorities, Interim Guide fore Design of Intersections at Grade,(National Association of state Road Authorities, Sydney,1979.

Assessment:

Continuous assessment - 40%
Written examination - 60% (1 x 3 hrs)

**CE 442: TRANSPORTATION ENGINEERING IV
(Elective)**

Hours per week: 5(3/2)

Objectives:

On completion of this subject, the student should be able to:

1. Explain the interaction between land use and transport in relation to planning of the transport system;
2. Explain these concepts in transport planning; traffic generation, distribution, modal split, and traffic assignment;
3. Carry out traffic surveys and undertake feasibility studies of alternative road project proposals;
4. Evaluate the socio-economic impact of transport projects;
5. Undertake road design using computer software;
6. Carry out economic analysis of alternative road construction and maintenance strategies and make comparison with results from the

World Bank Highway Design and Maintenance Model, HDM-III.

Syllabus:

Further topics in Highway and Traffic Engineering including traffic studies and local area traffic management, urban and rural land use transportation planning and Socioeconomic-economic analysis, Computer aided route location techniques.

Assessment:

Continuous Assessment - 60%
Written Examination - 40% (1 x 3 hrs)

CE 451: CONSTRUCTION MANAGEMENT III

Hours per week: 4(3/1)

Objectives:

On completion of this subject, the student should be able to:

1. Explain contracts and tender procedures - preparation and assessment;
1. 2. Discuss the implications of environmental aspects and safety in site management;
2. Monitor progress and prepare routine reports;
3. Explain risk analysis/management;
4. explain management science models and their applications to construction industry;
5. Discuss computer aided project management.

Syllabus:

Project organisation structure, duties and responsibilities of a construction engineer. Tenders, contracts and sub contracts. Replacement age of machines. Fixing hire charges for construction machines.

Personal management Human factors in construction projects. How safety, quality and environmental factors influence the projects. Detail planning procedures of civil engineering projects.

Textbooks:

Harris, H and McCaffer R. (1989), Modern Construction Management, 3rd Edition, Blackwell Scientific Publications, Oxford.

Peurifoy R.L., and Ledbetter W.B. (1986), Construction Planning, Equipment and Methods, 4th Edition, McGraw Hill, Singapore.
Atkinson A.V. (1992), Civil Engineering Contract Administration, 2nd Edition, Stanley Thornes.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 3 hrs)

CE 452: CONSTRUCTION MANAGEMENT

Hours per week: 5(3/2)

Objectives:

On completion of this subject students should be able to:

1. Carry out total planning and documentation of a chosen project;
2. Explain advanced features and macros of computer aided project management;
3. Carry out plant management analysis.

Syllabus:

Further study in application of planning techniques, resource allocating and cost control. Use of computers in project management. Case studies. Project management reports.

Textbook:

Peurifoy, R.L. and Ledbetter, W.B, (1989), Construction Planning, Equipment and Methods, 4th Edition, McGraw-Hill, Singapore.
Harris, H. and McCaffer R. (1989), Modern Construction Management, 3rd Edition, Blackwell Scientific Publications, Oxford.

Assessment:

Continuous Assessment - 60%
Written Examination - 40% (1 x 3 hrs)

CE 461: CIVIL ENGINEERING PROJECT

Hours per week: 3

Objective:

On completion of this subject the student will acquire and develop basic skills necessary to carry out a detailed design, experiment or analysis of an approved civil engineering project.

Syllabus:

Students are expected to select a project from the list of design-oriented projects proposed by the staff of the department. The projects could involve experimental, and/or analytical work. At the end of the semester the student will submit a project report and present a seminar.

Assessment:

Continuous assessment - 100%

CE 462: CIVIL ENGINEERING PROJECT

Hours per week: 5

Objective:

On completion of this subject the student will acquire and develop basic skills necessary to carry out a detailed design, experiment or analysis of an approved civil engineering project.

Syllabus:

The students are expected to select a project from the list of design-oriented projects proposed by the staff of the department. The projects could be the same as those in CE461 with a wider scope or an entirely new design, experiment or analysis. A final report on the project work is required at the end of the semester for the final assessment which will include a presentation.

Assessment:

Continuous assessment - 100%

CE 471: INDUSTRIAL FIELD TRIP

Duration: 5 days

Objective:

The aim of this field trip is to expose students to

wider dimensions and complexities of practical projects both at design and implementing stages.

Syllabus:

Five days field trip at sometime during the 4th year visit to construction sites, industrial plants and design offices.

Assessment:

Report - 100%

CE 472: MECHANICS OF DEFORMABLE SOLIDS - (Elective)

Hours per week: 5(3/2)

Objectives:

On completion of this subject, the student should be able to:

1. Gain an understanding of how forces are distribution in a component in the form of stress;
2. Understand the relationship between biaxial stress and strain;
3. Appreciate the factors which contribute to elastic failure in a component;
4. Understand the determination of stress in a component by the measurement of strain;
5. Perform stress and strain analysis for a number of mechanical and structural systems.

Syllabus:

Review of biaxial stress and Mohr's circle for stress. Strain measurement and Mohr's circle for strain. Strain energy under plane stress conditions. Theories of elastic failure. Generalised theory of bending for thick curved beams; the Winkler theory.

Bending of shear effects in beams, Shear deflexion.

Torsion of thin walled tubes; the Bredt-Batho theory. Beams curved in plan. Thick cylinders; Lamé's theory; compound cylinders; force fits. Bending and deflexion of circular flat plates. Membrane theory of shells.

Textbook:

Timoshenko, S. P. and Gere, J.M. (1972), Mechanics of Materials, Van Nostrand - Reinhold, New York.

Assessment:

Continuous assessment - 60%
Written examination - 40% (1 x 3 hrs)

CE 482: COASTAL ENGINEERING (Elective)

Hours per week: 5(3/2)

Prerequisite: CE 321, CE 322

Objectives:

The students will be able to perform the following tasks on completion of this subject:

1. Discuss the behavior of waves in sea
2. Discuss the process of waves propagation
3. Analysis of wave forces on coastal structures
4. Design of coastal structures
5. Explain the process of alongshore and cross shore sediment transport
6. Quantifications of sediment transport
7. Explain the methods of beach protections and effects of these methods on unprotected area.

Syllabus:

Linear wave theories, Wave diffraction, reflection and breaking, Wave forces on Small bodies, Wave forces on large bodies, Coastal defence: study and design of Sand dune, groins, headland control, Inlet entrances, Jetties, Piers, Seawalls, Bulk head and Revetments and Coastal Sediment transport.

Textbook:

Water Waves, Stoker, J.J., Interscience Publishers, Inc., 1957.

Wind Waves - Their Generation and Propagation on the Ocean Surface, Kinsman, B., Dover Publications, Inc., 1965.

Linear and Nonlinear Waves, Whitham, G.B, John Wiley and Sons, 1974.

Waves in Fluids, Lighthill, J., Cambridge University Press, 1978.

Beach Processes and Sedimentation, Komar, P.D., Prentice-Hall, 1976.

Reference:

The Mechanics of Coastal Sediment Transport, J. Fredsoe and R. Deigaard, World Scientific, 1992.
Coastal Bottom Boundary Layers and Sediment Transport, P. Nielsen, World Scientific, 1992.
The Dynamics of the Upper Ocean, 2nd ed., Phillips, O.M., Cambridge University Press, 1977.
Water Wave Mechanics for Engineers and Scientists, R.G. Dean and R.A. Dalrymple, World Scientific, 1991.
Hydrodynamics of Coastal Zones, S.R. Massel, Elsevier, 1989.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hrs)

CE 492: BRIDGE ENGINEERING (Elective)

Hours per week: 5(3/2)

Prerequisite: CE 302, CE 321, CE 401, CE411

Objectives:

On completion of this subject, the student should be able to:

1. Derive the bridge loadings in accordance to the PNG Bridge loading code.
2. Design a reinforced concrete deck of a bridge.
3. Design the bridge superstructure for vehicular and pedestrian traffic, stream flow, debris mat, log impact, temperature, shrinkage, braking force, wind, earthquake, earth pressure and any other loads including combinations of these loads that produces the worse effect.
4. Design the bridge abutment and piers for vehicular and pedestrian traffic and all other loads as indicated in item 3 and any others loads including combinations of these loads that produces the worse effect,
5. Appreciate the design of seismic restraints to the bridge superstructure.
6. Provide a ductile design in the piers and abutments to withstand seismic loads.

7. Design and select an appropriate bearing system for a bridge.
8. Prepare a bill of quantities of a bridge in accordance to the PNG Road and Bridge Design Specification.
9. Provide an estimated construction cost of a bridge.

Syllabus:

Discuss the various types of Bridges, Derive the bridge loadings in accordance to the PNG Bridge loading code. Discuss the steps involved in the design of a reinforced concrete deck bridge, the design of the bridge superstructure for vehicular and pedestrian traffic, stream flow, debris mat, log impact, temperature, shrinkage, braking force, wind, earthquake, earth pressure and any other loads including combinations of these loads that produces the worse effect in accordance with the Australian Bridge Design Code. Discuss the steps involved in the design of the bridge abutment and piers for all the loads mentioned above any other loads including combinations of these loads that produce the worse effect and appreciate the design of seismic restraints to the bridge to the bridge superstructure. Importance of provision of ductile design in the piers and abutments to withstand seismic loads. Design and selection of an appropriate bearing system for the bridge. Preparation of a bill of quantities (BOQ) of a bridge in accordance to the Department of Works Bridge Design Specification and provide an estimated construction cost of a bridge.

Textbook:

YK Telue (2009) Bridge Engineering in PNG, Department of Civil Engineering, PNG University of Technology ISBN 9980-56-011-8

Reference:

AS 5100 2004, Australian Standard on Bridge Design Parts 1-7.
PNG Bridge Design Code (traffic and pedestrian loads)
PNG Departments of Works, Road and Bridge Design Specification 1995.
Beca Gure (PNG) Ltd, (1985), Earthquake Engineering for Bridges in PNG, Prepared for PNG Department of Works.
Smec (1990), PNG Flood Estimation Manual

Assessment:

Continuous assessments - 50%
Written examinations - 50% (1 x 3 hrs)

**MASTERS OF ENGINEERING
(by RESEARCH) (IN CIVIL ENGINEERING)**

**CEME 501: MASTERS OF ENGINEERING
RESEARCH THESIS**

**Hours per week: Research Orientated on a full
time or part-time basis**

Objectives:

To enable the candidate to undertake full-time or part-time (Masters) research on a topic in the appropriate field of Civil Engineering and shall be supervised by an academic in the related field on the topic of interest.

**Admission, registration, supervision and
Administration**

The rules in relation to admission, registration, supervision and administration of post graduate programs shall be those of the PNG University of Technology in relation to Master of Philosophy programs (except for specific entry requirements mentioned herein).

Syllabus:

Full-time or part-time research undertaken by the candidates on a topic in the appropriate field of Civil Engineering and shall be supervised by an academic in the related field on the topic of interest. The subject is continuous over 2 years or 4 semesters for a fulltime student and over 4 years or 8 semesters for a part-time student. Additional units may be incorporated in the Masters by Research in the appropriate field to ensure that the student acquires the additional skills in order to complete his/her research thesis.

Textbooks:

Nil

Assessment:

Research Thesis - 100%

**DOCTOR OF PHILOSOPHY
(IN CIVIL ENGINEERING)**

**CEDP 601: DOCTOR OF PHILOSOPHY
RESEARCH THESIS**

**Hours per week: Research Orientated on a full
time or part-time basis**

Objectives:

To enable the candidate to undertake full-time or part-time (PhD) research on a topic in the appropriate field of Civil Engineering and shall be supervised by an academic in the related field on the topic of interest.

**Admission, registration, supervision and
Administration**

The rules in relation to admission, registration, supervision and administration of post graduate programs shall be those of the PNG University of Technology in relation to Doctor of Philosophy programs (except for specific entry requirements mentioned herein).

Syllabus:

Full-time or part-time research undertaken by the candidates on a topic in the appropriate field of Civil Engineering and shall be supervised by an academic in the related field on the topic of interest. The subject is continuous over 4 years or 8 semesters for a fulltime student and over 8 years or 16 semesters for a part-time student.

Textbooks:

Nil

Assessment:

Research Thesis - 100%

DEPARTMENT OF ELECTRICAL & COMMUNICATION ENGINEERING

Acting Head of Department:

Kavi, M., M.Eng.,(Univ.NSW), B.Eng. (PNGUT)
Dipl. Electronics (PNGUT)

Deputy Head of Department:

Kunsei, H., MEng Sc (Univ. NSW), B.Eng
(PNGUT)

Associate Professor:

Dr Gehlot N., Ph.D (University of Pittsburgh, PA
USA; MS (NJIT, NJ, USA), MSc (Hons) Physics
(BITS, Pilani, India; BE (Hons) Electrical &
Electronics Engineering (BITS, Pilani, India. IEEE
Senior Member (US since 1998).

Senior Lecturers:

Lecturers:

Aiau, S. S, M.Phil,B.Eng,(PNGUT), MIEPNG.,
Reg. Eng.(PNG).

Senior Technical Instructors:

Maeaoka, R., B.Eng (PNGUT), MIEPNG Reg
Eng (PNG)

Mandawali, E., B.Eng (PNGUT), Dipl. Com Eng
(PNGUT)

Muap, D., B.Eng. (PNGUT)

Technical Instructors:

Kaupa, S., B.Eng (PNGUT)

Laboratory Manager:

Sangin,D., Dipl.Comm.Eng.(PNGUT)

Principal Technical Officers:

Bonner,L., B.Eng.,(PNGUT), Dip. Elect.
Eng.(PNGUT)

Principal Technical Officer (Power):

Senior Technical Officer (Power):

Wara T, PETT Cert., (Hagen Tech.), Trade Cert.
Communications/Electronics (POM Tech)

Senior Technical Officers (Communication):

Pek C, B. Science, (UPNG)

Sangon, M., Dipl.Comm.Eng. (PNGUT)

Technical Officer:

Kevin L., Dipl. Comp. Technology, (DBTI)

Pepi F., Cert. Electrical Technology,(POM
Tech.)

Senior Stores Supervisor:

Kondo V., Dipl, Cert in Telecommunication,
Cert. IT Studies, (Telecom Training Col.)

Executive Secretary 1:

Sombo, E., SecCert (Hagen Tech)

Secretary 2:

Koreng, N., SecCert, StenoCert, (Lae Tech).

The Department offers courses in Electrical and
Communication Engineering degree and diploma
levels.

The Undergraduate Course leads to the Degree of
Bachelor of Engineering in Electrical Engineering.
This course has been designed to equip students
with a broad knowledge of electrical engineering
with opportunity to specialise in power or
communications engineering during the final year.
The course is of four years duration and is
supported by extensive practical work performed
in well-equipped laboratories. The first year of the
degree course provides emphasis on basic studies
in English, Mathematics, Physics and Engineering
Science.

During the long vacations at the end of each year,
students are expected to take employment with
sponsors or organisations which deal in some
aspect of Electrical and Communication Engineer-
ing. Experience gained during these periods is
regarded as an essential and integral part of the
student's training. Students are required to
accumulate at least ten weeks vacation training
experience during the course. This training must be
approved by the Head of Department and all
students are required to submit a report at the end
of each training period. The major employers of
degree graduates are Telikom PNG, the Papua
New Guinea Electricity Commission, National
Broadcasting Commission, Office of Civil
Aviation, Department of Works, and mining
industries.

The Department has a keen interest in rural
outreach, and has research programmes in power
systems, power electronics, microwave propa-

gation (terrestrial and satellite communication), computer networks, microhydro generation, power systems, power system protection, computer architecture, PLC's, and microprocessors and industrial control.

Degree students are streamed after completing the 3rd year programme into two streams, i.e. Power & Communication streams. The Department is planning to introduce a third stream in the near future, i.e. Computer Engineering stream.

In response to requests from industry to provide further training for graduate engineers, the Department offers specialist short courses, which can be given at the University or at the industrial site.

The Diploma in Electrical Engineering is a three year course, of which the first two years are common with the Degree students. First two years, Diploma students will undertake the same academic programme as all degree students. The students, willing to proceed for Diploma qualification will be undertaking one further year of studies in two streams, i.e. Diploma of Electrical Engineering (Communication) and Diploma of Electrical Engineering (Electronics).

Those students, who successfully complete the Diploma programme, will be eligible to enrol in our Degree programme to our third year. This means that Diploma graduates will be able to complete a Degree programme in additional two years. Such articulation became possible, because of the common first two years programmes for the Degree and Diploma students.

The Communication Option has specialist subjects on modern communication systems and measurement techniques. Topics such as computers, broadcast television and long distance communication are also covered. The Electronics Option has specialist subjects on advanced analogue and digital electronics measurements and industrial techniques, and the application and use of microcomputers and control electronics.

The Department has an extensive Master programme. This Masters degree is based on research to be presented as a thesis and will normally take two years to complete. Masters degrees are offered in propagation studies, control engineering and instrumentation, power systems and computer network. There will be shortly the opportunity to study for the M.Sc. by course work

and dissertation in Power and Communication Engineering.

STRUCTURE OF COURSES

Code	Semester	Average Weekly Hours

BACHELOR OF ENGINEERING IN ELECTRICAL ENGINEERING

Year 1 First Semester

MA167	Engineering Mathematics I	5
PH141	Principles of Physics I	5
CH181	Chemistry for Engineers I	2
LA101	Learning & Communications Skills	3
ME171	Engineering Drawing I	3
EE101	Introduction to Computing & Problem Solving I	2
EE103	Electric Circuits I	<u>3</u>
		<u>23</u>

Year 1 Second Semester

MA168	Engineering Mathematics II	5
PH142	Principles of Physics II	5
CH182	Chemistry for Engineers II	2
LA102	Study & Academic Skills	3
ME172	Engineering Drawing II	3
EE102	Introduction to Computing & Problem Solving II	2
EE104	Electric Circuits II	<u>3</u>
		<u>23</u>

Year 2 First Semester

MA235	Engineering Mathematics 1(A)	4
PH251	Physics of Engineering Materials I	2
EE211	Networks and Fields	5
EE223	Operational Amplifier Measurements	3
EE233	Linear Electronics	4
EE241	Introduction to Computers	3
EE251	Introduction to Digital Systems	3
EE263	Electrical Engineering	<u>3</u>
		<u>29</u>

Year 2 Second Semester

MA236	Engineering Mathematics I (B)	4

PH252	Physics of Engineering Materials I	2
ME202	Mechanical Engineering IIE	4
EE212	Network Theory	2
EE234	Non-Linear Electronics	3
EE242	Software Engineering	3
EE252	Electrical Machines I	4
EE262	Digital Electronics & Systems	<u>4</u>
		<u>26</u>

Year 3 First Semester

MA333	Engineering Mathematics II EE (B)	4
EE311	Signals & Systems	3
EE321	Electrical Measurements Instrumentation	3
EE331	Telecommunication Principles I	2
EE341	Computer Architecture	4
EE351	Electrical Machines II	4
EE361	Control Systems I	3
EE371	Transmission Media	<u>2</u>
EE382	Industrial Electronics and Computer Control	<u>3</u>
		<u>28</u>

Year 3 Second Semester

MA334	Engineering Mathematics III EE (B)	4
BA132	Introduction to Management	3
EE332	Telecommunication Principles II	4
EE342	Interfacing Techniques	3
EE352	Electrical Power Systems I	
EE362	Control Systems II	4
EE372	Computer Aided Engineering	<u>2</u>
		<u>24</u>

Year 4 First Semester

BA482	Management for Engineers	3
EE411	Instrumentation Systems and Process Control	3
EE431	Thesis A	4

ADDITIONAL SUBJECTS:

POWER OPTION

EE421	Electrical Design I	3

ME401	Mechanical Engineering Systems	2
EE441	Electrical Power Systems II	4
EE451	Power Electronics I	<u>3</u>
		<u>2</u>

COMMUNICATION OPTION

EE461	Computer Communications	3
EE471	Communication Systems Analysis & Design	5
EE481	Antennas and Propagation	3
EE491	Microwave & Optical Systems	<u>4</u>

Year 4 Second Semester

EE402	The Professional Engineer	2
EE412	Thesis B	8

ADDITIONAL SUBJECTS:

POWER OPTION

EE432	Electrical Machines III	3
EE442	Electrical Power Systems III	4
EE452	Power Electronics II	3
EE462	Electrical Design II	<u>2</u>
		<u>22</u>

COMMUNICATION OPTION

EE472	Satellite Communications	5
EE482	Data Communications	4
EE492	Electronic Navigation Systems	3

*Both Power and Communication Options may not be available every year.

DIPLOMA IN ELECTRICAL ENGINEERING

Year 1 First & Second Semesters

(Same as First Year Electrical & Communication Engineering academic programme).

Year 2 First & Second Semesters

(Same as Second Year Electrical & Communication Engineering academic programme).

COMMUNICATIONS OPTION

Year 3 First Semester

ED301	Electronic Test Equipment & Measurements	8
ED311	Digital Electronics I	5
CM321	Communications Principles (Analogue)	6
CM331	Aerials and Propagation	<u>5</u>
		<u>24</u>

Year 3 Second Semester

LA204	Communication in the Workplace	2
ED312	Disk Operating Systems & I/O Interfacing	6
CM322	Communication Principles (Digital)	7
CM332	Microwaves	5
CM342	Broadcasting Techniques	<u>5</u>
		<u>25</u>

ELECTRONICS OPTION

Year 3 First Semester

ED301	Electronic Test Equipment & Measurements	8
ED311	Digital Electronics I	5
EL341	Power Electronics	6
EL351	Control Engineering	<u>7</u>
		<u>26</u>

Year 3 Second Semester

LA204	Communication in the Workplace	2
ED312	Disk Operating Systems & I/O Interfacing	6
EL362	Industrial Electric Machines	6
EL372	Data Communication Systems	7
EL352	PLC Project	<u>3</u>
		<u>24</u>

*Both Communication and Electronics Options may not be available every year.

SUBJECTS TAUGHT BY THE DEPARTMENT

EE101	Introduction to Computing &

	Problem Solving I
EE102	Introduction to Computing & Problem Solving II
EE103	Electric Circuits I
EE104	Electric Circuits II
EE211	Networks and Fields
EE212	Network Theory
EE223	Operational Amplifier Measurements
EE233	Linear Electronics
EE234	Non-linear Electronics
EE241	Introduction to Computers
EE242	Software Engineering
EE251	Introduction to Digital Systems
EE252	Electrical Machines 1
EE262	Digital Electronics and Systems
EE311	Signals and Systems
EE321	Electrical Measurements & Instrumentation
EE331	Telecommunication Principles I
EE332	Telecommunication Principles II
EE341	Computer Architecture
EE342	Interfacing Techniques
EE343	Computer Hardware
EE351	Electrical Machines II
EE352	Electrical Power Systems I
EE361	Control Systems I
EE362	Control Systems II
EE371	Transmission Media
EE372	Computer Aided Engineering
EE402	The Professional Engineer
EE411	Instrumentation Systems & Process Control
EE412	Thesis B
EE421	Electrical Design I
EE431	Thesis A
EE432	Electrical Machines III
EE441	Electrical Power Systems II
EE442	Electrical Power Systems III
EE451	Power Electronics I
EE452	Power Electronics II
EE461	Computer Communications
EE462	Electrical Design II
EE471	Communications Systems Analysis & Design
EE472	Satellite Communications
EE481	Antennas and Propagation
EE482	Data Communications
EE491	Microwave & Optical Systems
EE492	Electronic Navigation Systems

CM321	Communications Principles (Analogue)
CM322	Communications Principles (Digital)
CM331	Aerials and propagation
CM332	Microwaves
CM342	Broadcasting Techniques
ED301	Electronic Test Equipment & Measurements
ED311	Digital Electronics II
ED312	Disk Operating Systems & Interfacing
EL341	Power Electronics
EL351	Control Engineering
EL352	PLC Project
EL362	Industrial Electric Machines
EL372	Data Communication Systems
EE263	Electrical Engineering III
EE343	Computer Hardware
EE382	Industrial Electronics and Computer Control
EE398	Electrical Engineering for Mining

SUBJECTS DETAILS

EE 101: INTRODUCTION TO COMPUTING AND PROBLEM SOLVING I

Hours per week: 2(1/1)

Objectives:

On completion of this subject, students should be able to:-

1. Know the main units of a micro computer hardware architecture
2. Understand the functions and relationships of different computer units
3. Use the keyboard and mouse and other peripheral confidently
4. Use basic Disc Operating System commands
5. Be familiarised with windows environment
6. Use basic computer application programs such as Word Processing and Spreadsheets for engineering applications
7. Know how to use Excel for engineering graphics

Syllabus:

Introduction to basic computer architecture, organisations, DOS (disc operating system), keyboard skills, basic word processing, spread-sheets and Engineering graphics.

Textbook:

Lecture notes

Assessment:

Continuous assessment - 100%

EE 102: INTRODUCTION TO COMPUTING AND PROBLEM SOLVING II

Hours per week: 2(1/1)

Prerequisite: EE 101

Objectives:

On completion of this subject, students should be able to:-

1. Understand how computers work
2. Know basic computer programming language (Visual Basic)
3. Know basic commands in Visual Basic
4. Understand the meaning and use of different options in Visual Basic programming
5. Develop flow charts for given engineering problems
6. Know how to write simple programs in Visual Basic
7. Solve typical engineering and mathematic problems using Visual Basic language
8. Manipulate and manage data.

Syllabus:

The need for computer programming in engineering. Introduction to computer programming in Visual Basic, records and data, structures, arrays, strings, loops and Boolean logic, files and editing. Engineering problem solving from various engineering disciplines using Visual Basic programming language, introduction to data base management.

Textbook:

Lecture notes

Assessment:

Continuous assessment - 100%

EE 103: ELECTRIC CIRCUITS I

Hours per week: 3(2/1)

Objectives:

On completion of this subject, students should be able to:-

1. Understand fundamental concepts of Electrical Engineering
2. Know basic analytical techniques to solve electric and magnetic circuits
3. Analyse DC circuits
4. Understand basic electronic circuits
5. Know typical applications for electric and electronic circuits.
6. Solve RL and RC transients.

Syllabus:

Electric Circuits: Sources and sinks of energy, circuit parameters, Ohm's law, Kirchhoff's laws, voltage sources, current sources.

Circuit theorems: Branch current analysis, mesh analysis, node analysis, maximum power transfer, Thevenin's and Norton's.

Capacitance: Energy stored in capacitors, charging and discharging of capacitors, transient in RC circuits.

Inductors: Self and mutual inductance, Faraday's law, Lenz's law, transient in RC circuits.

Magnetic circuits: Basic analysis of magnetic circuits. Introduction to electronic devices, OpAmp circuits.

Textbook:

R. L. Boylestad, "Introductory Circuit Analysis", 7th Edition, Merrill Pub. Co., 1994. R. L. Boylestad & Konsouron, "Experiments in Circuit Analysis; Laboratory Manual", 7th Edition, Merrill Pub. Co., 1994.

Assessment:

Continuous assessment - 40%
Written examination - 60% (1 x 3 hours)

EE 104: ELECTRIC CIRCUITS II

Prerequisite: EE 103

Hours per week: 3(2/1)

Objectives:

On completion of the subject, students should be able to:-

1. Understand fundamental techniques to study AC circuits
2. Know how to draw phasor diagrams
3. Understand the concepts of active and reactive power
4. Understand the meaning of the power factor
5. Know how to analyse AC circuits in the steady-state mode
6. Have understanding of circuits frequency response
7. Know filter's and resonance.

Syllabus:

AC circuit analysis, impedance triangle, phasor diagrams, conductance, admittance and susceptance, complex power, power factor, frequency response, the decibel, high-pass and low-pass filters, resonance circuits, quality factor and bandwidth.

Textbook:

R. L. Boylestad, "Introductory Circuit Analysis", 7th Edition, Merrill Pub. Co., 1994. R. L. Boylestad & Konsouron, "Experiments in Circuit Analysis; Laboratory Manual", 7th Edition, Merrill Pub. Co., 1994.

Assessment:

Continuous Assessment - 40%
Written examination: - 60% (1 x 3 hours)

EE 211: NETWORKS & FIELDS

Hours per week: 5 (4/1)

Prerequisites: EE 104, EE 103

Corequisites: PH 251, MA 235

Objectives:

On completion of this subject, students should be able to:-

1. apply Gauss' theorem to a range of electrostatic problem.
2. explain the meaning of current density, conductance and resistance
3. describe the properties of conducting, insulating and ferromagnetic materials
4. state Faraday's and Ampere's laws
5. explain modified Ampere's law and state Maxwell's equations for time varying fields
6. explain the meaning and use of Kirchhoff's laws in electric circuits
7. give basic definitions of alternating current, phasors, and complex notation
8. use this theory to calculate the behaviour of resonant circuits
9. perform calculations on simple circuits consisting of combinations of resistance, inductance and capacitance.

Syllabus:**A. Network Theory****Basic Circuit Theory:**

Electrical quantities, circuit parameters, temperature coefficient of resistance, Kirchhoff's laws and application, circuit theorems, superposition, reciprocity, maximum power transfer, Thevenin and Norton equivalents and applications.

Transients:

Transient response of first order circuits, RC and RL series.

Sinusoidal Steady State Analysis (Alternating Current Principles):

Basic definitions of alternating current, phasors and complex notation, AC circuits.

Series and Parallel Resonance:

Q factor, applications.

B. Field Theory**Electrostatics:**

Electric field. Electric field intensity and electric field flux, Gauss' law. Electrostatic potential. Divergence theorem. Poisson and Laplace's equations. Energy stored in an electric field. Capacitance, permittivity.

Magnetostatics:

Magnetic field. Magnetic field strength, magnetomotive force and magnetic flux density. Energy stored in magnetic field, permeability. Ampere's circuital law.

Material media:

Conductors, semiconductors, dielectric materials. Electric and magnetic fields in material media. Relative permittivity and permeability. Conductance. Resistance. Ferromagnetic, piezoelectric and cegnetoelectric materials.

Time varying electromagnetic fields and Maxwell equations:

Conflict in Ampere's law statements for time varying fields. Generalised magnetomotive force equation and Maxwell's first equation. Faraday's laws and Maxwell's second equation.

Textbooks:

Kraus, J. D., Electromagnetics, 4th ed., McGraw-Hall Irwin, J.D. & Chwan-Hwawu, Basic Engineering Circuit Analysis, 6th ed., John Wiley.

Assessment:

Continuous assessment	- 40%
Written examination	- 60% (1x3 hours)

EE 212: NETWORK THEORY**Hours per week: 3****Objective:**

On completion of this subject, students should be able to:-

1. Analyse two-port networks, using resistance, conductance, hybrid-h and g-parameters.
2. Describe the behaviour of second order RLC circuits.
3. Perform sinusoidal steady state analyses of simple circuits.
4. Draw phasor diagrams and calculate power and power transfer.
5. Explain how resonance, frequency response, energy and bandwidth are related.
6. Make simple analyses of three-phase circuits.

Syllabus:

Two-port networks, resistance, conductance, hybrid-h and g-parameters. Second order circuits

series and parallel RLC circuits, natural response, step response. Sinusoidal steady state analysis, impedance, reactance, admittance, conductance, susceptance. Phasor transform, power factor, maximum power transfer. Resonance and frequency response, energy in a resonant circuit, filters, bandwidth. Three-phase circuits, voltage source, star-delta connections, unbalanced system, power measurement, star-delta and delta-star transformation.

Textbook:

Kraus, J. D., Electromagnetics, 4th ed., McGraw-Hall Irwin, J.D. & Chwan-Hwawu, Basic Engineering Circuit Analysis, 6th ed., John Wiley.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hours)

EE 223: OPERATIONAL AMPLIFIER MEASUREMENTS

Hours per week: 3

Prerequisite: EE 103, EE 104

Corequisite: EE 211, EE 233, MA 235

Objective:

On completion of this subject, students should be able to:-

1. Analyse, build and evaluate by measurements simple circuits based on a single Operational Amplifier.
2. Use voltmeters, ammeters, signal generators and oscilloscopes.

Syllabus:

The oscilloscope, characteristics of periodic signals, circuit loading by instrument. Differential amplifier, inverting amplifier. AC amplifiers, gain and Bode plot. Wien bridge oscillator. Low pass and high pass first order filters. Second order filters.

Practical sessions: 3 hours per week

Textbook:

Stanley, William D., Operational Amplifiers with

Linear Integrated Circuits, Merrill, Macmillan Publishing Company, New York, 1994.

Assessment:

Continuous Assessment - 100%

EE 233: LINEAR ELECTRONICS

Hours per week: 4

Prerequisite: E 103, E 104

Corequisite: EE 211, EE 223, MA 235

Objective:

On completion of this subject, students should be able to:-

1. Analyse passive and active circuits.
2. Explain and use the concept of infinite and zero impedance ideal generators.
3. Describe the operation of a simple OPAMP in terms of virtual earth, input and output resistance, circuit loading, gain, negative and positive feedback.
4. Calculate the bandwidth of active and passive circuits.
5. Describe the operation of diodes, PNP and NPN transistors.
6. Make simple designs using single transistors.
7. Design and analyse power supplies for low power applications.
8. Describe the principles of oscillators.
9. Design basic filter circuits.

Syllabus:

Ideal amplifier. Source models. Controlled source models. Amplifier signal model. Cascaded amplifiers. Input and output loading effects. Decibel voltage gain. Frequency response, phasors, spectral analysis. One pole low pass model. Bode plot, breakpoint. PN junction, diodes, transistors. Simple transistor amplifier. Power supplies. Ideal operational amplifier analysis and design, saturation, signal terminals and voltages, differential input voltage, inverting and non-inverting amplifiers, voltage follower, bias compensation. Closed-loop and balanced closed-loop differential amplifier. DC effects and limitations. Gain, input

impedance and output impedance. Offset voltage and currents. AC effects and limitations. Closed-loop frequency response, roll-off, gain-bandwidth relationship, rise time, slew rate. Noise in operational amplifiers, common mode rejection. Instrumentation amplifier, ground loops. Oscillators, Wien bridge oscillator. Active 1 and 2-pole Butterworth filters.

Textbook:

Stanley, William D., Operational Amplifiers with Linear Integrated Circuits, Merrill, Macmillan Publishing Company, New York, 1994.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

EE 234: NON-LINEAR ELECTRONICS

Hours per week: 3

Prerequisite: EE 233

Corequisite: MA 236, EE 212

Objective:

On completion of the subject, students should be able to:-

1. Explain the theory and application of charged coupled devices.
2. Explain the use of CMOS, NMOS and PMOS technology.
3. Describe how non-linear devices are used to control amplifier gain.
4. Describe the operation of mono and astable vibrators.
5. Design simple comparator circuits, including the Schmitt trigger.
6. Design simple logic circuits using logic gates.
7. Explain the causes of switch bounce and its correction.
8. Give examples of the use of the 555 timer.
9. Explain the theory and use of 7-segment LED and liquid crystal displays.
10. Explain how a TV raster scan gives a digital display.

Syllabus:

Simple digital gates as oscillators and amplifiers. TTL, CMOS, NMOS and PMOS technology. MOSFET transistor gates. Charged coupled devices. Comparators, switching delay, special comparator circuits, comparison with other non-specialised OPAMPS. Applications of logic gates to oscillators, amplifiers and debouncing circuits. Monostable and astable multivibrators. 555 timer applications. 7-segment and liquid crystal displays. TV raster scan theory for digital display.

Textbook:

Stanley, William D., Operational Amplifiers with Linear Integrated Circuits, Merrill, Macmillan Publishing Company, New York, 1994.

Assessment:

Continuous Assessment - 40%.
Written Examination - 60% (1x3 Hrs)

EE 241: INTRODUCTION TO COMPUTERS

Hours per week: 3 (1/2)

Corequisite: EE 251

Objective:

On completion of the subject, students should be able to:-

1. Identify the basic hardware elements of a computer system, comprising a CPU memory and I/O devices, as well as explain their purpose.
2. Detail the main characteristics of an operating system and describe its main functions.
3. Demonstrate an understanding of the basic principles of the DOS operating system by creating, copying, modifying and deleting files and directories.
4. Identify the various types of disks and file types used by the system, and be able to perform routine disk and file maintenance, specifically: creating/deleting/backing up and restoring files and directories, formatting floppy disks, and identifying text files, system files and executables.
5. Identify and cause to execute specific

- programmes, including word processors, the MATLAB analysis package and excel.
6. Demonstrate competence in the operation of the MATLAB analysis package, by successfully completing a number of assignments in variable declaration, matrix manipulation, polynomial factorisation and elementary curve plotting and printing.

Syllabus:

Introduction to computer hardware and software systems using the IBM PC and DOS as examples. Use of existing commercial programmes which work well. Execution of programs. Introduction to the basics of software engineering.

Textbooks:

MATLAB Handbook. Norton, P., Inside the IBM PC, Prentice-Hall Press, 1990. Brent, R. J. and Sethares, G. C.; BASIC, 4th Ed., Brooks/Cole Publishing Co., CA, USA, 1993.

Assessment:

Continuous Assessment - 100%

EE 242: SOFTWARE ENGINEERING

Hours per week: 3

Prerequisite: EE 241

Corequisite: EE 262

Objective:

On completion of this subject, students should be able to:-

1. Outline the basic functions of an operating system, such as file management, task management, user access and I/O management, and provide examples of each from popular operating systems such as DOS and UNIX.
2. Describe why formal system specification and design procedures are required throughout engineering before solutions are attempted.
3. Identify where the main costs of systems development are, and how to minimise those costs.

4. Recognise the main phases of the software life cycle.
5. Detail the characteristics of real-time systems and the special problems faced by designers of real-time systems.
6. Use a variety of formal system specification techniques, including flow charting, structured design and object oriented design methods.
7. Identify variable types such as integers, floating point, characters, strings, structures and pointers to each of these types and explain the need for such a diversity of variable types.
8. Develop simple algorithms and accompanying documentation for the solution of a number of problems involving data input, calculations, data sorting and structured data output.
9. Successfully complete a number of programming assignments in a HLL which implement the above algorithms.

Syllabus:

Principles of software system requirements, from the analysis of problems to the documentation of solutions, including specification, design, coding and maintenance. Examples are given using a HLL (High Level Language). Operating system functions. Examples from widely used commercial systems such as the UCSD P-system, DOS and Unix.

Textbook:

Norton, P., Inside the IBM PC, Prentice-Hall Press, 1990.

Assessment:

Continuous Assessment - 100%

EE 251: INTRODUCTION TO DIGITAL SYSTEMS

Hours per week: 3 (2/1)

Prerequisite: MA 167, MA 168, PH 141, PH 142

Corequisite: EE 241

Objective:

On completion of this subject, students should be able to:-

1. Identify and draw truth tables for the commonly used combinational logic functions NOT, AND, OR, NOR, NAND and XOR.
2. Simplify compound boolean expressions, expressing them in standard forms such as truth tables and Sum of Product form, as well as designing circuits to implement these functions using gates of any specified type.
3. Convert numbers from one base to any other base, specifically base 10, base 16 and binary, and perform arithmetic calculations.
4. State what is meant by information and information transfer, state the requirements for international coding schemes such as ASCII, and perform basic calculations on message information content such as number of bits per symbol, message entropy, information transmission rates and channel capacity.
5. Detail coding schemes for error detection and correction, and be able to describe hamming codes and parity coding schemes.

Syllabus:

Introduction to Boolean Algebra, truth tables, logic functions, information theory, symbol and codes, digital storage elements and microprocessor fundamentals. Concept of logic states, memory, buses, clocks and control of peripherals. Simple programming.

Textbook:

Tocci, R.J., Digital Systems, Principles and Applications, Prentice-Hall International, 1988.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

EE 252: ELECTRICAL MACHINES I

Hours per week: 4 (3/1)

Objective:

On completion of this subject, students should be

able to:-

1. Describe the construction, testing and operation of a single phase transformer.
2. Describe the construction, testing and operation of an autotransformer.
3. Give examples of and make calculations on DC machines.

Syllabus:**Single phase transformer:**

Construction. Equivalent circuit, OC & SC tests, Efficiency, Voltage regulation. Autotransformer.

DC machine:

Construction, Connections, Armature reaction, Commutation. DC generators, OC and load characteristics. DC motors, Speed and torque characteristics. Efficiency.

Practical sessions: 6 x 3 hours.

Textbook:

Electric Machinery and Transformers, Guru, B.S. B-Mizinoglu, M.R., 3rd ed., Oxford University Press.

Assessment:

Continuous assessment - 40%
Written Examination - 60% (1x3 hrs)

EE 262: DIGITAL ELECTRONICS AND SYSTEMS

Hours per week: 4 (3/1)

Prerequisite: EE 251

Corequisite: EE 242

Objective:

On completion of the subject, students should be able to:-

1. Differentiate between combinational and sequential logic, between synchronous and asynchronous circuits.
2. Design synchronous and asynchronous logic circuits such as counters, sequence generators and memory decoder circuits.
3. Detail the characteristics of various logic families, such as DTL, RTL, TTL, ECL and

CMOS.

4. Design circuits to interface each of the above families.

Syllabus:

Aspects of digital systems. Introduction to the electronic implementation of functional digital systems. Synchronous and asynchronous circuits. Counters, sequence generators and memory decoder circuits. Logic families.

Practical sessions: 6 x 3 hours

Textbooks:

Tocci, R.J., Digital Systems, Principles and Applications, Prentice-Hall International, 1988.
Norton, P., Inside the IBM PC, Prentice-Hall Press, 1990.

Assessment:

Continuous Assessment - 40%
Written Examinations - 60% (1x3 hrs)

EE 263: ELECTRICAL ENGINEERING

Hours per week: 3

Prerequisites: Nil

Objective:

The objective of this subject is to equip the students with the basic understanding of electrical machines and its circuits including transformers and its usefulness in the industrial environment.

On the completion of the subject, the student should be able to:-

1. Understand the use of DC Circuits and DC machines.
2. Understand the single and three phase circuits and their operation.
1. Understand AC and DC generators, motors and controls.
2. Understand the basic principles construction of AC generators and its applications.
3. Be familiar with different types of transformers, regulators and electrical generators when exposed to industrial environment.
4. Be familiar with the determination of different

size/capacity of machines or electric motors for different conditions.

Syllabus:

Direct current circuits, primary and secondary cells. Electromagnetic induction. Direct-current generators. Direct-current motors and controls. Alternating current. Single-Phase Circuits. Three-phase circuits. Transformers and regulators. Alternating-Current generators. Single-phase motors. Synchronous motors and self-synchronous apparatus.

Textbook:

Mychael, A, Electric Circuits and Machines, 2nd Edition, McGraw_Hill Book Company, New York, 1977.

Assessment:

Continuous Assessment - 60%
Written Examination - 40% (1x3 hrs)

EE 311: SIGNALS & SYSTEMS

Hours per week: 3(3/0)

Prerequisite: MA 235, MA 236, EE 211

Objectives:

The main objective is to provide an in depth foundation on the mathematical tools and techniques used in the study of Linear Systems. The course will build a sound background in Discrete Time and Continuous Time Linear Systems required for more advanced courses in the area of Electronics & Communication, Computer Science & Engineering and Control System & Power Engineering.

Syllabus:

Signals: Definition, classification, transformation of independent variables, basic continuous time (CT) and discrete time (DT) signals. Representation of an arbitrary signals by linear combination of the basic signals. Systems: definition, properties and classification of systems.

Linear Time-Invariant (LTI) Systems: Impulse response, convolution integral and summation,

properties of LTI systems, causality and stability conditions. System described by linear constant coefficients differential and difference equations.

Fourier Techniques: Eigenfunction of LTI systems. Fourier series using complex exponentials.

Fourier Transforms (FT): Definition and properties. FT of periodic signals. Use of FT in analysis of linear systems - frequency response.

Laplace Transform (LT): Bilateral LT and region of convergence (ROC). Properties of LT. Relationship with FT. Use of LT in study of LTI systems-transfer function, poles and zeros, frequency response, stability.

Sampling of CT Signals: Sampling theorem. Reconstruction of signal from its sampled values.

Fourier Transform (FT) of Discrete Time Signals: Periodic spectrum. Brief introduction of DFT and FFT.

z-Transform: Definition, ROC, properties. Transfer function of DT system pole and zeros, stability, frequency response. Relationship with FT.

Introduction to Filters:

Ideal filters, type and degree of approximations. Butterworth, Chebysev, elliptic and computer aided approximations. Butterworth low pass filter function.

Introduction to Random Signals: Random variables, statistical averages, random process, and response of LTI systems to random signal input.

Use of Computer Tools: Students may be introduced to software tools (like Matlab) in the evaluation of convolution, impulse response, magnitude and phase response of LTI systems through assignments.

Text Books:

A.V. Oppenheim, A.S. Willsky and I.T. Young, Signals and Systems, Englewood Cliffs, N.J.: Prentice Hall, 1983.

C.D. McGillen and G.R. Cooper, Continuous and Discrete Signal and System Analysis, New York, Holt Rinehart and Winston, 1984.

Practicals - computer simulations 12 hours

Assessment:

Continuous assessment - 40%
Written examination - 60% (1x3 hrs)

EE 321: ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

Hours per week: 3 (2/1)

Prerequisite: EE 211, EE 212

Objective:

On completion of this subject, the students should be able to:-

1. Define, explain and calculate errors: absolute, relative, systematic, FSD and random errors.
2. Explain principle of operation and applications of moving coil, moving iron, dynamometer and induction instruments.
3. Explain principle of operation and applications of current transformer (CT) and voltage transformer (VT).
4. Measure power in single and three phase systems, for balanced and unbalanced load and for any waveshape, using dynamometer wattmeters.
5. Use current and voltage transformers for three phase measurements and protection applications.
6. Use bridges for RCL measurements.

Syllabus:

Accuracy of measurements. Errors: absolute, relative, systematic, random, FSD error. Error of complex method. Error calculations. Moving coil instruments. Moving iron instruments. Dynamometer instruments. Dynamometer wattmeter. Induction instruments. Energy meter. Instrument transformers. Single and three phase power and energy measurements. DC and AC bridges.

Practical Sessions: 4 x 3 hours

Textbook:

Gregory, B.A., An Introduction to Electrical Instrumentation and Measurement Systems, Macmillan, 1982.

Assessment:

Continuous assessment - 100%

**EE 331: TELECOMMUNICATION
PRINCIPLES I**

Hours per week: 2

Prerequisite: EE 233, EE 234

Corequisite: EE 311

Objective:

On completion of this subject, students should be able to:-

1. Describe methods of quantifying noise in digital systems and to show how minimum detectable level is related to noise.
2. Define the information content of a digital signal.
3. Describe the principles of sampling, information content and information rate.
4. Define Shannon's Law.
5. Describe how a simple pulse code modulation system works in terms of sampling, time division multiplexing, bandwidth, quantisation, companding and noise.
6. Show how PCM is transmitted over single and multiplexed channels and how the problems of synchronisation can be overcome.

Syllabus:

Noise in digital systems. Minimum detectable level. Information content of a digital signal. Sampling, information rate. Shannon's Law. Simple pulse code modulation system, quantisation, companding, signal to noise ratio. Multiplexed channels and synchronisation. Practical work: 3 hours

Textbook:

McGillen C.D. & Cooper G.R., Continuous and Discrete Signal & System Analysis, Holt, Rinehart

and Winston.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

**EE 332: TELECOMMUNICATION
PRINCIPLES II**

Hours per week: 4 (3/1)

Prerequisite: EE 233, EE 234, EE 331

Objective:

On completion of this subject, students should be able to:-

1. List the main communications systems in use nationally and internationally.
2. Describe in general terms the operation of telephones, facsimile and television.
3. Define the terms message, signal, noise and communications channel.
4. Show by description and calculation the distortion and noise limitations to the dynamic range of systems.
5. Define and make calculations on signal to noise ratio and noise figure.
6. Describe the different types of noise in communications systems.
7. Show the relation between information and bandwidth.
8. Describe and make simple calculations of amplitude, frequency and phase modulation.
9. Define the terms frequency spectrum, power spectrum, modulation index, baseband signal and bandwidth.
10. Describe the operation of AM, FM, SSB and DSB-SC practical modulator circuits.
11. Describe the methods of demodulation of AM, FM and SSB signals
12. Describe a range of practical modulator circuits.
13. Use the signal to noise ratio and carrier to noise ratios to compare different modulation systems and to demonstrate the significance of threshold effects.
14. Compare AM and FM methods of transmission in terms of S/N ratio, bandwidth, power and transmission medium.

15. Describe the main features of a range of receivers.
16. Describe in general terms the main features of transmission lines.

Syllabus:

Review of main communication systems. Message, signal, noise and communication channel. Distortion and dynamic range. Noise in systems. S/N ratio. Information and bandwidth. Filters. Amplitude, frequency and phase modulation. Practical modulator circuits. FM and SSB systems. Comparison of modulation methods. Receivers, detection, AGC. Super-heterodyne receivers. Transmission lines.

Practical work: 6 hours

Textbook:

F.G. Streamler, Introduction to Communication Systems, 3rd Edition. Addison-Wesley.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

EE 341: COMPUTER ARCHITECTURE

Hours per week: 4 (3/1)

Prerequisite: EE 241, EE 242

Objective:

On completion of this subject, students should be able to:-

1. Describe the Von Neumann architecture and be able to detail the subsystems found in modern PC architectures.
2. Explain what is meant by a CPU instruction set and give a brief overview of the interactions between CPU, memory and I/O subsystems.
3. Provide a detailed description of the function of a number of commercially available 16 and 32 bit microprocessors and their bus systems, including their memory and I/O architectures.
4. Detail the difference between software and hardware interrupts and explain the function

of interrupt vector tables.

5. Describe the system design for the IBM PC, at a hardware and firmware level. This will include basic hardware design, BIOS structure, major subsystem interface requirements as well as the DOS disk structure.

Syllabus:

Computer architectures, hardware and software. CPU, ALU, memory, I/O. Bus architectures, I/O structure, interrupts. The inner workings of an IBM PC. .

Textbook:

Mazidi, M.A., The Handbook of the IBM PC/XT, P52 and other 8088/86 Compatible's, Micro-processor Education Group, Duncanville, USA, 1994.

Tannenbaum, A., Operating System Design & Implementation, Prentice-Hall, 1986.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

EE 342: INTERFACING TECHNIQUES

Hours per week: 3 (1/2)

Prerequisite: EE 241, EE 242, EE 341

Objective:

On completion of this subject, students should be able to:-

1. Identify the difference between serial, parallel, synchronous and asynchronous interfaces, and provide a number of examples of each type.
2. Describe various analog to digital and digital to analog conversion techniques.
3. Provide the design for a number of simple digital interfaces, using memory mapping, software polling, hardware and software interrupt techniques.

Syllabus:

Introduction to microprocessor interfacing techniques. Microprocessor control of analog and digital equipment. Sensors in feedback systems.

Digital I/O interfacing. A/D and D/A conversion. In addition, there is a number of assignments on interfacing analog and digital devices to the IBM PC, including the writing of simple software routines to operate the interface. The interfaces implement A/D and D/A functions, simple open and closed loop motor speed control, and a temperature controller.

Textbook:

Tomkins, W.J., Webster, J.G., Interfacing Sensors to the IBM PC, Prentice-Hall, 1987.

Assessment:

Continuous assessment - 100%

EE 343: COMPUTER HARDWARE

Hours per week: 5 hours per week Year 3 Semester 1

Prerequisites: MA 167, PH 141

Objectives:

On completion students should be able to:-

1. understand and explain the principle components and peripherals of a computer system how they work individually and as a system.
2. find and repair basic faults.
3. explain data communication between computer systems and networks.

Syllabus:

Von Neumann architecture, milestones in computer architecture. Mother board and contents. CPU organisation; memory:- cache, main secondary. Arithmetic and logical units. Control of processing, memory management. Input, output, terminals, modems, mice, printers, font sets. Bus architecture, examples of bus systems, examples of modem chips, interfacing, interrupts. Basic diagnostics and fault finding for micro computers. Networking and communications, protocols, reliability, costs, interfaces, multiplexors. Data communication, network hardware.

Textbook:

Tanenbaum, A Structured Computer Organisation (Prentice Hall) (1990).

Assessment:

Continuous Assessment - 50%
Examination: - 50%

EE 351: ELECTRICAL MACHINES II

Hours per week: 4 (3/1)

Objective:

On completion of this subject, students should be able to:-

1. Understand the concept of rotating magnetic field produced by 2-phase and 3-phase currents.
2. Know the constructional details of cylindrical rotor and salient pole synchronous machines.
3. Solve problems using the simple equivalent circuit of the synchronous machine.
4. Draw the phasor diagram of the synchronous machine operating as a motor or generator at lagging, leading and unity power factors respectively.
5. Evaluate the synchronous impedance and short circuit ratio of the machine from the open-circuit and short-circuit tests.
6. Develop the power-angle equation of the synchronous machine, and to determine its maximum power limit.
7. Draw the phasor diagram and develop the power-angle relations of a salient-pole machine using the two-reaction theory.
8. Know the constructional features of the induction motor.
9. Solve problems on induction motor based on its equivalent circuit and phasor diagram.
10. Establish the relationship, rotor input: copper loss: output $1:s:(1-s)$.
11. Discuss the torque-speed curve, determine the maximum torque, and the slip at which it occurs, and the effect of rotor resistance on torque-speed characteristic.
12. Determine the effects of star-delta, auto-transformer, and rotor-resistance starters on starting torque and starting current of the induction motor.

13. Know the principle of operation of solid state drives for induction motors, e.g., squirrel-cage motor with AC power controller and with inverter.

Syllabus:

The Three-Phase Synchronous Machine: Constructional type, rotating magnetic field, e.m.f. equation including winding pitch and distribution factors. The Three-Phase Synchronous Generator: Winding, generator operation, armature reaction, phasor diagram: o/c, s/c tests, two-axes theory, parallel operation. Short-circuit transients, various reactances and time constants. The **Three-Phase Synchronous Motor:** Principle of operation, phasor diagram, starting, V-curves, torque-angle characteristics.

Fractional KW Motors:

Single-phase induction motors: Theory and performance, starting methods, split-phase, capacitor start/run; and shaded-pole arrangements and applications, starting and running performance, testing of small motors.

Induction Motor:

Basic theory and construction, windings, phasor diagram and equivalent circuit, torque-speed characteristics, testing, starting and speed control, principle of operation of solid state drives for induction motors, variable speed a.c machines.

Practical sessions: 6 x 3 hours

Textbooks:

Fitzgerald, Kingsley & Umans: Electric Machinery, McGraw Hill, 4th Edition, 1983.
Slemon, G.R., Electric Machines and Drives, Addison Wesley, 1982.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

EE 352: ELECTRICAL POWER SYSTEMS I

Hours per week: 4

Objective:

On completion of this subject, students should be

able to:-

1. Describe the workings of conventional and non-conventional conversion plants.
2. Calculate the inductance, capacitance and resistance of 1-phase and 3-phase overhead lines.
3. Represent an overhead line by its appropriate equivalent circuit.
4. Calculate the insulation resistance, dielectric loss and capacitance of underground cables.
5. Calculate the current-carrying capacity of underground cables.
6. Explain the different 3-phase transformer connections so as to produce given phase shifts.
7. Understand the importance and use of on-load tap changing gear in transformers.
8. Describe the testing and rating of circuit breakers.
9. Be acquainted with the earthing requirements and techniques.
10. Be familiar with hazardous installations and safe wiring practices.
11. Describe the methods of improving the power factor of an installation.

Syllabus:

Supply:

Primary energy, load characteristic and energy storage, single-line diagrams of typical substation arrangements, choice of system voltages, multi-voltage level power systems.

Conversion Plant:

Thermal, gas turbine, hydro-electric and nuclear power plants, M.H.D. generation, fuel cells, non-conventional energy sources, plant efficiencies. Per Unit Representation of Systems.

Overhead Lines:

Construction, corona, insulators, inductance of single-phase and three-phase lines, capacitance of single-phase and three-phase lines, Resistance and skin effect, Line representations, short line, medium length line, long line. A, B, C, D parameters, line charts and power flow.

Underground Cables:

Construction and electrical characteristics, insula-

tion resistance and dielectric loss, capacitance of 3-core cables, thermal considerations and ampacity calculation.

Transformers:

Construction, three-phase connections, polarity, phase shift, vector groupings, parallel operation, on-load tap changing.

Circuit Breakers:

Arc extinction, general construction of different types, auxiliary equipment, testing, rating.

Utilisation:

Earthing requirements and techniques, hazardous installation and safe wiring practices, power factor improvement, economic choice of plant, environmental control.

Textbooks:

Weedy, B.M., Electric Power Systems, John Wiley, 1987. Stevenson, W.D. Jr., Elements of Power System Analysis McGraw-Hill, 4th Edition. Cotton, H. & Barber, H., Transmission and Distribution of Electrical Energy, ELBS & EUP Ltd.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

EE 361: CONTROL SYSTEMS I

Hours per week: 3 (2/1)

Prerequisite: EE 241, EE 252

Corequisite: EE 311, MA 333

Objective:

On completion of this subject, students should be able to:-

1. Describe the operation of open and closed loop systems.
2. Show how computers may be used to simulate other systems.
3. Use BCSSP and PC MATLAB to write computer programs corresponding to first and second order control systems.

4. Derive mathematical models of first and second order systems using differential equations, transfer functions and block diagrams.
5. Derive mathematical models of simple RCL electric circuits, mechanical translational and rotational systems.
6. Derive mathematical models of d.c. generator and systems with gearing.
7. Explain the relation between external disturbances and system sensitivity in open and closed-loop control system.
8. Design a closed-loop system of the required accuracy.

Syllabus:

Introduction to control concepts:

Open and closed-loop systems.

Computer simulation methods:

BCSSP and PC MATLAB programming.

Mathematical modelling:

Ordinary differential equations, Laplace Transform applications, transfer function, block diagrams. Mathematical modelling of electric RCL circuits and mechanical translational systems. First and second order systems.

System sensitivity to disturbances:

Closed-loop vs open loop systems. Closed-loop system design. Mathematical modelling of mechanical rotational systems. Model of d.c. generator. Model of a system with gearing.

Practical Sessions: 6 x 3 hours

Textbook:

Ogata, K., Modern Control Engineering, Prentice-Hall, 1990.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

EE 362: CONTROL SYSTEMS II

Hours per week: 4 (2.5/1.5)

Prerequisite: EE 311, MA 333, EE 361

Objective:

On completion of this subject, students should be able to:-

1. Describe the principles of closed-loop systems and feedback control.
2. derive the mathematical models of complex systems: dc servo-motor position and speed control.
3. Find the time response of first and second order systems using analytical methods (Laplace Transform) and computer simulation (PC MATLAB).
4. Explain stability terminology and stability criteria for feedback systems.
5. Use Routh method of stability determination.
6. Use pole location in s-plane for stability determination.
7. Explain frequency response analysis concept.
8. Explain Nyquist Diagram and Bode Plots derivation.
9. Obtain Nyquist Diagram and Bode Plots using PC MATLAB.
10. Determine stability of a system using Nyquist Diagram and Bode Plots.
11. Improve system operation and derive new conditions using PC MATLAB, Nyquist and Bode Plots.

Syllabus:

Mathematical modelling of servo-motor, position control system and speed control system. Transient response analysis of first and second order systems for step, impulse and ramp input. Analytical solution using Laplace Transform. Graphical interpretation. Position control system investigation using computer simulation (PC MATLAB). Position control system design and optimisation using PC MATLAB. Types of controllers: PD, PI, PID control. Position control system with P, PI and PID controllers. Velocity feedback. Error analysis. Stability analysis: Stability in s-plane Routh stability. Frequency response analysis. Nyquist diagram and Bode plots. Gain and phase margins. Frequency response using MATLAB. Compensation techniques.

Practical Sessions: 3 x 6 hours

Textbook:

Ogata, K., Modern Control Engineering, Prentice-Hall, 1990.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

EE 371: TRANSMISSION MEDIA

Hours per week: 3(2/1)

Objectives:

On completion of this subject, students should be able to:-

1. explain the use of lumped and distributed parameters in transmission lines.
2. derive the LC model of a transmission line
3. make calculations using the Smith chart.
4. describe the concepts of microstrip and coaxial lines
5. explain propagation of plane waves in material media
6. give a geometrical description of the theory of guided waves in parallel plate and dielectric waveguiding structures
7. describe the concepts of optical fibers and dielectric waveguides

Syllabus:

Transmission Lines:

Transmission lines, lumped and distributed parameters, LC model of transmission line. Wave solution. Propagation constant, phase velocity, characteristic impedance. VSWR. Smith chart Power flow and Poynting theorem. Two-wire lines, coaxial cables and microstrip lines.

Material media:

Maxwell equations and plane wave limitations; wave equation; solution for sinusoidal variations, wave velocity; intrinsic impedance, power flow, Poynting vector; propagation in lossy dielectrics, attenuation, loss tangent; propagation in conductors.

Waveguides and optical fibers:

Short-comings of two-conductor lines. Propagation in parallel plate and dielectric waveguides -

geometrical considerations, boundary conditions. Optical fibre concepts, mode of propagation, material properties

Practicals: Computer simulations 12 hours

Assessment:

Continuous assessment - 100%

EE 372: COMPUTER AIDED ENGINEERING

Hours per week: 2

Prerequisite: EE 233, EE 234, EE 261, EE 262

Objective:

On completion of this subject, students should be able to:-

1. use a number of electrical design aids in the course of their everyday work.
2. Produce a detailed plan for a project including the identification of suitable project milestones, estimates of time required, materials costs and projected benefits accrued from its completion.
3. Successfully complete a project from a detailed proposal, using a project plan as identified above followed by an oral presentation and a written project report.

Syllabus:

This course introduces students to a number of electrical engineering design and simulation packages. For the first part of the course, students are exposed to a PCB layout package and a circuit simulator. They are required to complete a number of assignments using these packages. In addition students will undertake a major project (8 weeks or more), requiring a written report and a 15-20 minute talk on their experiences. This course will act as a springboard to the final year by introducing students to a range of engineering techniques; and to the methods of project planning, time management, report writing and confidence building through verbal and written presentation of results.

Assessment:

Continuous assessment - 100%

EE 382: INDUSTRIAL ELECTRONICS AND COMPUTER CONTROL

Hours per week: 3

Prerequisites: Nil

Objective:

To develop an understanding of the electronic devices and circuits, electronic analogue and digital measuring instruments such as transducers and PC based instruments and microcomputer control and applications.

On the completion of the subject, the student should be able to:-

1. Understand the principles of operation of electronic analogue and digital instrumentation.
2. Understand the application of micro-computers in control systems.
3. Understand the operation of PC based instrumentation system.
4. Understand the construction, logic and operation of Programmable Logic Controllers (PLC).
5. Understand the application of PLC for control of various industrial processes in manufacturing industries.
6. Understand the application of flow charts, PLC wiring diagram and PLC ladder diagrams in industry.

Syllabus:

Electronic devices and circuits, analogue and digital circuits and techniques, electronic measurements and control; micro-computer control and applications; Principles of Engineering instrumentation; transducers and instrumentation systems, PC based instrumentation; PLC – Programmable Logic Controllers with its construction and its application using various languages such as Boolean Statements, Static logic and Ladder diagrams. Emphasis may be placed on logical thinking and efficient, logical program development.

Textbook:

Newman, M., Industrial Electronics and Controls, John Wiley & Sons, New York, 1986.

Reference:

Ramsay, D.C., Principles of engineering Instrumentation, Halstead Press, New York, 1996.

Assessment:

Continuous Assessment - 60%
Written Examination - 40% (1x3 hrs)

EE 398: ELECTRICAL ENGINEERING FOR MINING

Hours per week: 4 (3/1)

Objective:

On completion of this subject, students should be able to:-

1. Describe the main features of electric power generation, transmission and distribution.
2. Discuss the problems of electrical installations in mines.
3. Describe methods of measurement in mining applications.

Syllabus:

Introduction to electric power generation, transmission and distribution systems. Motor characteristics, theory and control and application in mining. Special problems of electrical equipment in mines, flame proofing, intrinsic safety, earth leakage protection. Concepts of instrumentation in mining. Control systems. Telemetry in instrumentation. Electrical safety regulations in mines. Transducers.

Textbook:

Cummins, A.A., and Giuen, I.A, (eds.) SME Mining Engineering Handbook, SME, NY 1973.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1x3 hrs)

EE 402: THE PROFESSIONAL ENGINEER

Hours per week: 2

Objective:

On completion of this subject, students should be able to:-

1. Explain aspects of law, business and ethics in engineering.
2. Communicate verbally and through other media.

Syllabus:

Topics of relevance to a practising professional engineer, including aspects of law, business, ethics and responsibility. Communication skills, covering topics such as report writing, interviews, meetings and public speaking.

Assessment:

Continuous assessment - 100%

EE 411: INSTRUMENTATION SYSTEMS AND PROCESS CONTROL

Hours per week: 3 (2/1)

Prerequisite: EE 241, EE 251, EE 262, EE 321

Objective:

On completion of this subject, students should be able to:-

1. Explain the principles of operation of electronic analogue and digital instrumentation.
2. Explain the reasons for instrumentation systems.
3. Operate PC based instrumentation systems.
4. Log and process data and graphically display results (hardcopy included) using Virtual Instrumentation Systems (VIS) and spreadsheet packages.
5. Explain construction and operation of Programmable Logic Controller (PLC).
6. Apply PLC for control of various industrial processes in mining, manufacturing industry and traffic control.
7. Develop flow charts, PLC wiring diagrams and PLC ladder diagrams for a given industrial problem.

8. Operate multicomputer PC/PLC system, implement and execute developed programs, monitor on-line process.

Syllabus:

Electronic Instruments and Instrumentation Systems:

Electronic analogue and digital measuring instruments. Transducers. Instrumentation systems. PC based instrumentation, VIS - Virtual Instrumentation Systems. Industrial Process Control: Sequential control. Relay control. PLC - Programmable Logic Controller. Construction. Languages:

Boolean Statements, Static Logic, Ladder Diagrams. PLC applications.

Practical Sessions: 8 x 3 hours 3 Laboratory projects.

Textbook:

Newman, M., Industrial Electronics and Controls, John Wiley & Sons, 1986.

Korzeniowski, K., Application of Programmable Logic Controllers to Industrial Process Control, Departmental Handout, 1990.

Assessment:

Continuous assessment - 100%

EE 412: THESIS (B)

Hours per week: 8

Objective:

On completion of this subject, students should be able to:-

1. Make design decisions and present design results in public discussion.
2. Produce a technical report on a design project.

Syllabus:

A project and dissertation carried out on an individual basis with a member of staff.

Assessment:

Continuous assessment - 100%

EE 421: ELECTRICAL DESIGN I

Hours per week: 3

Prerequisite: EE 211, EE 223, EE 234, EE 252, EE 351, EE 352, EE 372

Objective:

On completion of this subject, students should be able to:-

1. Explain the philosophy of engineering design as a complex problem-solving activity to satisfy some human need.
2. Discuss the importance of an operational model of the design process and identify its main phases.
3. Interpret the concepts of size ranges, preferred number series, similarity laws and modular system/products.
4. Substantiate the importance of standardisation and classify and use standard specifications in common design situations.
5. Identify the various constraints and essential economic factors in design of engineering systems/products.
6. Produce a checklist of objectives in embodiment design.
7. Perform design calculations of main dimensions of the stator and rotor core and of armature winding details for cage and slip-ring induction motors.
8. Perform design calculations of main dimensions of the stator and rotor core and of armature winding details for cylindrical and salient-pole synchronous generators.
9. Perform design calculations of main dimensions of the armature and of armature winding details for DC motors and generators.
10. Perform design calculations of main dimensions of the core of single and three-phase transformers and of transformer winding details.
11. Perform design calculations of basic electronic circuits such as rectifiers, filters, amplifiers, comparators, oscillators, switching regulators, DC power supplies, inverters and converters, opto-couplers and selected digital circuits.

Syllabus:

Philosophy of engineering design, operational model of the design process, size ranges, preferred number series, similarity laws, modular systems, standardisation and standard specifications, design constraints, economic factors in design. Design of power apparatus: a.c. and d.c. rotary machines and transformers. Design of selected basic electronic circuits.

Textbook:

Svensson, N.L., An Introduction to Engineering Design, UNSW Press, 1990.

Say, M.G., Alternating Current Machines, Pitman Publishing Ltd, ELBS Edition, 1980.

Say, M.G. and Taylor, E.O., Direct Current Machines, Pitman Publishing Ltd, ELBS Edition, 1980.

Mitchell, F.H., Jr., and Mitchell, F.H., Sr., Introduction to Electronics Design, Prentice-Hall International, Inc. 1988.

Assessment:

Continuous assessment - 100%

EE 431: THESIS (A)

Hours per week: 4

Objective:

On completion of this subject, students should be able to:-

1. Make design decisions and present design results in public discussion.
2. Produce a technical report on a design project.

Syllabus:

A project, or projects, involving analysis, design and implementation carried out on an individual basis.

Assessment:

Continuous assessment - 100%

EE 432: ELECTRICAL MACHINES III

Hours per week: 3 (2/1)

Objective:

On completion of this subject, students should be able to:-

1. Describe the torque-speed load characteristics of induction machines.
2. Explain the industrial applications of induction machines.

Syllabus:

Review of induction machines theory. Torque - speed load characteristics of induction motor. Industrial applications and selection of drives. Starting and speed control. Induction generator.

Textbook:

Guru, B.S. & Miziroglu, M.R., Electric Machinery and Transformers, 3rd ed., Oxford University Press.

References: Manufacturers Manuals.

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1x3 hrs)

EE 441: ELECTRICAL POWER SYSTEMS II

Hours per week: 4 (4/0)

Objectives:

On completion of this subject, students should be able to:-

1. Calculate the variation of frequency with time for single-area and two-area systems for step-load increases for both controlled and uncontrolled cases.
2. Explain the methods of controlling the voltage and reactive powers in a system.
3. Calculate switching and lightning over-voltages in simple systems.
4. Understand the importance of insulation co-ordination.
5. Calculate the fault levels in a system for different types of fault.
6. Decide appropriate protection schemes for generators, transformers, feeders, busbars etc.
7. Explain the application of surge diverters

for overvoltage protection.

Syllabus:

Automatic Generation Control:

Frequency control and power-frequency relationship, transfer function models for control, generator characteristics and governor settings, effect of tie-line power on interconnected system operation, phase-shift transformers.

Control of Voltage and Reactive Power:

Injection of reactive power-static and synchronous condensers, tap-changing transformers, induction regulators and AVRs. Economics of reactive power generation.

Short-Circuit Calculations:

Symmetrical 3-phase faults, symmetrical components, unsymmetrical faults, sequence reactances of plant, current-limiting reactors, fault levels in a typical system, neutral grounding.

Protection:

Overcurrent and earth leakage schemes, balanced differential schemes, distance (Impedance) schemes, generator protection, transformer protection, feeder protection, busbar protection, carrier-current protection, relay co-ordination, overvoltage protection.

Power System Transients:

Generation of overvoltages, propagation of surges, transmission and reflection at discontinuities, switching transient calculations, current chopping, overvoltage and insulation co-ordination.

Textbook:

Weedy, B.M., Electrical Power Systems, John Wiley, 1987.Elgerd, O.L., Electric Energy Systems Theory, McGraw-Hill, 1982.Stevenson W.D. Jr.: Elements of Power System analysis, 4th Edition, McGraw Hill.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1 x 3 hrs)

EE 442: ELECTRICAL POWER SYSTEMS III

Hours per week: 4

Objective:

On completion of this subject, students should be able to:-

1. Understand the difference between steady-state and transient stability.
2. Develop and/or use a computer program for load flow studies.
3. Describe load flow control in a power system.
4. Understand the difference between steady state and transient stability.
5. Calculate the swing curve of the system for large disturbances.
6. Apply the equal-area criterion to investigate the transient stability of a system.
7. Conceptualise and forecast the present and future needs of electrical energy in the country.
8. Evaluate the loss of load probability and the expected value of demand not served as the two indices of generation system reliability.

Syllabus:

Economic Operation:

Fuel cost and incremental fuel costs, cost of loss in transmission, unit commitment and distribution of load between plants, economic dispatch, principles of automatic load dispatch.

Load Flow Calculations:

Modelling of power system components, load flow problem formulation, development of load flow equations, mismatch formulation of the load flow problem, iterative methods of load flow calculations - use of computer programs, load flow control.

Power System Stability:

Steady-state power limits, load instability, synchronous instability, transient power limits, rotor movement and equation of motion, step-by-step calculation of the swing curve, multi-machine systems, equal-area criterion, critical clearing angle, improving system stability, computer programs for transient stability.

Load Forecasting:

Forecasting methodology, energy and peak demand forecasting, non-weather sensitive and weather-sensitive forecasts, annual and monthly peak demand forecasts.

Generation System Reliability:

Probabilistic load models, reliability analysis for an isolated system, reliability analysis of interconnected areas.

Textbook:

Elgerd, O. L., Electric Energy Systems Theory, McGraw-Hill, 1982.

Weedy, B. M., Electric Power Systems, John Wiley, 1987.

Stevenson, W. D. Jr., Elements of Power System Analysis, 4th Edition McGraw-Hill.

Sullivan, R.L., Power System Planning, McGraw-Hill, 1977.

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1x3 hrs)

EE 451: POWER ELECTRONICS I

Hours per week: 3

Objective:

On completion of the subject, students should be able to:-

1. Explain the use of semiconductors in power systems.
2. Describe the operation of rectifiers, converters and inverters.

Syllabus:

Single and three-phase semiconductor rectifying circuits. Regulation, control and overlap. Silicon controlled rectifiers, converters and inverters.

Textbook:

Rashid, M.H., Power Electronics: Circuits, Devices and Applications, Prentice-Hall, 1988, 2nd ed.

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1x3 hrs)

EE 452: POWER ELECTRONICS II

Hours per week: 3

Objective:

On completion of this subject, students should be able to:-

1. Describe inverter techniques.
2. Describe uninterruptible and switched mode power supplies.

Syllabus:

Forced-commutated inverter techniques. AC and DC variable speed drives. Battery chargers. Uninterruptible power systems. DC power links.

Textbook:

Rashid, M. H., Power Electronics: Circuits, Devices and Applications, Prentice-Hall, 1988, 2nd ed.

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1x3 hrs)

EE 461: COMPUTER COMMUNICATIONS

Hours per week: 3 (3/0)

Prerequisites: EE 371, EE 342

Corequisites: EE 471

Objectives:

On completion of this subject, students should be able to:-

1. Describe the basic telecommunication networks and principles of their operation.
2. Discuss the basic computer networks and computer networking principles.
3. Interpret the concepts of OSI and TCP/IP reference models.
4. Explain the concept of protocols and services.
5. Describe transmission layer protocols, packet concept and error assessment.
6. Explain advantages of level structured approach, inter-level protocols and standards.
7. Describe the techniques for improving of a network efficiency.

8. Explain multiplexing concept and strategies.

Syllabus:

Purpose of telecom networks. Basic networks, ideal transmission link, voice to digital signal. Human switch point (the operator), operator v. automatic local call connect, channel associated signalling.

Automatic crosspoint switch, inter-switch linkage, scale of modern network, the automated network challenge. Circuit switched networks, packet switched networks.

Computer networking principles and engineering:

wide-area networking, local area networks network topology. Communication hardware and software protocols.

Open-system-interconnection model TCP/IP reference model.

Transmission link digital capability (level 1). Basic characteristics of copper, optical fibre & radio, sources of error, power budgets, bandwidths, simple system design.

Transmission layer protocols, purpose and structure (level 2). Packet concept, error assessment, response to error, error correction.

Physical structures at level 2: memory processing and control.

Network functionality at level 3, purpose and range. Header, networking information, switching function, simple switching architecture & control, routing and queuing concepts.

Service enabling and level 4 objective.

Construction of end to end circuits, common channel signalling concepts, switch to switch communication, the call model. Virtual channel concepts, buffered queues, basic traffic issues. Implementation of software control, data structures, link lists etc..

The complete level diagram, advantages of level structured approach, inter-level protocols, standards consistent signalling, effecting global communications.

Improving networking efficiency. Use of time domain, time frames, synchronization, multiplexing concept, time/space switching

architectures, non-blocking strategies, further switch control issues, multiplexing strategies, construct the network engine.

Text books:

Andrew S. Tanenbaum Computer Networks. 1996 Prentice-Hall Inc., 813 pp.

Assessment:

Continuous assessment - 40%
Written examination - 60% (1 x 3 hours)

EE 462: ELECTRICAL DESIGN II

Hours per week: 2

Objective:

On completion of the subject, students should be able to:-

Apply published standards to the design and installation of power equipment and systems.

Syllabus:

Design techniques applied to power equipment and systems; use and choice of materials; component and equipment limitations; use of standards; testing and maintenance procedures.

Textbook:

SAA Wiring Rules, Australian Standard AS3000-1991, 10th Ed., Standards Association of Australia.

Assessment:

Continuous assessment - 100%

EE 471: COMMUNICATION SYSTEMS ANALYSIS & DESIGN

Hours per week: 5 (4/1)

Prerequisite: EE 311, EE 331, EE 332

Corequisite: EE 481, EE 491

Objective:

On completion of this subject, students should be

able to:-

1. Explain the philosophy of engineering design as a complex problem-solving activity to satisfy some human needs.
2. Discuss the importance of an operational model of the design process and identify its main phases.
3. Explain methods of multiplexing in frequency and time division.
4. Describe amplitude, frequency, phase and digital modulation and demodulation techniques.
5. Explain how noise can be described and how it impairs the performance of communications systems.
6. Describe methods of data formatting in the context of bandwidth, error rate and error correction.
7. Describe a range of waveform coding techniques.

Syllabus:

Telecommunication Systems and Networks:

Philosophy of system analysis and design. Source, receiver and communication interface, transmission modes. Analogue and digital signals, synchronous and asynchronous systems. Introduction to interface standards, universal asynchronous receiver/transmitter, OSI reference model and standards. Protocols, concept of a protocol, ASCII based protocols.

Modems:

Conventional modem. Modulation and demodulation techniques. Single side-band modulation, frequency modulation, on-off keying, frequency-shift keying, phase-shift keying, multisymbol signalling QAM, MFSK, MPSK, MSK. Radio modems. Data compression techniques. Multiplexing, Frequency Division Multiplex/Frequency Modulation. Time Division Multiplex/Pulse Code Modulation. Framing structure, digital hierarchy, multiplexer format. Groups, super groups, master groups and super-master groups. Smart modems.

Noise Impairments:

Signal-to-Noise Ratio. Comparison of linear modulation systems, S/N and angle modulation,

threshold in FM, pre-and de-emphasis, S/N improvements. Carrier-to-noise ratio. Bit error rate in PCM, fading and BER. Baseband shaping for data transmission. Binary data Format. Nonreturn-to-zero unipolar, polar and bipolar format. Manchester format. Correlative coding. Duobinary signalling, modified duobinary signalling. Wave-shaping and bandwidth consideration.

Performance of Communication Systems:

Limitations due to noise. BER and optimum decision levels.

Information Capacity of PCM Systems:

Relations among signal power, noise, and bandwidth.

Waveform Coding Techniques:

Quantization noise and signal-to-noise ratio, companding, differential PCM and adaptive differential PCM, delta modulation and adaptive delta modulation.

Practical work: 9 hours.

Textbook:

F. G. Streamler, Introduction to Communication Systems, 3rd Edition. Addison-Wesley.

Assessment:

Continuous assessment	- 40%
Written examination	- 60% (1x3 hours)

EE 472: SATELLITE COMMUNICATIONS

Hours per week: 5

Prerequisite: EE 311, EE 471, EE 491

Corequisite: EE 482, EE 492

Objective:

On completion of this subject, students should be able to:-

1. Explain the importance of satellite communications in the modern world.
2. Calculate the up and downlink budgets in a satellite earth station link.
3. Describe the methods of frequency and time

- division multiple access.
4. Describe the different services that are available via satellite.
 5. Carry out calculations on interference, inter modulation, fading and cross polarisation.
 6. Describe the principles of digital modulation and to show how coding depends on bandwidth and error rate.
 7. Describe the various international satellite organisations, and their impact on PNG communications.

Syllabus:

Case study:

A case study of a type-B earth station similar to the Gerehu station in Port Moresby provides an introduction to satellite orbits, single channel per carrier operation, antenna specifications, leasing arrangements, inter modulation, transponder back-off, EIRP calculations, power flux densities, carrier to noise density ratio, channel capacity, channel threshold and signal to noise ratio.

Earth Stations:

G/T, high power amplifiers, low noise amplifiers, upconverter, downconverter, monitoring and control.

Satellite Link:

Co- channel, adjacent channel and interleaving channel noise. Inter modulation. Atmospheric effects, fading and cross-polarisation, system availability. C/I and C/N. Frequency and Time Division Multiple.

Access:

FM, FDM, FDMA, CFDMA, SCPC, SPADE. TDMA frame structure, acquisition and synchronisation, timing, equipment, packet switching (ALOHA), DSI, SS-TDMA. SDMA. CDMA. DME, IDR.

Digital Modulation:

Phase shift keying, Quaternary phase shift keying, frequency shift keying, OQPSK, noise and error rates, error correction coding. Link.

Budgets:

CFDM, SCPC, TDMA.

Satellite Services:

Telephone, data, television, navigation, weather, mobile, news gathering, video conferencing.

Local Satellites:

INTELSAT series, AUSSAT, PALAPA, PEACESAT, INMARSAT, ETS-V.

Satellite Systems:

International organisations, INTELSAT, INMARSAT, INTERSPUTNIK. Regional organisations, EUTELSAT, ARABSAT. Domestic organisations by country and types of satellite use. Experimental organisations, ATS, OTS, Olympus, SIRIO.

Textbook:

Roden, Martin S., Analogue and Digital Communication Systems, Prentice-Hall, 1991.

Assessment:

Continuous Assessment	- 40%
Written Examination	- 60% (1x3 hrs)

EE 481: ANTENNAS AND PROPAGATION

Hours per week: 3

Prerequisite: EE 331, EE 332,

Corequisite: EE 471, EE 491

Objective:

On completion of the subject, students should be able to:-

1. Describe types of HF, VHF, UHF and SHF antennas commonly used in PNG.
2. Describe and define the meaning of directivity, effective aperture, beam-width, polar patterns, antenna gain and radiation loss.
3. Describe in simple theoretical terms, and with use of diagrams, the behaviour of a simple resonant dipole, an isotropic radiator and a rectangular aperture antenna.
4. Describe, with suitable diagrams, a range of antenna types to include resonant and non-resonant antennas, wire antennas, arrays, parabolic apertures and feeds.

5. State the meaning of radiation resistance, its effects on matching and its relation to the methods of top and bottom loading.
6. Describe the factors, including antenna coupling, that affect the bandwidth and losses in antenna systems.
7. Explain how the propagation properties of the atmosphere, ionosphere and deep space affect the behaviour of antennas.
8. Explain the meaning of antenna noise temperature and show how this is affected by feeder loss.
9. Perform noise gain and G/T calculations at a receiver/antenna front end.
10. Calculate and specify the route parameters of radio relay systems.

Syllabus:

Elemental antennas:

Half wave dipole, vertical monopole, long wire radiators, Hertzian dipole, isotropic radiator.

Wire radiators:

Rhombic antennas, horizontal and vertical dipoles with reflectors, arrays of 2+n radiators, broadside co-linear and stacked dipoles, Yagi array, slot array and log periodic array. Parabolic reflectors, feeds and horns: Rectangular and circular horns, parabolic reflectors, focal length, pattern shapes and aperture illumination, corrugated waveguide and dipole feeds, slot antennas and lenses. Polarisation, polar diagram and beamwidth, directivity and gain, radiation resistance, effective aperture, power transfer, reciprocity and the radar equation.

Matching:

The conditions and methods of loading and impedance matching of wire antennas. The impedance matching of other antennas.

Antenna noise:

Sky noise temperature, ground noise, feeder loss, receiver front end noise, input noise temperature and G/T ratio.

Propagation:

Reflection, refraction, diffraction. Ground wave. Sky wave in the ionosphere. Space wave in the troposphere. Ray bending and effective earth

radius scattering, fading and scintillation. Fresnel zone. Radio relay system route planning.

Textbook:

Balanis C.A., Antenna Theory, J Wiley.

Assessment:

Continuous Assessment	- 40%
Written Examination	- 60% (1x3 hrs)

EE 482: DATA COMMUNICATIONS

Hours per week: 4 (3/1)

Objective:

On completion of this subject, student should be able to:-

1. Understand and explain basics of packet switching data networks.
2. Measure and compare the rate of performance of various communication protocols.
3. Describe various methods of synchronous communication using framing and packetisation techniques, error detection and correction, Automatic Repeat Request.
4. Describe various synchronous data communication protocols and formats such as SDLC, HDLC, X.25, IEEE 802 series, TCP/IP, ISDN, Frame Relay and etc.
5. Develop a network architecture based on OSI's seven layer model.
6. Explain reliability and failure rate, in terms of MTBF and MTTF, bathtub curve.
7. Have an understanding of probability of packet collision theory, queuing theory and traffic.

Syllabus:

Basics of data network communication, channel capacity and utilisation, TRIB calculations, error detection and correction, basic coding theory, Cyclic Redundancy Code generation, asynchronous versus synchronous communication, EIA serial communication standards, various modem protocols and CCITT recommendations, Aloha network, dedicated versus circuit switched networks, packet switching networks, public data networks, investigation of X.21 and X.25 network, SDLC, HDLC and IEEE 802 series framing

formats, TCP/IP protocols, ISDN, Frame Relay, FDDI versus CDDI and several other Internetwork communication standards. Study of Network Architecture based on Open System Interconnection's 7 layer model, Backbone network architecture, Routing protocols.

Study of reliability theory, failure rate, bathtub curves, Mean Time Between Failure rate (MTBF) and Mean Time To Failure (MTTF), Queuing theory and traffic.

Textbook:

Markley, R. W., Data Communication and Interoperability, Prentice-Hall, 1990.

Assessment:

Continuous assessment - 40%

Written examination - 60%

EE 491: MICROWAVE AND OPTICAL SYSTEMS

Hours per week: 4 (3/1)

Prerequisite: EE 311, EE 331, EE 332

Corequisite: EE 471, EE 472

Objective:

On completion of this subject, students should be able to:-

1. Describe the main features of the microwave and optical communications systems in PNG.
2. State the frequency bands of the microwave and satellite links in PNG.
3. Give a description of plane waves based on Maxwell's equations and the wave equation.
4. Give a description of the theory of guided waves in terms of TE and TM modes.
5. Draw and explain common waveguide components.
6. Describe the concepts of stripline design and operation.
7. Draw and explain a range of microwave amplifiers and oscillators.
8. Describe, using diagrams where necessary, the concepts and components of optical communications systems.

Syllabus:

Microwaves and optical waves as part of EM spectrum, electromagnetic waves, plane waves. Maxwell equations and plane wave limitations; wave equation; solution for sinusoidal variations, wave velocity; intrinsic impedance, power flow, Poynting vector; propagation in lossy dielectrics, attenuation, loss tangent; propagation in conductors, skin effect and skin depth, surface resistance.

Waveguide Theory:

Shortcomings of two-conductor lines. Propagation in waveguides - geometrical considerations, boundary conditions. TE and TM modes - excitation and suppression. Modes in rectangular and circular wave-guides, wave velocity, wave impedance; attenuation and losses in waveguides.

Waveguide Components:

Couplers, joints, matched loads, detectors, Stripline: Types of stripline, characteristic impedance dimensions, wavelength, phase velocity, phase constant, attenuation. Slotline. Finlines. Resonant circuits. Filters. Microwave Amplifiers and Oscillators: GaAs FET. GUNN Diodes. MIC's. Klystrons. TWT.

Optical Communication Components:

Optical fibre concepts, mode of propagation, material properties, multi-mode and single fibres, attenuation and dispersion. Cables, index and mode, design, splices, connectors. Light sources and detectors, laser diodes, light emitting diodes, photodiodes. Modulation and demodulation.

Optical Communication Systems:

Advantages and applications. Transmitter and receiver performance. Optical signal processing, noise and overall system and performance.

Practical work: 6 hours in Microwave Laboratory.

Textbook:

Olver, A.D., Microwave and Optical transmission, Wiley, 1992.

Assessment:

Continuous Assessment - 40%

Written Examination - 60% (1x3 hrs)

EE 492: ELECTRONIC NAVIGATION SYSTEMS

Hours per week: 3

Prerequisite: EE 471, EE 481, EE 491

Objective:

On completion of the subject, students should be able to:-

1. State the frequency bands of radio navigation aids in PNG.
2. Describe the principles of operation of radio navigation aids based in PNG.
3. Describe the principles of Loran-C, Omega and NAVSTAR nav systems.
4. Describe the principles of surveillance radar and draw block diagrams.
5. Derive the radar equation and perform relevant calculations.
6. Explain the principles and use of weather radar, radar altimeter and "police" radar.
7. Describe the principles of the Secondary Surveillance Radar System and its modes, its limitations and new developments.
8. Describe the principles of the ILS, and MLS and compare their merits.
9. Give examples of new developments in electronic navigation.

Syllabus:

Introduction:

Air Traffic control methods, procedures and organisation. Summary of aviation electronics developments. Radio frequency bands used in electronic navigation systems. Regulations and standardisation agencies. The PNG airspace and airways.

Direction Finding:

Principles of direction finding. Non directional beacons, the loop antenna, automatic direction finders. Availability of NDBs and use in PNG. Long range Radionavigation Systems: Principles of Loran-C, location of Omega Stations. The Omega system principles, location of Omega Stations. Satellite navigation systems. Transit and NAVSTAR Global Positioning Systems. Accuracy and availability.

Medium range Radio-navigation Systems:

Conventional VOR, doppler VOR, principles of operation. Reliability. Distance Measuring Equipment (DME) principles. Use of these services in PNG.

Surveillance Systems:

Principles of radar, the radar equation. Surveillance Radar, Weather Radar, Secondary Surveillance Radar, Radar Altimeter, cw radar; Block diagrams and principles. SSR limitations and improvements.

Landing Systems:

The Instrument Landing System (ILS) Principles, categories and limitations. The Jackson's Airport ILS. The Microwave Landing System (MLS) Principles. Performance comparison with ILS.

Major New Systems:

A summary of new systems, e.g., airborne collision avoidance system, sar via satellite. Visit Nadzab Airport

Textbook:

Helfrick, Alfred, Modern Aviation Electronics, Prentice-Hall. 1991.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

DIPLOMA COURSES

ED 301: ELECTRONIC TEST EQUIPMENT AND MEASUREMENTS

Hours per week: 8 (5/3)

Prerequisite: EE 223, EE 233, EE 234

Objective:

On completion of this subject, student should be able to:-

1. Describe special features of oscilloscopes such as delay sweep, x-y operation and storage cathode ray tube.
2. Draw and describe the function of block diagrams for spectrum analysers and digital

- multimeters.
3. Be able to explain technical specifications and standards used in writing specifications.
 4. Be able to describe three methods of fault location.
 5. Be able to describe methods that systematically locate faults in electronic equipment or
 6. Be able to describe steps to systematically locate faults in electronic equipment.

Syllabus:

Introduction to Specifications, Testing and Quality Control. Measurement Techniques. Review Analog instruments. Impedance measurement. Oscilloscope use and calibration. Spectrum analyser. Test signal sources from VLF and VHF. Care and calibration of test equipment. Fault location principles. Documentation. Logic test instruments.

Textbook:

Electrical and Communication Department. Test Equipment 1- 4.
Herrick, Clyde, Instruments and Measurements for electronics, Tokyo, McGraw-Hill Kogakusha, 1972.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

ED 311: DIGITAL ELECTRONICS II

Hours per week: 5 (3/2)

Prerequisite: EE 251

Objective:

On completion of this subject, student should be able to:-

1. Analyse, evaluate and decode ripple and parallel counters, any modulus up or down counters.
2. Analyse multiplexers, demultiplexers and encoders.
3. Use correct terminology for memory devices.
4. Describe the function and operation of the five basic elements of a computer system.
5. Use basic DOS commands to change drive,

- change directory, copy files to disk, screen or printer, clear the screen, list the directory etc.
6. List the DOS boot up sequence and the significance of the boot up files.

Syllabus:

Counter and Counter applications. Data handling logic circuits. Input/Output technique in digital systems. Memory devices. General logic fault diagnosis. Disk storage, sides, cylinders, tracks and sectors, disk capacity. Disk operating systems. MS DOS boot sector, file allocation tables, directories. File formats. ASCII, (text) files, config. sys file, commands. com, setting the environment. DOS commands. Batch files, autoexec. bat files.

Textbook:

Tocci, R. J., Digital System: Principles and Applications. Norton, P., Inside the IBM PC.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

ED 312: DISK OPERATING SYSTEMS & I/O INTERFACING

Hours per week: 6 (3/3)

Prerequisite: ED 311

Objective:

On completion of this subject, students should be able to:-

1. Enter data into memory with the E command, enter mnemonics into memory with the A command. Display memory with the D command and unassembled memory with the U command.
2. Explain the displays seen using the D and U commands.
3. Generate an ASCII file using a word processor. Generate an .OBJ file from the ASCII file. Generate a .COM FILE and a .EXE file. General EXE files by directly entering assembly language commands into memory and saving these as a file.
4. Read the status of switches connected via a

- PIA into memory.
5. Redirect the status via the PIA to LEDS acting as output. Control an external motor by reading the status of inputs switches.
 6. Read an analogue input and display its decimal value on the VDU.

Syllabus:

Translating programs, compiling, interpreting, assembling. Debug. Debug commands, file dumps. Memory dumps other file handling utilities. Assembly language instruction set. MSMA SM. Creating .ASM files. Linking files, DOS Linker creating .COM files, EXE2BIN. Unassembly of .COM files. Interfacing. Input and output control using simple assembly language problems.

Reference:

Norton, P., Inside the IBM PC. MSMA SM by Microsoft.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

CM 321: COMMUNICATIONS PRINCIPLES (ANALOG)

Hours per week: 6 (4/2)

Objective:

On completion of this subject, student should be able to:-

1. Draw the block diagram of a basic FDM telephone system. For the following types of modulation, AM, SSB, FM.
2. State advantages and disadvantages.
3. Explain the use of Phase Locked Loop as a synthesizer.
4. Draw a block diagram of a transmitter and receiver and explain the function of each block.
5. State the causes of noise in communication systems.
6. Define Signal to Noise ratio.
7. Determine noise factor and noise temperature.

Syllabus:

Basic carrier telephony techniques, Amplitude modulation, Angle modulation. AM Receivers and Transmitters, FM Receivers and Transmitters. Noise in Communication Systems.

Textbook:

Kennedy, George, Electronic Communication Systems, 4th Edition. McGraw-Hill Book Co., Singapore.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

CM 322: COMMUNICATION PRINCIPLES (DIGITAL)

Hours per week: 7 (4/3)

Prerequisite: CM 321

Objective:

On completion of this subject, students should be able to:-

1. Define and calculate the channel capacity, Bit rate and Baud rate for digital transmission.
2. State the advantages and disadvantages of various line codes. Describe synchronous/asynchronous communications.
3. Draw the block diagram of a pulse code modulation transceiver; stating the function and characteristics of each block.
4. Describe various error detecting codes, for example, CRC and Hamming code.
5. Explain the function of Analog/Digital and Digital/Analog conversion.
6. Draw the need for interfacing.

Syllabus:

Shannon's postulate, line codes, Error correction, Analog to Digital and Digital to Analog converters, Interfacing.

Textbook:

Kennedy, George, Electronic Communication Systems, 4th Edition. McGraw-Hill Book Co., Singapore.

Assessment:

Continuous Assessment	- 40%
Written Examination	- 60% (1x3 hrs)

CM 331: AERIALS AND PROPAGATION

Hours per week: 5 (3/2)

Objective:

On completion of this subject, students should be able to:-

1. Draw the equivalent circuit of a transmission line.
2. Describe various types and their construction
3. Define primary constants and calculate Z_0 and cut-off frequency using a Smith Chart.
4. Design stubs and quarter wavelength matching transformers.
5. Demonstrate how optical fibre transmission lines work and how they are used in telecommunication systems.
6. Explain how radio waves may travel from one point on earth to another.
7. Describe various types of aerials. Calculate radio system performance using different types of aerials and frequency bands.

Syllabus:

Transmission Lines: fundamentals, characteristic impedance, loss. Standing waves. Matching, use of Smith chart. Radiation & propagation of waves.

Aerials: polar diagrams, gain, loss, bandwidth, polarization.

Textbook:

Kennedy, George, Electronic Communication Systems, 4th Edition, McGraw-Hill Book Co. Singapore.

Assessment:

Continuous Assessment	- 40%
Written Examination	- 60% (1x3 hrs)

CM 332: MICROWAVES

Hours per week: 5 (3/2)

Objective:

On completion of this subject, students should be able to:-

1. Identify common waveguide components and make accurate calculations of wavelength, phase velocity, cut off wavelength.
2. Describe common modes of propagation within waveguides, coupling and tuning methods.
3. Describe methods of excitation, various forms of microwave amplifier, generators, and common semiconductor microwave devices.
4. Describe and identify mechanical components such as directional couplers, isolators, circulators, and explain the operation of ferrites at microwave frequencies.
5. Draw block diagrams of microwave transmission links.
6. Draw block diagrams of radar systems.
7. Describe the use of radar in electronic navigation systems.

Syllabus:

Revision of transmission lines. Resonant cavities. Wave guides. Microwave amplifiers and oscillators. Aerials, gain and polar diagrams. Microwave link and troposcatter system. Satellite communication systems. Microwave propagation and losses.

Textbook:

Kennedy, George, Electronic Communication Systems, 4th Edition. McGraw-Hill Book Co., Singapore.

Assessment:

Continuous Assessment	- 40%
Written Examination	- 60% (1x3 hrs)

CM 342: BROADCASTING TECHNIQUES

Hours per week: 5 (3/2)

Objective:

On completion of this subject students should be able to:-

1. Discuss the nature of sound and state how velocity, frequency and wavelength are related.
2. Distinguish between concepts of loudness and power and use the units decibel and phon.
3. Calculate studio acoustic reverberation.
4. Differentiate between different micro-phones, their characteristic and uses.
5. Distinguish between different loud-speakers and their enclosures.
6. Summarise the concepts of audio magnetic tape recording systems.
7. Recognise the advantages/disadvantages of disc recording systems including compact discs.
8. Discuss modern sound mixing techniques.
9. Compare the different video transmission systems colour and black and white.
10. Distinguish between the video recording systems, tape and disc.
11. Discuss modern video mixing techniques.

Syllabus:

Acoustics and Recording. Microphones and Loudspeakers. Magnetic tape recording, signal processing equipment, Audio mixers. Stereophonic principles. Disc recording and playback systems. Compact disc players. Light and colorimetry. Camera tubes. Colour television and the PAL. Telecine and film. Video switchers. Videotapes. Video Cassette Recorders, Video Tape Recorders. Television programme centre. Outside broadcasts.

Textbook:

Kennedy, George, Electronic Communication Systems, 4th Edition. McGraw-Hill Book Co. Singapore.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

EL 341: POWER ELECTRONICS

Hours per week: 6 (4/2)

Objective:

On completion of this subject students should be

able to:-

1. Produce characteristic curves for devices used in power control.
2. Describe the basic operation of power control circuits (single and multi-phase).
3. Provide analytical evaluation of power electronic circuits.
4. Develop skills in the use of electrical and electronic instruments, relevant to power electronic circuits and devices.
5. Interpret published data associated with power control devices.
6. Diagnose basic faults in electronic power control circuits.
7. Discuss and compare inverters and converters.

Syllabus:

Power electronics devices characteristics, circuits. Rectifier circuits, single - and three phase. Phase control. Inverters, converters. Protection. Filters. Applications. Voltage regulation, voltage multiplication.

Textbook:

Larson, B., Power Control Electronics, Prentice Hall, 1983.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

EL 351: CONTROL ENGINEERING

Hours per week: 8 (5/3)

Objective:

On completion of this subject students should be able to:-

1. Describe the two types of control system: open-loop and closed-loop. List the advantages and disadvantages of each of the above systems. Produce examples of each of the above systems.
2. Analyse control system block diagrams. Derive the following transform functions for a system. Open-loop, closed-loop, error ratio, primary feedback ratio.
3. Reduce complex system diagrams to their

canonical form.

4. Assess the stability of control systems.
5. Utilise Laplace transforms to solve system equations.
6. Apply the Nyquist stability criterion to systems to validate their performance.
7. Produce harmonic response curves of given systems.
8. Explain the operation of various types of transducer.
9. Provide diagrams showing the different configurations of an operational amplifier.

Syllabus:

Introduction to control systems. Open and closed-loop control. Transfer functions. Electrical, electronic, mechanical instrumentation. System response, stability. Practical control system review. Transducers, characteristics and applications.

Textbook:

Katsuhiko Ogata: Modern Control Engineering; Prentice Hall International Editions.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

EL 352: PLC PROJECT

Hours per week: 3 (0/3)

Prerequisite: EL 341, EL 351

Objective:

On completion of this subject, students should be able to:-

1. Describe the functions of discrete I/O devices and modules, AC, DC and motion control.
2. Describe common types of PLC peripherals and their uses.
3. Describe what a ladder diagram is and the relationship to a ladder logic diagram and the input and output functions of a PLC.
4. Design and implement a typical PLC application.

Syllabus:

Application of computers in Industrial electronics.

Textbook:

Power Control Electronics PLC. CD Department.

Assessment:

Continuous assessment - 100%

EL 362: INDUSTRIAL ELECTRIC MACHINES

Hours per week: 6 (4/2)

Prerequisite: EL 341, EL 351

Objective:

On completion of this subject, students should be able to:-

1. Explain the principles of operation of rotating electrical machines.
2. Distinguish between generator and motor action.
3. Differentiate the construction and the operational characteristics of all types of DC generators.
4. Differentiate the construction and the operational characteristics of AC generators.
5. Appreciate the limitations of DC machines and be able to discuss the choice of machine for particular applications.
6. Outline the operation and use of DC servo motors in control circuitry.
7. Discuss various types of single phase AC motors with respect to their operating characteristics and be able to choose the best motor for a given application.
8. Describe various methods of speed control AC and DC.
9. Explain the operation of stepper motors and how they may be used in position control.

Syllabus:

DC motor and generator principles, rotating DC machine construction, DC generators, DC motor characteristics, AC generators, servomotors. Efficiency, rating and applications of DC machines, speed control, fractional horsepower AC motors, synchronous machines.

Textbook:

Newman, M., Industrial Electronics & Control, John Wiley & Sons.

Reference:

Sen, R. C., Principles of Electric Machines and Power Electronics, John Wiley and Sons, 1989.
Daniels, A. R., Introduction to Electrical Machines, Macmillan.

Assessment:

Continuous assessment - 40%
Written Examination - 60% (1 x 3 hrs)

Error detection and correction. Networking. Protocols.

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs)

EL 372: DATA COMMUNICATION SYSTEMS

Hours per week: 7 (4/3)

Objective:

On completion of this subject, students should be able to:-

1. Describe the two types of transmission system. State that Digital Transmission Systems consist of binary information. Specify that Analog Transmission systems consist of constantly changing signals.
2. Assess the following Communication codes: ASCII, EBDIC, BAUDOT.
3. Translate a simple message into each of the above codes. Compare each message in terms of length and complexity. Describe the effects of different protocols.
4. Compare the following methods of error detection and correction: echo check, cyclic redundancy check, automatic repeat request, forward error correction. Provide examples of each of the above methods. Contrast the above methods in terms of accuracy and speed.
5. Describe the operation of a computer network. State the meaning of network related terminology. Produce block diagrams of common network topologies. Explain how the fileserver services requests.

Syllabus:

Types of systems. Communication codes, signals. Data Transmission, modes, rates. Transmission path, media. Modems. Interfacing. Multiplexers.

DEPARTMENT OF MECHANICAL ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING

Head of Department and Professor:

Pumwa, J., Ph.D. (Texas A&M), M.Eng. (Hons), (Wollongong), B.Eng. (PNGUT), Fellow ASME Fellow IEPNG, CEng MIMechE, MASEE

Professors:

Minh, Vu Trieu, Ph.D. (AIT, Thailand), MEng (AIT, Thailand), BEng (HUT, Vietnam)

Associate Professors:

Senior Lecturers:

Sumanasiri, K. E. D., Ph.D., M.Eng. (Katholieke, Belgium), B.Sc. Eng (Peradeniya, Sri Lanka), CEng MIE Sri Lanka.

Lecturers:

Satter, M.R., M.Eng., B.Sc. (Texas A&M)

Senior Technical Instructors:

Srivastava, H. S., M.Sc. (Kursk State, Russia) N'drelan. B. J., MSc. (ITB, Indonesia), BEng (QUT, Aust.), BEng (PNGUT), MIEPNG.

Acting Laboratory Manager:

Peter, T., B.Eng. (PNGUT), ASNT Level II (Radiography).

Principal Technical Officer:

Kami, P.

Senior Technical Officer:

Korokan, A. S., BEng (PNGUT)
Kuniaka, A., B.ComSc. (PNGUT)
Cholai, R. T., BAPhysics (PNGUT))

Technical Officer:

Kasir, M. E.

Technical Assistant:

Artisan:

Kamuai, Z.
Yaldo, K.
Peruka, M. Jnr (Temporary)
Giltip, G. J. (Temporary)

Senior Storeman:

Mendode, H.

Senior Secretary:

Botieniu, R.

Secretary:

Wamala, T.

REGULAR COURSE

The Department offers a course leading to the degree of Bachelor of Engineering in Mechanical Engineering. The course involves four years of full time study post Grade 12 entry. The Department admits students to its First Year Engineering programme with minimum requirements of B in Mathematics (extension) and Physics, and C in English, or equivalent.

The undergraduate teaching in the Department is aimed at providing a broad and solid basis in fundamental Mechanical Engineering and at the same time offering relevant workshop experience and management studies.

The first year of the course is basically common to all engineering students with the exception of one or two department specific subjects. This consists of the study of language, mathematics, physics, chemistry, engineering, drawing, computing, workshop practice and introduction to mechanical engineering.

Students who have successfully completed a Foundation Year Science Programme at the University of Papua New Guinea or other equivalent institution may be admitted to the second year, but will be required to complete a bridging course in Drawing, and Workshop Practice and other subject prescribed by the Department before the commencement of Semester 1.

The second and third years consist of further studies to develop analytical skills in Mechanical Engineering Sciences - Thermo fluids, Applied Mechanics, Engineering Materials, Drawing and Design, Manufacturing Processes, Industrial Electronics, Industrial Engineering and Management, and Language or Surveying studies. The fourth year consists of more advanced studies in Thermo fluids, Applied Mechanics, Design,

together with studies in Manufacturing Technology and further Industrial Engineering and Management. A special feature of this year is that students are required to undertake a major engineering project. Also students are allowed to choose elective subjects in the second semester. It is not possible for students to obtain, within the University, anything to replace the fund of practical experience and knowledge of engineering processes, which is essential to the engineer's development. So students taking the regular course are required to accumulate at least ten weeks of practical vocational training in the latter part of the course during their vacations. This training must be approved by the Head of the Department and all students are required to submit a diary and report at the end of each training period. Completion of at least ten weeks of approved practical training and completed diaries and satisfactory reports covering that period are necessary requirements for graduation.

SANDWICH COURSE

An optional sandwich programme is available for students who have satisfactorily completed the third year of study. This programme is designed to provide students with industrial training and selected academic studies for a minimum duration of 30 weeks. This will extend the time to complete the degree requirements, but will provide sponsorship as well as additional undergraduate engineering experience. Students who elect to take the sandwich option after the third year will normally require an additional year to complete the whole course. Such students are exempt from the vocational training requirement of ten weeks.

ENTRY REQUIREMENTS & PROCEDURES

The minimum entry requirement is Grade 12 or an equivalent qualification with the following results:

Major Mathematics:	A
Physics:	A
English:	B
Chemistry:	B

Students with strong background in mathematics are given preference.

A total of 50 students are admitted into the first year of study consisting of both school-leavers and non school-leavers. School-leavers generally make

up more than 75 percent of the new intake quota allocation.

Female students who have met the requirements have been admitted and have graduated over the past years and the Department is encouraging female students to study mechanical engineering. School-leavers apply through the normal *School Leavers Form (SLF)* applications while non school-leavers apply directly through the *Admissions Office* of the University.

Tentatively accepted non-school leavers are required to sit for an entrance examination. The final admission into the program will depend on their performance on the entrance examination. The entrance examination consists of similar questions for grade 12 examinations on the core subjects, such as Major Mathematics, Physics, English and Chemistry.

POSTGRADUATE DIPLOMA IN ENERGY ENGINEERING

This is a post-graduate diploma course, which is being offered as a one-year full-time residential course, and is structured to provide formal coursework as necessary. Candidates are encouraged to work on their own, especially in regard to a major project to be undertaken. The course is designed to meet an important specific need within Papua New Guinea. Those interested should contact the Department for further information.

MASTER OF PHILOSOPHY (M.Phil.)

This is a post-graduate degree course based completely on research to be undertaken over two years full-time.

To gain entry, candidates must have a good Bachelor of Engineering degree. Normally some work experience in a relevant area is also expected. Supervision is available in all the research areas listed under Research, Development and Services below.

The University offers a number of Post-graduate Scholarships with substantial stipends, and all eligible post-graduate students may apply. Alternatively assistant lectureships may be made available.

MASTER OF TECHNOLOGY (M.Tech.)

This is a post-graduate degree course of two to three years duration. It is essentially a non-residential course composed of coursework and a dissertation.

The overall objective is to further develop practising engineers in industry and government bodies, and also assistant lecturers who would eventually take up teaching positions in this university. The programme is intended to function with co-operation from overseas universities, which would also moderate the curriculum, dissertation, and examinations.

The programme has a built-in flexibility in that those undertaking the course need not leave their place of employment for more than four to six weeks in a year. The programme also provides incentives to industry in that the selection of dissertation topics is chosen jointly by employers and university staff, the aim being to assist in the solution of specific industrial problems.

EMPLOYMENT

There is a wide range of employment opportunities for mechanical engineering graduates in Papua New Guinea, particularly in the fields of manufacturing, power, mining, agriculture, maintenance of plant and machinery, transport, rural and community development. Activities of graduates include design, supervision of maintenance, planning and supervision of engineering projects, production processes and process control, sales and management.

FACILITIES

The Department's laboratories have a large range of teaching, research, and test equipment in the fields of heat engines and vehicle technology, engineering materials science, applied dynamics and machine elements, heat transfer and combustion, refrigeration and air conditioning, flexible manufacturing, metrology, solar energy, fluid power and fluid flow, and non-destructive testing (NDT). In addition there are extensive facilities for teaching workshop technology, and for the manufacture of specialized equipment, including both vertical and horizontal CNC machine centres, and an EDM machine. CAD (computer-aided design) facilities are also available.

RESEARCH, DEVELOPMENT AND SERVICES

There are several active research and development projects in the Department, centred on problems of special interest in Papua New Guinea, including the development of low-cost solar heating systems, and solar powered systems for water pumping and space cooling. Other projects include structural vibration analysis, vibration monitoring in machine maintenance, applications to transport and farm machinery, and the development of low-cost water wheels for hydropower.

The staff of the department are willing to offer services to industry in the form of consultancy, personnel training and short courses on selected topics. The areas of involvement may comprise rural development including mechanisation of agricultural production, materials testing, solar energy applications, alternative fuels and renewable energy

sources, including charcoal and pyrolytic liquid fuels, wind power, hydro power, production systems including manufacturing processes, plant layout, materials handling, warehouse design and operations, production planning and control, and computer-aided design and drafting.

DEPARTMENTAL ADVISORY COMMITTEE

A Departmental Advisory Committee has been operative since 1994. Composed of senior executives and engineers from industry and government departments employing mechanical engineering graduates, and university staff, the Committee meets occasionally to review and upgrade the curriculum, and to deliberate on other matters within the context of the Terms of Reference. It will in particular peruse course details to ensure their relevance to the changing needs of Papua New Guinea and the region.

COURSE STRUCTURE

BACHELOR OF ENGINEERING IN MECHANICAL ENGINEERING

		Average
Code	Subject	Weekly Hours
Year 1	First Semester	

MA167	Engineering Mathematic 1(A)	5
PH141	Principles of Physics I	5
CH181	Chemistry for Engineers I	2
LA101	Study Skills	3
ME121	Introduction to Mechanical Engineering Systems	3
ME171	Engineering Drawing I	3
CS145	Introduction to Information Technology (A)	<u>2</u>
		<u>23</u>

Year 1 Second Semester

MA168	Engineering Mathematics 1(B)	5
PH142	Principles of Physics II	5
CH182	Chemistry for Engineers II	3
ME124	Engineering and Business Communication	3
ME162	Workshop Technology and Practice	3
ME172	Engineering Drawing II	3
CS146	Introduction to Information Technology (B)	<u>2</u>
		<u>24</u>

Code	Subject	Average Weekly Hours
Year 2 First Semester		
EE 263	Electrical Engineering	3
MA235	Engineering Mathematics 2(A)	4
ME231	Manufacturing Technology I	3
ME261	Statics	3
ME271	Engineering Drawing III	3
ME281	Engineering Materials I	3
ME291	Thermodynamics I	<u>3</u>
		<u>22</u>

Year 2 Second Semester

MA236	Engineering Mathematics 2(B)	4
ME232	Manufacturing Technology II	3
ME252	Fluid Mechanics	4
ME262	Dynamics	4
ME266	Solid Mechanics I	3
LA204	Communication in the Workplace	<u>2</u>
		<u>20</u>

Code	Subject	Average Weekly Hours
Year 3 First Semester		
ME313	Industrial Training I (Sandwich Course only)	-
MA339	Engineering Statistics	3

ME311	Experimental Engineering I	3
ME361	Solid Mechanics II	3
ME371	Machine Element Design I	3
ME381	Engineering Materials II	2
ME391	Thermodynamics II	3
ME393	Heat Transfer	3
	Elective I*	<u>3</u>
		<u>23</u>

Year 3 Second Semester

ME314	Industrial Training II (Sandwich Course only)	-
MA336	Mathematics 3ME(B)	4
EE 382	Industrial Electronics and Computer Control	4
ME302	Production/Operations Management	3
ME336	Engineering Analysis for Mechanical Engineers	3
ME362	Mechanics of Machines	4
ME372	Machine Element Design II	3
BA386	Principles of Economics	<u>2</u>
		<u>23</u>

* to be chosen from either LC311 Developing Communication and Communicating Development or ME303 Ethics and Engineering.

Code	Subject	Average Weekly Hours
Year 4 First Semester		
ME411	Experimental Engineering II	3
ME441	Project I	3
ME451	Applied Fluid Mechanics I	3
ME463	Vibration Analysis	3
ME403	Organisational Management	3
BA141	Introduction to Law	3
BA485	Accounting for Engineers	2
	Elective II **	<u>3</u>
		<u>23</u>

Year 4 Second Semester

ME422	Vocational Training (Regular Course only)	-
ME402	Maintenance Engineering	3
ME432	Automatic Control	3
ME442	Project II	3
BA484	Marketing for Engineers	2
BA486	Finance for Engineers	2
	Elective III **	3

Elective IV ** 3
19

** to be chosen from the list of subjects offered or recommended by the Department.

First Semester Electives:

ME405 Quality Control
ME407 Management Information Systems
ME433 Advanced Manufacturing
ME471 Mechanical Systems Design
ME481 Fundamentals of Non-Destructive Evaluation
ME491 Applied Thermodynamics

Second Semester Electives:

ME436 Flexible Manufacturing Systems
ME438 Computer Integrated Manufacture
ME452 Applied Fluid Mechanics II
ME472 Design for Manufacture
ME474 Design & Analysis of Mechanisms
ME476 Computer-Aided Design
ME482 Failure Analysis
ME492 Refrigeration & Air-Conditioning
ME494 Automotive Engineering
ME496 Renewable Energy

SUBJECTS TAUGHT BY THE DEPARTMENT

ME121 Introduction to Mechanical Engineering Systems
ME124 Engineering and Business Communication
ME162 Workshop Technology and Practice
ME171 Engineering Drawing I
ME172 Engineering Drawing II
ME202 Mechanical Engineering IE
ME231 Manufacturing Technology I
ME232 Manufacturing Technology II
ME252 Fluid Mechanics
ME261 Statics
ME262 Dynamics
ME266 Solid Mechanics I
ME271 Engineering Drawing III
ME276 Workshop Technology and Practice for Food Technology
ME281 Engineering Materials I
ME291 Thermodynamics I
ME292 Thermodynamics for Food Technology

ME302 Production/Operations Management
ME303 Ethics and Engineering
ME311 Experimental Engineering I
ME313 Industrial Training I *
ME314 Industrial Training II *
ME336 Engineering Analysis for Mechanical Engineers
ME361 Solid Mechanics II
ME362 Mechanics of Machines
ME371 Machine Element Design I
ME372 Machine Element Design II
ME381 Engineering Materials II
ME391 Thermodynamics II
ME393 Heat Transfer
ME401 Mechanical Engineering Systems IIE
ME402 Maintenance Engineering
ME403 Organisational Management
ME405 Quality Control
ME407 Management Information Systems
ME411 Experimental Engineering II
ME422 Vocational Training *
ME432 Automatic Control
ME433 Advanced Manufacturing
ME436 Flexible Manufacturing Systems
ME438 Computer-Integrated Manufacture
ME441 Project I
ME442 Project II
ME451 Applied Fluid Mechanics I
ME452 Applied Fluid Mechanics II
ME463 Vibration Analysis
ME471 Mechanical Systems Design
ME472 Design for Manufacture
ME474 Design & Analysis of Mechanisms
ME476 Computer-Aided Design
ME481 Fundamentals of Non-Destructive Evaluation
ME482 Failure Analysis
ME491 Applied Thermodynamics
ME492 Refrigeration & Air-Conditioning
ME494 Automotive Engineering
ME496 Renewable Energy

* Supervised jointly with Industry.

SUBJECT DETAILS

ME 121: INTRODUCTION TO MECHANICAL ENGINEERING SYSTEMS

Hours Per Week: 3

Objective:

The objective of this subject is to enable freshman students an appreciation/understanding of mechanical engineering systems, system components, and their associated functional principles.

On completion of the subject, students should be able to:

1. Understand the working principles of system such as engines, boilers, turbines, compressors, machine tools, hydraulic and pneumatic systems, robots, etc.;
2. Understand how various components of a system work to produce useful functions;
3. Understand the shape, size and material of various components;
4. Understand the role of fasteners.

Syllabus:

Functional principles of systems such as petrol and diesel engines, micro-hydro, boilers, turbines (steam and gas), air compressors, pumps, CNC machines, EDM machines and robots; study of mechanisms such as slider-crank mechanism, cam mechanism; hydraulic and pneumatic systems; study of shapes, size and materials of system components such as shafts, pulleys, gears, sprockets, chains, belts, bearings, springs; automotive parts: piston rings, connecting rods, crank shafts, couplings, brakes, gaskets, seals, etc; various types of fasteners: screws, bolts, nuts, keys, rivets, welding, glue, etc; individual and group projects; seminar presentation.

Textbook:

Departmental course notes

References:

Mechanical Engineering and Plant Engineering Handbooks

Assessment:

Continuous assessment – 100%

ME 124: ENGINEERING AND BUSINESS COMMUNICATION

Hours per week: 3

Prerequisite: Nil

Objectives:

To develop students skills and abilities in technical, engineering and business writing. On the completion of the subject, students should be able to:

1. Understand and acquire skills in technical writing including reports, proposals, manuals, conference papers, resumes and professional correspondences.
2. Understand and acquire skills in writing business letters such as memorandums, job applications, electronic mails etc.
3. Understand and acquire skills for oral presentations in speaking, listening for seminar or conference or project presentations.

Syllabus:

Overview of the subject; engineers and writings; some guidelines for good engineering writing; spelling, punctuation, proper referencing, sentence construction, paragraph writing, technical usage, editing; writing business letters, memorandums, electronic mail; principles of composition, rhetoric, and document design applied to the basic genres of research-based scientific and technical writing, including conference papers and articles, documents for inspection, laboratory, specifications, progress, proposal and instruction; format of engineering reports; presentation of reports; preparation, delivery, team presentation; preparing resumes, writing job applications and follow-up letters; tips on writing with computer. Oral presentations for seminars, conferences, project presentations etc.

Textbooks:

Beer D. F. and D. A. McMurrey, *A Guide to Writing as an Engineer*, 3rd ed., John Wiley & Sons, Inc., 2010.

Assessment:

Continuous Assessment: 100%

ME 162: WORKSHOP TECHNOLOGY & PRACTICE

Hours Per Week: 3 (1/2)

Objective:

On completion of the subject, students should be able to:

1. Understand different types of metallic materials their properties.
2. Be familiar with various metallic manufacturing processes such as machining, welding, fabricating, casting, etc.
3. Be familiar with various measuring instruments and their applications.
4. Understand how various machine tools operate and be able to operate them.

Syllabus:

Introduction to engineering materials: Iron and Steel; cast iron, wrought iron, mild steel, carbon steel. Properties of steel; brittleness, ductility, elasticity, hardness, malleability, plasticity, toughness; heat treatment of steel. Non-ferrous metals and Alloys: aluminum, copper, lead, tin, and their alloys.

Measurement: slip gauges, comparator, vernier height gauge, micrometer, vernier caliper, roughness measurement, etc.

Overview of basic manufacturing processes: machining, sheet metal working, casting, molding, bending, rolling, forging, drawing, spinning, shearing. Joining processes: welding, soldering, brazing, sintering, pressing, screw fastening, adhesive joining.

Use of hand tools. Use of machine tools: lathe, milling, shaping, drilling, and grinding.

Textbook:

Chapman, W.A.J., *Workshop Technology Part I&2*, Edward Arnold Publishers, London, U.K.

Reference:

Begeman, M.L., and Amstead, B.H., "Manufacturing Processes", (John Wiley, New York, USA)

Assessment:

Continuous assessment - 100%

ME 171: ENGINEERING DRAWING I

Hours per week: 3 (1/2)

Objectives:

On completion of the subject, students should be able to:

1. Read, understand, and produce simple engineering drawings using engineering standards and conventions.
2. Read, understand, and apply different projections to engineering drawings including orthogonal, oblique and isometric projections.
3. Make freehand sketches of engineering shapes.
4. Apply dimensions to views.

Syllabus:

Introduction to engineering drawing; geometry of lines, planes and solids; geometric constructions tangency, polygons, ellipses; freehand sketching; oblique and isometric drawing; visualization practice; orthographic projections (1st and 3rd angle); sectioning; dimensioning.

Textbook:

Geotsch, D.L., Chalk W .S. Nelson J.A. and R. L. Rickman, *Technical Drawing and Engineering Communication*, 6th ed., Delmar Publishers Inc., 2010.

Assessment:

Continuous assessment - 100%

ME 172: ENGINEERING DRAWING II

Hours per week: 3(1/2)

Prerequisite: ME 171

Objectives:

On completion of the subject, students should be able to:

1. Understand and apply the concepts of limits, fits, and tolerances;

2. Make pictorial drawings;
3. Make assembly drawings and details drawings using standards and conventions;
4. Learn computer-aided drafting.

Syllabus:

Limits and fits; simple detail and assembly drawing; perspective drawing; welding symbols; pipe and structural drawing; electrical & electronic drafting symbols, circuit diagrams; logic diagrams, printed circuit diagrams; standards and conventions; introduction to computer-aided drafting.

Textbook:

Geotsch, D.L., Chalk W.S. Nelson J.A. and R. L. Rickman, *Technical Drawing and Engineering Communication*, 6th ed., Delmar Publishers Inc., 2010.

Assessment:

Continuous assessment - 100%

ME 202 MECHANICAL ENGINEERING IE

Hours per week: 3

Prerequisite: PH141, PH142

Objectives:

To provide Electrical Engineering students with a broad background in Statics, Dynamics, Mechanics of Machines, Strength of Materials, Fluid Mechanics and Thermodynamics. On completion of the subject, students should be able to solve elementary problems in the topics listed above.

Syllabus:

Statics: Force and gravity, equilibrium of forces, moment and torque. Dynamics: review of work, power, and mechanical energy. Mechanics of Machines: machines and mechanical drives. Strength of Materials: stress and strain, bolted and welded connections, bending of beams, and basic structures. Fluid Mechanics: properties of fluids, pressure and its measurement, applications of fluid pressure, fluid flow in pipes - continuity, Bernoulli, and energy equations.

Thermodynamics: Conduction and convection heat transfer; First Law for closed and open systems; steam, and team plant; combustion; internal combustion engines.

Textbook:

To be specified.

Reference:

Ivanoff, V., *Mechanical Engineering Science*, (McGraw-Hill, 1984)

Assessment:

Continuous assessment - 60%

Written examination - 40% (1 x 2 hours)

ME 231: MANUFACTURING TECHNOLOGY I

Hours per week: 3

Prerequisite: ME161

Objectives:

On completion of the subject, students should be able to:

1. State basic working principles, process capabilities, and scope of the application of a common range of manufacturing processes and processing machines.
2. Explain the basic concepts in casting, welding, machining, bulk deformation and forming processes and their applications.

Syllabus:

Casting processes: Furnaces and melting practice, pattern making, moulds, and casting types.

Joining processes: Mechanical joining methods, welding types, brazing and soldering.

Machine processes: Cutting tools, machine tools, and process cutting surfaces.

Bulk deformation processes: Forging, rolling, and extrusion. Sheet metal forming: Shearing, bending and blanking.

Plastic forming and shaping: Injection molding, blow molding and rotational molding and thermoforming

Textbook:

Kalpakjian, S. and S. Schmid, *Manufacturing Engineering and Technology*, 6th ed., Prentice Hall, 2010.

Assessment:

Continuous assessment - 60%
Written examination - 40% (1 x 2 hours)

ME 232: MANUFACTURING TECHNOLOGY II

Hours per week: 3

Prerequisite: ME 231

Objectives:

On completion of the subject, students should be able to:

1. Describe operations and equipment for the conversion of raw materials into products, through material removal.
2. Identify geometric features to be measured, and apply principles of allocation of tolerance to products.
3. Plan and perform measurements at specified levels of accuracy on discrete product components.
4. Calibrate instruments and minimize the sources of errors in measurement.

Syllabus:

Conventional methods of material removal (cutting tools, cutting fluids, tool wear, grinding, machining variables, machining costs).

Non-conventional methods of material removal (chemical machining,

Electrical discharge machining, laser-beam machining)

Metrology and precision measurements (calibration, measurement methods and measuring machines, inspection)

Tolerancing (size control, tolerance control of dimensions and form).

Textbook:

Kalpakjian, S. and S. Schmid, *Manufacturing Engineering and Technology*, 6th ed., Prentice Hall, 2010.

Assessment:

Continuous assessment - 60%
Written examination - 40% (1 x 2 hours)

ME 252: FLUID MECHANICS

Hours per week: 4

Objectives:

To introduce students to basic concepts of Fluid Mechanics in order to prepare them for applications in later years. On completion of the subject, students should be able to:

1. Solve problems involving pressures and forces in hydrostatic systems, and problems involving basic equations of fluid dynamics applied to pipe flow;
2. Discuss measuring devices, and common dimensionless parameters.

Syllabus:

Fluid Statics: Physical properties of fluids, manometry, hydrostatic forces on submerged surfaces, buoyancy and stability of bodies in fluids. Fluid Dynamics: Basic concepts of ideal flow, applications of continuity equation, Bernoulli and momentum equations introduction to turbo machinery, flow measuring devices, laminar and turbulent flow, head loss in pipes, common dimensionless parameters used in fluid mechanics, and their applications.

Textbook:

Fox, R. W., Pritchard P. J. and A. T. McDonald, *Introduction to Fluid Mechanics*, 7th Ed., John Wiley & Sons Inc., 2009.

Assessment:

Continuous assessment - 60%
Written Examination - 40% (1 x 2 hours)

ME 261: STATICS

Hours per week: 3

Prerequisite: PH141

Objectives:

On completion of the subject, students should be able to:

1. Apply principles of statics to engineering problems.
2. Analyse forces acting on rigid bodies at rest as a preliminary step to solving design problems.

Syllabus:

Force Systems:

Two-dimensional force systems: Rectangular components, Moments, Couple, Resultants.

Three-dimensional force systems: Rectangular components.

Equilibrium: Equilibrium in two dimensions: Mechanical system isolation, Equilibrium conditions

Equilibrium in three dimensions.

Structures:

Plane trusses, Method of joints, Method of sections, Frames and machines.

Distributed Forces:

Center of mass, Centroids of lines, Centroids of areas, Centroids of volumes, Composite bodies and figures, Beams – external effects, Beams – internal effects: Bending-moment diagram.

Friction: Mechanism of friction, Types of friction problems.

Area Moments of Inertia: Rectangular and polar moments of inertia, Radius of gyration, Transfer of axes, Composite areas, Products of inertia, Transfer of axes, Rotation of axes, Mohr's circle of inertia.

Textbook:

Meriam, J.L., and L. G. Kraige, Engineering Mechanics: Statics, 6th ed., John Wiley & Sons Inc., 2007.

Assessment:

Continuous assessment - 60%
Final examination - 40% (1 x 2 hours)

ME 262: DYNAMICS

Hours per week: 4

Prerequisite: ME261

Objectives:

On completion of the subject, students should be able to:

1. Apply principles of dynamics to engineering problems.
2. Analyse forces acting on rigid bodies in motion, and motion of bodies under the action of forces, as a preliminary step to solving design problems.

Syllabus:**Kinematics of particles:**

Rectilinear motion, Graphical representation of the equations, Plane curvilinear motion, Rectangular coordinates, Normal and tangential coordinates, Polar coordinates, Relative motion (Translating axes).

Kinetics of particles:

Newton's second law, Rectilinear motion, Curvilinear motion, Work & kinetic energy, Power, Efficiency, Potential energy, Impulse and momentum, Relative motion (Constant-velocity translation systems).

Plane kinematics of rigid bodies:

Categories of plane motion of a rigid body, Rotation, Relative velocity, Instantaneous center of zero velocity, Relative acceleration.

Plane kinetics of rigid bodies:

General equations of motion, Analysis procedure, Translation, Fixed-axis rotation.

Textbook:

Meriam, J.L., and L. G. Kraige, Engineering Mechanics: Dynamics, 6th ed., John Wiley & Sons Inc., 2009.

Assessment:

Continuous assessment - 60%
Final examination - 40% (1 x 2 hours)

ME 266: SOLID MECHANICS I

Hours per week: 3

Prerequisite: ME261, ME281

Objectives:

To develop an understanding of the more advanced concepts in solid mechanics, and the analysis of

two-dimensional and three-dimensional loading conditions. On completion of the subject, students should be able to:

1. Analyze advanced problems in bending;
2. Apply energy techniques for determining;
3. Deformation;
4. Analyze 2D and 3D stresses;
5. Analyze the stability of columns.

Syllabus:

Introduction – Concept of Stress:

Brief review of Forces and Stresses, Normal stress, Shearing stress, Bearing stress in connections, Application to the analysis of simple structures, Stress on an oblique plane under axial loading, Stress under general loading conditions, Ultimate and allowable stress.

Stress and Strain – Axial Loading: Brief review of Normal strain under axial loading, Stress-strain diagram, Hooke's law, Deformations of members under axial loading, Statically indeterminate problems, Problems involving temperature changes, Poisson's ratio, Generalized Hooke's law, Shearing strain, Relation among E , ν and G , Saint-Venant's principle, Stress concentrations.

Torsion: Preliminary discussion of the stresses in a shaft, Deformations in a circular shaft, Stresses in the elastic range, Angle of twist in the elastic range, Statically indeterminate shafts, Design of transmission shafts.

Pure Bending: Preliminary discussion of the stresses in pure bending, Deformations in a symmetric member in pure bending, Stresses and deformations in the elastic range, Deformations in a transverse cross section, Bending of members made of several materials.

Transverse Loading: Transverse loading of prismatic members, Basic assumption regarding the distribution of the normal stresses, Determination of the shear on a horizontal plane, Determination of the shearing stresses in a beam, Shearing stresses in common types of beams.

Design of Beams for Strength: Basic considerations for the design of prismatic beams, Shear and bending-moment diagrams, Relations among load, shear, and bending moment, Design of prismatic beams.

Deflection of Beams by Integration:

Deformation of beam under transverse loading, equation of the elastic curve.

Textbook:

Beer F.P., Johnston E.R. and De Wolf J.T., *Mechanics of Materials*, 4th Edition, McGraw Hill, 2006.

Assessment:

Continuous assessment	- 60%
Final examination	- 40% (1 x 2 hours)

ME 271: ENGINEERING DRAWING III

Hours per week: 3

Prerequisite: ME172

Objective:

To introduce students to the principles of engineering drawing for mechanical engineering purposes. On completion of the subject, students should be able to:

1. Make quick sketches of machine parts and components in oblique, isometric, and orthogonal projections.
2. Recognize machine units and components
3. Prepare engineering drawings using standards and conventions.
4. Apply tolerances, surface finish, and various joining methods.
5. Use computer-aided drawing.

Syllabus:

Sketching: Freehand pictorial drawing of mechanical components in oblique, isometric and orthogonal projection.

Auxiliary views: Primary and secondary.

Engineering drawing: 3rd angle projection, assembly and detail drawing.

Conventions: Joining methods, dimensioning, tolerancing, surface finish, representation of common components.

Computer aided drawing.

Textbook:

To be specified.

Reference:

Boundy, Q.W., Engineering Drawing, 3rd Ed, (McGraw-Hill, 1992)

Assessment: Continuous assessment - 100%

ME 276: WORKSHOP TECHNOLOGY AND PRACTICE FOR FOOD TECHNOLOGY

Hours per week: 2

Objectives:

On completion of the subject, students should understand engineering drawing concepts, conventions and practices and become familiar with basic tools and machines in a mechanical engineering workshop.

Syllabus:

Orthographic projection using first and third angles; types of lines; dimensioning; sectioning; assembly and detail drawings; pictorial drawing; introduction to hand tools and measuring tools; conventional machine tools; manufacture of a small assembly related to food technology equipment.

Textbook:

Departmental course notes

Assessment:

Continuous assessment - 100%

ME 281: ENGINEERING MATERIALS I

Hours per week: 3

Corequisite: ME261

Objectives:

To develop an understanding of the structure of Materials, mechanical, optical, thermal, magnetic and electrical, properties of solids, and the methods used for material testing. On completion of the subject, students should understand:

1. The crystal structure of materials;

2. Mechanical, optical, thermal, magnetic and electrical Properties of materials;
3. The difference in their properties of metals, polymers, ceramics and composites in terms of bonding and crystal structure;
4. Material testing methods;
5. Crystalline imperfections and their relation to plastic deformation and strain hardening;
6. The microstructures of basic alloy systems and their properties.

Syllabus:

Mechanical optical thermal magnetic and electrical properties of materials; differences in properties of metals, polymers, ceramics and composite materials in terms of bonding and crystal structure and material testing methods. Atomic and crystal structures its relation-ship to mechanical properties . An attempt should be made for students to study various simple machine items such as lawn mower engines or bicycles etc. after dismantling them. These should enable them to understand why various materials are used in different parts of the engine or systems. Crystal imperfections and deformation by slip, plastic deformation and strain hardening . The iron-carbon equilibrium diagram. Basic types of thermal equilibrium phase diagrams of binary alloy.

Textbook:

Callister, W.D., Jr., *Materials Science and Engineering, an Introduction*, 7th Edition, John Wiley, 2007.

Assessment:

Continuous assessment - 60%
Written examinations - 40% (1 x 2 hours)

ME 291: THERMODYNAMICS I

Hours per week: 3

Objectives:

To introduce students to the subject of Thermodynamics and in particular to the First Law of Thermodynamics, and to provide techniques necessary for analysis and design in later years.

On completion of the subject, students should be able to solve problems, which require them to apply:

1. Basic equations derived from the First Law;
2. Gas laws, and vapour tables and diagrams;
3. Gas mixture laws;
4. Basic principles of combustion;
5. Thermodynamic principles of heat engines and refrigeration systems.

Syllabus:

Basic concepts and definitions: intensive and extensive properties, system, reversibility, work, heat, thermal equilibrium and Zeroth law of thermodynamics.

First law of thermodynamics: conservation of energy, non-flow and steady flow energy equations.

Working fluids: liquid, vapour, vapour tables and diagrams, perfect gas, gas laws, gas mixture laws.

Reversible processes: non-flow and steady flow.

Fuels and combustion: basic chemistry, common fuels and their properties, combustion equations, exhaust gas analysis.

Thermal systems: first law treatment of turbines, compressors, engines, and refrigeration systems.

Textbook:

Eastop, T.D. & McConkey, A., *Applied Thermodynamics for Engineering Technologists*, 5th Ed., Prentice Hall, 1993.

Reference:

Rogers, G.F.C., & Mayhew, Y.R., *Thermodynamic and Transport Properties*, 5th Ed., (Basil Blackwell, 1995)

Assessment:

Continuous assessment - 60%
Written Examination - 40% (1 x 2 hours)

ME 292: THERMODYNAMICS FOR FOOD TECHNOLOGY

Hours per week: 3

Objective:

To introduce Food Technology students to the subject of Thermodynamics and in particular to the

First Law of Thermodynamics, and to provide some application techniques. On completion of the subject, students should be able to solve problems, which require them to apply:

1. Basic equations derived from the First Law;
2. Vapour tables and diagrams;
3. Thermodynamic principles of heat engines, refrigeration systems, and psychrometry.

Syllabus:

First Law: Conservation of energy, non-flow and steady-flow energy equations.

Working Fluid: Liquid, vapour, vapour tables and diagrams.

Reversible Processes: Non-flow and steady-flow.

Thermal Systems: First Law treatment of engines, compressors, and refrigeration systems; psychrometry and cooling towers.

Textbook:

Eastop, T.D. & McConkey, A., *Applied Thermodynamics for Engineering Technologists*, 5th Ed., Prentice Hall, 1993.

Reference:

Rogers, G.F.C., and Mayhew, Y.R., *Thermodynamic and Transport Properties*, 4th ed., (Basil Blackwell, 1988)

Assessment:

Continuous Assessment - 60%
Written Examinations - 40% (1 x 2 hours)

ME 302: PRODUCTION/OPERATIONS MANAGEMENT

Hours per week: 3

Objectives:

To introduce students to the study of production and operation of goods and services. On completion of the subject, students should be able to:

1. Gain the knowledge dealing with the design, planning, operation and control of production process,
2. Understand the factors that promote job satisfaction among employees,

3. Schedule production of goods,
4. Understand the importance of quality of products,
5. Understand the importance of maintenance responsibilities of production equipment.

Syllabus:

Introduction; resource allocation/linear programming; Project planning; product life style; detailed design; process and operation design, job design, job satisfaction; plant layout, materials handling; forecasting and market analysis, production planning, materials requirement, scheduling; inventory and purchasing; quality control; maintenance responsibilities.

Textbook:

To be specified.

Reference:

R.J. Tersine, Production/Operation management, PTR Prentice Hall, Eaglewood Cliffs, N.J, (1985)

Assessment:

Continuous assessment - 60%
Written examination - 40% (1 x 2 hours)

ME 303: ETHICS AND ENGINEERING

Hours per week: 3

Prerequisite: Nil

Objectives:

The objective of the subject is to equip the students with ethical issues and professional codes of ethics that are encountered in the course of engineering practice for familiarity and awareness. On completion of the subject, students should be aware and familiar with:

1. The code of ethics for engineers, the fundamental principles and rules of practice including the professional obligations.
2. The nature of the ethical problems that are encountered in the engineering practice.
3. How an engineer manages ethical problems.
4. The distinction between personal ethics and professional, or business ethics.

5. The required professionalism and code of ethics and attitudes for an engineer.
6. The interdisciplinary boundaries on ethical issues
7. The engineer's role in multi-disciplinary issues

Syllabus:

Code of ethics for engineers, the fundamental principles and rules of practice, professional obligations. Contract Law principles, engineering and construction contracts, professional liability, Positive attitude formation and development of techniques of moral analysis and their application to ethical problems encountered by engineers, such as professional employee rights and whistle blowing; environmental issues; ethical aspects of safety, risk and liability and conflicts of interest; emphasis on developing the capacity for independent ethical analysis of real and hypothetical cases and case studies involving the ethical issues. Emphasizes will be on developing a code of ethics relating to wantok system, development issues and general work ethics for national engineers.

Textbook:

Fleddermann, C., *Engineering Ethics*, 3rd ed., Prentice Hall, 2008.

Reference:

Bennett, F. Lawrence, *The Management of Engineering, Human, Quality, Organizational, Legal, and Ethical Aspects of Professional Practice*, John Wiley & Sons, Inc., New York, USA, 1996.

Assessment:

Continuous assessment - 60%
Written examination - 40% (1 x 2 hours)

ME 311: EXPERIMENTAL ENGINEERING I

Hours per week: 3 (1/2)

Objectives:

To develop and equip students with the skills to plan, design and conduct experiments and to be familiar with various application of basic

measurement techniques and instrumentation to conduct experimental investigation of mechanical engineering systems. On completion of the course, the student should be able to:

1. Formulate an experimental plan including precise statement of problems to be solved etc.
2. Show familiarity with various experimental procedures, analysis and reporting of results.
3. Identify and select factors to be used in an experiment including the parameters to be measured.
4. Understand full factorial and fractional factorial experiments.
5. Develop skills in Technical Communications in the presentation of experimental results (report, letters, memos, etc.) and public speaking (talks, seminars, etc.).
6. Verify relevant theory studied in various subjects.
7. Demonstrate the understanding of how theory applies to relevant industrial plant.

Syllabus:

Introduction; objectives of design of experimentation, the design of experiments process; overview of basic statistical concepts, techniques and procedures; full factorial and fractional factorial experiments. Measurement system design and application; technical communications; written reports covering the planning, execution, results and conclusions of the investigations.

Laboratory sessions on mechanical engineering systems to supplement the course material such as materials testing, engines, turbines, manufacturing methods, flow and heat transfer devices, mechanical systems (ME232, ME252, ME261, ME262, ME281, ME291, ME381).

Textbooks:

Doebelin, O. Ernest, Engineering Experimentation Planning, Execution, Reporting, McGraw-Hill, Inc., New York, USA, 1995.

Department Laboratory Manual or handouts

Reference:

Ross, J. Phillip, Taguchi Techniques for Quality Engineering, Loss Function, Orthogonal

Experiments, Parameter and Tolerance Design, Second Edition, McGraw-Hill, New York, USA.

Assessment:

Continuous assessment - 100%

**ME 313: INDUSTRIAL TRAINING I
(SANDWICH COURSE ONLY)**

Duration:

A period of 15 weeks of approved attachment to one or more engineering based industries, accumulated after successful completion of Year 3 regular program.

Objective:

On completion of the subject, students should have gained:

1. Hands-on training in the practical aspects of mechanical engineering;
2. Appreciation and practical skills of communication within the workforce;
3. Experience in the day-to-day management of a working life;
4. Skill in applying theoretical knowledge to practical situations.

Syllabus:

Depending on the organisation's structure and areas of involvement, students should cover most if not all of the following: Practical aspects of planned and emergency maintenance, design, modification and installation, workshop processes, plant operation, testing and experimentation, power generation, electrical installation and maintenance, stock control, budgeting and financial control.

Assessment:

Diaries and reports as prescribed by the Department.

**ME 314: INDUSTRIAL TRAINING II
(SANDWICH COURSE ONLY)**

Duration:

A period of 15 weeks approved attachment to

one or more engineering-based industries, accumulated after successful completion of ME313.

Objective:

On completion of the subject, students should have gained:

1. Hands-on training in the practical aspects of mechanical engineering;
2. Appreciation and practical skills of communication within the workforce;
3. Experience in the day-to-day management of a working life;
4. Skill in applying theoretical knowledge to practical situations.

Syllabus:

Depending on the organisation's structure and areas of involvement, students should cover most if not all of the following: Practical aspects of planned and emergency maintenance, design, modification and installation, workshop processes, plant operation, testing and experimentation, power generation, electrical installation and maintenance, stock control, budgeting and financial control.

Assessment:

Diaries and reports as prescribed by the Department.

ME 336: ENGINEERING ANALYSIS FOR MECHANICAL ENGINEERS

Hours per week: 3

Prerequisite: Nil

Objectives:

Introduce students to numerical methods for solving engineering problems. On completion of the subject, the student should be able to:

1. Select appropriate numerical methods for a given engineering problem.
2. Set-up the numerical methods and verify with hand calculations.
3. Write programs to numerically solve engineering problems using various available programming softwares.

Syllabus:

Brief review of the useful numerically problem solving softwares available (Matlab/Fortran/Visual Basic/C or other programs) for utilizing in solving engineering problems. Error estimation: truncation error, round off errors, significant figures. Root finding methods: bracketing methods and open methods. Solution of systems of algebraic equations: Gauss elimination, matrix inversion, Gauss-Seidel, LU decomposition. Curve fitting: regression techniques, interpolations. Numerical differentiation and integration: Newton-Cotes integration (trapezoidal rule, Simpson's rules etc.), finite difference methods. Ordinary Differential Equations (ODE): One-step methods, Boundary value and Eigenvalue problems. Partial Differential Equations (PDE): finite difference methods for parabolic and elliptic equations. Write programs from numerical method algorithms covered to solve problems in various areas of mechanical engineering.

Textbook:

Chapra, S.C. and R.P. Canale, *Numerical Methods for Engineers*, 6th Ed, McGraw-Hill, Inc., 2010.

References:

Kreyszig, E., "Advanced Engineering Mathematics", John Wiley & Sons, Inc., 1983.

Assessment:

Continuous assessment - 60%
Written examination - 40% (1 x 2 hours)

ME 361: SOLID MECHANICS II

Hours per week: 3

Prerequisite: ME266

Objectives:

To develop an understanding of the more advanced concepts in solid mechanics, and the analysis of two-dimensional and three-dimensional loading conditions.

On completion of the subject, students should be able to:

1. Analyze advanced problems in bending;
2. Apply energy techniques for determining

- deformation;
 3. Analyze 2D and 3D stresses;
 4. Analyze the stability of columns.

Syllabus:

Pure bending – Advanced topics: Unsymmetric bending, Bending of curved members

Transformations of stress and strain: Transformation of plane stress, Principal stresses, Maximum shearing stress, Mohr's circle for plane stress, General state of stress, Application of Mohr's circle for stress to the 3D analysis of stress, Yield criteria for ductile materials under plane stress, Fracture criteria for brittle materials under plane stress, Stresses in thin-walled pressure vessels, Transformation of plane strain, Mohr's circle for plane strain, Measurements of strain, strain rosette

Energy method: Strain energy, Strain-energy density, Elastic strain energy for normal stresses, Elastic strain energy for shearing stresses, Work and energy Work and energy under several loads, Castigliano's theorem

Columns: Stability of structures, Euler's formula for pin-ended columns

Textbook:

Beer F.P., Johnston E.R. and De Wolf J.T., *Mechanics of Materials*, 4th Edition, McGraw Hill, 2006.

Assessment:

Continuous assessment - 60%
 Final examination - 40% (1 x 2 hours)

ME 362: MECHANICS OF MACHINES

Hours per week: 4

Prerequisites: ME 261, ME 262

Objectives:

To introduce the students to the study of Mechanics of Machines. On completion of the subject, students should be able to:

1. Construct velocity and acceleration diagrams for machine components.
2. Determine the forces (static and dynamic) acting on the components of a machine in operation.
3. Analyze the dynamics of a system to produce a specified motion.

Syllabus:

Velocity and acceleration diagrams. Dynamic analysis of forces in mechanisms. Balancing of rotating and reciprocating masses. Cam design. Flywheel/Crank effort diagrams. Governors.

Textbook:

To be specified.

Reference:

Hannah, J., and Stephens, R.C., *Mechanics of Machines, Elementary Theory and Examples*, (Edward Arnold, 1989)

Assessment:

Continuous assessment - 60%
 Written examination - 40% (1 x 2 hours)

ME 371: MACHINE ELEMENT DESIGN I

Hours per week: 3

Prerequisite: ME266

Objectives:

To introduce students to the concepts of machine design and teach them how to design basic mechanical engineering components. On completion of the subject, students should be able to:

1. Explain the process of the design of machine elements,
2. Develop analytical skills in designing simple machine elements.

Syllabus:

Fundamentals of mechanical engineering design: phases of design, factors of safety, codes and standards, economics, reliability. Brief review of mechanical/thermal stresses in beams, bars and cylinders, press and shrink fits, Hertz contact

stresses. Design of screws, fasteners and nonpermanent joints. Design of welded and bonded joints. Design of brakes and clutches. Design of flexible mechanical elements: belts, chains, ropes and flexible shafts.

Textbook:

Juvinall R.C. and Marshek, K.M. *Fundamentals of Machine Component Design*, 4th edition, John Wiley, 2006.

Reference book:

Shigley, J.E. , Mischke C.R. and Budynas R.G, *Mechanical Engineering Design*, 7th edition, McGraw Hill, 2004 .

Assessment:

Continuous assessment - 60%
Written examination - 40% (1 x 2 hours)

ME 372: MACHINE ELEMENT DESIGN II

Hours per week: 3

Prerequisite: ME371

Objectives:

To introduce students to advanced design topics and teach them how to design selected mechanical engineering components. On completion of the subject, students should be able to:

1. Further develop analytical skills in machine element design,
2. Design simple machines and components,
3. Further develop skills in engineering drawing, both manual and computer-aided.

Syllabus:

Addressing uncertainties in design. Failure prevention: material aspects, failure resulting from static loading, failure from variable loading. Design of mechanical spring, rolling-contact bearing, journal bearing, spur and helical gears, bevel and worm gears, shafts and axles. Design of linkages. Design of simple machines and their presentation using CAD systems. Brief introduction to design of robots and smart machines.

Textbook:

Juvinall R.C. and Marshek, K.M. *Fundamentals of Machine Component Design*, 4th edition, John Wiley, 2006.

Reference book:

Shigley, J.E. , Mischke C.R. and Budynas R.G, *Mechanical Engineering Design*, 7th edition, McGraw Hill, 2004 .

Assessment:

Continuous assessment - 60%
Written examination - 40% (1 x 2 hours)

ME 381: ENGINEERING MATERIALS II

Hours per week: 2

Prerequisite: ME281

Objectives:

To develop an understanding of the testing and behaviour of materials and their interrelationships among composition, microstructure and properties; thermomechanical treatment for the full range of materials including metals and alloys, polymers, ceramics and composites. Also to develop an understanding of the methods of controlling mechanical properties of materials, fundamentals of and the corrosion of metals and to understand the underlying theories of materials that account for their mechanical properties; material selection and design. On completion of the subject, students should understand:

1. The behaviour and testing of materials and their inter-relationships among composition, microstructure and properties,
2. The microstructures and properties of carbon steels, cast irons, and copper alloys (as an example of non-ferrous alloys),
3. The methods of controlling the mechanical properties of materials,
4. Fundamentals of mechanical corrosion,
5. Material selection and design.

Syllabus:

Failure of engineering materials; Fracture, fundamentals of Fracture mechanics, impacts,

ductile-to-brittle transition, Materials. White, grey malleable, and nodular cast irons. Controlling the mechanical properties of materials by alloying, cold working, and heat treatment (with emphasis on steels). An attempt should be made for students to study microstructure of various machine components of simple machines such as lawn mower or a bicycle etc. and determine the type of material and the importance of using this material microstructure in this environment. Copper and copper alloys. Fundamentals of corrosion in metals. Materials design and selection for various applications. Laboratory includes mechanical testing, microstructural analysis and thermal treating of engineering materials.

Textbook:

Callister, W.D., Jr., *Materials Science and Engineering, an Introduction*, 7th Edition, John Wiley, 2007.

Assessment:

Continuous assessment - 60%
Written examinations - 40% (1 x 2 hours)

ME 391: THERMODYNAMICS II

Hours per week: 3

Prerequisite: ME291

Objectives:

To introduce the students to the Second Law of Thermodynamics and some of its consequences, and to further develop understanding of gas power, vapor power and refrigeration cycles. On completion of the subject, students should be able to:

1. Discuss the construction and performance of internal combustion engines;
2. Discuss the Second Law of Thermodynamics and the concept of entropy;
3. Analyze the thermodynamics of internal combustion engines, compressors, steam power plant, and solve related problems.

Syllabus:

Reviewing the First Law of Thermodynamics with applications to internal combustion engines and

compressors, using the non-flow and steady flow energy equations. Construction and operation of four-stroke and two-stroke engines. Internal combustion engines performance measurements in indicated power, brake power, friction power, brake mean effective pressure, indicated mean effective pressure, mechanical efficiency, thermal efficiency, fuel consumption. Reversible and irreversible flow and non-flow processes. The Carnot cycle. Entropy. The Second Law of Thermodynamics. Availability. Air standard cycle for reciprocating engines. Compressors. Steam power cycle. Ideal vapor compression refrigeration and heat-pump cycles.

Textbook:

Moran M. J., Shapiro H.N., Boettner D. D. and M. Bailey, *Fundamentals of Engineering Thermodynamics*, 7th edition, John Wiley & Sons, 2011..

Reference:

Eastop, T.D. & McConkey, A., *Applied Thermodynamics for Engineering Technologists*, 5th Ed., Longman Sci & Tech. 1993.

Assessment:

Continuous - 60%
Written Examination - 40% (1 x 2 hours)

ME 393: HEAT TRANSFER

Hours per Week: 3

Prerequisite: ME291

Objective:

To introduce to the students basic concepts of heat transfer processes and techniques for analyzing and designing related systems. On completion of the subject the students must be able to:

1. Discuss basic concepts of conduction, convection radiation, combined modes of heat transfer.
2. Solve the one-dimensional problem in convection and conduction
3. Solve two-dimensional problems involving convection and radiation.
4. Solve heat exchanger problems.

Syllabus:

Concept of heat and conservation of energy: heat transfer modes: conduction, convection and radiation. Development of the general heat conduction equation from basic principles of energy conservation.

Conduction application: steady heat flow without heat generation through an an-isotropic medium in rectangular co-ordinates, cylindrical and spherical co-ordinates. Applications restricted to 1-D problems. Development of specific equations of temperature distribution in slab, cylinder and sphere and application of Fourier's conduction equation for heat flow. Resistance concept for heat conduction through multi-layer slab, cylinder, and sphere. Numerical methods in conduction, Overall heat transfer coefficient

Forced convection: External Flow: dimensionless numbers, laminar and turbulent flow over flat plate. Flow over single circular, non-circular cylinders, and spheres. Internal Flow: Fully developed laminar flow.

Free convection: dimensionless numbers, flow over flat plate, long cylinder, sphere, and enclosed spaces.

Radiation: concepts in radiation, black body radiation laws, radiation property of surfaces, View Factor Concept. View Factor determination, Network method for radiation exchange

Heat Exchangers: Classifications and Temperature distribution. Overall heat transfer coefficient and LMTD method. LMTD Correction, ϵ - NTU Method

Textbooks:

Incropera F. P., DeWitt D. P., Bergman T. L. and A. S. Lavine, *Fundamentals of Heat and Mass Transfer*, 6th ed., John Wiley & Sons, 2007.

References:

Bayazitoglu, Y, and Ozisik.M.N., Elements of Heat Transfer, McGraw-Hill International Ed, 1988.

Eastop, T.D. & McConkey, A., *Applied Thermodynamics for Engineering Technologists*, 5th Ed., Prentice Hall, 1993.

Assessment:

Continuous assessment - 60%
Written examination - 40% (1 x 2 hours)

ME 401: MECHANICAL ENGINEERING SYSTEMS IIE

Hours per week: 2

Prerequisite: ME202

Objective:

To familiarize the Electrical Engineering students with mechanical systems and their operating principles used in power generation. On completion of the subject, students should be able to:

1. Calculate heat exchanger parameters, and describe their characteristics;
2. Calculate thermal and hydroelectric power plant parameters and describe their various mechanical components.

Syllabus:

Review of heat transfer, thermodynamics and fluid mechanics principles. Application to heat exchanger systems, and any three of the following: gas and steam turbines, diesel engines, steam power plant, hydro power plant.

Textbook:

Departmental course notes

Assessment:

Continuous assessment - 60%
Written examination - 40% (1 x 2 hours)

ME 402: MAINTENANCE ENGINEERING

Hours per week: 3

Objectives:

To introduce students to the basic concepts of maintenance engineering and particularly that of preventive maintenance. On completion of the subject, students should be able to:

1. Compare the costs of different types of maintenance;
2. Design a lubrication program, inspection programme and scheduling;
3. Design work order forms;
4. Establish a preventive maintenance programme.

Syllabus:

Fundamentals of maintenance, maintenance costs, codes and inventories, recording of machine history, lubrication and lubrication programme, inspection procedures, maintenance planning and scheduling, work order system, typical maintenance procedures, condition-based maintenance, computerized maintenance, building maintenance, queuing theory.

Textbooks:

To be specified.

Departmental course notes

Reference:

Patton, J.D., *Preventive Maintenance*, 2nd Ed., Instrument Society of America, 1995.

Higgins, L.R., (Editor in Chief), *Maintenance Engineering Handbook*, 5th Ed., McGraw-Hill, 1995.

Assessment:

Continuous assessment - 60%

Written examination - 40% (1 x 2 hours)

**ME 403: ORGANISATIONAL
MANAGEMENT**

Hours per week: 3

Objectives:

To introduce the student to the study of management of engineering and technological organizations. On completion of the subject, the student should be able to:

1. Gain the knowledge dealing with the planning process of an engineering organization in a competitive environment.
2. Understand different type of organizations.
3. Understand staffing and training needs.
4. Understand the importance of creativity and innovation in an organization.
5. Learn various theories of motivation, job satisfaction and leadership.

6. Learn what is project management.

Syllabus:

Overview of engineering management; business mechanism of manufacturing firms; elements of competitive power; corporate objectives; phases of planning; forecasting; general economic, technological, social, political, environmental considerations; various types of organization; staffing and training; creativity and innovation; motivation; job satisfaction; group dynamics; leadership; project management and control.

Textbook:

To be specified.

Reference:

Shannon, R.E., *Engineering Management*, John Wiley & Sons, New York, 1980.

Ono, K. and Negoro, T., *The Strategic Management of Manufacturing Business*, 3A Corporation, Tokyo, Japan, 1992.

Saloner, G., Shepard, A., and Podolny, J., *Strategic Management*, John Wiley & Sons, Inc., New York, USA, 2001.

Assessment:

Continuous assessment - 60%

Written examination - 40% (1 x 2 hours)

ME 405: QUALITY CONTROL

Hours per week: 3

Prerequisite: MA 339

Objectives:

To introduce students to the basic quantitative methods for quality control in industry. On completion of the subject, students should be able to:

1. Apply various statistical techniques for quality control;
2. Apply quality assurance and reliability;
3. Apply sampling inspection methods.

Syllabus:

Introduction to quality control, statistical approaches:

frequency distribution, cause and effect diagram, Pareto diagram, check sheets, correlation diagram, control charts, process analysis and improvement, process capability, process control, quality assurance and inspection, quality assurance methods, reliability, inspection methods, sampling inspection.

Textbook:

Ishikawa, K., *Introduction to Quality Control*, 4th printing, 3A Corporation, 1994.

Assessment:

Continuous assessment - 60%

Written examination - 40% (1 x 2 hours)

ME 407: MANAGEMENT INFORMATION SYSTEMS

Hours per week: 3

Prerequisite: ME 334

Objective:

On completion of the subject, students should be able to:

1. Understand how information is managed;
2. Identify different types of information systems;
3. Understand the design and implementation of information systems;
4. Understand how data communication systems work;
5. Describe the functionality and logic used in Database technology;
6. Use a micro-computer-based database package.

Syllabus:

Management information and decision support systems: an organization as a system, types of information systems, data and information, the decision system, information needs for management, computer processing.

Information systems design: design criteria, approaches, system objectives and considerations, system specifications and standards.

Electronic information processing. Computers in manufacturing. Business data processing.

Implementation of a computer system. Computer-Integrated Manufacturing systems. Decision theory. Database systems: Database Management systems, creating a database, relational databases, introduction to SQL, the basic use of a database package.

Textbook:

To be specified.

Assessment:

Continuous Assessment - 60%

Written Examinations - 40% (1 x 2 hours)

ME 411: EXPERIMENTAL ENGINEERING II

Hours per week: 3 (1/2)

Objectives:

To develop and equip students with the skills to plan, design and conduct experiments, analyze and interpret data for trends and draw meaningful conclusions from the results and to be familiar with various applications of basic measurement techniques and instrumentation for conducting experimental investigation of mechanical engineering systems. On completion of the course, the student should be able to:

1. Plan and conduct an experiment on their own for investigating a problem.
2. Choose and select appropriate experimental designs for various experimental applications.
3. Formulate a model including the mathematical model that describes the observations anticipated under the experiment plan.
4. Familiarize and understand the Taguchi method of Orthogonal Array selection
5. Develop an ability to analyze and interpret experimental data and draw up meaningful conclusions
6. Demonstrate and verify relevant theory studied in various subjects and understand how theory applies to relevant industrial plant.

Syllabus:

Overview of full factorial and fractional factorial experiments, introduction to Taguchi method, Orthogonal Array (OA) selection and utilization;

examples of the use of OA such as L4, L8 and L9 matrices, analysis and interpretation methods for experiments; analysis of variance (ANOVA); introduction to quality engineering; applications of design of experiments in the improvement of manufacturing processes.

Laboratory sessions on mechanical engineering systems to supplement the course material such as materials testing, engines, turbines, refrigeration systems, flow and heat transfer devices, boilers, mechanical vibration, NDE and mechanical systems (ME391, ME393, ME451, ME463, ME362, ME481, ME491).

Textbooks:

1. Ross, J. Phillip, Taguchi Techniques for Quality Engineering, Loss Function, Orthogonal Experiments, Parameter and Tolerance Design, Second Edition, McGraw-Hill, New York, USA.
2. Departmental Laboratory Manual or handouts

Reference:

Montgomery, C. Douglas, Design and Analysis of Experiments, Fifth Edition, John Wiley & Sons, New York, USA, 2001.

Assessment:

Continuous assessment - 100%

**ME 422: VOCATIONAL TRAINING
(REGULAR COURSE ONLY)**

Duration:

Periods of up to a total of ten (10) weeks of approved attachment to one or more engineering-based industries normally accumulated during the vacations following completion of the second and third years of study.

Objective:

On completion of the subject, students should have gained:

1. Hand-on-training in the practical aspects of mechanical engineering;
2. Appreciation and practical skills of communication within the workforce;
3. Experience in the day-to-day management of a working life;

4. Skill in applying theoretical knowledge to practical situations.

Syllabus:

Depending on the organisation's structure and areas of involvement, students should cover most if not all of the following: practical aspects of planned and emergency maintenance, design, modification and installation, workshop processes, plant operation, testing and experimentation, power generation, electrical installation and maintenance, stock control, budgeting and financial control.

Assessment:

Diaries and reports as prescribed by the Department. Students are required to submit diaries and reports at the end of each training period.

ME 432: AUTOMATIC CONTROL

Hours per week: 3

Prerequisite: ME 363

Objective:

To introduce students to the basic concepts of automatic control, in particular to industrial pneumatic and hydraulic control systems, and the methods of analysis of both open-loop and closed-loop control systems. On completion of the subject, students should be able to:

1. Gain insight into the principle of automatic control;
2. Design pneumatic control circuits for industrial processes;
3. Design hydraulic control circuits for industrial processes;
4. Analyze control systems.

Syllabus:

Introduction to automatic control systems, application of fluid power systems, pneumatic components for pressures, flow and directional control; basic circuits, pneumatic symbols, pneumatic logic circuits; basic principles of hydraulic pumps, motors, actuators, valves, hydraulic circuits design; maintenance of hydraulic

systems, micro-processor control in fluid power. Analysis of control systems: mathematical representation of control components and systems, characteristic functions, the root-locus method. Introduction to application of MATLAB and SIMULINK to control systems.

Textbook:

Yeaple, F., *Fluid Power Design Handbook*, 3rd ed., Marcel Dekkar Inc., 1996.

Reference:

Raven, F.H. *Automatic Control Engineering* (McGraw-Hill Book Company, 1987)

Ogata, K., *Modern Control Engineering*, 3rd Ed., Prentice Hall, 1997

Franklin, G. F., J. D. Powell and A. E.-Naeini, *Feedback Control of Dynamic Systems*, 5th ed., Prentice Hall, 2006.

Assessment:

Continuous Assessment - 60%

Written Examination - 40% (1 x 2 hours)

ME 433: ADVANCED MANUFACTURING

Hours per week: 3

Prerequisite: ME 232

Objective:

To develop an understanding of advanced topics in manufacturing technology. On completion of the subject, students should understand:

1. Processing of plastics;
2. Surface technology;
3. Quality assurance;
4. CNC programming;
5. Manufacturing in a competitive environment.

Syllabus:

Forming and shaping plastics and composite materials. Surface treatment and coating. Quality assurance, testing and inspection. CNC programming. Automation of manufacturing processes. Competitive aspects of manufacturing.

Textbook:

Kalpakkjian, S. and S. Schmid, *Manufacturing*

Engineering and Technology, 6th ed., Prentice Hall, 2010.

Assessment:

Continuous Assessment - 60%

Written Examination - 40% (1 x 2 hours)

ME 436: FLEXIBLE MANUFACTURING SYSTEMS

Hours per week: 3

Objective:

To introduce students to FMS concepts and its applications. On completion of this subject, students should:

1. Have a through understanding of the FMS concepts;
2. Have a reasonable understanding of FMS applications in industry;
3. Be able to use FMS-related computer software.

Syllabus:

FMS concept and application. Flexible manufacturing cell and island. Material handling MRP. System design/simulation. Economics of FMS. Process planning. Computer-aided quality control, design, manufactures. Group technology and JIT.

Textbook:

To be specified.

Departmental course notes

Reference:

Besant, C.B., and Lui, C.W.K., *Computer-Aided Design and Manufacture*, 3rd ed., (Ellis Harwood Pub. 1986)

Assessment:

Continuous Assessment - 100%

ME 438: COMPUTER-INTEGRATED MANUFACTURE

Hours per week: 3

Objective:

To introduce students to CIM concepts and their applications. On completion of the subject, student should:

1. Have a through understanding of the CIM concepts;
2. Have a reasonable understanding of CIM applications in industry;
3. Be able to use CIM related computer software.
4. Be able to perform CNC programming.

Syllabus:

Introduction to CIM concept, Manufacturing Systems, CAD: Fundamentals of CAD, Hardware in CAD design, Computer graphics software and database, CAM: CNC programming, Robot technology, Group technology, Computer-aided process planning and rapid prototyping.

Textbook:

To be specified.

Departmental course notes

Reference:

Walder J B, *CIM: Principles of Computer Integrated Manufacture*, Wiley Pub., 1992.

Assessment:

Continuous Assessment - 100%

ME 441: PROJECT I

Hours per week: 3

Objective:

To provide the students with skills involved in handling a typical engineering project. On completion of the subject, students should be able to:

1. Identify the main activities of a typical engineering project;
2. Plan a detailed schedule of activities to complete and meet the project deadline.

Syllabus:

According to the nature of the project, this may include a combination of the following areas: literature survey, data collection, engineering analysis, design, manufacturing, computing and/or

managerial techniques.

Assessment:

Continuous Assessment - 50%
Preliminary written report - 50%

ME 442: PROJECT II

Hours per week: 3

Prerequisite: ME 441

Objective:

To provide the students with the skills involved in handling a typical engineering project.

On completion of the subject, students should be able to:

1. Apply the engineering principles learnt in other subjects in the development of the project work;
2. Meet the requirements as set out in the project description.

Syllabus:

According to the nature of the project, this may include a combination of the following areas: data collection, engineering analysis, design, manufacturing, computing and/or managerial techniques. Submission of written project report.

Assessment:

Continuous Assessment - 50%
Final written report - 50%

ME 451: APPLIED FLUID MECHANICS I

Hours per week: 3

Prerequisite: ME252

Objectives:

To enable students to apply the theory of fluid mechanics to a wide variety of fluid flows encountered in mechanical systems for the purpose of analysis, testing or design. On completion of the subject, students should have developed a good understanding in the following areas

1. Fundamental principles of fluid mechanics,

2. Calculation of useful parameters such as velocities, pressures, forces, and energy losses associated with common fluid flows.

Syllabus:

Fundamental fluid mechanics principles and laws. Principle of conservation of mass in a flow field and two-dimensional flow. Rotational and irrotational flow, potential function. Stream function and streamline in a flow field. Control volume concept. Conservation of mass and continuity Equation. Calculation of mass flux through a surface and mass flow rate. Momentum equation of forces applied to a control volume. Boundary Layer Concept. Von Karman Momentum Integral Equation. Drag forces. Turbulent flow. Calculation of drag in laminar and turbulent flows.

Textbook:

Fox, R. W., Pritchard P. J. and A. T. McDonald, *Introduction to Fluid Mechanics*, 7th Ed., John Wiley & Sons Inc., 2009.

Reference Book:

Seddigh, F., *Applied Fluid Mechanics*, (Unitech, 1997)

Assessment:

Continuous assessment - 60%
Written examination - 40% (1 x 2 hours)

ME 452: APPLIED FLUID MECHANICS II

Hours per week: 3

Prerequisite: ME 451

Objective:

To enable students to apply the theory of fluid mechanics to a wide variety of fluid flows encountered in mechanical systems for the purpose of analysis, testing or design. On completion of the subject, students should have developed a good understanding in the following areas:

1. Basic calculations in aerodynamics;
2. Basic calculations in turbo machinery for energy generation, pumping and compression;
3. Basic concepts of compressible and

unsteady flows.

Syllabus:

Simple irrotational flow patterns, Superposition of simple flow patterns, Lift and drag, Circulation, Bound vortex, Kutta Joukowski Theorem, Wake and boundary layer Separation, Aerofoil characteristics, lift Coefficient and its variation with the incidence, finite wing, elliptical lift distribution. Fluid machinery including water turbines, Pumps and their selection criteria, Fans and compressors. Theory of rotodynamic machines and performance characteristics. Introduction to compressible and unsteady flows, Nozzle flow, Critical conditions, Normal shock, Oblique shock.

Textbook:

Fox, R. W., Pritchard P. J. and A. T. McDonald, *Introduction to Fluid Mechanics*, 7th Ed., John Wiley & Sons Inc., 2009.

Reference:

Seddigh, F., *Applied Fluid Mechanics*, (Unitech, 1997)

Assessment:

Continuous Assessment - 60%
Written Examinations - 40% (1 x 2 hours)

ME 463: VIBRATION ANALYSIS

Hours per week: 3

Prerequisite: ME 363

Objective:

To enable students to analyse the vibration of mechanical systems. On completion of the subject, students should be able to:

1. Analyse the dynamic behaviour (vibrations) of mechanical systems having a single-degree of freedom;
2. Analyse simple problems arising from the unbalanced masses in the rotating parts of machinery;
3. Analyse the dynamic behaviour of systems having two or more degrees of freedom

without damping the external forcing functions.

Syllabus:

Introduction to mechanical vibrations, lab. demonstration of vibrating systems, definitions, harmonic motion, vector and complex representations of harmonic motion, periodic motion, Fourier series, vibration terminology. Single degree of freedom system: modelling of systems, undamped free vibration, equation of motion, (Newton's law), -equivalent stiffness, energy methods, Rayleigh -method, viscously damped free vibration, logarithmic decrement, coulomb damping, structural damping. Harmonic excitation of single degree of freedom system, rotating unbalance, rotor unbalance, whirling of shafts, support motion, vibration measuring instruments, demonstration of instruments, transient vibration. Two-degree of freedom system, normal mode vibration, coordinate coupling, forced harmonic vibration, vibration absorber, vibration damper, multi-degree of freedom systems; numerical methods.

Textbook:

Thomson, W.T. and M. D. Dahleh, *Theory of Vibrations with Applications*, 5th ed., Prentice Hall, 1998.

Assessment:

Continuous Assessment - 60%
Written Examination - 40% (1 x 2 hours)

ME 471: MECHANICAL SYSTEMS DESIGN

Hours per week: 3

Prerequisite: ME372

Objective:

To introduce students to system design procedures. On completion of the subject, students should:

1. Have a thorough understanding of the design procedures for mechanical systems;
2. Be able to design mechanical systems.

Syllabus:

Introduction to mechanical design process; planning for design process; customer satisfaction, determination of customer requirements, use of QFD; concept generation methods, concept evaluation techniques; product design phase, form design, properties of common materials; product evaluation for performance, robust design, parameter and tolerance design for quality, robust design through testing; product evaluation for cost, manufacture, assembly, reliability, and environment; examples of mechanical systems.

Textbook:

Ullman, D.G., *The Mechanical Design Process*, 4th ed., McGraw-Hill, 2010.

Assessment:

Continuous Assessment - 60%
Written Examination - 40% (1 x 2 hours)

ME 472: DESIGN FOR MANUFACTURE

Hours per week: 3

Prerequisite: ME372

Objective:

To introduce students to design for manufacture concept and its application for improvements in product development, product design, manufacturing process design, and manufacturing system design. On completion of this subject, students should be able to:

1. Understand design for manufacture concept,
2. Understand design procedures for mechanical systems,
3. Be able to improve design efficiency of an existing design,
4. Understand cost reduction programs such as value analysis/value engineering.

Syllabus:

Introduction to design for manufacture, application and benefits, design for manufacture applied to product development, product design, manufacturing process design, and manufacturing system design, design for machining, forming, welding, casting and assembly concepts, design

efficiency, value analysis/value engineering.

Textbook:

To be specified.

Reference:

Trucks H. E., *Design for Economical Production*, S.M.E. Publications, 1981.

Hoffman, E.G., *Jigs and Fixture Design*, 3rd Ed, Delmar Publications Inc, 1995

Assessment:

Continuous Assessment - 100%

ME 474: DESIGN & ANALYSIS OF MECHANISMS

Hours per week: 3

Prerequisite: ME 362

Objectives:

To introduce students to creativity and idea in mechanisms, and typical methods of analysis and synthesis of selected linkages. On completion of the subject, students should be able to:

1. Understand the actions and principles of operation of various types of mechanisms used in Mechanical engineering;
2. Carry out kinematic analysis.

Syllabus:

Introduction to mechanisms for various action such as snap-action, linear and rotary actuation, fine adjustment, clamping, locating, escapements, indexing, oscillating, reciprocating, reversing, coupling, stop-pause-hesitation, transportation, loading and unloading, path and function generation, computing, speed changing and robotic. Basic linkage concepts, mobility criterion, synthesis of mechanisms, kinematic analysis of a four-bar linkage, velocity, acceleration, and inertia force in linkages.

Textbooks:

To be specified.

Reference:

Erdman, A.G. and Sandor, G.N., *Mechanism Design*, 2nd ed., Prentice-Hall, 1991.

Shigley, J.E. and Mischke, C.R., *Standard Handbook of Machine Design*, McGraw-Hill, 1986.

Assessment:

Continuous assessment - 60%

Written examination - 40% (1 x 2 hours)

ME 476: COMPUTER-AIDED DESIGN

Hours per week: 3

Prerequisites: ME 334, ME 272

Objectives:

On completion of the subject, students should be able to:

1. Effectively use Computer-Aided-Design software;
2. Produce two- and three-dimensional engineering drawing;
3. Understand Database interfaces for CAM.

Syllabus:

Use of CAD techniques within an integrated approach to conceptual design and links to manufacturing and assembly systems. Overview of standard CAD software packages. Drawing tools, Producing and viewing 2D drawings. Principles of geometric modelling: solid modelling, surface modelling, 2D modelling. Databases as the interface with computer aided manufacturing and production control.

Textbook:

To be specified.

Assessment:

Continuous assessment - 100%

ME 481: FUNDAMENTALS OF NON-DESTRUCTIVE EVALUATION

Hours per week :3

Prerequisite: Nil

Objectives:

The objective of this subject is to equip the students with the basic techniques of non-destructive testing and to explain its application and usefulness in the industrial environment. On completion of the subject, the students should be able to acquire the knowledge of fundamentals of:

1. The theory and practice of various Non-destructive testing techniques.
2. The advantages and limitations of each technique and how they are applied in various industrial applications and their uses in quality control.

Syllabus:

Introduction to principles of various non destructive testing techniques, the uses and benefits of various non-destructive testing techniques; Visual techniques, Liquid penetrant inspection, Magnetic particle inspection, Eddy current, Ultrasonic, Radiography, and other non-destructive testing techniques (optical probes, neutron radiography, laser-induced ultrasonics, time of flight diffraction, acoustic emission, crack depth gauges, thermography and texture analysis), NDT and design.

Textbook:

To be specified.

Reference:

Barry Hull and Vernon John, Non-Destructive Testing, Macmillan, 1988.
Bray D.E. and Stanley R.K., Nondestructive testing, A tool in design, manufacturing and service, Revised edition, CRC press, 1997.

Assessment:

Continuous assessment - 60%
Written examination - 40% (1 x 2 hours)

ME 482: FAILURE ANALYSIS

Hours per week: 3

Prerequisites: ME 281, ME 381, ME 372

Objective:

The objective of this subject is to equip the students with general procedures, techniques and precautions employed in the investigation and analysis of metallurgical failures that occur in service. On completion of the subject, students should be able to:

1. Understand and appreciate what failure analysis means in terms of profitability and liability, and to be familiar with general procedures, techniques, and precautions in failure analysis;
2. Identify design-related failures and to analyze the factors that cause failure with basic understanding of processing- and material-related failures;
3. Identify the environmental sources responsible for failures and determine ways to prevent them, and discuss how stress systems relate to fracture of ductile and brittle materials;
4. Appreciate and determine typical fatigue characteristics and the basic fracture modes and their characteristics, including the factors affecting ductile brittle relationships, with a good grasp of the many inter-related factors involved in examining a fracture.

Syllabus:

Failure, failure analysis, failure analysis methodology, Tools and techniques of failure analysis, fracture mechanics, failure data retrieval through failure experience matrix, and reliability.

Defects: types and characteristics; defects in casting, primary processing defects, secondary processing defects, effects of defects on service properties.

Procedural steps for investigation; feedback system, investigation procedure, background information, visual examination, non-destructive testing, fractographic examination, metallurgical

tests, analysis of service parameters and simulated tests.

Failure: types and characteristics; types of failure, overload failures, fatigue failures, corrosion failures, wear failures.

Techniques of failure analysis: non-destructive testing techniques, metallographic techniques.

Concept and mechanism of failure: fatigue, stress corrosion, hydrogen embrittlement.

Case studies relating both to in-process and service failures.

Textbook:

Wulpi J. Donald, *Understanding How Components Fail*, 2nd ed., American Society of Metals (ASM), Ohio, USA, 2000.

Reference:

Collins, A. Jack, *Failure of Materials in Mechanical Engineering Design*, John Wiley & Sons, Second Edition, New York, USA, 1993.

Das, A.K., *Metallurgy of Failure Analysis*, McGraw-Hill Book Company, New York, USA, 1996.

Assessment:

Continuous Assessment - 60%

Final Examination - 40% (1 x 2 hours)

ME 491 APPLIED THERMODYNAMICS

Hours per week: 3

Prerequisite: ME 391

Objective:

To introduce students to more advanced topics in

Thermodynamics. On completion of the subject, students should be able to:

1. Discuss layout of thermal power plant;
2. Discuss various approaches for improving efficiency of the power cycle;
3. Discuss fuel systems and alternative fuels.

Syllabus:

Air standard cycles of piston I.C. engines and gas turbines. Performance characteristics of gas turbines.

Fuels and combustion; real engine systems and

performance; alternative fuels. Reciprocating compressors and expanders. Power plant: methods of improving economy; examples of diesel and steam power plant and typical layout.

Textbooks:

Moran M. J., Shapiro H.N., Boettner D. D. and M. Bailey, *Fundamentals of Engineering Thermodynamics*, 7th ed., John Wiley & Sons, 2011.

References:

Skrotzki, B.G.A., and Vopat, W.A., Power Station Engineering and Economy, (Tata McGraw-Hill, 1986)

Aschner, F.S., Planning Fundamentals of Thermal Power Plants, (John Wiley, 1978) {Mech Eng Dept Library}

Assessment:

Continuous assessment - 60%

Written examination - 40% (1 x 2 hours)

ME 492: REFRIGERATION & AIR-CONDITIONING

Hours per week: 3

Prerequisite: ME 391

Objective:

On completion of this subject, the students should be able to:

1. Estimate heat load for refrigeration and air-conditioning purposes;
2. Explain the function of refrigeration and air-conditioning materials and equipment.

Syllabus:

Air cycle. Body comfort. Psychrometry and the use of the psychrometric chart. Principles of heat

load estimation for air-conditioning systems. Types of air-conditioning equipment. Air distribution. Ducts. Residential and commercial air-conditioning. Air-conditioning equipment. Refrigerants. Analysis

of refrigeration cycles. Heat pumps. Cooling towers. Food preservation, and the growth of micro organisms. Calculation of refrigeration heat load. Compressors, condensers, expansion devices, and evaporators. Charging and testing of refrigeration systems. Basic systems control.

Textbook:

To be specified.

Reference:

Jones, W.P., *Air-conditioning Engineering*, 3rd ed., Edward Arnold, 1985.

Eastop, T.D., and McConkey, A., *Applied Thermodynamics For Engineering Technologists*, ELBS/Longman, 1994.

Assessment:

Continuous assessment - 60%

Written examination - 40% (1 x 2 hours)

ME 494: AUTOMOTIVE ENGINEERING

Hours per week: 3

Objectives:

To introduce students to the structure, function, and general design and maintenance aspects of the engineering systems of an automobile. On completion of the subject, students should be able to:

1. Describe the major engineering systems;
2. Apply principles of relevant fields of study in basic design considerations of the systems;
3. Effect minor modifications to the design of some systems;
4. Appreciate the importance of improving thermal efficiency and reducing pollution of the environment.

Syllabus:

Summary of the major components and functions of the engineering systems of an automobile. Detailed

description of S.I. engines, C.I. engines, cooling systems, fuels and fuel systems, combustion air and turbo charging, pollution control

systems, transmission systems, steering and suspension

systems, braking systems, electrical systems, and lubrication systems. Basic design calculations.

Engine performance tests and calculations

Essential maintenance procedures. Latest trends - alternative engines.

Textbooks:

May, E., *Automotive Mechanics*, Volume 1, McGraw-Hill, 2000.

References:

ATAL, and Hirst, J., *Engines, Electronics and Related Systems*, Macmillan Ed. Aust., 1996.

ATAL, and Whipp, J., *Transmission, Chassis and Related Systems*, Macmillan Ed. Aust., 1996.

Assessment:

Continuous assessment - 60%

Written examination - 40% (1 x 2 hours)

ME 496: RENEWABLE ENERGY

Hours per week: 3

Prerequisite: ME391

Objectives:

On completion of the subject, students should be able to:

1. Discuss different types of renewable energy sources;
2. Discuss the technologies for renewable energy utilization and conversion devices currently available;
3. Explain the economics of renewable energy conversion devices.

Syllabus:

Range of renewable energy resources and its potential. Selected technologies, which are generally recognized as being the most feasible technically and economically, e.g., solar (both thermal and photo-voltaic), wind, hydro, tidal, waste and biomass.

Methods of harnessing and using energy from these sources, including hybrid systems.

Limitation of renewable energy harnessing:

principles of energy conversion; storage and transfer for renewable energy systems. Feasibility and design studies for selected renewable energy technologies. National and international trends.

Textbook:

To be specified.

Reference:

Dunn, P.D., *Renewable Energy Sources, Conservation & Application*, Peter Peregrinns Ltd., 1986.

Assessment:

Continuous assessment - 60%

Written examination - 40% (1 x 2 hours)

**MASTER OF TECHNOLOGY (M.Tech.)
DEGREE PROGRAMME IN MECHANICAL
ENGINEERING**

1.0 OUTLINE OF PROGRAMME

1.1 Introduction

This department shares the view with others that there is a need to develop postgraduate training facilities in mechanical engineering to meet the manpower requirements of industries, government departments and academic institutions. This postgraduate course, that combines both formal lectures and self-motivated research, aims to meet the present need. In order to facilitate greater participation of practising engineers in industries and government departments, the course has been structured to have built-in flexibility.

1.2 Flexible Instructional Features

In order to facilitate greater participation of potential students, intensive instructions are given over a period of three to four weeks per semester. After each period, candidates return to their normal place of employment to study on their own and complete prescribed assignments. Teaching periods will preferably be in the three to four weeks prior to the commencement of each semester of the academic year. A maximum of two subjects can be taken in each semester. The

flexibility built into the programme has employers in mind, who might otherwise be unwilling to release their employees for studies over a prolonged period.

1.3 Course Duration

There is no course duration set for the course, but students are normally expected to complete the course in less than three years, i.e., four to six semesters.

1.4 Entry Requirements

Candidates with a bachelor's degree or equivalent in engineering will be admitted for enrolment; priority will be given to candidates with past superior academic performance or to those who have gained adequate professional experience. Some applicants may be required to take a prescribed number of undergraduate subjects to qualify for candidacy.

2.0 COURSE STRUCTURE

The course structure has three major components as specified below:

2.1 Core Subjects

Four subjects come under this category out of which at least two subjects including Research Methodology & Computation should be taken. Each course carries 3 credits.

2.2 Dissertation

Each student is required to engage in a research project and write a dissertation for which 6 credits will be earned. Topics for the project will preferably be chosen to aid in the solution of specific industrial problems in consultation with the student's academic supervisor.

2.3 Elective Subjects

Elective subjects contain topics dealing with current advances in technology which are grouped together under three subject areas. A minimum of four subjects should be taken from groups A, B, and C. Each subject will be covered in 35-42 lecture hours. Candidates will earn 3 credits upon successful completion of each subject.

2.4 Degree Requirements

In order to complete the degree requirements, each

student is expected to earn 24 credits (six subjects plus a dissertation).

2.5 Course Examinations

Course examinations will take place when the students return to the University for subsequent instruction periods. The award of the Degree of Master of Technology will be made in accordance with the Rules of the University's Higher Degrees Committee.

3.0 SUBJECT TITLES

1. CORE SUBJECTS

MM 001 Advanced Engineering Mathematics I
MM 002 Advanced Engineering Mathematics II
MM 003 Numerical Methods
MM 004 Research Methodology & Computation

2. DISSERTATION

MM 090 Research Project

3. ELECTIVE SUBJECTS GROUP A

MM 006 Advanced Machine Design
MM 007 Materials Handling Systems
MM 008 Computer-Aided Design
MM 009 Finite Element Method
MM 010 Advanced Vibration
MM 011 Noise Control Engineering

GROUP B

MM 012 Computer-Integrated Manufacturing
MM 013 Conventional Manufacturing
MM 014 Robotics in Manufacturing
MM 015 Total Quality Management
MM 016 Just-In-Time Systems
MM 017 Advanced Quality Control
MM 018 Planned Preventive Maintenance

GROUP C

MM 019 Internal Combustion Engines
MM 020 Gas Turbines
MM 021 Hydraulic Machines
MM 022 Advanced Heat Transfer
MM 023 Renewable Energy
MM 024 Fossil Fuels & Combustion Technology
MM 025 Refrigeration & Air-Conditioning

4.0 SUBJECT DETAILS

MM 001: ADVANCED ENGINEERING MATHEMATICS I

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Objective:

On completion of the subject, the student should be able to:

1. Use Fourier Series and Laplace Transform for solving problems;
2. Solve common types of partial differential equations encountered in engineering problems;
3. Apply vector analysis theorems for solving engineering problems.

Syllabus:

Fourier Series and Integrals: Euler coefficients, half range expansion, harmonic analysis, the Fourier Integral as the limit of Fourier Series, from Fourier Series to Laplace Transform. Applications in engineering problems.

Laplace transformation: definitions and general methods, transforms of special functions, transform of ordinary differential equations. Applications in engineering problems.

Partial differential equations: types of PDE, solution of PDE, separation of variables methods, Laplace Transform method. Vector Analysis: Curl, Del, gradient and divergence operators, directive of a function along a line, Green's Theorem, Divergence Theorem, Stokes Theorem. Applications in engineering problems.

Textbook:

Zill, D.G., and Cullen, M., *Advanced Engineering Mathematics*, 3rd ed., Jones & Bartlett Publishers Inc., 2006.

Assessment:

Continuous assessment - 60%
Written Examination - 40% (1 x 2 hours)

MM 002: ADVANCED ENGINEERING MATHEMATICS II

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Objectives:

On completion of the subject, the student should be able to:

1. Solve linear first order set of ordinary differential equations;
2. Apply theory of analytical functions and commonly used series for solving engineering problems.

Syllabus:

Ordinary Differential Equations: Simultaneous linear differential equations, complementary functions and particular integrals for systems of equations. Bessel Functions and Legendre polynomials, series solution of Bessel's equation. Application of Bessel functions in engineering problems. Rank and equivalence of matrices, systems of linear equations, quadratic forms, transformation matrices. Theory of analytic functions, functions of a complex variable, analytic functions, Cauchy-Riemann theorem, conformal mapping, Schwarz-Christoffel transformation, Joukowski transformation.

Textbook:

Zill, D.G., and Cullen, M., *Advanced Engineering Mathematics*, 3rd ed., Jones & Bartlett Publishers Inc., 2006.

Assessment:

Continuous assessment - 60%
Written Examination - 40% (1 x 2 hours)

MM 003: NUMERICAL METHODS

Credits: 3

Hours per week: 15 (A minimum of 45 hours)

Objective:

On completion of the subject, the student should be able to:

1. Find roots of equations and polynomial equations of higher order;
2. Solve linear and non-linear differential equations;

3. Find eigen values, approximation of functions and their integration;
4. Solve common partial differential equations.

Syllabus:

Roots of a function: Bisection, Regula Falsi, Secant, and Newton methods. Roots of polynomial equations: Newton algorithm, deflation procedures, Muller algorithm, other algorithms. Applications.

Solution of linear systems of equations: Gauss elimination method, computation of matrix inverse. Applications.

Eigenvalue problems: Power method, Householder algorithm, QR algorithm. Applications. Polynomial Interpolation: Lagrange polynomial, Newton forward difference form, Aitken Interpolation algorithm, splines. Applications.

Approximation of Functions: Taylor polynomial, Chebyshev polynomial, least square approximation, rational approximations. Applications.

Numerical Integration: Trapezoidal rule and Simpson's rule, Newton-Cotes Integration Formulas, Gaussian quadrature, Patterson's method.

Applications.

Numerical solution of ordinary differential equations: Euler algorithm, Taylor algorithms, Runge-Kutta Methods, predictor-corrector method. Applications.

Solution of Partial Differential Equations: Hyperbolic equations, parabolic equations, elliptic equations.

Textbook:

To be specified.

Reference:

Chapra, S.C. and R.P. Canale, *Numerical Methods for Engineers*, 6th Ed, McGraw-Hill, Inc., 2010.

Assessment:

Continuous assessment - 60%
Written Examination - 40% (1 x 2 hours)

**MM 004: RESEARCH METHODOLOGY
AND COMPUTER
APPLICATIONS**

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Objective:

On completion of the subject, the student should be able to:

1. Apply research methodology;
2. Use the computer applications for use in independent study and research.

Syllabus:

Elements of an experimental test set-up. Basic instrumentation. Data acquisition system. Data analysis. Hypothesis formulation. Designing questionnaire. Statistical analysis and interpretation of data. Writing and presentation of technical reports. Bibliography and references. Presentation techniques to an audience. Different

types of computers: Computer types, micro-processors and their principle of operation. Different input/output devices. Different types of computer memory. Disk operating systems. High-level languages. Software. Application of computers in solving engineering problems. Computer-Aided Engineering.

Textbook:

Holman, J.P., *Experimental Methods for Engineers*, 7th ed., McGraw-Hill, 2001.

Assessment:

Continuous assessment - 60%

Written Examination - 40% (1 x 2 hours)

MM 005: RESEARCH PROJECT

Credits: 6 (A total of 270 hours)

Objective:

On completion of the subject, the student should be able to:

1. Identify the main activities of a typical engineering product, process or system;

2. Plan a detailed schedule of activities to complete and meet the project deadline;
3. Apply the engineering principles learnt in other subjects in the development of the project work;
4. Write a dissertation on the project work.

Syllabus:

This course involves a project given to each student as an independent study for which lecturers will provide guidance. Topics of research project will be chosen in consultation with supervisors in areas relevant to PNG conditions. Candidates are expected to prepare objectives of the project, review the literature, propose the methodology of research, and initiate and conduct the research work required. The candidate is expected to present results of the research in the form of a dissertation.

Assessment:

Continuous assessment and submission of a dissertation - 100%

MM 006: ADVANCED MACHINE DESIGN

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Objective:

On completion of the subject, the student should be able to:

1. Apply the fundamentals of product planning and development;
2. Carry out systematic design of industrial projects.

Syllabus:

The scope of design: fundamentals of engineering systems and systematic approach; the design process; product planning; product specification; conceptual design; search for solutions; methods of analysis; choosing the best design; product design; reliability; design project (preferably from industry).

Textbooks:

Pahl, G., and Beitz, W., Engineering Design (Springer-Verlag), translation edited by Ken Wallace, (The Design Council, London)
Departmental course notes

Assessment:

Continuous Assessment - 60%
Written examination - 40% (1 x 2 hours)

MM 007: MATERIALS HANDLING SYSTEMS

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Objective:

On completion of the subject, the student should be able to:

1. Analyse and design integrated material handling systems for automatic storage and retrieval of unit loads;
2. Specify key parameters for such systems.

Syllabus:

Analysis and design of integrated material handling systems; automatic storage and retrieval of unit loads, and identifying and establishing boundary conditions on key parameters required to specify the desired system required for equipment vendors to design appropriate hardware.

Textbook:

Departmental course notes

Assessment:

Continuous assessment - 60%
Written Examination - 40% (1 x 2 hours)

MM 00: COMPUTER - AIDED DESIGN

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Objective:

On completion of the subject, the student should be able to:

1. Understand the supporting technologies for CAD;
2. Introduce practical applications of CAD relevant to manufacturing engineering.

Syllabus:

History and advantages of CAD; classification of CAD systems; system hardware and software packages; conceptual design of CAD systems; artificial intelligence and knowledge databases in CAD; interfaces of a CAD system with its application environment; geometric modelling-wire-frame modelling, surface modelling, solid modelling; fundamentals of Finite Element Method - a CAD tool;
CAD application examples.

Textbook:

To be specified.

Reference:

Meguid, S.A., *Integrated Computer-Aided Design of Mechanical Systems*, Elsevier Applied Science Publishers Ltd., 1987.

Assessment:

Continuous assessment - 60%
Written Examination - 40% (1 x 2 hours)

MM 009: FINITE ELEMENT METHOD

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Objective:

On completion of the subject, the student should be able to apply the Finite Element Method for solving mathematical problems related to practical engineering situations.

Syllabus:

General description of the Finite Element Method (FEM); static and dynamic analysis of

mechanical engineering problems; solution of finite element equations; general procedure of finite element method; finite element meshes; review of finite element packages; comparison of FEM with other methods of analysis.

Textbook:

To be specified.

Reference:

Steele, J.M., *Applied Finite Element Modelling: Practical Problem Solving for Engineers*, Marcel Dekker, Inc., 1989.

Assessment:

Continuous assessment - 60%

Written Examination - 40% (1 x 2 hours)

MM 010: ADVANCED VIBRATION

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Objective:

On completion of the subject, the student should be able to analyse mechanical vibration in any one of the areas of random vibrations, nonlinear vibrations and vibrations of continuous systems.

Syllabus:

This course may be offered in any of the following topics depending on the requirements of attending students:

- (a) Mechanical Vibrations and Experimental Methods in Vibrations: Linear theory of Vibrations of finite number of degrees of freedom systems via languages equations Sensors, instruments, measurements techniques data acquisition methods; data reduction methods for vibration measurement and modal analysis; applications including turbo machinery blades, vanes, gears, bearings and rotors; structures such as beams, frames and machine foundations.

- (b) Continuous systems: Introduction to continuous systems; vibration of strings, longitudinal vibration of rods, torsional vibration of rods; beam vibration, effect of rotary inertia and shear deflection; vibration of the plates.

- (c) Random vibrations: Random phenomena, defining expected value, frequency responses function, probability distribution, correlation of signals, power spectrum, power spectral density, Fourier Transform, response of single and multidegree systems to stationary random excitations.

- (d) Nonlinear vibrations: Introduction to nonlinear vibration, exact methods of solution, approximate analytical methods, graphical methods, stability of equilibrium, numerical methods.

Vibration measurement and control common to all topics.

Textbooks:

Rao, S.S., *Mechanical Vibrations*, 5th ed., Prentice Hall, 2011.

Thomson, W.T. and M. D. Dahleh, *Theory of Vibrations with Applications*, 5th ed., Prentice Hall, 1998.

Assessment:

Continuous assessment - 60%

Written Examination - 40% (1 x 2 hours)

MM 011: NOISE CONTROL ENGINEERING

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Objective:

On completion of the subject, the student should be able to:

1. Apply basic concepts of the nature of sound and noise to engineering situations;
2. Measure and analyse noise signals;

3. Recommend noise control measures in machinery and processes.

Syllabus:

The nature of sound; units; sound measurements; instruments; effects of noise on people; hearing loss; noise and law; near and far field noise; acoustics of rooms and enclosures, noise analysis; noise criteria; damping of panels; principles of noise control: vibration isolation, noise source identification and their relative importance, noise control procedures applicable to source, path and receiver; case studies: cooling fan, mine ventilation fan noise, duct noise, material handling impact noise, engine noise, turbine noise, jet noise; factory noise, industrial noise control programme.

Textbook:

To be specified.

Reference:

Lord, H.W., et. al., *Noise Control for Engineers*, McGraw Hill Book Company, 1980.

Assessment:

Continuous assessment - 60%
Written Examination - 40% (1 x 2 hours)

MM 012: COMPUTER-INTEGRATED MANUFACTURING

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Objective:

On completion of the subject, the student should be able to:

1. Understand the concepts of Computer-Integrated Manufacturing,
2. Recognize constituent parts of CIM systems, and integration of the parts to form a system

Syllabus:

Requirements for implementing CAD/CAM systems; components design using geometric modelling techniques; classification systems for

part-family formation; computer numerical control; computer-aided quality control; robotics; automated guided vehicles; computer-aided process planning; concepts and applications of flexible manufacturing systems (FMS); computer-aided manufacturing management.

Textbook:

To be specified.

Reference:

Rembold, U., Blume, C., and Dillmann, R., *Computer-Integrated Manufacturing Technology and Systems*, Marcel Dekker, Inc., 1985.

Assessment:

Continuous assessment - 60%
Written Examination - 40% (1 x 2 hours)

MM 013: CONVENTIONAL MANUFACTURING TECHNOLOGY

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Objective:

On completion of the subject, the student should be able to understand relevant fundamentals and real-world practices of some advanced manufacturing processes, and interrelationships among many technical and economic factors involved.

Syllabus:

Powder metallurgy; forming and shaping plastics and composite materials; non-traditional machining processes - chemical machining, electrochemical machining, electrochemical grinding, electrical-discharge machining, travelling-wire electrical-discharge machining, laser-beam machining, electron-beam machining, hydrodynamic machining; economics of non-traditional machining processes; joining processes and equipment - oxyfuel gas welding, arc-welding processes, consumable and

nonconsumable electrodes, resistance welding processes; surface technology; competitive aspects and economics of manufacturing - selection and substitution of materials, selection of manufacturing processes, manufacturing costs and value engineering.

Textbook:

Kalpakjian, S. and S. Schmid, *Manufacturing Engineering and Technology*, 6th ed., Prentice Hall, 2010.

Assessment:

Continuous assessment - 60%
Written Examination - 40% (1 x 2 hours)

**MM 014: ROBOTICS IN
MANUFACTURING**

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Objective:

On completion of the subject, the student should be able to understand industrial robots, their mechanical elements, sensory systems, and control systems, and their use in manufacturing.

Syllabus:

History and development of robotics; types and configurations of robot; mechanical elements of robot - arms, hands, actuation methods; robot senses and sensory systems - vision, touch, hearing; programming and controlling the robots the use of robots in computer-aided manufacture; artificial intelligence for robots.

Textbook:

To be specified.

Reference:

Todd, D.J., *Fundamentals of Robot Technology*, Kogan Page Ltd., 1986.

Assessment:

Continuous assessment - 60%
Written Examination - 40% (1 x 2 hours)

**MM 015: TOTAL QUALITY
MANAGEMENT (TQM)**

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Objective:

On completion of the subject, the student should be able to:

1. Understand the fundamental concepts of TQM;
2. Understand the procedure for implementation of TQM in industries.

Syllabus:

Introduction; TQM defined; CWQM in Japan; management tools: histogram, cause and effect diagram, check sheets, pareto diagram, control charts, scatter diagram, binomial probability paper; customer-supplier relationship; continuous improvement models; tools for continuous improvement; management commitment; implementation strategies: quality control circles, training of workforce, importance of communication, improvement of interpersonal relationship; case studies.

Textbooks

To be specified.

Reference:

Sprouster, J., *TQC : Total Quality Control*, Castle Books, 1984.
Total Quality Management (The Plastics and Rubber Institute, UK)

Assessment:

Continuous assessment - 60%
Written Examination - 40% (1 x 2 hours)

MM 016: JUST-IN-TIME SYSTEM

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Objective:

On completion of the subject, the student should be able to:

1. Understand the basic philosophies of JIT system;
2. Gain sufficient understanding for implementation of JIT in a manufacturing industry.

Syllabus:

Brief history of Just-In-Time system; definition, objectives and benefits of JIT; basic philosophies; key elements of JIT; Kanban; Kanban rules; inventory control under JIT; reduction of lead time, reduction of set-up time, standard operations; machine layout in JIT, multifunctional workforce, job rotation, training requirements; improvement activities; autonomous defects control; functional management and its organization; adapting to JIT system, obstacles; future development of JIT system.

Textbook:

To be specified.

Reference:

Monden, Y., *Toyota Production System*, Institute of Industrial Engineers, 1983

Assessment:

Continuous assessment - 60%
Written Examination - 40% (1 x 2 hours)

MM 017: ADVANCED QUALITY CONTROL

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Prerequisite: Knowledge of statistics.

Objective:

On completion of the subject, the student should be able to:

1. Understand both classical and advanced acceptance sampling methods;
2. Gain in depth understanding of statistical process control methods.

Syllabus:

Advanced methods applied to quality control. Acceptance sampling plans from the classical lot attribute plan to sophisticated multi-lot dependent plans. Classical treatments and recent developments in process control. Evaluation, design and maintenance of quality control programs.

Textbook:

Departmental course notes

Assessment:

Continuous assessment - 60%
Written Examination - 40% (1 x 2 hours)

MM 018: PLANNED PREVENTIVE MAINTENANCE

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Objective:

On completion of the subject, the student should be able to:

1. Understand the fundamentals of preventive maintenance;
2. Implement and supervise maintenance programmes.

Syllabus:

Maintenance fundamentals; systematic approach to maintenance; maintenance economics; maintenance organization; origin of maintenance problems; inspection and maintenance tools; inspection and lubrication schedules; condition based maintenance; maintenance records; maintenance inventory examples of maintenance of elements and machines; maintenance planning; scheduling; manual vs computer assisted maintenance; motivation of workforce; implementation of maintenance programme.

Textbook:

To be specified.

Reference:

Patton, J.D. Jr., *Preventive Maintenance*, Instrument Society of America, 1983.
Wireman, T., *Computerized Maintenance Management Systems*, Industrial Press, 1986.

Assessment:

Continuous assessment - 60%
Written Examination - 40% (1 x 2 hours)

MM 019: INTERNAL COMBUSTION ENGINES

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Objective:

On completion of the subject, the student should be able to:

1. Understand advanced concepts of the combustion process;
2. Perform calculations for the design of engines and selection of equipment.

Syllabus:

Types and arrangements; theoretical gas cycles; combustion thermodynamics; actual gas cycles - dynamometers, fuel and air flow, exhaust gas analysis; air, fuel, and exhaust flows - pumping and scavenging work, carburetion, fuel injection, measurement techniques; combustion and emissions - auto ignition, nitrogen oxides, carbon monoxide, hydrocarbons, particulates, emission control and legal requirements; fuel technology - gasoline, diesel fuel, fuel additives; engine performance - criteria, testing, critical factors.

Textbook:

Ferguson, C.R., *Internal Combustion Engines*, Second edition, John Wiley, 2000.

Assessment:

Continuous assessment - 60%
Written Examination - 40% (1 x 2 hours)

MM 020: GAS TURBINES

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Objective:

On completion of the subject, the student should be able to:

1. Estimate performance parameters for different types of gas turbines, and gas turbine arrangements;
2. Gain a thorough knowledge of the principles of the operation of industrial gas turbines;
3. Apply the principles of the operation of modern gas turbines, parts and components.

Syllabus:

Gas turbine principles of operation. Single-shaft and multi-shaft arrangements. Aircraft propulsion. Shaft power cycle (ideal). COGAS cycles and cogeneration schemes. Gas turbine cycle for aircraft propulsion: simple turbojet cycle, turbofan engine, turboprop engine, thrust augmentation. Axial and centrifugal compressors: theory, factors affecting pressure ratio, degree of reaction, compressor map and characteristic. Combustion systems: Factors affecting combustion, combustion process, combustion chamber performance. Prediction of performance of simple gas turbines. Gas turbines, components and their principles of operation. Industrial gas turbine engines.

Textbook:

Cohen, H., et al, *Gas Turbine Theory*, 3rd ed., Longman Sci. & Tech.

Assessment:

Continuous assessment - 60%
Written Examination - 40% (1 x 2 hours)

MM 021: HYDRAULIC MACHINES

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Objective:

On completion of the subject, the student should be able to:

1. Analyse fluid flow in hydraulic machines;
2. Design rotodynamic machinery and their components;
3. Select pumps and turbines for industrial applications.

Syllabus:

System analysis for pump selection, specific speed and modelling laws, specific speed charts; design considerations for various applications; impeller design - impeller layout, development of impeller vane; volute design, double and triple volute casing design, circular volute; design of multi-stage casing; double-suction pumps and side-suction design; pump applications - vertical pumps, wet-pit pumps, barrel-mounted pumps, slurry pumps, pumps for chemical processes; hydraulic turbines - selection process, turbine performance prediction, fixed guide vane turbines, variable guide vane turbines; pump and turbine components - mechanical seals, bearings and lubrication; gear pumps and vane pumps; compressors - types and design considerations; vibration and noise - causes of vibration, cavitation, diagnosis of pump vibration problems; controls - constant power control, constant pressure control, constant flow control.

Textbook:

To be specified.

Reference:

Lobanoff, V.S., & Ross, R.R., *Centrifugal Pumps - Design & Applications*, Gulf Publishing Company, 1992.

Assessment:

Continuous assessment - 60%
Written Examination - 40% (1 x 2 hours)

MM 022: ADVANCED HEAT TRANSFER

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Objective:

On completion of the subject, the student should be able to:

1. Analyse complex heat transfer problems;
2. Perform calculations for design/operation changes and for equipment selection.

Syllabus:

Steady-state heat conduction in one, two, and three dimensions - graphical and numerical methods; unsteady-state heat conduction - chart and numerical methods; convection - review, dimensional analysis, boundary layer analysis, Reynolds' analogy, free convection, forced convection inside tubes and over exterior surfaces; heat exchangers - types and arrangements, LMTD and effectiveness methods of analysis, fouling factors, selection; radiation - review, gas-filled enclosures, combined modes with conduction and convection; boiling heat transfer, condensing heat transfer.

Textbook:

Incropera F. P., DeWitt D. P., Bergman T. L. and A. S. Lavine, *Fundamentals of Heat and Mass Transfer*, 6th ed., John Wiley & Sons, 2007.

Assessment:

Continuous assessment - 60%
Written Examination - 40% (1 x 2 hours)

MM 023: RENEWABLE ENERGY

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Objective:

On completion of the subject, the student should be able to:

1. Discuss different types of renewable energy sources;
2. Discuss the technologies for renewable energy utilization and conversion devices currently available;
3. Explain the economics of renewable energy conversion devices.

Syllabus:

Range of renewable energy resources and its potential; selected technologies generally recognized as being the most feasible technically and economically, e.g., solar (both thermal and photo-voltaic), wind, hydro, tidal, waste and bio-mass; methods of harnessing and using energy from these sources, including hybrid systems; limitations of renewable energy harnessing; principles of energy conversion; storage and transfer for renewable energy systems; feasibility and design studies for selected renewable energy technologies; national and international trends.

Textbook:

To be specified.

Reference:

Dunn, P.D., *Renewable Energy Sources, Conservation & Application*, Peter Peregrinns Ltd, 1986.

Assessment:

Continuous assessment - 60%
Written examination - 40% (1 x 2 hours)

MM 024: FOSSIL FUELS & COMBUSTION TECHNOLOGY

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Objectives:

On completion of the subject, the student should be able to:

1. Have a broad knowledge of different types of fossil fuels and methods for their exploration and production;
2. Apply combustion technology to combustion equipment to improve efficiency and control emissions.

Syllabus:

Different types of fossil fuels, geographic spread of reserves, life-span, processes involved from exploration to production; grades of fuels; impurities; processes involved in refining the

fuels; thermochemical reactions and combustion of fossil fuels on theoretical and practical bases; theory of combustion and brief introduction to combustion kinetics; air supply in combustion; by-products of fuel production and combustion; control of combustion processes; pulverized fuel combustion; fluidized-bed combustion; environmental control systems; particulate emissions; particulate and sulphur dioxide removal; scrubbers.

Textbook:

To be specified.

Reference:

Sarkar, S., *Fuels and Combustion*, 2nd ed., Sangam Books, 1990.

Assessment:

Continuous assessment - 60%
Written Examination - 40% (1 x 2 hours)

MM 025: REFRIGERATION & AIR-CONDITIONING

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Objective:

On completion of the subject, the student should be able to:

1. Estimate heat load for air-conditioning and refrigeration purposes;
2. Describe air-conditioning and refrigeration materials and equipment.

Syllabus:

Air cycle; body comfort; psychrometric chart and processes; principles of heat load estimation for air-conditioning systems; types of air-conditioning equipment; air distribution; ducts; residential and commercial air-conditioning; air-conditioning equipment; refrigerants; types of refrigeration systems; food, and growth of micro-organisms; basic principles of heat transfer; latent heat; calculation of heat load; insulation; evaporator; condenser design; compressors; charging and testing of refrigeration systems;

basic refrigeration controls; electrical components.

Textbook:

To be specified.

Reference:

Jones, W.P., *Air-conditioning Engineering*, 3rd ed., Edward Arnolds, 1985.

Assessment:

Continuous assessment - 60%

Written Examination - 40% (1 x 2 hours)

DEPARTMENT OF MINING ENGINEERING

Head of Department & Professor:

Vacant

Associate Professor:

Gena, K., PhD (Akita), MSc (Akita) BSc (UPNG)

Visiting Professor:

Chakrabarti, A., PhD (Calcutta), M.Eng (Calcutta), B.Eng (Calcutta), B.Sc (Calcutta)

Lecturers:

Arpa, G., PhD (Kyushu), MSc (Akita), B.Eng. (PNGUOT)

Ail, K., MSc. (Curtain), B.Eng. Mining (PNGUOT)

Tongamp, W., MSc. (Tohoku), B.Eng. Mineral Processing (PNGUT)

Lecturers on Study Leave:

Lem, J., B.Eng. Mineral Processing (PNGUOT), MPhil (PNGUOT)

Oseah, N., MSc (Tokyo), B. Eng. Mineral Processing (PNGUOT)

Senior Technical Instructors:

Saki, M., BSc. Mineral Processing (PNGUOT)

Pakne, D., MSc (NSW), B.Eng. Mining (PNGUOT), Cert. (Japan)

Kama, M., BSc. Mineral Processing (PNGUOT), PG Dip. Science Education (Curtain)

Technical Instructors:

Sirao, S., B.Eng. (PNGUOT)

Laboratory Manager:

Tera, K., Dip. Lab. Science (Lae Tech)

Senior Technical Officers:

Robert, R.,

Kobal, W., B.Eng. Mineral Processing (PNGUOT)

Technical Officers:

Aiwa, J., B. Eng. Mining (PNGUOT)

Mosbi, J., Dip. App. Science (Polytech)

Secretaries:

Rapula, J., PETT Cert (Mt. Hagen Tech.)

Benjamin, S.,

Administrative Clerk:

Aisi, L., Dip. Office Administration (Lae Tech)

Cleaners:

Zibang L.

Inzewong L.

UNDERGRADUATE PROGRAMME

The Department of Mining Engineering was set up in 1988 at this University to train graduates for the Mineral Industry. In January 1990, the Mineral Technology Section then in the Department of Chemical Technology was transferred to the Department of Mining Engineering.

The Department offers the following programmes:

1. Bachelor of Engineering in Mining Engineering - 4 years.
2. Bachelor of Engineering in Mineral Process Engineering - 4 years.

The Department admits students to the first year of these two programmes on merit basis from Grade 12 School Certificate (or equivalent) level. Strict Minimum requirements for admission are: B in Physics, Chemistry and Mathematics (Major) and C in English.

The undergraduate teaching in the Department aims at producing quality engineers for the mineral industry with basic technical, managerial and data handling skill and up-to-date information required for economic exploitation of mineral resources maintaining high standard of safety and environment.

The teaching-learning and research infrastructure and environment in the Department is being constantly updated in the laboratories housed in Moseley Moramoro Mining Building and Kaindi building. The Department is proud of having world class facilities that include Mineral Processing Laboratory with XRD and XRF analyzers, Cyclosizer, Autoclave and UV-Visible Spectrophotometer, laboratory-size crushing, grinding, sizing and flotation machinery. Besides there are Rock Mechanics Laboratory, Geology Laboratory, Computer and Mine Planning Laboratories.

Students are required to undergo about 12 weeks of industrial training during the vacation. This industrial training must be approved by the Head of Department and every student is required to submit a report at the end of each training period. Graduates in Mining Engineering and Mineral Process Engineering are employed in various areas in the community; examples of Government associated employers are:

- Department of Minerals and Energy
- National Works Authority
- Electricity Commission
- Bureau of Water Resources
- Provincial Governments
- Local Governments
- Universities
- Technical Colleges

In addition, they are employed in the private sector in large and small mines, consulting companies, equipment sales companies and manufacturing companies. The alumni of this Department are serving in many prestigious industries like PJV, OTML, Lihir Gold, Oil Search Ltd, Pilbara Iron Pty Ltd etc.

POSTGRADUATE PROGRAMME

The Department currently runs **Master of Philosophy (M Phil)** programme. This is a research based post graduate degree programme to be undertaken for minimum two years full time.

The M.Phil programme is open to the following candidates:

1. A good Bachelor of Engineering or equivalent degree
2. A M.Sc. degree in Earth Sciences

The University offers Post Graduate scholarship through its Graduate Assistance Programme. Eligible post graduate students may also obtain Assistant Lectureship to carry out research oriented post graduate studies.

The research areas that the Department offers supervision include Geotechnology, Mine Planning and Design, Geostatistics, Remote Sensing and GIS Applications, Maintenance Management in Mining Industry, Geo Environmental Engineering, Environmental Management in Mineral industry, Gravity

Separation, Mineral Processing Techniques, Tailing Management, Safety Engineering, Bulk Material Handling, Acid Mine Drainage, Drilling and Blasting, Under Sea Prospecting,, Mineral Economics.

MINING INDUSTRY ADVISORY COMMITTEE

The Department keeps close interaction with the mining industry of PNG through its contacts with the Mining Industry Advisory Committee comprising of the representatives of different mining and petroleum companies operating in PNG, Department of Mines and Department of Petroleum of Government of PNG, PNG Chamber of Mines and Petroleum and Academics. The courses offered by the Department are reviewed periodically to accommodate changes required as per the needs of the academic developments and the industrial requirement.

STRUCTURE OF COURSES

Code	Subject	Average Weekly Hours

BACHELOR OF ENGINEERING IN MINING ENGINEERING

Year 1	First Semester	
MA167	Engineering Mathematics I	5
PH141	Principles of Physics I	5
CH181	Chemistry for Engineers I	2
LA101	Learning & Communications Skills	3
ME161	Workshop Technology & Practice	3
CE171	Engineering Drawing I	3
EE101	Introduction to Computing & Problem Solving I	2
		<u>23</u>

Year 1	Second Semester	
MA168	Engineering Mathematics II	5
PH142	Principles of Physics II	5
CH182	Chemistry for Engineers II	3
LA102	Study & Academic Skills	3
CE172	Engineering Drawing II	3

EE102	Introduction to Computing & Problem Solving II	2	LA204	Communication in the Workplace	<u>2</u>
MN122	Geology, Mining & Mineral Processing	<u>3</u>			<u>23</u>
		<u>24</u>	MN336	Mining Geology Field Trip	5 days
			MN356	Industrial Training	12 weeks
Year 2	First Semester		Year 4	First Semester	
ME261	Statics	3	MN401	Project	4
ME291	Thermodynamics I	3	MN411	Mineral Economics	4
CE221	Engineering Materials I	3	MN413	Environmental Engineering	3
CE241	Engineering Drawing I	3	MN415	Mine Design I	6
MA233	Engineering Mathematics IIA	4	MN417	Computer Applications in Mining	3
MP251	Introduction to Mineral Processing	3	MN419	Ore Reserve Estimation	4
MN231	Introduction to Geology	3			<u>24</u>
SV291	Surveying for Engineers I	<u>3</u>			
		<u>25</u>	Year 4	Second Semester	
Year 2	Second Semester		MN402	Project	8
CE242	Engineering Drawing II	3	MN412	Mine/Mineral Management	3
MA236	Engineering Mathematics IIB	4	MN414	Mining Legislation	3
ME252	Fluid Mechanics I	4	MN416	Mine Design II	6
MN212	Introduction to Mining	3	Elective	Any one of the following	<u>4</u>
MP236	Economic Geology and Mineralogy	4			<u>24</u>
LA201	Advanced Academic and Research Skills	2	MN456	Industrial Training	12 weeks
SV292	Surveying for Engineers II	<u>3</u>			
		<u>23</u>	Electives		
SV252	Survey Camp	10 days	MN422	Alluvial Mining	4
Year 3	First Semester		MN424	Underground Metalliferous Mining	4
MA339	Engineering Statistics	3	MN426	Raise, Tunnel Boring and Shaft Sinking	4
MN313	Geotechnology	4	MN428	Advanced Mining Engineering	4
MN315	Surface Mining	4	MN432	Introduction to Petroleum Engineering	4
MN319	Mine Ventilation	3			
MN331	Engineering Geology & Mapping	4	BACHELOR OF ENGINEERING IN MINERAL PROCESS ENGINEERING		
SV399	Mine Surveying	4	Year 1	First Semester	
MP341	Hydrometallurgy I	<u>4</u>	MA167	Engineering Mathematics I	5
		<u>26</u>	PH141	Principles of Physics I	5
Year 3	Second Semester		CH181	Chemistry for Engineers I	2
EE398	Electrical Engineering for Mining	4	LA101	Learning & Communications Skills	3
MN324	Bulk Materials Handling	3	ME161	Workshop Technology & Practice	3
MN314	Applied Geotechnology	4	CE171	Engineering Drawing I	3
MN316	Underground Mining	3			
MN340	Computer Programming	3			
MN332	Mining Geology	4			

EE101	Introduction to Computing & Problem Solving I	<u>2</u> <u>23</u>			
Year 1	Second Semester		Year 3	Second Semester	
MA168	Engineering mathematics II	5	LA204	Communication in the Workplace	2
PH142	Principles of Physics II	5	MP322	Process Technology II	4
CH182	Chemistry for Engineers II	3	MP302	Computer Applications in Mineral Process Engineering	2
LA102	Study & Academic Skills	3	MP324	Surface-Chemical Processing	7
CE172	Engineering Drawing II	3	MP342	Hydrometallurgy II	5
EE102	Introduction to Computing & Problem Solving II	2	MP344	Pyrometallurgy II	<u>4</u> <u>24</u>
MN122	Geology, Mining & Mineral Processing	<u>3</u> <u>24</u>	MP356	Industrial Training	12 weeks
Year 2	First Semester		Year 4	First Semester	
ME261	Statics	3	MP401	Project	4
ME291	Thermodynamics I	3	MN411	Mineral Economics	4
CE221	Engineering Materials I	3	MN413	Environmental Engineering	3
CE241	Engineering Drawing I	3	MP421	Process Design	4
MA233	Engineering Mathematics IIA	4	MP423	Solid/Liquid Separation and Fine Particle Processing	5
MN231	Introduction to Geology	3	MP427	Process Control and Instrumentation	<u>5</u> <u>25</u>
CH231	Physical Chemistry I	<u>4</u> <u>23</u>	Year 4	Second Semester	
Year 2	Second Semester		MP402	Project	6
CE242	Engineering Drawing II	3	MN412	Mine/Mineral Management	3
MA236	Engineering Mathematics IIB	4	MP422	Plant Design	6
MN212	Introduction to Mining	3	MP424	Bulk Materials Handling	3
CH232	Physical Chemistry II	4	MP426	Industrial Minerals Processing	4
MP224	Sampling, Size Analysis and Size Reduction	7	Elective	Anyone of the following	<u>4</u> <u>26</u>
MP236	Economic Geology and Mineralogy	<u>4</u> <u>25</u>	MP456	Industrial Training	12 weeks
Year 3	First Semester		Electives		
LA201	Advanced Academic and Research Skills	2	MP428	Metallurgical Performance Evaluation & Optimisation	4
MA339	Engineering Statistics	3	MP430	Feasibility Study of an Ore Deposit	4
MP321	Process Technology I	4	MP442	Advanced Extractive Metallurgy	4
MP323	Physical Processing and Metallurgical Accounting	7	MN432	Introduction to Petroleum Engineering	4
MP341	Hydrometallurgy I	4			
MP343	Pyrometallurgy I	3			
MP325	Instrumental Analysis	<u>3</u> <u>26</u>			

SUBJECTS TAUGHT BY THE DEPARTMENT

MN122	Geology, Mining & Mineral Processing
MN212	Introduction to Mining
MN231	Introduction to Geology
MN232	Mining Geology I
MN311	Material Handling in Mines
MN312	Mine Ventilation
MN313	Geotechnology
MN314	Applied Geotechnology
MN315	Underground Mining
MN316	Surface Mining
MN331	Mining Geology and Mapping
MN332	Mining Geology
MN340	Computer Programming
MN336	Mining Geology Field Trip
MN355	Industrial Training
MN391	Mining Techniques & Mining Economics
MN401	Project
MN402	Project
MN411	Mineral Economics
MN412	Mine Management
MN413	Environmental Engineering
MN414	Mining Legislation
MN415	Mine Design I
MN416	Mine Design II
MN417	Computer Applications in Mining
MN419	Ore Reserve Estimation
MN422	Alluvial Mining (Elective)
MN424	Underground Metalliferous Mining (elective)
MN426	Raise, Tunnel Boring & Shaft Sinking (elective)
MN428	Advanced Mining Engineering (Elective)
MN432	Introduction to Petroleum Engineering (Elective)
MN456	Industrial Training
MP224	Sampling, Size Analysis and Size Reduction
MP236	Economic Geology and Mineralogy
MP251	Introduction to Mineral Processing
MP302	Computer Applications in Mineral Process Engineering
MP321	Process Technology I

MP322	Process Technology II
MP323	Physical Processing and Metallurgical Accounting
MP324	Surface-Chemical Processing
MP326	Instrumental Analysis
MP341	Hydrometallurgy I
MP342	Hydrometallurgy II
MP343	Pyrometallurgy I
MP344	Pyrometallurgy II
MP356	Industrial Training
MP401	Project
MP402	Project
MP421	Process Design
MP422	Plant Design
MP423	Solid/Liquid Separation and Fine Particle Processing
MP424	Bulk Materials Handling
MP426	Industrial Minerals Processing
MP427	Process Control and Instrumentation
MP428	Metallurgical Performance Evaluation and Optimisation (elective)
MP430	Feasibility study of an ore deposit (elective)
MP442	Advanced Extractive Metallurgy (elective)
MP456	Industrial Training

SUBJECT DETAILS

MN 122: GEOLOGY, MINING AND MINERAL PROCESSING

Hours per week: 3 (2/1)

Objective:

To provide students with an introduction of geology, mining and mineral processing. On completion of the course the student should be able to:-

1. Understand various types of earth materials and mineral deposits.
2. Understand the basic techniques involved in mining and processing of minerals.
3. Understand and appreciate the relevance of basic sciences and engineering disciplines to the mining industry.

Syllabus:

Structure and history of the earth. Basic rock types. Minerals and ores. Plate tectonics, earthquakes and volcanoes. Elements of prospecting and exploration. Mining in Papua New Guinea and the world. Performance and requirements of mining in relation to the natural environment, mineral deposits - metallic, non-metallic and fuels. Basic mining techniques and methods. Mining equipment and services. Basic mineral processing techniques. Professional roles of mining and mineral process engineers. Relevance of the basic sciences and engineering disciplines to the mining industry.

Text Books:

- Course Handouts
- Reference Text books
Hartman, H.L. Introductory Mining Engineering, John Wiley & sons, New York, 1987.

Assessment:

- Continuous - 50%
Written Exam - 50% (1 x 3 hours)

MN 212: INTRODUCTION TO MINING**Hours per week: 3****Objectives:**

To provide students with an introduction of mining engineering techniques as well as their economic, environmental, socio-political and technological challenges. To provide students with an understanding of basic unit operations in mining drill, blast, load and haul.

On completion of the subject the student should be able to:-

1. Understand basic stages involved in a mineral enterprise;
2. Be able to classify mineral deposits on the basis of their genesis and morphology;
3. Understand principles of rock fragmentation and design drilling, blasting patterns.

Syllabus:

Introduction to the mineral industry in Papua New Guinea and world.

Mining Engineering: stages in a mineral enterprise - exploration, development, production; introduction to unit operations in mining; principles of rock fragmentation; introduction to rock drilling, excavating and ripping equipment; mechanisms of blasting rock breakage, types of explosives, blasting patterns, storage and handling of explosives.

Textbook:

Hartman, H.L., Introductory Mining Engineering, John Wiley & Sons, New York, 1987.

Assessment:

- Continuous assessment - 50%
Written examination - 50% (1 x 3 hours)

MN 231: INTRODUCTION TO GEOLOGY**Hours per week: 3(2/1)****Objectives:**

To provide students with basic knowledge of geology and the geology of Papua New Guinea. On completion of the subject the student should be able to:-

1. Understand geological history of the earth;
2. Classify various rock formations;
3. Be familiar with geological structures;
4. Be familiar with geological maps;
5. Outline the geology of Papua New Guinea.

Syllabus:

Earth materials and processes; introduction to rock forming minerals; identification of hand specimens; identification and classification of igneous, sedimentary and metamorphic rock; weathering processes and products; plate tectonics; earthquakes and volcanoes; volcanism; structure and history of the earth; fossils and stratigraphic record.

Structural geology and geomorphology; deformation, folding and jointing of rocks; impact of rock type and structure on surface features.

Geology mapping techniques.

Geology of Papua New Guinea.

Textbook:

Blyth, F.G.H. & De Freitas, M.H., A Geology for Engineers, 7th Edition, ELBS with Edward Arnold, 1984.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hours)

MN 319: MINE VENTILATION

Hours per week: 4(3/1)

Prerequisite: ME 296

Objectives:

To provide students with an understanding of fundamental principles involved in mine ventilation and its applications in mines.

On completion of the subject the student should be able to:-

1. Understand sources of mine heat, gas and dust;
2. Design layout of ventilation systems in a mine;
3. Solve air-flow network problems;
4. Be familiar with common ventilation practices in mines.

Syllabus:

Introduction to heat and mass transfer; assessment of underground comfort conditions; gases, dusts, mine fires and mine explosions.

Air flow distribution calculation; ventilation networks; mechanical and natural ventilation; fan engineering.

Common ventilation practices in mines.

Practices on above topics.

Textbook:

Course handouts.

Reference:

Vutukuri V.S. & Lama, R.D., Environmental Engineering in Mines, Cambridge, London, 1986.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hours)

MN 313: GEOTECHNOLOGY

Hours per week: 4(3/1)

Prerequisite: CE 211

Objectives:

To provide students with basic aspects of geotechnology and instrumentation techniques. On completion of the subject the student should be able to:-

1. Understand geotechnical properties of rock and rock masses;
2. Make stress and strain analysis of a rock mass;
3. Make use of laboratory equipment and instruments.

Syllabus:

Axial and shear forces; bending and twisting moments; stress and strain; rock structures and deformations; rock strength criteria; rock mass behaviour.

Analytical models of rock as linear, elastic plastic and visco-elastic media.

Practice on geotechnical properties of rocks.

Textbook:

Roberts, A., Geotechnology, Pergamon, 1981.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hours)

MN 314: APPLIED GEOTECHNOLOGY

Hours per week: 4(3/1)

Prerequisite: MN 313

Objectives:

To provide students with an understanding of stability problems induced by mining excavations. On completion of the subject the student should be able to:-

1. Understand principles of soil mechanics;
2. Design and optimise rock slopes and underground openings.
3. Select support techniques to maintain rock stability.

Syllabus:

Soil description and classification; fluid flow in soils; bearing capacity.
Rock slope stability and waste dump stability.
Underground excavation stability; rock bolting and ground stability control.
Monitoring and control of rock blasting vibrations.
Practice on above topics.

Textbook:

Course handouts.

References:

Hoek, E. & Bray, J.W., Rock Slope Engineering, London, IMM, Revised 3rd Edition, 1981.
Brady, G.H.G. & Brown, E.T., Rock Mechanics for Underground Mining, Chapman & Hall, 1993.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hours)

MN 315 : SURFACE MINING

Hours per week: 4(3/1)

Prerequisite: MN 212

Objectives:

To provide students with an understanding of unit operation techniques in surface mining.
On completion of the subject the student should be able to:-

1. Apply mining techniques to design surface mining production systems.
2. Optimise surface mining methods;
3. Select appropriate mining equipment.

Syllabus:

Elements of alluvial mining and open pit mining;
Open pit mining equipment -shovels, draglines, hydraulic excavators, front end loaders, scrapers, bucket wheel excavators trucks, continuous miners; surface haul road construction. Surface mine planning and design.

Textbook:

Kennedy, B.A. (Ed), Surface Mining, SME, 1990.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hours)

MN 316: UNDERGROUND MINING

Hours per week: 3

Prerequisite: MN 212

Objectives:

To provide students with an understanding of unit operation techniques in underground mining. On completion of the subject the student should be able to:-

1. Apply mining techniques to design underground mining production systems;
2. Optimise underground mining methods;
3. Select appropriate mining equipment.

Syllabus:

Underground mine development; tunnels, drifts, raises and shafts.

Underground Transport: tracked and trackless transportation systems – trains, locomotives, LHDs, wire ropes, winding in shafts and machines.
Underground metal mining methods; equipment, supports and services.

Use of compressed air.

Introduction to underground coal mining.

Textbook:

Cumins, A.B., and Given, (eds), SME Mining Engineering Handbook, SME, New York, 2nd Edition, 1993.

Assessment:

Continuous assessment - 50%
Written examination - 50%

MN 331: ENGINEERING GEOLOGY AND MAPPING

Hours per week: 4

Prerequisite: MN 231 & MP 236

Objectives:

To provide students with an understanding of practical engineering geological techniques applied to mining activities. On completion of the subject the student should be able to: -

1. Recognise the effects of rock discontinuity on the stability of rock slopes;
2. Analyse geological hazards and provide solutions for remediation;
3. Participate in mining operation management when associated with geological problems.

Syllabus:

Engineering Geology: natural slopes and slope failure mechanisms; mine batter slopes and main types of batter failures; rock defect morphology and geometry – including faults, joints and shear zones; methods of site investigation – measurement of engineering geological properties of rocks and presentation of defect analysis results; introduction to geotechnical logging, terminology and practice; use of three dimensional techniques for problem solving in mine batter slope failures: stereographic projection; geological hazard analysis and avoidance of risk areas.

Engineering Geological and Mine geological Mapping: use and familiarity and mining and engineering geology mapping techniques, practice and symbols; face mapping of geology, ore/waste boundaries; defect orientation and spacing; practical exercises including stereographic projection of self collected data. Aerial photo-graphy and remote sensing.

Textbook:

Beavis, F.C., Engineering Geology, Blackwell, Melbourne, Australia.

Assessment:

Continuous assessment - 50%
Written examination - 50%

MN 332: MINING GEOLOGY

Hours per week: 4(3/1)

Prerequisite: MN 331

Objectives:

To provide students with an understanding of prospecting and sampling techniques, mine geology and hydrogeology as well as their practical applications in the mining industry.

On completion of the subject the students should be able to:

1. Be familiar with geochemical and geophysical prospecting techniques;
2. Recognise and produce meaningful geological logs;
3. Be familiar with concept of grade control;
4. Be familiar with the concepts of hydro geology and their application in water management techniques in open pits and underground mines.

Syllabus:

Exploration Techniques: geochemical and geophysical methods; drilling techniques and geological logging of core; presentation and mapping of exploration data.

Mine Geology: structural controls on ore body formation and their impact on mining methods; principles and practices of grade control in opencast and underground mines.'

Hydro geology: introduction to hydro geology; origin of surface and ground water management as well as its control in opencast and underground mines; mine water inflow predictions and drainage calculation techniques; importance of ground water in mine stability. Elements of petroleum geology.

Textbook:

Shakleton, W.G., Economic and Applied Geology.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hours)

MN 336: MINING GEOLOGY FIELD TRIP

Period: 5 days field trip

Objectives:

To provide students with field experience in geological investigations.

On completion of the subject the student should be able to:-

1. Recognise regional geological formations and rock types;
2. Prepare a face log and collect geotechnical information from a rock face;
3. Recognise the influence of geology and geological processes in the geomorphic evolution of the landscape.

Syllabus:

Field practice and experience in the examination of rocks, minerals; geological exposures in general.

Assessment:

Assessment of field report - 100%.

MN 356 / MN 456: INDUSTRIAL TRAINING

Period:

12 weeks training in mines during 2nd and 3rd year long vacations.

Objectives:

To provide students with basic training as a mining engineer. On completion of the subject the student should be able to:-

1. Be familiar with aspects of mining activities and facilities in a mine;
2. Work as a practical mining engineer;
3. Write a training report.

Syllabus:

Training at a mine in all aspects mining including geology, surveying, mine planning, material handling, mineral processing, community services, supervision and administrations.

Writing Training Report: writing of technical report on training experience.

Assessment:

Continuous assessment - 100%

MN 340: COMPUTER PROGRAMMING

Hours per week: 3

Prerequisite: EE 102

Objectives:

On completion of the subject, students should be able to:-

1. Use the Turbo-C application.
2. Construct algorithms and implement them in computer programmed.
3. Write computer programme in ĖCí on the IBM compatible PC, and to solve engineer-ing problems.
4. Write programme in C for laboratory use with AD system.

Syllabus:

The “C” programming language. The Turbo-C computer programming tool. Compiling and linking programmer, data types, formatted input/output, variable names, arrays, string handling, reading from a file and writing to a file, loop structure, decision, header files, pointers, standard functions, language structure. Writing algorithms. Solving numerical problems using computer programs, solution of some engineering problems through C programs, write simple programs to be used in laboratories to control experiment and record data.

Textbook:

McBride, P.K., C Clearly – An Introduction to C Programming, Oxford Blackwell Scientific Publications, 1993, London.

Reference Books:

Deitel, H.M. & P.J. Deitel, P.J. C How to Program, Prentice-hall, New Jersey, 1994, 926 p.

Miller, L.H., and Quiliei, A.E., C Programming Language. An Applied Perspective, (John Wiley, 1987, 1987)

Kernighan, B.W., and Ritchie, D.M., The C Programming Language (ANSI C), 2nd ed., (Prentice Hall, 1988)

Thompson B.G. & Kuckes A.F., IBM-PC in the laboratory (Cambridge, 1989)

Assessment:

Continuous assessment - 100%

MN 391: MINING TECHNIQUES AND MINING ECONOMICS

Hours per week: 4

Objectives:

To provide students with a detailed summary of the processes of mineral exploration, mine development and mineral processing, and an appreciation of the economic factors inherent in the mine-investment decision-making process. On completion of this subject the student should be able to:-

1. Describe the process and outline the principle techniques of mineral exploration;
2. Describe the principal ore deposit types and the mineral commodities associated with each ore deposit;
3. Describe main surface and underground mining methods;
4. Describe the major processes and components used in mineral processing plants;
5. Identify the primary economic factors affecting mine development;
6. Identify the main capital and operating costs of a mining operation;
7. Outline the taxation and royalty system as applied to the mining industry in Papua New Guinea.

Syllabus:

Exploration methods, preliminary, geophysical and geochemical, drilling and providing up of ore bodies types. Statements of reserves. Selection of mining techniques to suit orebody size, shape and rock strength. Surface mining methods, alluvial and bedded deposits, vein deposits and massive deposits. Mining equipment and factors affecting choice of methods. Underground mining methods and equipment.

Activities undertaken by mining companies the structure of the industry. Mineral resources as diminishing assets. General factors affecting the supply and demand for minerals, mineral pricing. The feasibility study and prediction of project costs. Evaluation of capital costs for mine and processing plant. Evaluation of operating costs for mining and processing plant. The Papua New Guinea taxation and royalty system. Overall valuation of project worth by various criteria, such as

present value, discounted cash flow, internal rate of return, break even point. Sensitivity analysis. Sources of finance.

Reference:

Hartman, H.L., Introductory Mining Engineering, John Wiley and Sons, New York, 1987.

Assessment:

Continuous assessment	- 50%
Written Examination	- 50% (1x3hrs)

MN 401 / MN 402: PROJECT

Hours per week: 5 first semester, 8 second semester

Prerequisite: MN 316, MN 318

Objectives:

To train students with basic skills to initiate and fulfill a design or research project.

On completion of the subject the student should be able to:-

1. Search for information and literature required for a design or research project;
2. Organise sequential works and tests involved;
3. Write a project report;
4. Present two seminars on their projects.

Syllabus:

The topics for each student are assigned by the Department and supervised by a staff member. Review of related literature; organisation of works involved; experimentation and analysis of results; writing of project report; presentation of project seminars.

Assessment:

Continuous assessment - 100%

MN 411: MINERAL ECONOMICS

Hours per week: 4

Objective:

To provide students with a basic understanding of economic factors involved in mining industry. On

completion of the subject the student should be able to:-

1. Understand basic principles of mineral economics;
2. Apply techniques of mineral economics to mine designs and operations;
3. Analyse using spreadsheet modelling techniques to investment decision making processes.

Syllabus:

Basic economic principles; mineral economics; feasibility studies; taxation; metal pricing and marketing; mineral rents; royalties and compensation; concepts of exhaustibility and cut-off grade.

Evaluation of project worth by various criteria such as present value, discounted cash flow, rate of return, break even point; sensitivity analysis. Sources of finance.

Textbook:

Stermole, F.J. & Stermole, J.M., Economic Evaluation and Investment Decision Methods, 7th Edition, Investment Evaluations Corporation, 1987.

Reference:

Degarmo, E.P., Sullivan, W.G. & Bontadelli, J.A., Engineering Economy, 9th Edition, MacMillan, 1993.

Assessment:

Continuous assessment - 50%
Written Examination - 50%(1x3 hours)

**MN 413: ENVIRONMENTAL
ENGINEERING**

Hours per week: 3

Objectives:

To provide students with an understanding of the impacts of mining, mineral processing activities on the surrounding environment, the disposal of mineral wastes, and the rehabilitation and reclamation of mineral waste impoundments.

On completion of the subject the student should be able to:-

1. Understand basic aspect of the socio-economic and environmental conditions in which mineral extraction is normally undertaken, and the methods of managing these conditions;
2. Assess possible environmental impacts of mineral workings and determine the strategies to minimise these impacts;
3. Understand the rehabilitation and reclamation methods for mine wastes and tailings impoundments;
4. Understand the procedures for monitoring and sampling mine wastes and tailings impoundments;
5. Analyse the factors influencing environmental management strategies in Papua New Guinea.

Syllabus:

Environmental Impacts of Mining Operations: mine wastes and their potential impacts on the surrounding environment; waste rock and refuse dumps, the monitoring of mine wastes; rehabilitation and reclamation of mined out and waste dump areas.

Environmental Impacts of Mineral Processing Operations: pollution aspects of mineral and metal extraction, including the effects on biological systems, noise and dust; heavy metals and other toxic pollutants in liquid effluents and tailings from minerals operations, methods for the disposal of tailings and the rehabilitation of tailings impoundments.

Economical consideration of environment engineering.

Textbooks:

Course handout.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hours)

MN 415: MINE DESIGN I

Hours per week: 6(3/3)

Prerequisite: MN 315, MN 316

Objectives:

To provide students with basic knowledge of mine

design principles.

On completion of the subject the student should be able to:-

1. Understand basic principles of mine design;
2. Make assessment of aspects of mine layouts and their optimisation;
3. Carry out mine design exercises.

Syllabus:

Design of mine layouts including service facilities; environmental and economic assessment of a mine; computer applications in mine design; design exercises on surface and underground mining.

Textbook:

Course handouts.

Reference:

Kennedy, B.A.(Ed.), Surface Mining, SME, New York, 1990.

Assessment:

Continuous assessment - 100%

**MN 417 : COMPUTER APPLICATIONS
IN MINING**

Hours per week: 3(2/1)

Prerequisite: MN 340

Objectives:

To provide students with an introduction of practical computer applications of in mining industry and skills in programming.

On completion of the subject the student should be able to:

1. Understand different aspects of computer applications in mining industry;
2. Use selected mining software;
3. Use a high level computer language to simulate mining problems;
4. Undertake computer aided drafting and design.

Syllabus:

Introduction to computer data acquisition systems involved in mining activities; Introduction to

expert systems.

Exposure to various applications software including mineral economics, mineral exploration and geology, mine design and mining operations.

Use of a high level computer language to simulate some mining problems.

Textbook:

Course handouts.

Assessment:

Continuous assessment - 100%

MN 419: ORE RESERVE ESTIMATION

Hours per week: 4

Prerequisite: MN 331, MN 332

Objectives:

To provide students with basic skills in ore reserve estimation.

On completion of the subject the student should be able to:-

1. Understand theories and methods of ore reserve estimation;
2. Apply sampling and grade control techniques in mine planning and design.

Syllabus:

Reserves and resources; drilling programs; theories, methods and applications of estimating ore reserves; use of computers in ore reserve estimation; sampling and grade control.

Theory and application of geostatistical techniques in estimation of mineral content.

Textbook:

Isaake, E. & Srivastava, R., An Introduction to Applied Geostatistics, Oxford University Press, New York, 1989.

Reference:

Lane, K., Economic definition of Ore, Mining Journal Books Limited, London, 1989.

Assessment:

Continuous assessment - 50%

Written examination - 50% (1 x 3 hours)

MN 412: MINE/MINERAL MANAGEMENT

Hours per week: 3

Objectives:

To provide students with an understanding of basic principles of mine management.

On completion of the subject the student should be able to:-

1. Understand basic principles applicable to mine management;
2. Participate in short and long term aspects of mine management;
3. Understand basic principles of operation research applicable to mining industry.

Syllabus:

Principles of mine management; managerial function; objectives and decision making; organisation concepts; appraisal; industrial negotiation and communication.

Principles of operation research applicable to mining industry; network analysis, C.P.M., P.E.R.T.; linear programming, investment control and simulation.

Application of these principles to mineral industry.

Textbook:

Course Handouts.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hours)

MN 414: MINING LEGISLATION

Hours per week: 4

Prerequisite: MN 315, MN 316

Objectives:

To provide students with an understanding of legislation relating to mining industry.

On completion of the subject the student should be able to:-

1. Understand laws relating to mining industry including health, safety and environment;
2. Understand Mining Act relating to exploration and mining leases;

3. Understand procedures involved in mine rescue and first aid.

Syllabus:

An appreciation of the laws relating to mining practice, safety, health and environment.

Mine tenements and their management.

Mine rescue and first aid.

Textbook:

PNG Mining (Safety) Act, (1980) DME.

Reference:

Mining Act, 1993.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hours)

MN 416: MINE DESIGN II

Hours per week: 6(3/3)

Prerequisite: MN 411, MN 415

Objectives:

To train students with basic skills in mine design.

On completion of the subject the student should be able to:-

1. Collect information required for the mine design exercises;
2. Design a practical mine layouts;
3. Make assessment of mine facilities, impacts to environment and economics of mine operations;
4. Write a complete mine design report.

Syllabus:

Mine layout systems design; assessment exercises on mine facilities, environment, economics.

Exercises on surface and underground mine design.

Textbook:

Course handouts.

Reference:

Harin, H., Guide to Underground Mining Methods and Applications, Atlas Capco, Stockholm, 1980.

Assessment:

Continuous assessment - 100%

MN 422: ALLUVIAL MINING (Elective)

Hours per week: 4

Objectives:

To provide students with an understanding of alluvial mining techniques and their applications in design and management of alluvial mines.

On completion of the subject the student should be able to:-

1. Design facilities applicable to various alluvial mining systems;
2. Select appropriate mining methods for particular deposits;
3. Manage an alluvial mining mine operation.

Syllabus:

Alluvial mineral deposits and their occurrences in Papua New Guinea.

Gravity separation techniques and equipment.

Alluvial mining methods and their selections; planning considerations in alluvial mines; evaluation of alluvial mines.

Marketing of mine outputs.

Textbooks:

Course handouts.

Field trip:

1 day field trip to an alluvial mining area.

Assessment:

Continuous assessment - 100%

**MN 424: UNDERGROUND
METALLIFEROUS MINING
(Elective)**

Hours per week: 4

Prerequisite: MN 316

Objectives:

To provide students with an understanding of advanced underground metalliferous mining

techniques in design and management of an underground mines.

On completion of the subject the student should be able to:-

1. Understand different underground metallic-ferrous mining methods and their selections applicable to deposits;
2. Plan and design an underground metalliferous mines.

Syllabus:

Production, development and resource scheduling; mine development; stope development; cyclic and continuous production systems; optimum ore fragmentation; material flow in passes; pillar recovery; optimum fill selection, preparation and placement of mine fills, fill dewatering; ground support during stopping.

Textbook:

Course handouts.

Assessment:

Continuous assessment - 100%

**MN 426: RAISE, TUNNEL BORING AND
SHAFT SINKING
(Elective)**

Hours per week: 4

Prerequisite: MN 316

Objectives:

To provide students with an understanding of advanced techniques involved in tunneling and shaft sinking.

On completion of the subject the student should be able to:-

1. Select the excavation methods of tunneling, raising and shaft sinking under different geological conditions;
2. Optimise the tunnels and raises in a mine system plan design;
3. Understand support systems for tunnel, raises and shafts.

Syllabus:

Methods of excavation by tunnel-borers.

Methods of excavation by raise-borers.
Methods of excavation by shaft-borers.
Support of tunnel, raise and shaft excavations.

Textbook:

Course handouts.

Assessment:

Continuous assessment - 100%

**MN 428: ADVANCED MINING
ENGINEERING (Elective)**

Hours per week: 4

Objectives:

To provide students with up-to-date knowledge of advanced mining techniques.

On completion of the subject the student should be able to:-

1. Follow one or more techniques of newly developed mining techniques;
2. Understand technological challenges of modern mining industry.

Syllabus:

An advanced paper on a topic of topics in mining engineering to be determined each year by Head of the Department of Mining Engineering.

Textbook:

Course handouts.

Assessment:

Continuous assessment - 100%

**MN 432: INTRODUCTION TO
PETROLEUM ENGINEERING
(Elective)**

Hours per week: 4

**Prerequisite: MN 231, MP 236, MN 331 &
MN 332**

Objectives:

To provide students with an introduction to petroleum geology and petroleum engineering.

On completion of the student should be able to:-

1. Understand basic principles of Petroleum Geology;
2. Understand basic petroleum engineering processes;
3. Location and logistic of prospective and producing oil and gas fields in PNG.

Syllabus:

Fundamental principles of petroleum regarding its origin, migration and accumulation; chemical composition; stratigraphy; nature of source rocks; reservoirs and traps; geological fields of PNG. Introduction to petroleum industry; petroleum prospecting; drilling operation; petroleum production system; reservoir performance; oil and gas separation, oil and gas transportation; utilisation of oil and natural gas.

Location and characteristics of producing gas and oilfields of PNG.

Textbook:

Course handouts

Assessment:

Continuous assessment - 100%

**MP 224: SAMPLING, SIZE ANALYSIS AND
SIZE REDUCTION**

Hour per week: 7(4/3)

Objectives:

To introduce students to the initial unit operations involved in the concentration of minerals. On completion of this subject, the student should be able to:-

1. Determine/calculate the grade/recovery relationships in typical mineral concentration circuits;
2. Understand the basic theories of sampling, and also be able to describe both industrial and laboratory sampling equipment;
3. Understand the properties of particles (e.g. size, shape) and how they influence particle sizing processes in mineral processing operations;
4. Be familiar with comminution theories, size reduction processes and the industrial equip-

ment used in comminution unit operations.

Syllabus:

Sampling: Theory of Sampling; Laboratory and industrial Sampling Equipment; Industrial Practice. Particle Sizing: Properties of particles: sizes, shapes and comminution size distribution functions; Laboratory size measurements: wet and dry sieving, sub-sieve size analysis; interpretation and presentation of sizing data; performance evaluation; Industrial Screening: Theory and Practice. Comminution: Energy-size Relationships; Crushers: primary, secondary and tertiary; Grinding: particles, industrial machines, liners, media, grinding/classification circuits; Industrial plant practice (Ball milling, rod milling, Fully-Autogenous Grinding, Semi-Autogenous grinding, etc.).

Textbook:

Wills, B.A., *Mineral Processing Technology*, 4th Edition, Pergamon Press, Oxford, UK, 1988.

References:

Gill, C.B., *Materials Beneficiation*, Springer-Verlag, 1991. Kelly, E.G. & Spottiswood, D.J., *Introduction to Mineral Processing*, Wiley, 1982.

Assessment:

Continuous assessment - 50%
Written examination - 50%

**MP 236: ECONOMIC GEOLOGY
AND MINERALOGY**

Hours per week: 4

Prerequisite: MN 231

Objectives:

To introduce students to ore minerals and rock-forming minerals and the various techniques of identifying minerals.

On completion of this subject the student should be able to:-

1. Know the importance of minerals and identify the common ore and rock-forming minerals;
2. Assess the amount of a mineral in an ore;

3. Describe the mineral properties useful in mineral processing;
4. Describe the origin of ores and the rock types in which they occur.

Syllabus:

Minerals: physical and chemical properties of minerals (chemical structure of minerals e.g. rock-forming minerals and ore minerals), the uses of minerals; classification of minerals: based on chemical composition.

Introduction to crystallography: crystal systems, classes, indexing, crystal defects; use of crystallography in mineral identification.

Practicals to cover identification of minerals of hand specimens, in thin sections, polished sections and quantitative assessment of minerals. Emphasis to be placed on common ore minerals in PNG. Economic Geology: Ore deposits - classifications with emphasis on genetic classification; ores of igneous, sedimentary and metamorphic origin. Geological field trips to study rock types and ore deposits.

Textbook:

Read, H.H., *Rutley's Elements of Mineralogy*, 26th Edition, Murby, London, 1970.

Reference:

Craig, J.M. & Vaughan, D.J., *Ore Microscopy and Ore Petrograph*, John Wiley & Sons, Inc., 406p., 1981.

Assessment:

Continuous assessment - 50%
Written Examination - 50% (1 x 3 hours)

**MP 251: INTRODUCTION TO MINERAL
PROCESSING
(For Mining Engineering Students only)**

Number of hours: 3

Objectives:

To provide students with basic knowledge of mineral processing techniques and their use in Papua New Guinea. On completion of the subject the students should be able to:-

- a. Understand the necessity for mineral beneficiation
- b. Be familiar with mineralogical assessments of ores
- c. Be familiar with comminution and concentration processes
- d. To understand the application of these processes in PNG

Syllabus:

The necessity for mineral beneficiation; mineralogical assessment; comminution-fracture, liberation, sizing, energy-size relationships, crushing, grinding, screening and classification. Cyclones, concentration processes based on density, electrical properties, magnetic and other physical properties; application of these processes in Papua New Guinea- case studies of mineral processing plants.

Text Book:

Wills, B. A. Mineral Processing Technology, Oxford Pergamon
Course Handouts

Assessment:

Continuous Assessment	- 50%
Written Examination	- 50%

**MP 302: COMPUTER APPLICATIONS
IN MINERAL PROCESSING**

Hours per week: 2(1/1)

Pre-requisites: EE101 / EE102

Objectives:

To introduce students to the utilisation of software packages in Mineral Processing. On completion, the student should be able to:-

1. Competently use various application software packages for word processing, spreadsheet calculation, and database management;
2. Use statistical, modeling and simulation software available to perform material and flow computations in typical Mineral Processing circuits, and computations of Grade/Recovery relationships;

3. Understanding the basic concepts of expert systems and the application of expert systems in the Mineral Industry.

Syllabus:

Review of the basic concepts of computer hardware and software, and their functions. Review of Word processing, Spreadsheet, and Database Management Software packages selected from:

Word Perfect (DOS/Windows Version); 5.1 or later); Microsoft Word (DOS/Windows Version 2.0 Or later); Lotus 123 (DOS/windows Version); Microsoft Excel (Windows Version 4 or later); DBASEIV or later; Foxpro Version 2 or later Statistical, Modeling and Simulation Software selected from:

MINITAB (Version 7 or later); JKSimMet (version 3.6 or later); JKSim Float; METSIM (Version 5 or later)

A short course on Expert Systems in the Mineral Industry will be given covering topics such as Artificial Intelligence; Knowledge-based Systems;

The Nature of Expert Systems; Expert System Tools; Examples of Expert Systems; and the Application of Expert Systems in the Mineral Industry.

References:

Various Software User Manuals; conference proceeding on the Application of Computers to Mining and Mineral Processing.

Assessments:

Continuous assessment - 100%

MP 321: PROCESS TECHNOLOGY 1

Hours per week: 4

Objectives:

To provide students with an introduction to industrial processes particularly mineral and chemical processes. As an important analytical tool they will be taught material balances and the nature of flow of fluids, raw material and products. On completion of the subject the student should be able to:-

1. Identify the flow of raw material and products in processes and/or plant;
2. Perform material balances and calculate product tonnages;
3. Calculate flow rates, flow velocities and pressure drops in transporting fluids and slurries through pipes and channels.

Syllabus:

Material Balances in process flows: Component and total mass balances of reactive and non-reactive systems including recycling. Batch and steady state flows.

Fluid Mechanics: Basic fluid properties, Hydrostatics, stability of floating bodies, viscosity, shear stresses and friction in fluid flow, friction factor and pressure drop relationships in pipe and open channel flows. Velocity and shear stress distributions in laminar and turbulent flow.

Textbook:

Webber, N.B., Fluid Mechanics for Civil Engineers, Chapman & Hall.

Reference:

Coulson J.M. & Richardson J.F., *Chemical Engineering*, vol 1-3, Pergamon press.

Hayes. P., *Process Principles in Mineral and Materials Production*, Hayes Pub.Co., 1993.

Assessment:

Continue assessment - 50%
Written examination - 50% (1 x 3 hours)

MP 322: PROCESS TECHNOLOGY II

Hours per week:

Prerequisite: MP 321

Objectives:

To provide students with a knowledge of Behaviour of solid particles in fluids. Mechanisms of heat transfer in industrial process. Calculate of drying periods and psychrometry. On completion of the subject the student should be able to:-

1. Determine settling characteristic of particles in fluid;

2. Calculate heat transfer coefficients and the extent of heat transfer during an industrial process;
3. Drying requirements to meet product specifications.

Syllabus:

Particle/fluid mechanics: Batch sedimentation settling velocity calculations, Hindered settling, Elements of sediment transport theory, filtration theory. Heat transfer: Fluid/film coefficients, Overall transfer coefficients. Common heat exchange. Drying: Psychrometry, Drying period calculations, drying equipment.

Reference:

Coulson J.M. & Richardson J.F., *Chemical engineering*, vol 103, Pergamon Press. Hayes P., *Process Principles in and Minerals and Materials Production*, Hayes Pub. Co. 1993.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hours)

MP 323: PHYSICAL PROCESSING AND METALLURGICAL ACCOUNTING

Hour per week: 7(4/3)

Objectives:

To give a thorough understanding of modern mineral processing techniques. On completion of this subject, the student should be able to:-

1. Understand the basic theories of classification;
2. Understand and describe the operation of industrial classification equipment such as hydrocyclones, rakes, cones, etc.;
3. Understand the principles of gravity concentration processes including sluices, spirals, shaking tables, jigs and the Knelson concentrator;
4. Understand and describe magnetic and electrical concentration techniques.
5. Perform mass balance and metallurgical accounting.

Syllabus:

Classification: Free and hindered settling theory; Classifier types: cyclones, rakes, cones,

hydrosizers and elutriators; Recent developments in hydrocyclone design and application. Gravity concentration of minerals: Sluices, spiral, tables, jigs, cones, and the Knelson concentrator; Dense media separation; Recent developments.

Magnetic and Electrical Concentration of Minerals;

(a) Magnetic: Low intensity and high intensity separation; application to beach sand separation; Industrial circuits.

(b) Electrical: High tension separations; Electrostatic separations; Industrial applications.

Metallurgical accounting: Metal and Material Balances in typical Mineral Processing Circuits; Computation of Grade/Recovery Relationships in typical mineral concentration unit operations; Matrix methods of determining flows.

Textbook:

Wills, B.A., *Introduction to Mineral Processing Technology*, 4th Edition, Pergamon Press, Oxford, UK, 1988.

Reference:

Burt, R.O. & Mills, C., *Gravity Concentration Technology*, Elsevier, Amsterdam, 1984.

King, R.P., (Ed), *Principles of Flotation*, South African Institute of Mining & Metallurgy, Johannesburg, South Africa, 1982.

Assessment:

Continuous assessment - 50%
Written examination - 50%

MP 324: SURFACE-CHEMICAL PROCESSING

Hours per week: 7

Prerequisite: MP 224 and MP 323

Objectives:

To enhance the students, understanding of mineral processing unit operations. On completion of this subject, the student should be able to:-

1. Understand the principles of the flotation of minerals;
2. Describe the equipment and circuits commonly employed in industrial flotation operations;

3. Understand the theories of coagulation, flocculation and dispersion and their application in industrial mineral processing operations;

4. Describe selective flocculation processes for the separation of a variety of minerals.

Syllabus:

Concentration of Minerals by Flotation. Fundamentals of flotation; Surface chemical properties of minerals; Flotation reagents, chemistry of flotation; Flotation of sulphide and non-sulphide metalliferous minerals; Coal flotation; Flotation Machines (including flotation columns); Flotation circuit design and industrial practice; Research Techniques Applied to Flotation; Industrial Practice and Flotation Process Control.

Coagulation, Flocculation and Dispersion. Principles of Coagulation, Flocculation and Dispersion; Colloids, Colloid Chemistry, and the Stability of Colloidal Dispersions; Industrial Applications of Coagulation and Flocculation.

Selective Flocculation in Mineral Extraction. The Surface Chemistry of Minerals; properties of fine mineral particles; colloids and their properties; Surface Phenomena in Coagulation and Flocculation; Inorganic coagulants; Polymeric Flocculants; Separation of minerals by Selective Flocculation processes.

Textbook:

Wills, B.A., *Mineral Processing Technology*, 4th Edition, Pergamon Press, Oxford, UK, 1988.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hours).

MP 325: INSTRUMENTAL ANALYSIS

Hours per week: 3(2/1)

Prerequisite: CH 231 and CH 232

Objectives:

To give the student and understanding of the basic theory is instrumental analysis, and to provide students with practice in using a selection of analytical methods and instruments commonly used in the mineral industry. On completion, the

student should be able to:

1. Understand the general principles of analytical chemistry;
2. Understand and describe the instrumental methods of chemical analysis;
3. Perform chemical analysis of various ores and concentrates using various instrumental methods of analysis;
4. Determine the concentrations of precious metals in ores and concentrates by fire assaying techniques.

Syllabus:

Introductory Analytical Chemistry. General principles of Analytical Chemistry; Errors and handling small data sets; Sensitivity and detection limits; Sample Preparation Techniques. Analytical Methods. Titrations; Electrochemical Methods; Chromatographic methods; X-Ray Analytical methods: X-Ray powder Diffraction (XRD) and X-Ray fluorescence (XRF); Absorption Spectroscopy; UV-Visible absorption spectroscopy of molecules, and Infra-Red absorption Spectroscopy. Fire Assaying-Principles and Practice. Slags: bi silicate, mono-silicate and mixed slags; Reducing Fluxes: Reducing power of carbon, flour and various ores.

Oxidising Fluxes: Oxidising power of nitrites and ores.

Calculation of charges in the determination of gold and silver contents of siliceous and sulphide ores and concentrates.

Practicals: Experiments involving instrumental methods will include Atomic Absorption Spectrophotometry; Infra-Red spectrophotometry; Electrochemical techniques including pH, ion-selective electrodes, and Electrogravimetry; Fire assaying.

Textbook:

Skoog, D.A., & West, D.M., Principles of Instrumental Analysis, Saunders International. Edition, Tokyo, 1980.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hours)

MP 341: HYDROMETALLURGY I

Hours per week: 4 (2/2)

Objectives:

To introduce students to the principles of hydrometallurgical processes.

On completion of this subject the student should be able to:-

1. know the solution chemistry of the important minerals in PNG;
2. assess the thermodynamic feasibility of hydrometallurgical processes and plot Eh pH phase diagrams;
3. determine the kinetics of homogeneous and heterogeneous systems in hydrometallurgy;
4. know how to separate leach liquor from residue, concentrate and purify the leach liquor ready for metal extraction;
5. know how to recover metals from leach liquor;
6. know how to refine metals hydrometallurgically.

Syllabus:

Solution chemistry: liquid-liquid and solid-liquid interactions, speciation; activity-concentration relationship; thermodynamic feasibility of mineral reactions, equilibrium and Eh-pH diagrams for minerals.

Hydrometallurgical processes relating to the production of metals and compounds. Leaching processes and methods e.g. heap and agitation leaching; leaching kinetics and reactor vessel design.

Solution concentration and purification: thickening, filtration and precipitation; solution concentration and purification with solvents, ion exchange resins and activated carbon.

Practicals to cover leaching methods and kinetic models, solvent extraction, use of ion exchangers and activated carbon for solution concentration and purification.

Metal recovery processes: Cementation, gaseous reduction, compound precipitation, electro-winning. Hydrometallurgical refining of metals. Application of these processes to Cu, Au, Ag, Ni, Al and U.

Industrial extraction of metals (with flowsheets) including the extraction of Cu, Au, Ag and Ni and Al from their ores.

Textbooks:

Jackson, E., *Hydrometallurgical Extraction and Reclamation*. (John Wiley & Sons, 1986).
Biswas, A.K. & Davenport, W.G. *Extractive Metallurgy of Copper*, (Oxford, Pergamon, 1976).

Reference:

Gilchrist, J.D., *Extractive Metallurgy*, 2nd Edition, (Oxford, Pergamon, 1980). H.A. Fine (ed.), *Extractive Metallurgy Laboratory Exercises*. AIME, 1982, 173p. Osseo-Asare, K. and Miller, (ed.), *Hydrometallurgy, Research, Development and Plant Practice*. AIME, 1982.

Assessment:

Continuous assessment - 50%
Written examination - 50%

MP 342: HYDROMETALLURGY II

Hours per week: 5 (3/2)

Prerequisite: MP 341

Objectives:

To introduce students to the principles and concepts governing reactor design. On completion of the course, the student should be able to:-

1. understand homogenous and heterogenous reaction kinetics.
2. use rate data from Laboratory and Pilot plant test work to design leaching system, solvent extraction, CIP, etc.
3. know design equations, batch, semi-batch continuous reactors and plug flow reactors.
4. know how to design equilibrium stages in leaching, solvent extraction, CIP, etc.

Syllabus:

Critical study of gold ore treatments, hydro-metallurgical processing of Zn, Al, Ni, involving case studies of operating plants; further look at homogenous reaction kinetics, zero order, first order, second order, etc., heterogeneous reaction kinetics, flat plate geometry, spherical geometry, shrinking core model, continuous reaction model, rate determining steps, reactors design, equations of batch, semi-batch, CSTR and plug flow systems, mass balances, flow systems, concept of

residence time, residence time distributions, multiple reactor systems, design of equilibrium stages; solvent extraction distribution isotherm, McCabe-Thiele diagram, co-current and counter-current and crossflow system, CIP design, interstage screening, mechanical and air agitation, carbon transport, adsorption kinetics and equilibria.

Textbook:

Biswas, A.K. & Davenport, W.G., *Extractive Metallurgy of Copper*, Oxford, Pergamon, 1980.

Reference:

Marsden, J. & House, I., *The Chemistry of Gold Extraction*, Chichester, Ellis Horwood, 1992.

Assessment:

Continuous assessment - 50%
Written examination - 50%

MP 343: PYROMETALLURGY I

Hours per week: 4(2/2)

Prerequisite: CH 231 and CH 232.

Objectives:

To introduce student to the use of high temperatures for extracting metal from ores.

On completing this subject the student should be able to:-

1. Discuss the principles relating to pre-smelting processes (e.g. drying, calcining, roasting, sintering);
2. Know how to roast various ores/concentrates ready for smelting.

Syllabus:

Operations in extractives metallurgy utilising heat as the prime mover to accomplish chemical and structural changes, as in drying, calcination, roasting, sintering and smelting.

Thermochemistry and thermodynamics review: enthalpy, combustion and heat balances; free energy and predominance diagrams for oxidation, reduction, sulphation (chlorination) processes at high temperatures.

Calcination: Lime (alumina, magnesia), chemical factors affecting yield and purity; effects of rock

types, size, porosity, crystallinity, temperature, time, atmosphere etc. on calcination rate.

Roasting: Thermodynamics of roasting reactions of sulphides, sulphates and oxides. Predominance diagram representation and kinetics of roasting.

Sintering: partial smelting process.

Pre-smelting processes, practices and equipment: calcination, roasting and sintering of ores/concentrates and their respective furnace types (vertical and horizontal); advantages and disadvantages of furnace types.

References:

Biswas, A.K. & Davenport, W.G., *Extractive metallurgy of Copper*, Pergamon Press, Oxford, 1980.

Coudurier, L., Hopkins, D.W. & Wilkomirsky, I., *Fundamentals of Metallurgical processes*, Pergamon Press, Oxford, 1985.

Assessments:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hours)

MP 344: PYROMETALLURGY II

Hours per week: 4(3/1)

Prerequisite: MP 343

Objectives:

To introduce students to the use of heat for smelting ores and refining metals. On completion of this subject students should be able to:-

1. Describe the principles relating to smelting of ores and their reduction/converting to metals;
2. Know the type of fluxes to use for smelting various ores/concentrates;
3. Describe how to smelt ores/concentrates with various fluxes to produce metals;
4. Describe how to fire refine some impure metals.

Syllabus:

Smelting; physics and chemistry of melts and slags. Phase diagrams: simple, complex and their use in prediction of slag characteristics. Smelting and melting of sulphide/oxide concentrates. Slag structure, silicate bonding, melt compounds.

Valency variation in slags. Reactions between phases and detailed calculations of melts and slag composition e.g. for Ok Tedi concentrate. Converting: reactions, mass balance, heats of reactions and influence on cycle. Reduction: solids and molten materials, thermodynamics, kinetics.

Fire refining: principles of fire refining of metals.

Smelting processes, practices and equipment:

Smelting processes, practices and equipment:

Smelting and converting; oxidation-reduction;

furnace types (reverberatory, electric, flash);

factors affecting furnace efficiencies and oxygen

enrichment, fuel, feed preparation and calculation.

Roasting and smelting practices of some common

ore types/concentrates including those of Cu, Pb,

Zn, Ni and Fe. Fire refining of selected metals

including Au, Ag and Cu; advantages and

limitations of fire refining.

Practicals may cover gold, silver and copper smelting and refining.

Reference:

Pehlke, R.D., *Unit Processes of Extractive Metallurgy*, Elsevier, New York, 1975.

Gill, C.B., *Nonferrous Extractive Metallurgy*, John Wiley & Sons, New York, 1980.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hours).

MP 356 / MP 456: INDUSTRIAL TRAINING

Period:

12 weeks training in mines during end and 3rd year long vacations.

Objectives:

To introduce the student to industrial set up including practice and equipment in mineral processing and extractive metallurgy. On completion of the training the student should be able to:

1. Relate theoretical work to practice in industry;
2. Know and describe some of the industrial equipment.

Syllabus:

Training at a mineral processing plant in all aspects of mineral processing including crushing,

grinding, C.I.P. circuits, dewatering and tailings disposal, mining, supervision, and management of plant operations, community services. Training report writing.

Assessment:

Continuous assessment - 100%

MP: 401 / MP 402: PROJECT

Hours per week: 4 (6 in Semester II)

Objectives:

To give the student the opportunity to utilise the knowledge and skills acquired in carrying out independent research work under a supervisor. On completion of the project the student should be able to:-

1. Carry out independent research work, present the results in a logical manner and make appropriate conclusions.

Syllabus:

Students are to take research projects in Mineral Processing or extractive metallurgy. The projects enable students to experience research procedure, handle data and draw together relevant information from various parts of their course work. Students select topics, normally relevant to PNG and carry out the work under staff supervisors who guide them throughout the duration of the projects. At the end of Semester I, students will present literature reports and give a seminar. A final seminar of 10 to 15 minutes duration will be given on the project by every student.

Assessment:

Continuous assessment - 100%

MP 421: PROCESS DESIGN

Hours per week: 4 (3/1)

Prerequisite: MP 224, MP 323 and MP 324

Objectives:

To enable students to apply the principles of the unit mineral processing operations to efficient

design, operations. Upon completion, the student should be able to:

1. Understand and describe the techniques commonly used in the characterisation of ores and concentrates, such as sampling, mineral description, concentration of ores, and analysis of ores and concentrates;
2. Design a unit concentration process based on metal and material balances, including equipment sizing and selection;
3. Perform bench-scale and/or pilot plant process testing, and computer modeling and simulation of processes.

Syllabus:

Review of Mineral Processing Computations: Calculation of Grade/Recovery Relationships; Metal and Material Balance Calculations and the use of Computer Software (e.g. JKSimMet, METSIM) as an aid to Process Calculations. Elements of Ore Characterisation, flowsheet Selection, and Process Simulation, Ore Characterisation Techniques:

Sampling and the Statistical Analysis of Sampling Data; Mineralogical Analysis of ores; Concentration Methods (Laboratory); Analysis of Ore and Mineral Products

Flowsheet Development

Study of Industrial Mineral Processing Flowsheets, with particular reference to the Papua New Guinea Mineral Industry; Design of a unit concentration process based on metal and material balances, including equipment selection and sizing; Bench-scale and pilot plant process testing, and computer modeling and simulation of processes.

References:

Craig, J. & Vaughan, D., Ore Microscopy and Ore Petrography, Wiley, 1981. Lynch, A., Johnson, H., Manlapig, E. & Thorne, C., Mineral and Coal Flotation Circuits, Elsevier, 1981.

Lynch, A., Mineral Crushing and Grinding Circuits, Elsevier, 1977.

Mular, A. & Bhappu, R. (Eds), Mineral processing Plant Design, AIME, 1978.

Weiss, N.L. (Ed), SME Mineral Processing Handbook Vols. 1&2, SME Inc., 1985.

Assessment:

Continuous assessment - 100%

MP 422: PLANT DESIGN

Hours per week: 6(3/3)

Prerequisite: MP 224, MP 323 and MP 421

Objectives:

On completion, the students should be able to:-

1. Understand the concepts involved in flowsheet design, plant engineering, control, and management of Mineral Processing operations.
2. Undertake design projects involving detailed engineering plant design concepts, including costings and economic appraisals.

Syllabus:

Application of Mineral Processing principles in the detailed flowsheet development and optimisation for specific given ore.

Projects will be undertaken by students working in groups which will involve detailed plant design to a level suitable for final construction of the installation.

Control systems employed in a number of circuits will be studied in order to identify the controllable variables and the sensing instruments used to detect changes in these circuit operations. Design and Control of some circuits will be investigated using computer simulation.

The final project reports will include engineering drawings showing the physical location of pumps, cells, reactors, etc., as well as costings and economic appraisals for each project.

Reference:

Lynch, A., Johnson, H., Manlapig, E. and Thorne, C., Mineral and Coal Flotation Circuits, Elsevier, 1981. Lynch, A., Mineral Crushing and Grinding circuits, Elsevier, 1977.

Mular A., and Bhappu, R. (Eds), Mineral Processing Plant Design, AIME, 1978. Weiss, N.L. (Ed), SME Mineral Processing Handbook, Vols. 1 & 2, SME Inc., 1985.

Assessment:

Continuous Assessment - 100%

MP 423: SOLID/LIQUID SEPARATION AND FINE PARTICLE PROCESSING

Hours per week: 5

Prerequisite: MP 341 and MP 342

Objectives:

To provide students with principles and techniques of solid/liquid separation and processing of fine particles in the mineral industry.

On completion of this subject the student should be able to:-

1. Describe the techniques of dewatering mineral particles;
2. Discuss the need for agglomerating, briquetting and sintering fine mineral particles;
3. Utilise specific processing techniques for recovering minerals on the small scale.

Syllabus:

Dewatering in mineral processing: principles, techniques and equipment covering screening, thickening, filtering and drying. Agglomeration balling, briquetting and sintering. Small scale beneficiation techniques e.g. for gold and heavy mineral solids.

Textbook:

Wills, B.A., mineral Processing Technology, 4th Ed, Pergamon, Oxford, 1988.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hours)

MN 324 & MP 424: BULK MATERIALS HANDLING

Hours per week: 3 (2/1)

Objectives:

Introduce the students to material handling and treatment of industrial minerals relevant to Papua New Guinea.

On completion of this subject the student should be able to:-

1. Describe the various methods of conveying

materials (coarse and fine) from a unit process to another within a mineral processing plant.

2. Know the methods and equipment for storing ores within a processing plant and mining areas.

Syllabus:

Bulk material handling: various types of conveyors, feeders including reclamation equipment, storage equipment and design for coarse and fine materials/ores (dry or wet); slurry transport (by pumps, gravity etc.) and storage. Introduction to slurry handling systems.

References:

Kelly, E.G. and Spottiswood, D.J., *Introduction to Mineral Processing*, (Wiley & Sons, 1982).
Weiss, N.L., (Ed.) *SME Mineral Processing Handbook* (Vols. 1 & 2), (SME Inc., Littleton, Colorado, 1985).

Assessment:

Continuous assessment - 50%
Written examination - 50%

MP 426: INDUSTRIAL MINERALS PROCESSING

Hours per week: 4 (3/1)

Objectives:

To introduce the student the use and processing of the common industrial minerals. On completion, the student should be able to:-

1. Be familiar with the uses and importance of the common industrial minerals;
2. Know how to process specific industrial minerals including the PNG industrial minerals;
3. Realise the increasing use of industrial minerals in modern industries.

Syllabus:

Types of industrial minerals: aggregates for construction, clays, industrial minerals for agriculture, and chemical industry, refractory minerals, minerals for the glass, cement and plastic industries.

Processing: manufacture of Portland cement, clays for ceramics, bricks, paper etc., production of

silica for bricks and glass; the manufacture of silica, magnesia, aluminosilicate for the refractory industry. The use of industrial minerals in high tech industries.

Reference book:

Manning D.A.C. 1995. *Introduction to Industrial Minerals*. Chapman & Hall, London 1st Edition. ISBN 0 412 55550 6.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1x3 hours)

MP 427: PROCESS CONTROL & INSTRUMENTATION

Hours per week: 5(3/2)

Objectives:

To familiarise the student with techniques of process control used in mineral processing plants and the instruments used.

On completion of the subject the student should be able to:-

1. Identify and select a control circuit for a given mineral processing operations.
2. Represent a control system by block diagrams.
3. Compare different process controls systems and comment on their advantages and disadvantages.
4. Determine the gain factors, and other characteristics of proportional, derivative and integral controllers.
5. Determine steady-state and unsteady-state response of simple process control circuits.
6. Understand the working of various instruments used in mineral processing circuits.

Syllabus:

Purpose of manual and automatic control, block diagrams, control circuits, feedback, feed forward loops and their characteristics. ON-off proportional, integral and derivative control, transfer functions, steady state and unsteady state analysis of simple control loops.

Pneumatic and hydraulic controllers; temperature, flow level, density and pH measurements.

Modeling and control of Mineral process plant operations.

Reference:

Webber, T., Introduction to Process Dynamic and Control, (Wiley, New York. 1973)

Assessment:

Continuous assessment - 50%
Written examination - 50% (1 x 3 hours)

MP 428: METALLURGICAL PERFORMANCE EVALUATION AND OPTIMISATION (Elective)

Hours per week: 4 (3/1)

Objectives:

To give the students a thorough understanding of the tools needed (and used) for the evaluation and optimisation of metallurgical performance. On completion, the student should be able to:

1. Understand and explain the general mining and mineral process operating philosophies;
2. Perform quantitative assessments of the performance of the unit processes used in mineral processing operations.
3. Describe the optimisation procedures commonly employed in mineral processing operations.

Syllabus:

Mining and Mineral Process Operating Philosophies.

Quantitative assessment of the performance of unit operations in mineral processing: Process Sampling Methods: Problems & Solutions; Mass balancing and Data Adjustment techniques; Evaluation of Separation efficiency and the influence of ore variability; Modeling Comminution, Screening, Gravity Concentration-ratio, Flotation and other Mineral Processing circuits; Reconciliation of Mine Site, Mineral processing plant, concentrate and tailings inventories. Optimisation Procedures in Mineral Processing Plants.

On-Line Optimisation Techniques, for example: One variable at a time; Grid Search; Steepest Ascent; Evolutionary Operation (EVOP); Simplex

Self-Directing Evolutionary Operation (SSDEVOP).

Off-Line Optimisation Techniques, for example: Indirect Methods; Mathematical Programming Methods; Direct Climbing Methods. Applications of Circuit Optimisation.

References:

Kelly, E.G., and Spottiswood, D.J., Introduction to Mineral Processing, Wiley, 1982. Malhotra, D., Klimpel, T.R. and Mular, A.L., Evaluation and Optimisation of Metallurgical Performance, Society for Mining, Metallurgy and Exploration Inc., Littleton, Colorado, USA, 1991.

Assessment:

Continuous Assessment - 50%
Written examination - 50% (1 x 3 hours)

MP 430: FEASIBILITY STUDY OF A MINERAL DEPOSIT

Hours per week: 4

Objectives:

To introduce the student how to conduct simple feasibility projects.

On completion of the course the student should be able to:-

1. Collect information relevant for carrying out a feasibility assessment.
2. Carry out a simple feasibility assessment of a mineral deposit.
3. Economically evaluate a proposed mineral deposit project.

Syllabus:

Collection of information required to carry out a feasibility report, examples of feasibility reports on mineral deposit projects; assignment of a feasibility project.

Reference:

Friedrich - Wilhelm Wellmer, 1989 *Economic Evaluations in Exploration*, Springer - Verlag Berlin, Heidelberg, ISBN 0-387-50924-0.

Relevant information and feasibility reports provided.

Assessment:

Continuous assessment - 100%

**MP 442: ADVANCED EXTRACTIVE
METALLURGY (Elective)**

Hours per week: 4 (3/1)

**Prerequisite: MP 341, MP 342, MP 343 and
MP 344**

Objective:

To bring the student to an advanced stage in understanding and awareness of modern developments in Extractive Metallurgy. On completion of this subject, the student should be able to:-

1. Describe the principles and processes employed in the extraction of precious metals in Papua New Guinea.
2. Determine the concentration and fineness of precious metals ores and concentrates and other products.
3. Be familiar with modern developments in hydrometallurgy, pyrometallurgy and electro-metallurgy.

Syllabus:

Relevant topics will be selected from the units listed below.

Precious Metals Extraction in Papua New Guinea; The treatment of simple and refractory precious metals ores;

Precious Metals Refining: Chemical Refining, Electro-Refining, and Fire-Refining;

Assaying and Fineness Determination of precious metal ores and products.

Modern Developments in Extractive Metallurgy
Hydrometallurgy: Recent advances including the treatment of simple and refractory gold/silver ores; Developments in CIL/CIP techniques for the recovery of precious metals; Developments in Bio hydrometallurgy.

Pyrometallurgy: New and/or recent pyrometallurgical processes such as Continuous Smelting and Refining processes, the ISASMELT Process, etc; Developments in furnace design and refractories.

Electrometallurgy: advances in electrochemical principles and their application to extractive metallurgy; Rectification Systems (e.g. DC and PCR Systems); Recent Developments in Tankhouse Practice.

References:

Various Extractive Metallurgy Conference Proceedings.

Assessment:

Continuous Assessment - 50%

Written examination - 50% (1 x 3 hours).

DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE

MATHEMATICS AND COMPUTER SCIENCE

A/Head of Department:

Lanta, J., MSc. (Aust), B.Sc. (UPNG), Pg.Dip.Ed. (UPNG)

Deputy Head of Department Lecturer:
(Vacant)

Associate Professors:

Ursul, M., PhD (Moldova), Dr. Sc (Russia)

Moshi, A.M., PhD (Carleton), MSc (Carleton), BSc (Dar-es-Salaam), Dip CompSc (Lagos)

Nwabueze, K., PhD (Antwerp), MSc (Ibadam), MSc (Exeter), BSc (Nigeria)

Senior Lecturers:

Wilkins, C.W., PhD, BSc, DipEd (Adel)

Mirou, B., MSc (Aberystwith), BSc (UPNG)

Singh, K.B., Ph.D, MSc, (Lucknow)

Lecturers 2:

Wamil, J., MSc. (North Dakota), BSc (UPNG)

Lecturer 1:

Lanta, J., MSc. (Aust), B.Sc. (UPNG), Pg.Dip.Ed. (UPNG)

Senior Technical Instructors:

Shadlow J., BEc (Hons.A.N.U.)

Puy, N., BSc. (PNGUOT)

Benny, S., BSc (PNGUOT)

Technical Instructors:

Menggenang, S., BSc. (PNGUOT)

Angopa, B., BSc (UPNG)

Angra, I., BSc (UPNG)

Executive Secretary:

Agum, B.

Secretary:

Maira, F.

Administration Officer:

Konzang, M (Mrs.), DipCom (PNGUOT)

Maths Printery:

Naya, G.

Arapi, S.

Cleaner:

Taning, P.

DEGREE AND DIPLOMA COURSES

The Department offers a four-year programme leading to a Bachelor of Computer Science Degree. The course has a two-year plus two-year structure. Students initially register for a two-year programme leading to the Diploma in Computer Science. Upon successful completion of the Diploma programme, students may apply to enter the Bachelor Degree programme, which will involve another two years of full time study.

The Diploma programme gives students a basic knowledge of the mathematics, physics, and computer jargon, and as well a broad understanding of the operating system, the architecture of computers and local area networks. Students learn how to use the computer's potential by both using standard packages and programming in a higher-level language to solve problems in many areas of science, technology, education and commerce. The Degree programme continues the work of the Diploma programme, extending and deepening student's knowledge and applications of computers. Students take a range of courses in computer hardware and software, systems analysis, mathematical computation and computer modelling. There are many options available in the fourth year.

The Department's normal entry requirements for both programmes are a Grade 12 certificate, but some mature entry students can also be admitted. The Grade 12 requirements are a grade B or better in Mathematics A, Physics, and English. Students entering by an alternative route will be expected to have equivalent qualifications in Mathematics, plus practical experience in a computing area.

SERVICE COURSES

The Department offers service subjects in Mathematics, Statistics, and Computing to students in most Degree and Diploma Programmes throughout the University. First year subjects are designed to encourage the understanding of essential concepts and to aid in the development of

basic mathematical skills. Higher year subjects are designed to meet the particular requirements of the student's professional programme.

In all subjects an emphasis is placed on practical applications, using numerical examples relating to the mathematical and statistical problems likely to be encouraged by the students in their particular degree programme. Students use calculators and microcomputers extensively.

POST GRADUATE COURSES

The Department offers three Postgraduate Diploma programmes:

1. Postgraduate Diploma in Engineering Mathematics
2. Postgraduate Diploma in Mathematics
3. Postgraduate Diploma in Computer Science

The Department provides a range of postgraduate subjects in Mathematics, Statistics, and Computer Science for graduates who are preparing for higher degree studies and for those who require additional courses beyond the scope of their present training and skills.

The Diploma are practical in nature so those students who graduate will have skills, which can be readily used in Papua New Guinea.

Candidates for these programmes are normally expected to be graduates in mathematics, engineering, or computer science. Candidates without the prerequisite knowledge will be asked to take undergraduate subjects or formative modules before they start the Diploma.

In order to complete the Postgraduate Diploma candidates must take SIX subjects, and normally take a project equivalent to TWO subjects. In special cases two subjects may replace the project. These six (or eight) subjects can be chosen from the following lists of postgraduate subjects, but subject to the core subjects normally being studied first.

Diploma advisers will help students to select a set of appropriate subjects. Approved postgraduate subjects may be taken with other Departments of the University. The balance of the six courses (particularly the core subjects) and the project area will determine which Diploma is awarded.

The project is equivalent to a double subject and will be related to students' interests and staff availability.

Students may propose projects relating to their work place and these may be approved if at the right level.

The Diploma is usually offered part time. Students who have been awarded a Postgraduate Diploma or who satisfy the requirements prescribed by the Papua New Guinea University of Technology may be admitted to a M.Sc. or M.Phil. programme. The M.Sc. programme involves further course work and a thesis on some area of Mathematics, Computer Science or statistics. The M. Phil. programme is entirely by research.

STRUCTURE OF COURSES

DIPLOMA PROGRAMME

Code	Subject	Average Weekly Hours
Year 1		
First Semester		
MA161	Discrete Mathematics (A)	4
MA163	Fundamentals of Computer Science (A)	6
MA167	Engineering Mathematics 1(A)	5
PH111	Physics for Computer Science I	5
LA101	Study Communication Skills I	<u>3</u>
		<u>23</u>
Year 1		
Second Semester		
MA162	Discrete Mathematics (B)	4
MA164	Fundamentals of Computer Science (B)	6
MA168	Engineering Mathematics 1(B)	5
PH112	Physics Computer Science II	5
LA102	Study and Communication Skills II	<u>3</u>
		<u>23</u>
Year 2		
First Semester		
MA235	Engineering Mathematics 2(A)	4
MA261	Data Structures and Algorithms	5
MA263	End User Computing Applications	4
MA265	An Introduction Data Base Development	4
MA267	Networking and Communications	4
BA131	Introduction to Business	<u>3</u>
		<u>24</u>

Year 2

Second Semester

MA236	Engineering Mathematics 2(B)	4
MA266	Software Selection and Testing	2
MA262	Data Base Management	4
MA264	Applied Statistics	6
IS226	Systems Analysis and Design	4
LA204	Communication in the Workplace	<u>2</u>
		<u>22</u>

DEGREE PROGRAMME

Code	Subject	Average Weekly Hours

Year 3

First Semester

MA361	Systems Programming with C++	4
MA367	Sampling and Survey Techniques	3
EE343	Computer Hardware	5
IS315	Information Systems Design Project	6
MA369	Introduction to COBOL	3
LA201	Advanced Research Skills	<u>2</u>
		<u>23</u>

Year 3

Second Semester

MA365	Numerical Methods	5
MA364	Advanced Statistics	5
MA362	Operating Systems	5
ED312	Microcomputer Interfacing	6
MA366	Programming Languages	<u>5</u>
		<u>26</u>

Year 4

First Semester

CS401	Computer Science Project (A) Students take 4 subjects from the following electives (Semester II electives may be offered in Semester I, and vice versa.)	4
CS412	Special Topics	4
MA461	Linear Programming and Simulation	5
MA463	Graph Theory	5
MA465	Ordinary and Partial Diff Eqns	5
MA469	Software Engineering	5
MA471	Computer Graphics and Animation	5
MA473	Knowledge Based Systems	5
MA475	Advanced Database In Action	4

MA477	Linear Programming	5
MA479	Simulation	5
MA481	Unix Management	5
MA483	Advanced Networking	<u>5</u>
		<u>22-23</u>

Year 4

Second Semester

CS402	Computer Science Project (B) Students take 4 subjects from the following electives (Semester I electives may be offered in Semester II, and vice versa.)	4
CS412	Special Topics 2	4
IS462	UNIX Operating System	4
IS422	Information Systems Management	3
IS426	Information Systems Development	4
MA462	Optimization	4
MA468	Object Oriented Programming	4
MA464	FORTTRAN	4
MA466	Desk Top Publishing	4
MA472	Real Time Programming	4
MA474	Courseware Development	4
MA476	Human Computer Interface	4
MA478	Flow Through Networks	4
MA480	Computer Aided Design	5
MA482	Windows and HyperText Programming	4
MA484	Industrial Database and Oracle	4
MA485	Principles of Distributed Programming	5
MA486	Multi-Media and Web Publishing	4
MA488	Analysis of Algorithms	4
MA492	Microcomputer Hardware	4
MA494	Programming in Java	<u>4</u>
		<u>20-22</u>

POST GRADUATE DIPLOMA IN COMPUTER SCIENCE

Entry Requirements

Before starting the Post Graduate Diploma in Computer Science students should have a basic knowledge and experience with a modern micro-computer operating system, computer architecture, logic, algorithms and their coding in a higher-level language, and standard computer packages. Subjects for the Diploma include:

MAP60	Object Oriented Programming
MAP61	Data Communications and Networking

MAP62	Computer Programming
MAP63	Operating Systems
MAP64	Database Development
MAP65	Software Engineering
MAP66	Artificial Intelligence and Expert Systems
MAP67	Analysis of Algorithms
MAP68	Systems Programming with C++
MAP69	User Interface Design
MAP70	Real Time Programming

POST GRADUATE DIPLOMA IN ENGINEERING MATHEMATICS

Entry Requirements

Candidates are normally expected to be graduates in Mathematics, Engineering or Science with good performance in mathematics. Subjects for the Diploma include:

MAP51	Real Analysis (Core subject)
MAP52	Linear Algebra (Core subject)
MAP53	Operations Research
MAP54	Probability and Statistics (Core subject)
MAP55	Significant Aspects of Computer Science
MAP56	Graph Theory and Applications
MAP57	Special Functions and Methods of Mathematical Physics
MAP58	Numerical Methods
MAP59	Mechanics and Fluid Dynamics.

POST GRADUATE DIPLOMA IN MATHEMATICS

Entry Requirements

Candidates are normally expected to have obtained a first degree with mathematics as a major component. Subjects for the Diploma include:

MAP51	Real Analysis (Core Subject)
MAP52	Linear Algebra (Core Subject)
MAP53	Operations Research
MAP56	Graph Theory and Applications
MAP71	Complex Analysis (Core Subject)
MAP72	Algebraic Structures (Core Subject)
MAP73	Number Theory
MAP74	Transportation and Network Flow Problems

SUBJECTS TAUGHT BY THE DEPARTMENT

AG221	Agricultural Experimentation
CS145	Information Technology (A)
CS146	Information Technology (B)
CS401	Computer Science Project (A)
CS402	Computer Science Project (B)
CS411	SPECIAL TOPICS 1
CS412	SPECIAL TOPICS 2
FR284	Data Analysis and Experimental Design
MA111	Quantitative Methods 1
MA112	Quantitative Methods 2
MA121	Mathematics 1 AR (A)
MA122	Mathematics 1 AR (B)
MA141	Mathematics 1 LM (A)
MA142	Mathematics 1 LM (B)
MA151	Mathematics 1 S (A)
MA152	Mathematics 1 S (B)
MA161	Discrete Mathematics (A)
MA162	Discrete Mathematics (B)
MA163	Fundamentals of Comp.Science (A)
MA164	Fundamentals of Comp.Science (B)
MA167	Engineering Mathematics 1(A)
MA168	Engineering Mathematics 1(B)
MA171	Mathematics 1 AS (A)
MA172	Mathematics 1 AS (B)
MA181	Mathematics 1 A and F (A)
MA182	Mathematics 1 A and F (B)
MA212	Quantitative Methods 3
MA235	Engineering Mathematics 2(A)
MA236	Engineering Mathematics 2(B)
MA241	Mathematics 2 LM (A)
MA242	Mathematics 2 LM (B)
MA243	Maths for Communication (A)
MA244	Maths for Communication (B)
MA251	Mathematics 2 S (A)
MA252	Mathematics 2 S (B)
MA261	Data Structures and Algorithms
MA262	Data Base Management
MA263	End User Computing Applications
MA264	Applied Statistics
MA265	An Introduction Data Base Development
MA266	Software Selection and Testing
MA267	Networking and Communications
MA271	Mathematics 2 AS (A)
MA272	Mathematics 2 AS (B)
MA315	Quantitative Methods 4
MA316	Quantitative Methods 5

MA333 Mathematics 3 EE
 MA334 Mathematics 3 EE
 MA335 Mathematics 3 CE
 MA336 Mathematics 3 ME
 MA339 Engineering Statistics
 MA342 Statistics for Communication
 MA351 Mathematics 3 SV
 MA352 Mathematics 4 SV
 MA361 Systems Programming With C++
 MA362 Operating Systems
 MA363 Linear Mathematics
 MA364 Advanced Statistics
 MA365 Numerical Methods
 MA366 Programming Languages
 MA367 Sampling and Survey Techniques
 MA369 Introduction to COBOL
 MA461 Linear Programming and Simulation
 MA462 Optimization
 MA463 Graph Theory
 MA464 FORTRAN
 MA465 Ordinary and Partial Diff. Equations
 MA466 Desk Top Publishing
 MA468 Object Oriented Programming
 MA469 Software Engineering
 MA471 Computer Graphics and Animation
 MA472 Real Time Programming
 MA473 Knowledge Based Systems
 MA474 Courseware Development
 MA475 Advanced Database In Action
 MA476 Human Computer Interface
 MA477 Linear Programming
 MA478 Flow Through Networks
 MA479 Simulation
 MA480 Computer Aided Design and Visualisation
 MA481 Unix Management
 MA482 Windows and HyperText Programming
 MA483 Advanced Networking and Internet Application
 MA484 Industrial Database and Oracle
 MA485 Principles of Distributed Programming
 MA486 Multi-Media and Web Publishing
 MA488 Analysis of Algorithms
 MA492 MicroComputer Hardware
 MA494 Programming in Java
 MAP161 Mathematics CE (A)
 MAP162 Mathematics CE (B)
 MAP51 Real Analysis
 MAP52 Linear Algebra
 MAP53 Operations Research

MAP54 Probability and Statistics
 MAP55 Significant Aspects of Computer Science
 MAP56 Graph Theory and Applications
 MAP57 Special Functions and Methods of Mathematical Physics
 MAP58 Numerical Methods
 MAP59 Mechanics and Fluid Dynamics
 MAP60 Object Oriented Programming
 MAP61 Data Communications and Networking
 MAP62 Computer Programming
 MAP63 Operating Systems
 MAP64 Database Development
 MAP65 Software Engineering
 MAP66 Artificial Intelligence and Expert Systems
 MAP67 Analysis of Algorithms
 MAP68 Systems Programming with C++
 MAP69 User Interface Design
 MAP70 Real Time Programming
 MAP71 Complex Analysis
 MAP72 Algebraic Structures
 MAP73 Number Theory
 MAP74 Transportation and Network Flow Problems

SUBJECT DETAILS

CS 145: INTRODUCTION TO INFORMATION TECHNOLOGY (A)

Hours per week: 2

Objectives:

To provide a foundation in information technology, covering the basic hardware used in computer laboratories, use of keyboard and mouse, word processing, paint program, spreadsheets and simple use of a graphical user interface.

On completion of this subject students should be able to:-

1. Produce quality documents that are well organised, presented and laid out using a commonly available word-processing package.
2. Layout spreadsheets and develop applications using text, numerals, and formulae.
3. Graphically present the results of their academic work using simple graphics from a

- paint program or spreadsheet charting tool.
4. Manage a simple file store using suitable tools to organise, transfer and backup their files.

Syllabus:

Components of a micro-computer system. Main memory and secondary storage. Structure of networks: Use and care of floppy disks. Use of keyboard and mouse. Introduction to WIMP interface. Use of simple paint program, word processor and spreadsheet. Use of cut and paste buffer and program manager to transfer data between applications. Use of file manager.

Textbook:

Computer Science Department modules

Assessment:

Continuous Assessment - 100%.

CS 146: INTRODUCTION TO INFORMATION TECHNOLOGY (B)

Hours per week: 2

Prerequisite: CS 145

Objectives:

To extend the basic knowledge of information technology that was developed in CS145, including coverage of the peripherals commonly used with micro-computers, demonstration of the internet, use of a database, object oriented graphics, and user defined functions in a spreadsheet.

On completion of this subject students should be able to:-

1. Analyse the data for a particular application and produce a simple database to store that data;
2. Produce reports of ordered and selected data from a database;
3. Describe the peripherals necessary for a given application;
4. Produce technical diagrams appropriate to their discipline using an object oriented graphics package;
5. Extend the functionality of a spreadsheet

package by producing user-defined functions.

Syllabus:

Analysis of data required in a database. Use of a simple database to, enter, modify, sort, search, and report on a flat database. Description of computer peripherals and their characteristics. Examination of the use and benefits of the internet. Use of an object oriented graphics package to draw, move, scale, and group and link graphical objects. Simple use of macro language features in a modern spreadsheet to write simple functions.

Textbook:

Computer Science Department modules

Assessment:

Continuous Assessment - 100%.

CS 401: COMPUTER SCIENCE PROJECT (A)

Hours per week: 4

Objectives:

Under the guidance of a member of academic staff, the student will work on an open-ended project from an area of Computer Science or Information Technology. Students may propose their own projects for approval, or else must accept a project suggested by the Department. The project will occupy the student for the entire year (and be assessed in both CS401 and CS402).

The CS401 component of the project consists of the initial selection of the project, background reading, preliminary report, and oral presentation about the scope and aim of the project.

It would be expected that the students work on their project during the mid-semester and inter-semester break.

Assessment:

Project formulation - 20%,
Oral presentation (week 14) - 20%,
Project preliminary report (week 15) - 60%.

**CS 402: COMPUTER SCIENCE
PROJECT (B)**

Hours per week: 4

Prerequisite: CS 401

Objectives:

Under the guidance of a member of academic staff, students will continue on their project started in CS401. The CS402 component of the project consists of the completion of the project research, and should include the submission of a draft and final report, and an oral presentation about the findings the project. It would be expected that the students work on their project during the mid-semester break.

Assessment:

Draft final project report (week 8) - 20%,
Oral presentation (week 12) - 20%,
Final project report (week 15) - 60%.

CS 411: SPECIAL TOPICS 1

Hours per week: 4

Objectives:

To develop an in-depth analysis of a specialised topic of relevance to the student.

On completion of this subject students should be able to:-

1. Pursue a program of supervised study
2. Present oral and/or written discourses on the specialised topic.
3. Demonstrate knowledge of the topic to a depth as deemed appropriated by the examiner.

Syllabus:

Elective topics will be developed with Department Staff in an area of Computer Science or Information Technology including, but not restricted to, the following areas:

Database Systems, Networking and Internet Applications, Programming Languages, Operating Systems, Hardware.

Textbook:

As advised by the Examiner.

Reference:

As advised by the Examiner.

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

CS 412: SPECIAL TOPICS 2

Hours per week: 4

Objectives:

To develop an in-depth analysis of a specialised topic of relevance to the student.

On completion of this subject students should be able to:-

1. Pursue a program of supervised study
2. Present oral and/or written discourses on the specialised topic.
3. Demonstrate knowledge of the topic to a depth as deemed appropriated by the examiner.

Syllabus:

Elective topics will be developed with Department Staff in an area of Computer Science or Information Technology including, but not restricted to, the following areas:

Database Systems, Networking and Internet Applications, Programming Languages, Operating Systems, Hardware.

Textbook:

As advised by the Examiner.

Reference:

As advised by the Examiner.

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3hrs).

**MA 111: QUANTITATIVE METHODS 1
(Business Studies)**

Hours per week: 3

Prerequisite: Grade 12 Mathematics

Objectives:

To provide students with the basic mathematical concepts, principles and analytical processes needed for diploma and degree studies in Business Studies.

On completion of this subject students should be able to:-

1. Sketch diagrams representing AND and OR operations in inequalities,
2. Use function notation,
3. Draw and interpret graphs of linear, quadratic and exponential functions,
4. Use linear interpolation to estimate intermediate values in a table,
5. Find the solutions to a variety of equations both graphically and algebraically,
6. Determine properties of quadratic functions,
7. Solve a variety of word problems by translating the English into mathematical statements,
8. Use index laws,
9. Use forward differences and marginal values to determine rates of change,
10. Find optimum solutions of basic economic (cost/revenue/profit) models.

Syllabus:

Algebra: Use of calculators, revision of basic results, inequalities, laws of indices. Functions: Standard and multiple formulae. Linear, quadratic, and exponential functions and their graphs.

Equations: Solution of linear, simultaneous linear and quadratic equations, and equations involving exponents.

Marginal analysis: Forward differences, turning points, marginal economic functions, and optimisation problems involving economic functions.

Textbook:

Mathematics Department modules.

Reference:

Whipkey, K.L. et al., The Power of Mathematics: Applications for the Management and Social Sciences, 2nd ed. (Wiley, 1981).

Equipment:

Scientific/statistical calculator.

Assessment:

Continuous Assessment - 40%,
Written Examination - 60% (1x3 hrs).

**MA 112: QUANTITATIVE METHODS 2
(Business Studies)**

Hours per week: 3

Prerequisite: MA 111

Objectives:

To examine the mathematical bases of the elementary financial models used in Business Studies.

On completion of this subject students should be able to:-

1. Systematically develop logical mathematical arguments,
2. Use percentage variations in numeric calculations,
3. Use logarithmic and exponential functions,
4. Use the Simple Interest and Compound Interest models to calculate various unknown quantities,
5. Produce formulae for arithmetic and geometric series from first principles,
6. Calculate variables for ordinary annuities, present value of an annuity, and annuity due situations,
7. Calculate various types of loans, and termination of loans,
8. Calculate loan repayments with varying interest rates,
9. Calculate price adjustments.

Syllabus:

Financial Mathematics: discounts, simple and compound interest, annuities, repayment of loans, present value calculations, index numbers.

Textbook:

Mathematics Department modules.

Equipment:

Scientific/statistical calculator.

Reference:

Whipkey, K.L. et al., The Power of Mathematics:

Applications for the Management and Social Sciences, 2nd ed. (Wiley, 1981).

Assessment:

Continuous Assessment - 40%,
Written Examination - 60% (1x3hrs).

**MA 121: MATHEMATICS 1 AR
(Architecture)**

Hours per week: 4

Prerequisite: Grade 12 Mathematics

Objectives:

To provide students with the basic mathematical results and procedures needed for studies in Architecture and Building Science. On completion of this subject students should be able to:-

1. Solve exponential, logarithmic and trigonometric equations,
2. Express conic sections in their standard form, by completing squares, and then sketching their graphs,
3. Calculate arc lengths and areas of sectors, and volumes and surface areas of right prisms, calculate centre of gravity of homogeneous plane areas,
4. Sketch polar curves, express curves and points given in polar co-ordinates to rectangular co-ordinates and vice versa,
5. Add and subtract vectors in two and three dimensions,

Syllabus:

Use of calculator, ratio, formulae involving simple functions including logarithms and trigonometry. Geometry: Symmetry, centre of gravity, conic sections, second moment of area, polar co-ordinates. Vectors in two and three dimensions. Introduction to three dimensional co-ordinate geometry.

Equipment:

Scientific/statistical calculator, Geometric construction instruments.

Textbook:

Mathematics Department modules.

Reference:

Boughton, B. and Goodfellow, D., Construction Science Vols 1 and 2 (Granada, 1984).
Chao L., Introduction to Statistics (Wadsworth, 1980).
Ryan T.A., Minitab Student Handbook (Wadsworth, 1976).
Sliwa J. and Fairweather L., The New Metric Handbook (Architectural Press, 1989).

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3hrs).

**MA 122: MATHEMATICS 1 AR
(Architecture)**

Hours per week: 4

Prerequisite: Grade 12 Mathematics

Objectives:

To provide students with the basic mathematical results and procedures needed for studies in Architecture and Building Science.

On completion of this subject students should be able to:-

1. Use straight line laws in curve fitting,
2. Formulate and solve simple linear programming problems,
3. Apply the Binomial, Poisson and Normal Distributions, determine confidence intervals for estimates of parameters,
4. Use statistical packages and spreadsheets to perform statistical calculations.

Syllabus:

Mathematical modelling: Straight-line laws, dimensional analysis, linear programming. Probability: Laws of probability. Application of Binomial, Poisson and Normal distributions. Statistics and Computing: Tabular and graphical representation of data, sampling, and confidence intervals. Use of spreadsheets and statistical computing packages.

Equipment:

Scientific/statistical calculator, Geometric construction instruments.

Textbook:

Mathematics Department modules.

Reference:

Boughton B. and Goodfellow D., Construction Science Vols 1 and 2 (Granada, 1984).

Chao L., Introduction to Statistics (Wadsworth, 1980).

Ryan T.A., Minitab Student Handbook (Wadsworth, 1976).

Sliwa J. and Fairweather L., The New Metric Handbook (Architectural Press, 1989).

Assessment:

Continuous Assessment - 50%,

Written Examination - 50% (1x3 hrs).

MA 141: MATHEMATICS 1 LM (A) (Land Management)

Hours per week: 4

Prerequisite: Grade 12 Mathematics

Objectives:

To introduce the basic mathematical results and procedures required for Land Management and relate these to practical situations.

On completion of this subject students should be able to:-

1. Use commercial arithmetic to solve problems,
2. Solve problems involving indices and logarithms,
3. Simplify algebraic expressions and manipulate formulae,
4. Solve linear, quadratic and linear simultaneous equations,
5. Solve problems involving compound interest and annuities,
6. Solve problems relating to arithmetic and geometric progressions.

Syllabus:

Commercial arithmetic and basic algebra: Simplification of algebraic expressions including solutions of linear, quadratic and simultaneous linear equations, indices and logarithms. Mensuration: Use of standard area and volume formulae.

Simple interest, compound interest and annuities. Use of tables. Arithmetic and geometric progressions.

Textbook:

Mathematics Department modules.

Valuation tables (Australian Institute of Valuers).

Equipment:

Recommended scientific calculator.

Assessment:

Continuous Assessment - 50%,

Written Examination - 50% (1x3 hrs).

MA 142: MATHEMATICS 1 LM (B) (Land Management)

Hours per week: 4

Prerequisite: MA 141

Objectives:

On completion of this subject students should be able to:-

1. Use basic trigonometry to solve problems relating to distances and angles,
2. Solve problems involving areas and volumes,
3. Use rectangular and polar co-ordinates to solve problems relating to practical situations.

Syllabus:

Trigonometry: Review of mensuration. Areas and volumes, applications. Plane co-ordinate geometry: Rectangular and polar co-ordinates, applications.

Textbook:

Mathematics Department modules.

Equipment:

Scientific/statistical calculator.

Assessment:

Continuous Assessment - 50%,

Written Examination - 50% (1x3 hrs).

MA 151: MATHEMATICS 1 S (A)
(Surveying)

Hours per week: 5

Prerequisite: Grade 12 Mathematics

Objectives:

To introduce the basic concepts of mathematics relevant to surveying and to induce an understanding of the practical use of mathematical concepts in surveying and leveling.

On completion of this subject students should be able to:-

1. Solve problems involving length, area and volume,
2. Solve problems involving lines, angles, and polygons,
3. Manipulate algebraic expressions and solve algebraic equations,
4. Draw graphs of simple algebraic and trigonometric functions,
5. Use numerical techniques to calculate areas under curves.

Syllabus:

Algebra: Simplification of algebraic expressions including surds and indices, the solution of linear and quadratic equations.

Mensuration: Use of standard area and volume formulae.

Functions: Properties and graphs of linear, quadratic, exponential, and logarithmic functions.

Numerical procedures: Trapezoidal and Simpson's rule.

Textbook:

Mathematics Department modules.

Reference:

Berry J. and Wainwright P., Foundation Mathematics for Engineers (Macmillan, 1991).

Equipment:

Scientific/statistical calculator. Geometric construction instruments.

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

MA 152: MATHEMATICS 1 S (B)
(Surveying)

Hours per week: 5

Prerequisite: MA 151

Objectives:

On completion of this subject students should be able to:-

1. Solve problems involving length, area and volume,
2. Draw graphs of simple trigonometric functions,
3. Apply the concepts of differentiation, calculate the derivatives of algebraic and trigonometric functions; use of derivatives in practical problems,

Syllabus:

Trigonometry: Definitions and basic formulae in trigonometry. Graphs of basic trigonometric functions. Calculation of values of standard trigonometric functions. Calculus: Average and instantaneous rate of change. Principles of differentiation, differentiation of polynomials, exponential, logarithmic and trigonometric functions, differentiation of composite functions, chain rule, error calculations for functions of one variable. Plotting of simple curves, turning points, maxima and minima.

Textbook:

Mathematics Department modules.

Reference:

Berry J. and Wainwright P., Foundation Mathematics for Engineers (Macmillan, 1991).

Equipment:

Scientific/statistical calculator. Geometric construction instruments.

Assessment:

Continuous Assessment - 50%,
Written examination - 50% (1x3 hrs).

MA 161: DISCRETE MATHEMATICS (A)

Hours per week: 4

Prerequisite: Grade 12 Major Mathematics

Objectives:

On completion of this subject students should be able to:-

1. Use different number bases, modular arithmetic,
2. Use algorithms in arithmetical operations and apply them to the programming,
3. Manipulate logical, boolean, string and set operations and apply them in computer algorithms,
4. Use functions and relations in numeration, and use the computer data structures: strings, vectors, arrays, matrices, records in applications,
5. Display an understanding of proof, and use the various methods of proof.

Syllabus:

Algorithms for integers: sets of numbers - $\mathbb{Z}$, $\mathbb{N}$, integer division, primes, greatest common divisor, Cayley tables for $\times 12$, $+7$, etc., modular arithmetic, congruences, solutions of modular equations. Numbers in different bases, real numbers: changing base, arithmetic operations, representation of numbers in a computer, rational numbers, irrational numbers. , functions and relations: properties of sets, set operations, Venn diagrams, mapping between sets, functions and relations as a mapping from a domain into (onto) a co-domain. 1-1, many-1 mappings. Idea of inverse functions and inverse mappings. Multiply defined functions, functions of a function. Equivalence relations and partial order relations. Sequences, strings. Functions on the set of strings (length, first, rest, middle, concatenation). Idea of sub-string. Arrays and vectors, algorithms for finding the smallest value and the biggest values in an array. Logic: boolean functions and operations using: AND, OR, NOT, NOR, NAND and implication. Karnaugh maps to simplify Boolean expressions. Boolean expressions involving IF and WHILE. Compound propositions using the connectives. Truth tables, laws of logical algebra or propositional calculus. Predicates, quantifiers , ,

and relation to English sentences. Tautologies.

Proof: theory and mathematical induction; patterns of proof, mathematical induction, weak and strong forms of mathematical induction, well-ordering. Disproof by counter example.

Textbook:

Munro J.E., Discrete Mathematics (Chapman and Hall, 1992).

Reference:

Hirschfelder R., Introduction to Discrete Mathematics (Thomson, 1990).

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

MA 162: DISCRETE MATHEMATICS (B)

Hours per week: 4

Prerequisite: MA 161

Objectives:

On completion of this subject students should be able to:-

1. Develop recursive procedures and functions,
2. Apply recursive thinking for problem solving,
3. Construct and use algorithms (including sorting algorithms),
4. Compare algorithms and decide which of them is faster, and better for use in programming of specific problems,
5. Apply different counting and combinatorial techniques.

Syllabus:

Recursion: the idea of recursive thinking, problem solving by recursive operation. Recursion and lists. Recursion and sequences, calculation of the terms of a sequence, solving a recurrence relation by observing a pattern. Second order, linear, homogenous recursive relations.

Analysis of algorithms: slow algorithms (the towers of Hanoi, travelling salesman). Comparing algorithms. Applications of algorithms in sorting and searching.

Trees and graphs: matrices and matrix

multiplications, description of a graph by matrix representation, walks, paths, and other connections. Trees and binary trees. Searching trees, minimum weight spanning tree.

Counting: techniques of counting, counting members of a sequence, counting Cartesian products, the pigeonhole principle. Combinatorial models for counting. The binomial and multinomial theorems. Algorithms for counting subsets of a set and permutations.

Reasoning and correctness: algebraic structures (groups, lattices, Boolean algebras), natural deduction, correctness of algorithms.

Textbook:

Munro J.E., Discrete Mathematics (Chapman and Hall, 1992)

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

**MA 163: FUNDAMENTALS OF
COMPUTER SCIENCE (A)**

Hours per week: 6

Prerequisite: Grade 12 Major Mathematics

Objectives:

On completion of this subject students should be able to:-

1. Describe hardware and software and how they work together,
2. Detail computer generations and associated jargon,
3. Design and construct algorithms and structured programs in Pascal,
4. Use some standard software packages.

Syllabus:

Introductory history of computer generations, idea of computer architecture, number storage, fetch-execute cycle, memory, computer instructions, computer logic, boolean algebra.

Construction and design of information systems. Simple data types and their Pascal representation. Standard packages for information processing - word processors, spreadsheets Problem solving

and algorithms using top down design and coding via a modern high level language. Structured programming concepts, flow diagrams, documentation and testing. Idea of windows programming.

Textbook:

Capron H.L. and Perron J.D., Computers and Information Systems, 4th ed. (Benjamin/Cummings, 1995).

Reference:

Software manuals.

Weiskamp K., Turbo Pascal (Wiley, 1991).

Savitch W.J., Turbo Pascal, 3rd ed. (Benjamin/Cummings, 1992).

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

**MA 164: FUNDAMENTALS OF COMPUTER
SCIENCE (B)**

Hours per week: 6

Prerequisite: MA 163

Objectives:

On completion of this subject students should be able to:-

1. Design and construct algorithms and structured programs in Pascal, using records, enumeration types and case construct.
2. Display an understanding of memory, control, ALU, program compilation, operating systems, multi-programming, time-sharing, and paging.
3. Use standard software packages: database, graphics and mathematical packages.
4. Use various data types,
5. Explain how computer systems share information, storage and access using LANs. Communications.
6. Program in Delphi.

Syllabus:

Construction and design of information systems. Data types: record, enumeration types, case construct, and their Pascal representation.

Hardware: storage devices, communications: modems, transmission, types of media including fibre optics, Lan's, Wan's; topologies, protocols, e-mail.

Standard packages for information processing - graphics and mathematics packages. Data base software and data analysis. 4th generation languages. Software tools and utilities. Integrated packages. Other languages: Delphi, Fortran, Cobol, Basic, Prolog, Lisp, Logo, etc. Problem solving and algorithms using top down design of procedures and coding via a modern high level language. Software engineering project. Structured programming concepts, flow diagrams, documentation and testing. Sorting and searching algorithms. Pascal graphics: initialisation, plotting of parametric and polar equations.

Windows programming in Delphi.

Personal computers: selection of :- memory, secondary storage, monitor, speed of processor, for home, office or school.

Operating systems: scheduling, timesharing, paging, memory protection, and spooling.

Textbook:

Capron H.L. and Perron J.D., Computers and Information Systems, 4th ed (Benjamin/Cummings, 1990).

Reference:

Buchanan, Mastering Delphi (Macmillan 1999)
Weiskamp K., Turbo Pascal (Wiley, 1991).
Savitch W.J., Turbo Pascal, 3rd ed (Benjamin/Cummings, 1992).

Assessment:

Continuous assessment - 50%,
Written Examination - 50% (1x3 hrs).

**MA 167: ENGINEERING
MATHEMATICS 1 (A)**

Hours per week: 5

Prerequisite: Grade 12 Major Mathematics

Objectives:

To provide students with the basic mathematical concepts, principles and analytical processes

needed for degree studies in Engineering.

On completion of this subject students should be able to :-

1. Solve problems involving complex numbers
7. Demonstrate a clear understanding of trigonometric, logarithmic, exponential and hyperbolic functions, and their inverses.
8. Apply the techniques of differentiation to solve problems involving maxima and minima and related rates.
9. Use integration to find areas enclosed between curves, and volumes of solids of revolution.

Syllabus:

Revision: Some revision of high school mathematics will occur in the appropriate places.

Complex Numbers: Cartesian, polar and exponential forms of a complex number; Euler's Formula; De-Moivre's Theorem; Roots of a complex number.

Functions: Types of functions; Composition of functions; Inverse functions; Logarithmic and exponential functions; Trigonometric and hyperbolic functions; Inverse trigonometric and hyperbolic functions.

Differentiation: Differentiation by using limits; Techniques of differentiation; Applications of differentiation - maxima and minima, tangents to curves, small increments.

Integration: Antiderivatives; The First and Second Fundamental Theorems of Calculus; Techniques of integration - substitution, by parts; Applications of integration - the area enclosed between two curves, volumes of solids of revolutions.

Textbook:

Anton H., Calculus with Analytic Geometry, 6th ed (Wiley, 1999)

Reference:

Stroud K.A., Engineering Mathematics: Programmes and Problems, 4th ed (ELBS/Macmillan, 1995).

Equipment:

Scientific calculator

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

**MA 168: ENGINEERING
MATHEMATICS 1(B)**

Hours per week: 5

Prerequisite: MA 167

Objectives:

To provide students with further basic mathematical concepts, principles and analytical processes needed for degree studies in Engineering.

On completion of this subject students should be able to:-

1. Compute the dot, cross and scalar triple products of vectors
2. Solve problems involving the vectorial equations of lines and planes in 3-D space
3. Compute the products, determinants and inverses of matrices
4. Use Cramer's rule and Gauss elimination to solve systems of linear equations, including those with infinitely many solutions, geometric interpretation.
5. Test series for convergence, and find radii and intervals of convergence of power series
6. Solve problems involving Taylor and Maclaurin series.

Syllabus:

Vectors: Dot product; Cross product; scalar triple product; parametric equations of a line; planes in 3-space.

Matrices: Addition and multiplication of matrices; Systems of linear equations; Gauss elimination; Determinants; Inverses; Cramer's Rule.

Infinite Series and Processes: Sequences; Partial sums; Tests for convergence of a series of real numbers; Power series; radius and interval of convergence of a power series; Taylor and Maclaurin series.

Partial differentiation; Chain rules for functions of two variables.

Textbook:

Anton H., Calculus with Analytic Geometry, 6th ed (Wiley, 1999)

Reference:

Kreyszig E., Advanced Engineering Mathematics,

7th ed (Wiley, 1993)

Stroud K.A., Engineering Mathematics: Programmes and Problems, 4th ed (ELBS/Macmillan, 1995).

Equipment:

Scientific calculator

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

**MA 171: MATHEMATICS 1 AS (A)
(Applied Science)**

Hours per week: 5

Prerequisite: Grade 12 Mathematics

Objectives:

To reinforce those topics from High School mathematics directly applicable.

On completion of this subject students should be able to:-

1. Solve problems involving lengths, areas and volumes,
2. Manipulate algebraic expressions and solve algebraic equations,
3. Use traditional function notation, understand the properties of the standard mathematical functions, and graph these functions.

Syllabus:

Mensuration: Use of standard area and volume formulae, trigonometry, ratio and proportion, effect of errors in calculations.

Algebra: Simplification of expressions, the use of surds and indices, the solution of linear and quadratic equations. Logarithms.

Functions: Properties and graphs of linear, quadratic, exponential, logarithmic and trigonometric functions. Use of log-linear and log-log graph paper. Composition of functions. Inverse functions.

Differentiation: Idea of differentiation

Textbook:

Mathematics Department modules.

Reference:

Alldis B.K., Mathematics for Technicians, 2nd ed (McGraw Hill, 1986).

Berry J. and Wainwright, P., Foundation Mathematics for Engineers (Macmillan, 1991).

Equipment:

Scientific/statistical calculator.

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

**MA 172: MATHEMATICS 1 AS (B)
(Applied Science)**

Hours per week: 5

Prerequisite: MA 171

Objectives:

To introduce the concepts and procedures of calculus, and to introduce the methods of probability and descriptive statistics.

On completion of this subject students should be able to:-

1. Calculate the derivatives and integrals of standard functions,
2. Use numerical techniques to calculate areas under curves,
3. Construct frequency tables, histograms and ogives, and calculate descriptive statistics for centre and spread of data,
4. Calculate probabilities associated with experiments,
5. Use a hand calculator efficiently, including using scientific notation function key, and the statistics keys,
6. Use a computer program to investigate graphs of the standard mathematical functions,
7. Use a computer spreadsheet to perform numerical integration, construct ogives and histograms, and calculate descriptive statistics.

Syllabus:

Differentiation: Average and instantaneous rates of change, principles of differentiation, differentiation of polynomial, exponential, logarithmic and trigonometric functions, differentiation of composite

functions.

Integration: Trapezoidal rule, anti-derivatives of polynomial, exponential and trigonometric functions, definite integrals. Probability: Sample spaces, and probability of outcomes and events for simple experiments. Addition and multiplication laws of probability. Conditional probability. Statistics: Summary of data using frequency tables, ogives, and histograms. Descriptive statistics for central tendency and variation of data.

Textbook:

Mathematics Department modules.

Reference:

Alldis B.K., Mathematics for Technicians, 2nd ed (McGraw Hill, 1986).

Berry J. and Wainwright P., Foundation Mathematics for Engineers (Macmillan, 1991).

Equipment:

Scientific/statistical calculator.

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

**MA 181: MATHEMATICS 1 AF (A)
(Agriculture and Forestry)**

Hours per week: 4

Prerequisite: Grade 12 Mathematics

Objectives:

To reinforce those topics from High School mathematics directly applicable to tertiary studies in Agriculture and Forestry.

On completion of this subject students should be able to:-

1. Solve practical problems involving lengths, areas and volumes,
2. Manipulate algebraic expressions and solve algebraic equations,
3. Use traditional function notation, use the properties of the standard mathematical functions, and their graphs,

Syllabus:

Mensuration: Use of standard area and volume formulae, trigonometry, ratio and proportion, effect of errors in calculations. Numerical methods of estimating irregular areas and volumes (eg. land area, tree volumes).

Algebra: Simplification of expressions, the use of surds and indices, the solution of linear and quadratic equations. Functions: Properties and graphs of linear, quadratic exponential, logarithmic and trigonometric functions. Trigonometric relations.

Textbook:

Mathematics Department modules.

Equipment:

Scientific/statistical calculator.

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

MA 182: MATHEMATICS 1 F (B)
(Forestry)

Hours per week: 4

Prerequisite: MA 181

Objectives:

To reinforce those topics from High School mathematics directly applicable to tertiary studies in Agriculture and Forestry, to introduce the concepts of calculus, and to introduce the methods of probability and descriptive statistics. This techniques to be applied in Agriculture and Forestry situations.

On completion of this subject students should be able to:-

1. Use the properties of the standard mathematical functions, and their graphs,
2. Apply methods of differentiation and integration to problems in Agriculture and Forestry.
3. Use a numerical technique to calculate areas under curves,
4. Construct and apply frequency tables, histograms, and calculate descriptive statistics for

centre and spread of data,

5. Calculate probabilities associated with simple experiments,
6. Use a hand calculator efficiently, including using scientific notation, function keys, and the statistical keys,
7. Use computer programs to investigate graphs of the standard mathematical functions, and to use spreadsheets.

Syllabus:

Functions: Further Properties of linear, quadratic, exponential logarithmic and trigonometric functions. Use of log linear and log-log graph paper. Applications of these functions to Agriculture and Forestry situations.

Differentiation: Average and instantaneous rates of change. Rules and principles of differentiation and differentiation of polynomial functions. Applications of differentiation.

Integration: Anti-differentiation; rules of integration; use to find areas.

Probability: Sample spaces, probability of outcomes and events for simple experiments.

Statistics: Summary of data using frequency tables and histograms. Descriptive statistics for centre and variation of data. Applications.

Textbook:

Mathematics Department modules.

Equipment:

Scientific/statistical calculator.

Assessment:

Continuous Assessment - 50%,
Written Examinations - 50% (1x3 hrs).

MA 212: QUANTITATIVE METHODS 3
(Business Studies)

Hours per week: 3

Prerequisite: MA 112

Objectives:

To provide students with a basic knowledge of practical statistical procedures.

On completion of this subject students should be

able to:-

1. Represent statistical data using tables and diagrams, and extract and interpret information represented as tables and diagrams,
2. Analyse and design questionnaires, and understand the procedures for administering a questionnaire,
3. Show the difference between sampling and a census, and show how simple random samples can be selected,
4. Calculate descriptive statistics for the centre and spread of data, using both raw data and data represented in tables,
5. Calculate probabilities using symmetries and relative frequencies, and apply the basic laws of probability,
6. Use the properties of the Standard Normal distribution to calculate proportions, percentiles and probabilities associated with Normal populations, and use the Normal distribution to understand the essentials of Quality Control,
7. Use index numbers, and the various methods of calculating average indexes,
8. Calculate correlation coefficients and regression formulas,
9. Use moving average procedures to establish trends and seasonal cycles, and de-seasonalise time series data,
10. Use a spreadsheet to construct statistical tables and graphs, calculate descriptive statistics, index numbers, correlations, regression equations, and time series trends and cycles.

Syllabus:

Statistics: Using and interpreting tables and graphs. Questionnaires and sampling. Descriptive statistics. Basic probability. The Normal Distribution. Central Limit Theorem and application to quality control. Correlation and regression. Index numbers. Time series.

Textbook:

Mathematics Department modules.

Reference:

Walpole R.E., Introduction to Statistics 3rd ed (Macmillan, 1982).
Cryer D.C. and Miller, R.B., Statistics for Business: Data Analysis and Modelling (PWS

Kent, 1991).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs).

**MA 235: ENGINEERING
MATHEMATICS 2 (A)**

Hours per week: 4

Prerequisite: MA 168

Objectives:

On completion of this subject students should be able to:-

1. Integrate using a variety of techniques including partial fractions and reduction formulae,
2. Calculate surface areas of solids of revolutions,
3. Calculate length of curves,
4. Formulate and solve various first order differential equations,
5. Use Laplace and inverse Laplace Transforms to solve O.D.E.'s
6. Use numerical techniques to solve equations, calculate definite integrals, and solve differential equations.

Syllabus:

Integration: Further techniques of integration, including partial fractions, reduction formulae, trigonometric substitutions, and integrals of inverse functions. Applications, including surface areas of solids of revolution and length of curves.

First order Differential Equations: Formation. Solution techniques including separable variables, homogeneous, and integrating factors. Applications.

Laplace Transforms: Transforms of standard functions, properties of transforms, inverse transforms.

Numerical Methods: Solution of equations (bisection, Newton-Raphson), numerical methods of integration (Trapezoidal and Simpson's Rule), numerical solution of differential equations (Runge-Kutta technique).

Textbook:

Anton, H., Calculus with Analytic Geometry, 6th ed (Wiley, 1999)

Reference:

Kreyszig E., Advanced Engineering Mathematics, 7th ed (Wiley, 1993).

Stroud K.A., Engineering Mathematics: Programmes and Problems, 4th ed (ELBS/Macmillan, 1995).

Equipment:

Scientific/statistical calculator.

Assessment:

Continuous assessment - 50%,
Written examination - 50% (1x3 hrs).

**MA 236: ENGINEERING
MATHEMATICS 2 (B)**

Hours per week: 4

Prerequisite: MA 235

Objectives:

On completion of this subject students should be able to:-

1. Formulate a second order differential equation,
2. Solve second order linear differential equations with constant coefficients,
3. Find directional derivatives and optimum values for functions of two independent variables,
4. Find the integral of a function of several variables,
5. Use integration to find surface areas and centres of gravity,

Syllabus:

Second order Differential Equations: Formation. Solution of constant coefficient linear homogeneous and non-homogeneous equations. Method of undetermined coefficients. Applications. Multi-variable functions: Partial differentiation. Applications including tangent planes, total derivatives, directional derivatives, gradient, maxima/minima.

Introduction to partial differential equations.

Multiple integrals: Double integrals over rectangular and non rectangular regions. Triple integrals. Applications including surface areas, centroids, and centre of gravity.

Matrices: Transition and transformation matrices, eigen-values/vectors.

Textbook:

Anton, H., Calculus with Analytic Geometry, 6th ed (Wiley, 1999)

Reference:

Kreyszig E., Advanced Engineering Mathematics, 7th ed (Wiley, 1993)

Stroud K.A., Engineering Mathematics: Programmes and Problems, 4th ed (ELBS/Macmillan, 1995).

Equipment:

Scientific/statistical calculator.

Assessment:

Continuous assessment - 50%,
Written examination - 50% (1x3 hrs).

**MA 241: MATHEMATICS 2 LM (A)
(Land Management)**

Hours per week: 3

Prerequisite: MA 142

Objectives:

On completion of this subject students should be able to:-

1. Construct frequency tables, histograms, ogives, bar graphs, and other standard graphs and charts,
2. Calculate descriptive statistics for the centre and spread of data,
3. Calculate the coefficient of correlation and regression line for bivariate data,
4. Calculate index numbers and consider various averaging procedures used with index numbers,
5. Calculate probabilities associated with simple experiments,
6. Find probabilities, proportions and percentiles

for variables, which are Normally distributed.

Syllabus:

Tabular and graphical presentation of data. Measurements of central tendency and dispersion. Correlation and regression. Index numbers. Probability. The Normal distribution and applications.

Textbook:

Mathematics Department modules.

Equipment:

Scientific/statistical calculator.

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

MA 242: MATHEMATICS 2 LM (B)
(Land Management)

Hours per week: 4

Prerequisite: MA 241

Objectives:

On completion of this subject students should be able to:-

1. Use standard matrix operations,
2. Solve systems of linear equations using the Gaussian and Gauss-Jordan elimination methods,
3. Use linear programming to formulate and solve linear programming problems,
4. Calculate trend indexes, and apply these to financial problems,
5. Calculate seasonal indexes, and apply these to financial problems,
6. Solve mensuration problems involving triangles using basic trigonometry,
7. Solve problems involving lines and planes using the methods of coordinate geometry.

Syllabus:

Matrices. Solution of systems of linear equations. Linear Programming. Revision of basic trigonometry and plane coordinate geometry. Financial mathematics and further statistics

involving index numbers.

Textbook:

Mathematics Department modules.

Reference:

Whipkey K.L. et al, The Power of Mathematics: Applications to the Management and Social Sciences, 2nd ed (Wiley, 1981).

Assessment:

Continuous assessment - 50%,
Written examination - 50% (1x 3 hrs).

MA 243: MATHEMATICS FOR
COMMUNICATION I

Hours per week: 2

Prerequisite: Grade 12 Mathematics

Objectives:

To give mathematical support to the Communication for Development programme.

On completion of this subject students should be able to:-

1. Use basic arithmetic in calculating percentages, bearings and mappings,
2. Cost a project and loan repayments,
3. Determine area and volumes relevant to an applications project.

Syllabus:

Arithmetic: percentages, areas, ratio of areas (maps), bearings, gradients, ratios, graphs, meteorological maths, scales, dimensions, calculation of demographic counts.

Business mathematics: cost estimation, rent, royalties, inflation, exchange rates, interest rates, future values in costing a project, loan repayment, sinking fund, use of formulae.

Geometry: area and volumes of regular figures, symmetry, rotation, application.

Modelling: the idea of creating a model, discrete model examples, linear programming models, Markov chains, solutions and comparison with real life, other applications.

Textbook:

Maths Department Modules

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

**MA 244: MATHEMATICS FOR
COMMUNICATION II**

Hours per week: 2

Prerequisite: MA 243

Objectives:

To further develop mathematical support for modelling of various real situations, which are relevant to the Communication for Development programme.

On completion of this subject students should be able to:-

1. Use the idea of rates of change, differentiation and simple integration,
2. Use modelling for rates of change of population; conflict resolution, arms race and other modelling applications
3. Explain, analyse and use basic ideas in information theory.

Syllabus:

Introductory differentiation and integration -ideas with minimal techniques to cover the modelling applications.

Modelling: the idea of creating a model, population and predator-prey models, various model examples, solution and comparison with real life. Idea of limit cycle, bifurcations, chaos. Modelling harvesting: e.g. forestry or animals. modelling conflicts :arms race, landowner conflicts. Other modelling examples.

Information theory: message checking, check codes, idea of redundancy in a natural language, coding information content, channel capacity, encoding.

Textbook:

Maths Department Modules

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

**MA 251: MATHEMATICS 2 S (A)
(Surveying)**

Hours per week: 3

Prerequisite: MA 152

Objectives:

On completion of this subject students should be able to:-

1. Solve problems involving areas, tangents normalize and volumes,
2. Estimate errors of functions involving two variables,
3. Use numerical techniques and integral methods to calculate areas under curves,
4. Find the derivatives and integrals of standard functions,
5. Find partial derivatives and the use of partial derivatives in error estimation and rate measure.

Syllabus:

Review of algebraic and trigonometric functions and their graphs. Review of the derivatives of algebraic and trigonometric functions. Calculation of first and second derivatives of functions.

Equations of tangents and normalize, parametric equations, chain rule.

Functions of two variables: Implicit and partial derivatives. Total derivative and error estimation. Applications.

Textbook:

Stroud, K.A., Engineering Mathematics: Programs and Problems, 4th ed. (Macmillan /ELBS, 1995).

Equipment:

Scientific/statistical calculator.

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

MA 252: MATHEMATICS 2 S (B)
(Surveying)

Hours per week: 3

Prerequisite: MA 251

Objectives:

On completion of this subject students should be able to:-

1. Solve problems involving curvature and radius of curvature,
2. Use numerical techniques and integral methods to calculate areas under curve,
3. Calculate percent variation, compound variation and annuities.

Syllabus:

Calculation of curvature and radius of curvature at a point on a curve.

Integration: Techniques of integration and review of numerical integration. Calculation of exact area under a curve using integration.

Financial mathematics: Percentage variation, compound interest, and annuities.

Reference:

Stroud K.A., Engineering Mathematics: Programmes and Problems, 4th ed (Macmillan/ELBS, 1995).

Equipment:

Scientific/statistical calculator.

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

MA 261: DATA STRUCTURES AND ALGORITHMS

Hours per week: 5

Prerequisite: MA164

Objectives:

On completion of this subject students should be able to:-

1. Use several data structure types in a

PASCAL environment, including strings, arrays, records, files, tables and operations on them,

2. Develop searching and sorting algorithms and compare their efficiency,
3. Manage dynamic data structures,
4. Develop more advanced features of Pascal using procedures with these data structures,
5. Use advanced features of operating systems on a P.C.

Syllabus:

File organisation, sub directories, paging and multi programming.

Further Pascal programming using top down design and modularity. Data Structures with operations on them: constants, variables, strings, arrays, and files, string operations. Tables, file organisation and access, hashing, overflow.

Search algorithms: sequential and binary search, efficiency analysis. Sorting algorithms: selection, quicksort, bubble, and merge sort, efficiency analysis. Dynamic data structures: stacks, queues, trees, lists, pointer variables.

Textbook:

Dale N. and Lily S.C., Pascal plus Data Structures and Algorithms, 2nd ed (Heath, 1991).

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

MA 262: DATABASE MANAGEMENT

Hours per week: 4

Prerequisite: IS 213 / MA 265

Objectives:

On completion of this subject students should be able to:-

1. Manage, manipulate, construct and design a database system,
2. Demonstrate an understanding of access, security and integrity problems,
3. Program in SQL and Produce reports following data base queries.

Syllabus:

Data redundancy and independence leading to motivation for using a database. Database environment.

Architecture of a database with the external, conceptual and internal levels. Data models, entity-attribute relationships, models. Examples and applications. Relationship theory: domains, keys (primary, candidate, foreign) Representing conceptual data models. Data analysis and data base schemas.

Data manipulation: select, project, join, union, intersection and difference operators.

Constraints on attributes. Normalisation: single-valued facts, dependencies. The three normal forms and Boyce-Codd. Examples with diagrammatic support, use of SQL. SELECT and FROM clauses. WHERE clause, GROUP BY and HAVING clauses. Use of ORDER BY clause.

Data definition, tables, views. Updating facilities. Access and control for a multi user environment. Constraints. Transactions.

Database design, logical schema - definition, storage, schema design developing an SQL database. Database administration, data integrity, data dictionary. Distributed database.

Textbook:

Kroenke D.M., Database Processing Fundamentals, 2nd ed (Science Research Associates, 1983).

Reference:

Date C.J., An Introduction to Database Systems Vol. 1, 5th ed (Addison Wesley, 1991).

Assessment:

Continuous Assessment and
Project - 50%
Written Examination - 50% (1x3 hrs).

MA 263: END USER COMPUTING APPLICATIONS

Hours per week: 4

Prerequisite: MA 164

Objectives:

On completion of this subject students should be able to:-

1. Use some advanced features of office application packages
2. Use various standard mathematical, graphics, and data compression packages
3. Program using an RAD language.

Syllabus:

Office applications: Word processing (desk top publishing, keyboard macros); Spreadsheets (creation and use of macros, graphs); Presentation program; Database (multi-media records).

Mathematics packages. Data compression packages: data compression (zip, cab, tar, etc formats). Graphics packages: raster and vector graphics, compression schemes (gif, jpg, png, bmp, wmf, tif, etc formats).

Programming with Rapid Application Development (RAD) tools: Creating user interfaces; control properties; program coding.

The subject will include a project using the one of the topics above.

Reference:

On Line Resources.

Assessment:

Continuous Assessment - 40%
Project - 20%,
Written Examination - 40% (1x3 hrs).

MA 264: APPLIED STATISTICS

Hours per week: 6

Prerequisite: MA 233

Objectives:

On completion of this subject students should be able to:-

1. Present and analyse statistical data using tables and diagrams, test hypotheses, and goodness of fit,
2. Use the Binomial, Normal t- and Chi-square, Poisson, Negative exponential and Uniform distributions,
3. Apply linear and multiple regression tech-

- niques with understanding,
4. Use spreadsheet and statistical packages.

Syllabus:

Description and presentation of statistical data, sample space, events, probability measures, independent events, conditional probabilities. Expectation, measures of dispersion.

Time series analysis. Discrete distributions. The Binomial and Poisson distribution.

Continuous distributions: Normal distribution, sampling and sampling distributions; t-distribution, Chi-square distribution, F distribution.

Introduction to inference: estimation, confidence intervals, hypothesis testing, goodness of fit, contingency tables. Type I and type II errors. Simple linear regression, correlation coefficient, covariance matrix. Non-linear and multiple regression using packages.

Probability models: Poisson, negative exponential, uniform.

Reference:

Maths Department Modules,

Statistical package manuals.

Johnson R.A. and Bhattacharyya G.K., Statistical Concepts and Methods, 2nd ed (Wiley, 1992).

Chase W. and Bown F., General Statistics (Wiley, 1992).

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

**MA 265: AN INTRODUCTION TO
DATABASE DEVELOPMENT**

Hours per week: 4

Prerequisite: MA 164

Objectives:

To develop practical expertise in the use and development of database programs and to prepare the students for the theory in the succeeding module MA262 Database Management.

On completion of this subject students should be able to:-

1. Identify informally information necessary for

the application

2. Construct on-line Database files
3. Select records according to different criteria
4. Create queries and reports on the data
5. Develop applications using a development tool, eg. FoxPro
6. Design and write database program using a database programming language.

Syllabus:

What is a database? Entities and attributes. Extracting user requirements. Relational database structure. Database forms, Queries, Views and Reports. Database indexing. Application generation. FoxPro programming. Integrity and security issues.

Textbook:

Department Materials.

Reference:

Software Manuals.

Assessment:

Continuous Assessment - 100%.

**MA 266: SOFTWARE SELECTION AND
TESTING**

Hours per week: 2

Prerequisite: MA 263

Objectives:

To provide a basis for the testing, evaluation and selection of software packages. The emphasis is placed on evaluating tools used to create internet materials.

On completion of this subject students should be able to:-

1. Test, compare and evaluate commercial, shareware and freeware software packages and assess their suitability for prescribed tasks,
2. Develop a testing and evaluation plan, for the selection of a software package,
3. Develop internet (html) documents using various tools

Syllabus:

Internet, intranets and web browsers.
Introduction to HTML: elements, tags, attributes.
HTML Document structure: text, formatting, lists, tables, links, images, and frames.
Evaluation of HTML authoring packages (Office products, text editors, HTML code editors and dedicated WYSIWYG editors).
Each student will carry out exercises in the above areas, and will complete a project that covers aspects of evaluation, comparison and testing of current packages.

Reference:

On-line Resources

Assessment:

Continuous Assessment - 60%,
Major project - 40%.

MA 267: NETWORKING AND COMMUNICATIONS

Hours per week: 4

Prerequisite: MA 164

Objectives:

This subject seeks to expose the students to the fundamentals of computer networks and the principles of their use and security.

On completion of this subject students should be able to:-

1. Specify the advantages of networking
2. Understand the ISO Open Systems Interconnection 7 layer model
3. Choose, set up, evaluate, and Manage a local area network
4. Use a network operating system

Syllabus:

The Telephone Network principles and topologies, Exchanges, PABX. Synchronous and asynchronous communication modes.

Packet Switching, Packet assemble and dis-assemble.

I.S.O. (International Standards Organisation)
Open Systems Interconnection ; 7 Layer Model.
Physical Data Link, Transport, Network, Session,

Presentation, and Application layers.

Network Security principles, Network Topologies, Local Area Networks, Wide Area Networks.

Novell and NT4 networks and their services: choice, setting up, evaluation and maintenance of network systems in use in Papua New Guinea.

System configuration, file transfer, users, accounts, applications, integrity, e-mail.

The Internet and it services: History, gopher, TCP-IP, World Wide Web, Wide Area Information Service.

Textbook:

Black U., Data Networks, 2nd ed (Prentice-Hall, 1992).

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3hr).

**MA 271: MATHEMATICS 2AS (A)
(Applied Sciences)**

Hours per week: 4

Prerequisite: MA 172

Objectives:

On completion of this subject students should be able to:-

1. Apply the rules of matrix algebra,
2. Evaluate determinants,
3. Express systems of equations in matrix form,
4. Solve simultaneous linear equations using algebraic methods and Gaussian methods,
5. Use matrix operations to solve algebraic problems,
6. Use differential calculus for applications to maxima and minima, small error and approximations, and apply these techniques to problems in the field of chemical technology,
7. Use differential calculus to express functions as approximations of Taylor and Maclaurin series,
8. Solve functional equations using graphical and numerical methods.

Syllabus:

Matrix algebra, Solutions of linear equations using

algebraic and Gaussian methods. Solutions of quadratic equations, exponential equations, graphical solutions.

Differential and integral calculus: Extension of first year work. Small errors and approximations as applied to problems in chemical technology. Functional equations and their solutions by graphical and numerical methods.

Textbook:

Stroud K.A., Engineering Mathematics: Programmes and Problems, 4th ed (Macmillan, 1995).

Equipment:

Scientific/statistical calculator.

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

MA 272: MATHEMATICS 2AS (B)
(Applied Sciences)

Hours per week: 4

Prerequisite: MA271

Objectives:

On completion of this subject students should be able to:-

1. Solve first and second order differential equations using techniques of differential and integral calculus,
2. Calculate probabilities associated with simple experiments,
3. Calculate probabilities for Binomial, Normal and Poisson distributions,
4. Calculate the coefficient of correlation and regression line for bivariate data,
5. Determine the optimum sample size for a desired level of confidence,
6. Apply these techniques to problems in applied science.

Syllabus:

Integral calculus: Review integration by parts and partial fractions. First order differential equations, geometrical interpretation, and analytic and

numerical methods of solution. Second order differential equations and their applications to applied science.

Probability: Rules of probability. Binomial, Normal and Poisson distributions.

Statistics: Descriptive statistics. Linear correlation and regression. Sampling theory. Confidence Intervals. Quality control. Applications to applied science.

Textbook:

Stroud K.A., Engineering Mathematics: Programmes and Problems, 4th ed (Macmillan, 1995).

Equipment:

Scientific/statistical calculator.

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3 hrs).

MA 315: QUANTITATIVE METHODS 4

Hours per week: 4

Prerequisite: MA 212

Objectives:

On completion of this subject students should be able to:-

1. Manipulate algebraic expressions and solve algebraic equations,
2. Manipulate matrices and solve systems of linear equations,
3. Solve linear programming problems,
4. Differentiate polynomial and exponential functions,
5. Differentiate using the product, quotient and chain rules,
6. Apply differentiation techniques to solve maxima and minima problems,
7. Solve marginal analysis problems.

Syllabus:

Revision of algebra. Systems of linear equations, matrices. Linear programming. Curve fitting. Differentiation: Results and rules. Maxima and minima. Marginal analysis. Applications to

commerce.

Textbook:

Curwin J. and Slater R., Quantitative Methods for Business Decisions, 3rd ed (Chapman and Hall, 1991).

Reference:

Whipkey K.L. et al, The Power of Mathematics: Application for the Management and Social Sciences, 2nd ed (Wiley, 1981).

Equipment:

Scientific/statistical calculator.

Assessment:

Continuous Assessment - 40%,
Written Examination - 60% (1x3hrs).

MA 316: QUANTITATIVE METHODS 5

Hours per week: 4

Prerequisite: MA 212

Objectives:

On completion of this subject students should be able to:-

1. Calculate discrete probabilities (including conditional probabilities) using the definitions and laws of probability,
2. Construct and use probability trees,
3. Use Baye's theorem,
4. Apply the various counting procedures, including permutations and combinations,
5. Use random variables for continuous and discrete probability distributions,
6. Use the Binomial and Poisson distributions, and be able to adapt the distributions to problems in the business environment,
7. Explain the fundamentals of sampling theory, including the central limit theorem,
8. Estimate, and calculate confidence intervals for, the population parameters mean, standard deviation and proportion,
9. Apply the principles of hypothesis testing and apply it to tests of means of a single population, and to tests of difference of means of two populations,

10. Calculate correlation coefficients and simple and multiple regression equations, and conduct hypothesis tests on models using these tools,
11. Construct and interpret contingency tables,
12. Use a statistical computer package.

Syllabus:

Probability: Discrete and continuous probability distributions. Applications. Statistics: Sampling theory. Introduction to statistical inference including confidence intervals and tests of hypothesis.

Correlation and Regression. Applications to accountancy, commerce, economics and management.

Textbook:

Curwin J. and Slater R., Quantitative Methods for Business Decisions (Van Nostrand, 1985).

Reference:

Walpole R.E., Introduction to Statistics, 3rd ed (Macmillan, 1982).

Cryer D.C. and Miller R.B., Statistics for Business: Data Analysis and Modelling (PWS Kent, 1991).

Assessment:

Continuous assessment - 40%,
Written Examination - 60% (1x3hrs).

MA 333: MATHEMATICS 3 EE (A)

Hours per week: 4

Prerequisite: MA 236

Objectives:

On completion of this subject students should be able to:-

1. Recognise and work with periodic functions.
2. Calculate the Fourier Series of periodic functions.
3. Apply Fourier Series to solve Ordinary Differential equations.
4. Apply Fourier series to the solution of Partial Differential equations.

Syllabus:

Fourier Series: Periodic functions, Trigonometric series, Euler Formulas, Fourier coefficients, Representability by Fourier Series, Fourier Series of even and odd functions, Half range expansions, Applications of Fourier series in the solution of ordinary differential equations, Fourier integrals, Fourier transforms

Partial Differential Equations: Boundary conditions, Initial conditions, homogeneous partial differential equations.

The One Dimensional Wave Equation: Vibrating string, Product method, eigen-values and eigen-functions, D'Alembert's solution of the wave equation.

The Heat Equation: One dimensional heat flow, Heat Flow in an infinite bar, Temperature in an infinite bar.

The Two Dimensional Wave equation: Vibrating membrane, Laplace's equation, Heat flow in a plate, Laplace transformation applied to partial differential equations.

Textbook:

Kreyszig E., Advanced Engineering Mathematics, 7th ed (Wiley, 1993).

Reference:

Stroud K.A., Further Engineering Mathematics, 2nd ed (Macmillan).

Assessment:

Continuous assessment - 50%,
Written Examinations - 50% (1x3 hrs).

MA 334: MATHEMATICS 3 EE (B)

Hours per week: 4

Prerequisite: MA 333

Objectives:

On completion of this subject students should be able to:-

1. Evaluate line integrals in two and three dimensional space
2. Apply the Fundamental Theorem of Work Integrals to solve problems
3. Use Green's Theorem, The Divergence

Theorem and Stokes' Theorem in a variety of applications.

Syllabus:

Vector Fields: Inverse square fields, Divergence and curl, The del operator, The Laplacian operator.

Line Integrals: Evaluation of line integrals in 2D and in 3D space, Change of parameter, Applications to the evaluation of a mass of a wire, arc length and work.

Conservative Vector Fields: The Fundamental theorem of work Integrals, Independence of path, Recognition of conservative vector fields in 2 and 3 dimensional spaces.

Green's Theorem: Finding work using Green's Theorem, Greens Theorem for multiply connected regions.

Surface Integrals: Evaluation of surface integrals, Applications to the evaluation of a mass of a curved lamina, surface area and to vector fields associated with fluid flow and electrostatic forces.

The Divergence Theorem: Oriented surfaces, Using The Divergence Theorem to find flux, Sources and sinks, Gauss's Law for inverse square fields.

Stokes' Theorem: Relative orientation of curves and surfaces, using Stokes' Law to calculate work, Relationship between Green's Theorem and Stokes' Theorem, Curl viewed as circulation.

Textbook:

Anton H., Calculus With Analytic Geometry, 5th ed (Wiley, 1999).

Reference:

Kreyszig E., Advanced Engineering Mathematics, 7th ed (Wiley, 1993).

Assessment:

Continuous assessment - 50%,
Written examination - 50% (1x3 hrs).

MA 335: MATHEMATICS 3 CE

Hours per week: 3

Prerequisite: MA 234

Objectives:

On completion of this subject students should be able to:-

1. Construct frequency tables, histograms, and calculate descriptive statistics for the centre and spread of data,
2. Understand and calculate probabilities associated with simple experiments,
3. Solve probability problems using the Binomial and Poisson distributions,
4. Calculate the coefficient of correlation and the simple regression line for bivariate data,
5. Select a random sample from a population,
6. Use a statistical computer package,

Syllabus:

Probability: Laws of probability. The Normal distribution.

Statistics: Presentation of data, descriptive statistics. Probability distributions, Correlation and regression. Introduction to sampling.

Textbook:

Stroud K.A., Engineering Mathematics. Programmes and Problems, 4th ed (ELBS/Macmillan, 1995).
Mathematics Department modules.

Reference:

Walpole R.E. and Myers R.H., Probability and Statistics for Engineers and Scientists, 5th ed (Macmillan, 1993).

Equipment:

Scientific/statistical calculator.

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3hrs).

MA 336: MATHEMATICS 3 ME

Hours per week: 4

Prerequisite: MA 234

Objectives:

On completion of this subject students should be able to:-

1. Check the convergence of a series with positive terms and power series,
2. Expand the most popular functions of one variable as power series,
3. Expand any periodic function as a Fourier series,
4. Find the Laplace transform of a function,
5. Find inverse transforms,
6. Solve linear differential equations and systems of linear differential equations by using the Laplace transforms.

Syllabus:

Infinite series: Convergence and divergence, limits, convergence tests. Power series, radius of convergence. Taylor and Maclaurin series.

Fourier series: Application to harmonic analysis, odd and even functions, discrete spectrum. Graphical and numerical methods of evaluating coefficients from data.

The Laplace transform: Application to linear control systems, shift theorems, inversion using partial fractions and tables. Solution of second order linear, and first order simultaneous linear, differential equations with constant coefficients.

Textbook:

Stroud K.A., Further Engineering Mathematics 2nd ed (Macmillan, 1990).

Reference:

Kreyszig E., Advanced Engineering Mathematics, 7th ed (Wiley, 1993).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3 hrs).

MA 339: ENGINEERING STATISTICS

Hours per week: 3

Prerequisite: MA236

Objectives:

On completion of this subject students should be able to:-

1. Construct frequency tables, histograms, ogives and calculate descriptive statistics for the

- centre and spread of data,
2. Calculate probabilities associated with simple experiments,
 3. Find probabilities for variates that are Normally distributed,
 4. Solve probability problems using the Binomial and Poisson distributions,
 5. Calculate the coefficient of correlation and the simple regression line for bivariate data,
 6. Select a random sample from a population,
 7. Use a statistical computer package,

Syllabus:

Probability: laws of probability, the Normal Distribution.

Statistics: Presentation of data, descriptive statistics. Probability distributions, Correlation and regression. Introduction to sampling.

Textbook:

Stroud K.A., Engineering Mathematics. Programmes and Problems, 4th ed (ELBS/Macmillan, 1995).

Mathematics Department modules.

Reference:

Blank, L.T., Statistical Procedures for Engineering, Management and Science (McGraw-Hill, 1980).

Equipment:

Scientific/statistical calculator.

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

**MA 342: STATISTICS FOR
COMMUNICATION**

Hours per week: 4

Prerequisite: MA 244

Objectives:

To provide students with a basic knowledge of practical statistical procedures and concepts. On completion of this subject students should be able to:

1. Extract and interpret statistical data from tables, graphs, charts and diagrams, and represent statistical data through these means,
2. Analyse and design questionnaires, and explain the procedures for administering them,
3. Compare and explain the differences between a sampling and a census, and carry out the procedures for selecting random samples,
4. Calculate descriptive statistics for the centre and spread of data, using both raw data and data represented in tables,
5. Calculate probabilities using symmetries and relative frequencies, and apply the basic laws of probability,
6. Calculate proportions, percentiles and probabilities associated with normal populations, by using the properties of the Standard Normal distribution, use the normal distribution to show the essentials of quality control,
7. Explain the meaning and use of index numbers and the various methods of calculating average indexes,
8. Explain the concept of correlation and regression, and calculate correlation coefficients and regression formulas,
9. Use moving average procedures to establish trends and seasonal cycles, and de-seasonalise time series data, through the understanding and application of the concept of a time series,
10. Use a spreadsheet to construct statistical tables and graphs, and calculate descriptive statistics, index numbers, correlations, regression equations and time series trends and cycles.

Syllabus:

Using and interpreting tables, graphs, charts and diagrams; questionnaires and sampling; descriptive statistics; basic probability; the Normal Distribution; Central Limit Theorem and application to quality control; correlation and regression; index numbers; time series.

Textbook:

Department modules

Reference:

Cryer D.C. and Miller R.B., Statistics for Business: Data Analysis and Modelling (PWS Kent, 1991).

Walpole R.E., Introduction to Statistics, 3rd ed (Macmillan, 1982).

Assessment:

Continuous Assessment - 40%,
Written Examination - 60% (1x3 hrs).

MA 351: MATHEMATICS 3 SV

Hours per week: 4

Prerequisite: MA 252

Objectives:

On completion of this subject students should be able to:-

1. Use the concept of points in three-dimensional space,
2. Determine a line passing through two points and calculate its direction cosines and numbers,
3. Determine a plane passing through three points,
4. Recognise and determine surfaces corresponding to given equations,
5. Perform matrix algebra, calculate the determinant and find the inverse (if it exists) of a square matrix,
6. Find the matrix of a transformation in 2 and 3 dimensions,
7. Understand and calculate probabilities associated with simple experiments,
8. Find probabilities for variates of various distributions,
9. Calculate the coefficient of correlation and the simple regression line for bivariate data,
10. Select a random sample from a population.

Syllabus:

Introduction to three-dimensional geometry. Matrices and determinants, matrices as transformations of space, rotations in two and three dimensions. Inverse of a matrix. Normal, Student's t and Chi-square probability distributions. Central Limit Theorem. Linear regression. Sampling.

Textbook:

Mathematics Department modules.

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

MA 352: MATHEMATICS 4 SV

Hours per week: 4

Prerequisite: MA 351

Objectives:

On completion of this subject students should be able to:-

1. Use vectors to solve geometric problems,
2. Perform vector algebra,
3. Perform matrix algebra, calculate the determinant and find the inverse (if it exists) of a square matrix, and solve systems of simultaneous equations,
4. Derive the trigonometric results for problems on the surface of a sphere, and apply these results to problems in Surveying.

Syllabus:

Vectors: vector algebra and Applications. Review of matrix algebra and determinants. Solution of simultaneous equations; least squares method - application to levelling in surveying. Three dimensional geometry and coordinate geometry of the sphere and ellipsoid.

Textbook:

Mathematics Department Modules.

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

**MA 361: SYSTEMS PROGRAMMING
WITH C++**

Hours per week: 4

Prerequisite: MA 261

Objectives:

To develop the student's practical expertise in programming operating system utilities using the

object oriented approach to software development and the C++ programming language.

On completion of this subject students should be able to:-

1. Write C++ programs incorporating functions and pointers.
2. Understand the developments made to C to produce C++.
3. Define and incorporate objects, private and public data and functions into an object oriented program.
4. Write shell scripts in a UNIX environment.

Syllabus:

Functions, Libraries. Sequence, selection, iteration. Bit-wise operators, arrays, structures, pointers and files. Streams, Objects, Public and Private data. Public and Private member functions. Reusability and libraries.

UNIX C shell and Shell scripts.

Textbook:

Abrahams, P and Hasson, B Unix for the Impatient (Addison Wesley 1995)

Reference:

McDonald C., Introduction to C Programming, (Unitech)

Assessment:

Continuous Assessment	- 50%,
Written Examination	- 50% (1x3 hrs)

MA 362: OPERATING SYSTEMS

Hours per week: 5

Prerequisite: MA 164, MA 267

Objectives:

On completion of this subject students should be able to:-

1. Explain the use and work of an operating system both in stand alone and multipro-cessing environments,
2. Compare system performance under different operating systems,
3. Write shell scripts.

Syllabus:

Historical perspective of DOS. The Windows family. Introduction to Unix.

Requirements of an operating system, Storage Management: storage layout relocation, dynamic loading, movable regions and swapping, paging, segmentation. Virtual memory, page replacement algorithms, frame allocation, thrashing.

Processor management: real and virtual processor, job queuing, job scheduling, interrupts, imple-mentation.

Process management: concurrency, deadlock and its prevention, cooperating processes. Multi-tasking. Parallel processing.

Device management: files, protection and access, disk management, access and control, data integrity, file organisation request processing, input/output actions.

System performance and configuration. Unix shell and scripts.

Textbook:

Silberschatz A., Peterson, J. and Galvin, P., Operating Systems Concepts, 5th ed (Addison-Wesley, 1991).

Reference:

Deitel H.M., An Introduction to Operating Systems, 2nd ed (Addison-Wesley, 1990).

Tanenbaum A., Operating Systems: Design and Implementation (Prentice Hall, 1987).

Assessment:

Continuous Assessment	- 50%,
Examination	- 50% (1x3 hrs).

MA 363: LINEAR MATHEMATICS

Hours per week: 5

Prerequisite: MA 234

Objectives:

On completion of this subject students should be able to:-

1. Perform standard vector algebra operations, and find inner products,
2. Determine whether a given set of vectors is linearly independent.

3. Find eigen-values and eigen-vectors and apply them to the solution of problems involving differential equations and matrices,
4. Find the matrix associated with a linear transformation, transition matrices.
5. Construct an orthonormal basis for an n-dimensional inner product space.
6. Apply these matrix methods in a variety of real situations.

Syllabus:

Review of matrix algebra and determinants. Two person zero-sum matrix games. Saddle point of a pay-off matrix. Markov chains, transition matrix, steady state. Leontief models.

Vector Spaces: Fields, vector spaces, linear dependence, linear independence, basis, dimension, vector norms and inner products.

Linear Transformations: definition, the matrix of a linear transformation, transition matrix and change of basis.

The eigen-value problem: eigen-values and eigen-vectors, power method.

Applications chosen from the following plane geometry, equilibrium of rigid bodies, graph theory, theory of games, Markov chains, Leontiff economic models, forestry management, computer graphics, population growth, sustainable harvesting. Cryptography.

Textbook:

Anton H, and Rorres C., Elementary Linear Algebra - Applications Version, 6th ed (Wiley 1991)

Reference:

Spencer, A.J.M. and et al, Engineering Mathematics, Vol.1 (Van Nostrand-Reinhold, 1977).

Assessment:

Continuous Assessment	- 50%,
Written Examination	- 50% (1x3 hrs).

MA 364: ADVANCED STATISTICS

Hours per week: 5

Prerequisite: MA 264, MA 367

Objectives:

On completion of this subject students should be able to:-

1. Demonstrate an understanding of the concept of random variable
2. Apply probability models to practical situations
3. Use non-parametric statistics
4. Perform analysis of variance and associated tests.

Syllabus:

Random variables, functions of random variables, distribution functions, moments, moment generating functions. Sampling and sampling distributions.

Further discrete probability models - Hyper geometric, Poisson, Negative Binomial.

Markov chain: transition matrix, long term probabilities.

Non-parametric statistical methods.

Analysis of variance. One way, randomised block, Latin square, two-way factorial designs. Post tests.

Analysis of unbalanced designs.

Further regression analysis.

Introduction to Bayesian statistics.

Textbook:

Cryer J.D. and Miller R.B., Statistics for Business (PWS-Kent 1990)

Assessment:

Continuous Assessment	- 40%,
Project	- 20%,
Written Examination	- 40%. (1x3 hrs)

MA 365: NUMERICAL METHODS

Hours per week: 5

Prerequisite: MA 230

Objectives:

On completion of this subject students should be able to:-

1. Use numerical methods for approximation, solving linear equations, matrix manipulation, integration and solving ordinary differential

equations,

2. Solve applied problems in each of the above areas.

Syllabus:

Errors: rounding, truncation. Idea of ill-conditioning, induced and inherent instability. Solution of Non-linear equations and systems of linear equations using both direct and iterative methods. Convergence of iterative methods and acceleration techniques. Recurrence equations: solution and stability.

Polynomial approximation including interpolation and spline interpolation. Numerical integration methods, Simpson, Newton-Cotes and Gauss quadrature methods. Idea of minimax approximation. Numerical solution of ordinary differential equations; Euler, predictor - corrector and Runge-Kutta methods. Idea of stability.

Eigen-values and eigen-vectors by power and similarity transform methods. Matrix theory to support these numerical methods.

Textbook:

Turner P.R., Numerical Analysis (Macmillan 1994).

Reference:

Atkinson K., Elementary Numerical Analysis, 2nd ed (Wiley, 1993).

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

MA 366: PROGRAMMING LANGUAGES

Hours per week: 5

Prerequisite: MA 261

Objectives:

On completion of this subject students should be able to:-

1. Use a range of advanced concepts in Pascal,
2. Use the Prolog language.
3. Demonstrate an understanding of the role of compilers and how they work.

Syllabus:

Pascal syntax, simple, structured data types, control structures; functions, procedures. Abstract data types, information hiding, interface and implementation parts of a unit. Recursive procedures using factorial and tree operations.

Introduction to Prolog, clauses, rules, goals, backtracking, pattern matching.

Concurrent and sequential programming.

Idea of object oriented programming.

Introduction to compiling, syntax checking, production rules, symbol tables, infix and postfix form of expressions, polish notation, operand Stacks, Parsing, intermediate code generation. Error detection at compile and run-time.

Textbook:

Bal H. and Grune D., Programming Language Essentials (Addison-Wesley, 1994).

Reference:

Sethi R., Programming Languages: Concepts and Constructs (Addison-Wesley, 1989).

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

MA 367: SAMPLING AND SURVEY TECHNIQUES

Hours per week: 3

Prerequisite: MA264

Objectives:

On completion of this subject students should be able to:-

1. Design, administer and analyse questionnaires,
2. Demonstrate an awareness of some of the difficulties and biases which can occur in improperly designed questionnaires.

Syllabus:

Simple sampling, stratified, estimates, bias in sampling. Design of questionnaire. Data quality and errors in surveys, systematic sampling, cluster and double sampling. Imputation techniques.

Alternatives to household surveys. Design, implementation and analysis of a Sampling Survey project, including presentation of results using tables, graphs, charts etc. Use of specialised software for compilation of data, presentation of results, etc.

Textbook:

Barnett V., Sample Survey - Principles Methods (Edward Arnold, 1991).

Assessment:

Continuous Assessment - 60%,
Written Examination - 40% (1x3 hrs).

MA 369: INTRODUCTION TO COBOL

Hours per week: 3

Prerequisite: MA 160

Objectives:

The aim of this subject is to give the flavour of COBOL and enable students to modify and maintain COBOL programs. (Development of COBOL systems is rare in PNG).

On completion students should be able to:

1. Create top down designs, refine these and code these in a structured COBOL language.
2. Use the basic editing, filing and data structures in COBOL.
3. Use some COBOL utilities.

Syllabus:

Structure of COBOL and its syntax. The four divisions of COBOL. Design, coding and testing of a COBOL program. Detection of errors on input. File processing, arrays, loops. Control break processing. Use of COBOL Utilities.

Textbook:

Parkin A, et al, COBOL for Students, 4th ed (Arnold 1996).

Assessment:

Continuous Assessment - 50%
Written examination - 50% (1x3 hrs).

MA 461: LINEAR PROGRAMMING AND SIMULATION

Hours per week: 5

Prerequisite: MA365

Objectives:

On completion of this subject students should be able to:-

1. Recognise, formulate, model and solve various linear programming models with sensitivity analysis,
2. Simulate a variety of applications situations, devise performance measures and analyse the computed results.

Syllabus:

Linear algebra: idea of a vector space, linear dependence, basis, dimension, change of basis, linear transformations.

Modelling of a linear programming situation with various applications.

Formulation of linear programming model standard and canonical forms. Simplex algorithm. Duality and duality theorem. Two-phase method of solution and augmented form-revised simplex method. Sensitivity analysis. 0-1 variables.

Application to scheduling, transportation and mining problems and Knapsack problem.

Comparison of Simplex and Karmarkar's algorithms.

Simulation - Monte Carlo methods for integrals, variance reduction methods. Hand simulation of a queue.

Simulation language SIMIAN, modelling queues, transactions, attributes, facilities, multiple queues, branching. Transient and steady state behaviour. Little's result. Antithetic - variables. Formulate and analyse performance measures.

Planning and running experimental simulations, presenting the results and drawing conclusions.

Textbook:

Chvatal V., Linear Programming (Freeman 1983).
M371: Computational Mathematics (Open University, 1988 /2000).

Reference:

Morgan B.J.T., Elements of Simulation. (Chapman

and Hall 1984).

Assessment:

Continuous Assessment - 40%
Project - 20%,
Written Examination - 40% (1x3 hrs).

MA 462: OPTIMISATION

Hours per week: 4

Prerequisite: MA 365

Objectives:

On completion of this subject students should be able to:-

1. Use search methods to find local minimisers in one variable,
2. Use methods of optimisation, both unconstrained and constrained minimisers, and to demonstrate an understanding of the limitations of the several methods available and how these may be avoided,
3. Model and solve an optimisation application.

Syllabus:

Local and Global minima for a function of 1-variable. Numerical methods for stationary points. Search methods to find a local minimiser of a function of one variable: grid search, Golden Section, Quadratic search. Search for an interval. Minimising a function of two variables; classification of stationary points. Numerical methods for finding local minimisers: line search methods, alternating variables method, steepest descent, approximating the gradient vector, sensitivity analysis. Rosenbrock's function. Methods involving both gradient vector and Hessian matrix: Newton-Raphson method both with and without line searches. The Rank one method approximating the inverse Hessian matrix. Application to non-linear least squares problems. Optimisation with equality constraints: elimination methods, simple penalty function, practical difficulties. Lagrange multipliers and use of the Lagrangian function.

Multiplier penalty function method for equality constraints sensitivity.

Inequality constraints leading to the Kuhn-Tucker conditions (necessary but not sufficient).

Applications.

Textbook:

M371: Computational Mathematics (Open University, 2000).

Reference:

Fletcher R., Practical Methods of Optimization, 2nd ed (Wiley 1987).

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3 hrs).

MA 463: GRAPH THEORY AND APPLICATIONS

Hours per week: 5

Prerequisite: MA 365

Objectives:

On completion of this subject students should be able to:-

1. Recognise a practical situation where a graph theory method of solution is applicable,
2. Model, select and perform the graph theory solution using whichever algorithm is appropriate,
3. Use of error correcting codes.

Syllabus:

Introduction to graphs, digraphs, networks with capacities, flows and cuts; adjacency, cycles, bipartite graphs, edge colouring, Latin squares. Maximum matchings. Eulerian and Hamiltonian graphs, connectivity, Applications to electrical networks, braced frameworks, assignment scheduling. Hungarian algorithm, activity networks and PERT. Critical path analysis. Greedy algorithm. Minimum cut and maximum flow algorithms, labelling algorithms. Applications to scheduling, transportation and other network situations. Error-correcting codes: code, measure of error,

dimension, weight, parity check matrix, correcting errors, Hamming codes, cyclic codes.

Textbook:

Biges N., Discrete Mathematics (OUP, 1985).

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

MA 464: SCIENTIFIC PROGRAMMING WITH FORTRAN

Hours per week: 4

Prerequisite: MA 366

Objectives:

On completion of this subject students should be able to:-

1. Write Fortran programs,
2. Set up Fortran systems.

Syllabus:

Importance of Fortran? Topdown design and algorithm development.

Variables and their types - integer real, string. Conversions, Expressions. Do loop. IF... then... else. Syntax IF arithmetic with 3 labels for $> = < 0$. Input, output lists and formats. Use of arrays, functions and subroutines. Calling procedures use of Common blocks Equivalence. Double precision, logical and complex data types. Character manipulation File processing. Open and closing files Direct Access files.

Scientific and engineering applications. NAG library: scope and use. A full scale Fortran project will complete the subject.

Textbook:

Monro D.M., A Crash Course in FORTRAN 77 (Arnold, 1989).

Assessment:

Continuous Assessment - 30%,
Project - 20%,
Written Examination - 50% (1x3 hrs).

MA 465: ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS

Hours per week: 5

Prerequisite: MA 365

Objectives:

On completion of this subject students should be able to:-

1. Use polynomial approximation,
2. Model and solve initial value and two point boundary value problems,
3. Model and solve problems using partial differential equations.

Syllabus:

Polynomial interpolation and approximation, Newtonian and Hermite forms, Splines and B-splines. Rational approximations-Pade polynomials. One step and multi-step methods for ordinary differential equations. Analysis, Runge - Kutta methods.

Two point boundary value problems shooting methods, stability, global matrix methods.

Partial Differential Equations: elliptic problems how they arise in science and engineering, maximum principle, Dirichlet problems, classification into elliptic, parabolic and hyperbolic. Separable solutions using Fourier series and special functions, Analytic solutions using Green's functions.

Numerical solutions: five point formula, Neumann and mixed Neumann - Dirichlet problems. Non-rectangular regions, Richardson - extrapolation. Nine point formula. Solution of the resulting linear equations.

Case studies: a torsion problem and a heat conduction problem.

Parabolic equations, space and time discretisation, local discretisation error, Crank Nicolson method, stability. Theta method, stability. Case study of a cylinder heated outside.

Idea of characteristic solution for hyperbolic equations.

Textbook:

Gerald E.F. and Wheatley P.O., Applied Numerical Analysis, 5th ed (Addison-Wesley, 1994).

Assessment:

Continuous Assessment	- 40%
Project	- 20%,
Written examination	- 40% (1x3 hrs).

MA 466: DESKTOP PUBLISHING

Hours per week: 4

Prerequisite: MA 263

Objectives:

On completion of this subject students should be able to:-

1. Compare different desktop publishing packages and hardware support,
2. Design publications to include text, tables graphs and pictures including importing desktop materials of all kinds.

Syllabus:

What is DTP and the goal of DTP. Working under MS Windows. Text editing for DTP. Making bitmap and vector graphic files.

Introducing Page Maker-understanding the Page Maker window, toolbox.

Working with text: text tool, story editor, formatting paragraph, importing and flowing text, using styles, changing fonts, adding headers and footers, page setup, printing.

Working with graphics: importing graphics, using graphic tools, shade text, adding background for text.

Table editor. Working with big projects.

Textbook:

Bridges-Altman R., Mastering Page Maker 4 on the IBM PC (SYBEX, 1992).

Assessment:

Continuous assessment and project - 100%.

MA 468: OBJECT ORIENTED PROGRAMMING

Hours per week: 4

Prerequisite: MA 361

Objectives:

On completion of this subject students should be able to:-

1. Use objects,
2. Use encapsulation, inheritance and polymorphism,
3. Write code to define and manipulate array objects,
4. Write code to define and control windows objects,
5. Write simple programs in the windows environment.

Syllabus:

Philosophy of Object Oriented Programming. Objects, classes, and encapsulation. Inheritance. Polymorphism. Re-using code. Programming in the Windows (R) environment.

Textbook:

Bar-David T., Object Oriented Design for C++, (Prentice Hall, 1993).

Reference:

Myer B., Object-oriented Software Construction (Prentice-Hall, 1988).

Turbo Pascal User/Reference Manuals.

Assessment:

Continuous Assessment	- 40%
Written examination	- 60% (1x3 hrs)

MA 469: SOFTWARE ENGINEERING

Hours per week: 4

Prerequisite: IS 226

Objectives:

On completion of this subject students should be able to:-

1. Demonstrate an understanding of the software life cycle,
2. Use specification languages,
3. Design and manage and complete software project.

Syllabus:

The software life cycle, software development as

an engineering discipline. Requirement analysis and validation. System Specification: data flows, data dictionaries. Prototyping.

Yourdon Structured Method. Structure charts, symbols of the chart.

Transform analysis: afferent, transform, efferent controls, modularization.

V.D.M. specification language, formal specifications.

Programming: structure, modules, coupling, cohesion.

Software production: language, exception handling, concurrency.

Programming environment, testing - unit and system, test data, real data.

Project management, monitoring and control, software metrics, project planning.

Managing a project in practice executing the requirements analysis, system design, detailed design and implementation stages.

Textbook:

Sommerville I., Software Engineering, 4th ed (Addison Wesley, 1992).

Reference:

Casey C. A., Programming Approach to Formal Methods (McGraw Hill, 1994).

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

MA 471: COMPUTER GRAPHICS AND ANIMATION

Hours per week: 5

Prerequisite: MA 261

Objectives:

On completion of this subject student should be able to:-

1. Demonstrate knowledge of the basic concepts of computer graphics, transformations, vector and matrix methods in computer graphics,
2. Develop graphics displaying algorithms and programs,
3. Present computational efficiency in working

with computer graphics,

4. Demonstrate ability in computer animation.

Syllabus:

Two dimensional and 3D Cartesian coordinate systems: points, vectors and other objects in 3D; the observer (camera) and changing view; simple light definition.

The geometry of the computer screen: pixel and resolution, number of colors; RGB description of color; vector and bit images, Targa, PCX, TIF, BMP, GIF formats of graphic files.

Introduction to one of graphics programming languages (PovRay, Rayshade, Polyray, ART, DKBtrace), syntax of the basic scene description instructions (camera, coordinate systems, light, some fundamental primitives and pigments; short information about the environment: editor, compiling options.

Basic textures: defining RGB colors of objects, Phong values, bumps, color maps, predefined textures.

Transformations of objects in 3D space: translate, scale, rotate, transformations objects and textures, transformations order.

Solid finite primitives and its properties: spheres, boxes, cylinders, cones, torus, blob, height fields. Finite patch primitives: triangle and smooth triangle, discs, bicubic patches (Bezier surface).

Infinite solid primitives, plane, quadrics, cubic, quartics and polynomial surfaces.

Constructive solid geometry: inside and outside of object, union, intersection, difference, inverse and merge; advanced definitions of light sources: point lights, spotlights, area lights.

Advanced textures: color mapped patterns, image maps, pigment modifiers (turbulence, frequency and phase); surface modifiers: bumps, waves, etc.

Special effects: diffuse reflection (brilliance, crand graininess), specular reflection, layered textures, imitation of fog, surfaces generated by fractal methods (height fields, fractal landscapes).

Animation: key-frame and procedural animations, clock value, rendering series of frames, gluing series of frames into one movie file (one of formats FLI, FLC), displaying animation; the idea of behavioural animation and dynamic simulation.

Textbook:

Majewski M., Computer Graphics by Ray tracing

(Unitech, 1994).

Reference:

Vince J., 3D Computer Animation (Addison Wesley, 1992).

Mason D. and Enzman A., Making Movies on your PC (The Waite Group, 1993).

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

MA 472: REAL TIME SYSTEMS

Hours per week: 4

Prerequisite: MA 361

Objectives:

To provide an overview of Real Time Systems, what distinguishes them from conventional systems. To enable the use of specification, design and implementation tools and techniques. To provide a detailed examination of the classical concurrency problems, and practical experience of implementing device drivers.

On completion of this subject students should be able to:-

1. Explain the characteristics of real time systems in relation to distributed and parallel computing.
2. Specify the requirement of a real time system
3. Design a real time system using Yourdon Design Methodology
4. Use concurrency classical solutions to solve data and resource sharing problems.
5. Write device drivers.

Syllabus:

Characteristics of distributed, parallel and embedded systems. Real Time System attributes and issues, process control, reliability, verification, timing constraints, areas of application.

Design activities, Yourdon Systems Design Method for Real Time Systems: behavioural model, implementation model, state transition diagrams.

Concurrency and resourcing, Processes synchronisation and communication. Mutual

exclusion, semaphores, monitors, producers and consumers. The rendezvous, Dining philosopher problem.

Device drivers, interrupts and polling.

Textbook:

Burns A. and Wellings A., Real Time Systems and their Programming Languages, (Addison-Wesley, 1990).

Reference:

Oxford T., Concurrent Programming, (Wiley, 1989).

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3 hrs)

MA 473: KNOWLEDGE-BASED SYSTEMS

Hours per week: 5

Prerequisite: MA 261, MA 361, IS 226

Objectives:

To give students an application oriented introduction to knowledge-based systems (KBS).

On completion of this subject students should be able to:-

1. Decide on the suitability of a knowledge-based solution for a given problem.
2. Carry out a knowledge acquisition task.
3. Design knowledge representations and an inference engine for a given task.
4. Implement a knowledge-based solution using a shell.
5. Discuss how knowledge-based systems can be integrated with traditional computer systems.
6. Describe typical knowledge-based applications and discuss the potential of knowledge-based applications in the future.

Syllabus:

Knowledge Overview: What is knowledge? What is AI? Scope and limitations of knowledge-based Acquisition: Observation, interviews, use of protocols, selection of problems, expert programmer solutions, verification. Problems in

knowledge acquisition.

Knowledge Representation: Decision trees, rules, semantic nets, frames, uncertainty, fuzzy logic, meta rules.

Inferencing Techniques: Forward and backward chaining, Bayesian reasoning, case-based reasoning, machine learning.

Implementation: Use of a rule-based shell. Examination of the pros and cons of Prolog and Lisp, KRLs. Use of Prolog. Development of hybrid systems.

Applications: Examples will be taken from games, education, design support, customer support, medicine, geology, equipment configuration will be used to demonstrate search, classification, intelligent checklists, decision making/advice and problem solving. The future of KBS.

Textbook:

Jackson P., Introduction to Expert Systems, 2nd ed (Addison Wesley, 1991).

Reference:

Turban E. Expert Systems and Applied Artificial Intelligence, (Macmillan, 1992).

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

MA 474: COURSEWARE DEVELOPMENT

Hours per week: 4

Prerequisite: MA 261, MA 266, MA 361

Objectives:

On completion of this subject students should be able to:-

1. Analyse the learning requirements for a piece of courseware and design appropriate interactions for different types of learning.
2. Appreciate the importance of the user interface in effective courseware.
3. Distinguish the different types of courseware and explain what they are useful for.
4. Use an authoring system/language to implement a simple piece of courseware.
5. Describe the different types of media available

for courseware, and use them in simple ways to support courseware development.

Syllabus:

Prescriptive theories of instructional design: eg. Merrill's Component Display Theory and Keller's ARCS system.

User interface design for learning: Simple heuristics about complexity, and simplicity, evaluation of user interfaces in learning, and tools for interface design.

Types of courseware: drill and practice, directed tutoring (including hypermedia, multimedia and intelligent tutoring systems), simulations, educational games.

Implementation: Use of a suitable authoring tool such as Visual Basic, Toolbook, Macromind Director, or Authorware Professional.

Multimedia: text, graphics, sound, animations, digitised images, video, virtual reality. Storage devices: including, CD-ROM, Video Discs, CD-I, DVI, Photo-CD, Compression techniques.

A courseware project will form a significant part of the continuous assessment.

Textbook:

Alessi, S.M., and Trollip, S.R. Computer-Base Instruction, 2nd ed.(Prentice Hall, Englewood Cliffs, NJ 1991)

Reference:

Jonassen D.H., Instructional Designs for Microcomputer Courseware, (Lawrence Erlbaum Associates, 1988)

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

MA 475: ADVANCED DATABASE IN ACTION

Hours per week: 5

Prerequisite: MA 262, MA 265

Objectives:

To use and enhance the Database experience gained in earlier courses.

On completion of this subject students should be able to:-

1. Set up a Data Dictionary.
2. Design and set up a large-scale data base, subject to given constraints, rules and queries use normalisation and relational data base concepts.
3. Design and customize an application including help facility.
4. Manage Memo fields.
5. Design, build and distribute an application with multiuser access.

Syllabus:

Database environment, steps to creating a database including use of the integrity rules and normalisation. A complete example.

Need for a data dictionary setting up and using a data dictionary.

Calling in others modules and library routines including data validation and recital facility.

Template programing using Foxview; generating programs using text merge.

Handling date and time data.

Memo fields - design and use of these using memo files.

Report writing and printing techniques.

Review of SQL commands and programing.

Multiuser procedures and techniques including control of concurrent updating; deadlock.

Application - design build and distribution of a database built during this subject.

Introduction to Access and Oracle packages.

Textbook:

Olympia P.L and Cea K., Developing Foxpro 2.0 Applications, 2nd ed (Addison Wesley 1991).

Reference:

Date C.J., An introduction to Database Systems 5th ed (Addison Wesley 1991).

Assessment:

Continuous Assessment

(Including a project) - 50%,
Written Examination - 50% (1x3 hrs).

MA 476: HUMAN COMPUTER INTERFACE DESIGN

Hours per week: 5

Prerequisite: MA 261, MA 266

Objectives:

On completion of this subject students should be able to:-

1. Explain the problems of developing an effective user interface.
2. Analyse a problem for user interface requirements
3. Describe the different development methodologies used in human computer interface design
4. Apply user interface design techniques to a range of sample problems
5. Test and assess a user interface for usability
6. Use a prototyping tool.

Syllabus:

Psychological characteristics of users, types of user-computer interaction, interface models (analogies and metaphors), types of usability problem.

User population analysis, data flow analysis, data modelling, task analysis, context analysis.

User participatory design. Iterative development methods, evolutionary developments, prototyping, brainstorming. User support mechanisms (on-line help, documentation, etc).

Usability testing: timing, participants, metrics, checklists. Objective testing versus comparative testing. Formative and summative evaluation. Guidelines and standards for screen design, windows, menus, dialogue boxes buttons, and icons.

Implementation: Use of suitable prototyping tools, such as Visual Basic, Toolbook, Macromind Director, or Authorware Professional.

Textbook:

Cox K. and Walker D., User Interface Design 2nd ed (Prentice Hall, 1993).

Reference:

Preece J. et al, Human Computer Interaction (Addison Wesley, 1994).

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3 hrs).

MA 477: LINEAR PROGRAMMING

Hours per week: 5

Prerequisite: MA 365

Objectives:

On completion of this subject students should be able to:-

1. Formulate and solve linear programming problems.
2. Solve integer linear programming problems.
3. Solve transportation and network flow problems.

Syllabus:

Formulation of linear programming problems in the standard form, product mix problems.

The standard simplex algorithm, the two phase simplex algorithm, degeneracy and cycling, Bland's smallest subscript rule, the perturbation method, pivoting rules, the computational complexity of linear programming.

The duality theorem, complementary slackness conditions, primal-dual relationships, economic interpretation.

The revised simplex algorithm, the dual simplex algorithm, post optimality analysis

Integer linear programming problems: formulation, complexity and solution by branch and bound techniques.

Maximum flow problems: formulation as linear programming problems, solution by the augmenting path method, the maximum flow, minimum cut theorem, applications to processor scheduling and to open pit mining problems.

Transshipment problems: formulation as linear programming problems, solution by the network simplex method, transportation problems.

Textbook:

Chvatal V., Linear Programming (Freeman 1983)

Reference:

Taha H.A., Operations Research: An Introduction,

6th ed. (Prentice Hall, 1997)

Assessment:

Continuous assessment - 50%,
Written examination - 50% (1x3 hrs).

MA 478: FLOWS THROUGH NETWORKS

Hours per week: 4

Prerequisite: MA 461

Objectives:

On completion of this subject students should be able to:-

1. Apply the Max-flow Min-cut Theorem to some industrial problems such as the optimal selection of projects, and to job scheduling with pre-emption.
2. Solve instances of the Transportation Problem efficiently.
3. Apply the Critical Path Method to project scheduling (PERT-CPM).
4. Apply the Critical path Method to solve generalisations of the Assignment, Shortest Path and Transportation problems.

Syllabus:

Instances of the Maximum Flow Problem; Integral flows, Cuts in networks, Flow augmentation, Proof of the Max-flow Min-cut Theorem, The Maximum flow Algorithm of Ford and Fulkerson and its improvements, Applications to the problems of finding an optimal closure in a digraph and to scheduling with pre-emption.

The Shortest Path Problem: Dijkstra's Algorithm, the longest path problem and its intractability, Activity digraphs, The Critical Path Method, PERT-CPM.

The Network Simplex Algorithm; economic motivation, algebraic description, initialisation, decomposition into sub-problems, termination, cycling and its prevention, Applications to unweighted bipartite matching and to the scheduling of production and inventory.

The Minimum Cost Flow Problem; Algebraic formulation, complementary slackness conditions, the Primal-Dual Algorithm, Applications to the solution of generalisations of the shortest path, the

Hitchcock Transportation and Transshipment problems.

Textbook:

Taha H.A., Operations Research, 4th ed (MacMillan, 1987.)

Reference:

Lawler E.L., Combinatorial Optimisation: Networks and Matroids (Holt, Rinehart and Winston, 1976.)

Papadimitriou C.H. and Steiglitz K., Combinatorial Optimisation: Algorithms and Complexity (Prentice Hall, 1982.)

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

MA 479: SIMULATION

Hours per week: 5

Prerequisite: MA 364

Objectives:

On completion of this subject students should be able to:-

1. Understand and use Monte-Carlo methods and their applications.
2. Model a wide range of simulation applications, devise performance measures and use a 4GL computer language to perform the simulations.
3. Write reports summarizing the findings of a complete simulation modelling process and analysis of the results.

Syllabus:

Generation of pseudo-random numbers, Monte Carlo methods:- for integrals; variance reduction techniques: antithetic variables extraction of regular part; other applications.

Sampling from negative exponential, normal and histogram using their inverse cumulative distributions.

Queues, queue discipline, hand simulation of queues using sampling methods. Modelling queues: generation of transactions, facilities,

attributes, multiple queues.

Simulation language e.g. SIMIAN and its use to run simulation models. Transient and steady state behaviour. Use of preliminary analysis to determine equilibrium: utilisation of facilities, Little's result, expected waiting time, queue length. A number of practical situations, supermarket, banks, time-sharing computer network, airport formalities, ships coming to berths, football ground stands, etc. will be used as project material: involving modelling, formulation, preliminary analysis, performance measures, planning and running simulation experiments to optimise the situation; the project report will cover the work done with a presentation of the results and conclusions.

Textbook :

M371 Computational Mathematics (Open University, 2000)

Reference:

Morgan B.J., Elements of Simulation (Chapman and Hall, 1984).

Assessment:

Continuous Assessment - 40%,
Project - 20%,
Written Examination - 40% (1x3 hrs).

MA 480: COMPUTER AIDED DESIGN AND VISUALIZATION

Hours per week: 4

Prerequisite: MA 261, MA 471

Objectives:

To introduce the fundamental principles of Computer Aided Design and Visualization.

On completion of this subject students should be able to:-

1. Use at least one CAD program and understand the concepts of Computer Aided Design (Software-Microstation or Auto CAD)
2. Use at least one visualization tool: e.g. Model View or 3D Studio
3. Have a working experience of designing a 3D complex project -e.g. in Architecture or

- mechanical engineering
4. Visualize and animate a project

Syllabus:

Introduction to the specific CAD software interface - menus, options etc., viewing a design.
Drawing a 2D design - exterior and interior walls, architectural elements (doors, windows, stairs, etc.) .Labeling a design, using reference files.
Drawing in 3D.

Using a database (optional).

Viewing a CAD file using a visualization program
- view cone, shading the model. Tracing CAD files
- materials editor, setting sun position by time, location and date, lighting, quick trace.

Software specific environments – Model View: Pixie, Esher.

3D Studio:2D Shaper, 3 Loft . Animation of CAD projects - create keyframe list, animation of camera, declaring a specific path of animation, create hierarchy and relations between animated objects (inherited links, parent-child relations), object motion, producing final animation.

Software: any popular CAD software can be used, however preference should be given to the software which is standard in the marketplace: Intergraph (Microstation and ModelView) or Autodesk (AutoCAD and 3D Studio).

Reference:

Software Manuals

Assessment:

Continuous Assessment - 50%,
Projects - 50%.

MA 481: UNIX MANAGEMENT

Hours per week: 5

Prerequisite: MA 361, EE 343

Objectives:

On completion of this subject students should be able to:-

1. Apply the principles of system management, in a Unix environment, both in multi-user and single user environments.
2. Install both multi-user and individual Unix

- systems on networked personal computers.
3. Effect communications using Unix protocols.

Syllabus:

An overall view of the internal structure of Unix.

Comparison of the two main flavours of Unix (ATandT, Berkeley); Unix multi-user and in single user environments.

The installation of a Unix system. Installation of device drivers, hard discs and other peripherals, establishing a file system, printers. Building a boot disc and booting the system.

Connection to a network, TCP/IP, FTP, UUCP and modem. Use of the hosts file, NFS, Domain Name Server. Mail.

Terminal connection, serial ports and the terminfo/terncap databases, installing and using a graphical interface.

Unix system administration: installing new users, groups, monitoring users, disk quota restriction, monitoring system performance by consulting system logs, backing-up.

Inter-personal management skills for interacting with users, introducing naive users to the system and the need for local documentation.

Unix software ; availability and installation .

Textbook:

Abrahams P.W. and Larson B.R., Unix for the Impatient, 2nd ed (Addison-Wesley, 1995).

Nemeth E. et.al, Unix System Administration Handbook, 2nd ed (Prentice Hall, 1995).

Reference:

Tannenbaum A. S, Operating System Design and Implementation , (Prentice -Hall, 1987).

Assessment:

Continuous assessment - 30%
Examination - 70% (1x3 hrs).

MA 482: WINDOWS AND HYPERTEXT PROGRAMMING

Hours per week: 4

Prerequisite: MA 263, MA 361

Objectives:

On completion of this subject students should be able to:-

1. Write Visual Basic Windows application programs,
2. Write Excel and Access spreadsheet macros using Visual Basic, and
3. Write on-line information systems, incorporating text, graphics, search indexes and hypertext links.

Syllabus:

A short history of the Basic programming language. An introduction to the Windows API. The Windows Object Oriented philosophy. Windows as a multi-tasking environment. Event driven programming. Windows' controls. Using Visual Basic as a Windows' Resource Editor. The Visual Basic language. Creating simple Visual Basic applications which include menus, buttons, text and list boxes, and other standard Window's controls. Drawing draw text and graphics into a client window or picture box. Using standard Windows dialogs. Creating and using custom dialogs. Handling sequential files. Printing. Contrasting how Visual Basic and C++ use the Windows API.

Visual Basic as a macro language for Excel and Access. Creating spreadsheet macros.

Introduction to hypertext systems. Windows hypertext help. Using authoring tools to create Windows help and internet http web pages.

Reference:

On line Visual Basic, Spreadsheet Macro and Hypertext Authoring help
Gurewich N., Teach Yourself Visual Basic 5 in 21 Days, 3rd ed (Sams Publishing, 1995)

Assessment:

Continuous Assessment - 80%,
Written examination - 20% (1x3 hrs).

MA 483: ADVANCED NETWORKING AND INTERNET APPLICATIONS

Hours per week: 5

Prerequisite: MA 267, MA 362

Objectives:

On completion of this subject students should be able to:-

1. Describe the items of hardware needed to construct LANs, and to connect LANs and WANs together.
2. Demonstrate an understanding of different network protocols,
3. Debate the advantages and disadvantages of several commercial networking operating systems,
4. Use the internet to retrieve information,
5. Set up an internet web server.

Syllabus:

Network hardware: data media, network cards, routers, bridges, hubs, gateways, modems, and firewalls.

Network protocols: Comparison of different protocols, including Novell IPX, Microsoft Netbui, and Unix TCP/IP.

Network operating systems: Resource and application sharing, file and system security, system maintenance, platform independence. Client/Server architecture. Illustrations using several networking products, including Novell Netware, Microsoft NT, and Unix.

Internet applications: Mail applications, transferring files (ftp), search engines (e.g.:gopher, archie), using and creating internet web resource files.

Textbook:

Black U., Data Networks, 2nd ed (Prentice-Hall, 1992)

Reference:

Novell, Windows NT, Unix and other software manuals

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

MA 484: INDUSTRIAL DATABASE AND ORACLE

Hours per week: 4

Prerequisite: MA 262, MA 265

Objectives:

To introduce students to Relational Systems and Principles underlying such systems.

On completion of the subject students will be able to:-

1. Differentiate between relational and other databases.
2. Describe the various techniques by which data is physically arranged in stored database.
3. Set up a practical relational system.
4. Formulate queries in SQL and use Embedded SQL.
5. Describe the fundamentals of distributed computing.

Syllabus:

Basic Concepts: An overview of database management, an architecture for a database system, the internal level.

Relational Systems: Relational databases, the SQL language, Base tables, indexes, Simple Queries, Join Queries, Aggregate functions, Advanced features, Update Operation, Querying the system catalog, View definition, DML operations on views, Logical Data Independence, Advantages of views, Embedded SQL, Operations not involving cursors, Operations involving cursors, dynamic SQL.

Relational Model: Relational Data Structure; Domains, Relations, Relational databases. Relational Integrity Rules; Primary Keys, Entity Integrity Rule, Foreign Keys, Referential Integrity Rule, Foreign Key Rule. Relational Algebra, Relational Calculus.

Distributed Systems: Fundamental Principles, Problems of Distributed Systems; Query Processing, Catalog Management, Update Propagation, Recovery Control, Concurrency Control. Gateways.

Oracle implementation.

Textbook:

Coronel R., Database Systems (Wordsworth 1997).

Reference:

Date C.J., An Introduction to Database Systems, 5th ed (Addison- Wesley 1991)

Maier D., The Theory of Relational Databases (Computer Science Press).

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

MA 485: PRINCIPLES OF DISTRIBUTED PROGRAMMING

Hours per week: 4

Prerequisite: MA 361, MA 362

Objectives:

To introduce the fundamental principles of distributed computing and basic skills in distributed programming.

On completion of this subject students should be able to:-

1. Demonstrate an understanding of the differences between sequential, concurrent and distributed programming,
2. Demonstrate an understanding of basic forms of inter-process communication in distributed systems,
3. Develop distributed programs using monitors and rendezvous synchronisation in the UNIX operating system environment.

Syllabus:

The idea of concurrent and distributed programming; shared-memory and distributed memory multiprocessors; Shared-variable and message-passing communication.

Programming in shared memory, Mutual exclusion, Semaphores, Monitors.

Programming in distributed memory, Synchronous and asynchronous message passing, Client-server model, Rendezvous.

Concurrent and distributed programming UNIX environment, Multithreading, Remote procedure calls.

Elements of parallel programming.

Textbook:

M. Ben-Ari, Principles of Concurrent and Distributed Programming (PrenticeHall 1990).

Reference:

Tanenbaum A.T., Distributed Operating Systems (Prentice-Hall, 1995).

Assessment:

Continuous assessment - 50%,
Written examination - 50% (1x3 hrs).

MA 486: MULTIMEDIA AND WEB PUBLISHING

Hour per week: 4

Prerequisite: MA 466, MA 471

Objectives:

To introduce the fundamental principles of multimedia and WWW.

On completion of this subject students should be able to:-

1. Demonstrate knowledge of the basic concepts of local and distributed multimedia,
2. Develop graphic files appropriate for multimedia purposes,
3. Develop a compact multimedia applications, including educational presentations,
4. Setup a Microsoft WWW server and design WWW home pages.

Syllabus:

The general concept of local and distributed multimedia, differences between desktop publishing and multimedia publishing. Different multimedia components: graphics, video and sound. Examples of some multimedia.

Graphics files standards: GIF and animated GIF, JPG, PNG; animation files: Autodesk FLI/FLC, AVI; sound files WAV, MID formats appropriate for multimedia publishing.

Local multimedia design using one of the packages: Macromedia Director, Astound, Macromedia Authorware, etc.

Examples of educational multimedia presentations, esp. those using sound and video.

Edition of the HTML files with various links using Microsoft FrontPage editor, description of the basic commands of the HTML 3 language, Java script applets, building an WWW server using Microsoft Personal WWW Server, basic viewers

of WWW pages: Netscape or Microsoft Internet Explorer.

Virtual Reality concept, basic VRML commands, designing simple 3D virtual worlds, basic viewers of VRML sites.

Textbook:

Majewski M., WWW Publishing (Unitech 1998).
Wilson, S., World Wide Web Design Guide (Hayden Books, 1995),
Departmental textbooks and tutorials.

Assessment:

Continuous assessment - 100%.

MA 488: ANALYSIS OF ALGORITHMS

Hours per week: 4

Prerequisite: MA 463 or equivalent

Objectives:

To introduce the main complexity classes of algorithms and some of the techniques used in analyzing the complexities of algorithms.

On completion of this subject students should be able to:-

1. Distinguish polynomial time from exponential time algorithms,
2. Bound the complexities of some of their own algorithms,
3. Appreciate the complexity classes P, NP, co-NP, NP-complete and the significance of the P = NP question.
4. Recognize instances of the well known NP-hard problems.

Syllabus:

Decision problems, Languages, computability and decidability.

Time and space growth of computations, bounds on the asymptotic growth of functions.

Analysis of the complexities of the standard sorting, matrix multiplication and graph recognition algorithms.

Polynomial Equivalence, the Classes P and NP, the Satisfiability Problem, NP-complete problems.

Primality Testing, complements of NP-complete problems, the class co-NP, the NP = co-NP

question.

Heuristics and other techniques of solving NP-complete problems, performance guarantees for approximation algorithms.

Textbook:

van Leeuwen T. (Editor), Handbook of Theoretical Computer Science: Algorithms and Complexity, (Elsevier, 1990).

Reference:

Aho A.V., et al, The Design and Analysis of Computer Algorithms (Addison-Wesley, 1974).

Assessment:

Continuous Assessment	- 50%
Written Examination	- 50% (1x3 hrs).

MA 492: MICROCOMPUTER HARDWARE

Hours per week: 4

Prerequisite: PH 112, ED 343, ED 312

Objectives:

This subject takes both a theoretical and hands on approach to microcomputer hardware, looking particularly at recent trends and standards.

On completion of the subject students should be able to:-

1. Identify and explain the purpose of the components on a microcomputer motherboard.
2. Identify and explain the purpose of various peripheral devices used with microcomputers.
3. Demonstrate an understanding of terminology and standards associated with the central processor, memory and the system bus.
4. Demonstrate an understanding of the terminology and standards associated with expansion buses and peripheral components.
5. Recommend hardware required for specific computer applications, in particular file server applications.
6. Diagnose and replace user-serviceable parts of a faulty microcomputer.

Syllabus:

This subject will cover performance, standards,

compatibility and maintenance issues associated with current micro-computer technology, in particular looking at the following areas:

System boards: The microprocessor, cache and main memory, BIOS, chipsets, system and expansion buses, peripheral ports.

Peripheral Components: Networking, DVD/CD, Sound, Video, Modem, SCSI, Tape and Disk storage, printers, monitors, power supplies.

Reference:

Rosch W.L., Hardware Bible (5th Edition), (QUE Publications, 1999, plus associated web site).

Assessment:

Continuous Assessment	- 50%
Written Examination	- 50% (1x3 hrs).

MA 494: PROGRAMMING IN JAVA

Hours per week: 4

Prerequisite: MA 361

Objectives:

On completion of this subject students should be able to:-

1. Demonstrate the relationship between Java and the programming languages C++ and C#.
2. Write Java application programs.
3. Describe and incorporate objects using public and private data and functions into an Object Oriented Java program.
4. Write Internet application programs using Java beans and Java applets.

Syllabus:

History and development of the Java programming language.

Java syntax: Data types, operators, control statements, file input/output, scope, functions, classes and objects.

Using the Java library.

The Java philosophy: Bytecode and program portability.

Java Applications: Developing programs using the JDK and RAD Windows Java environments.

Introduction to Java applets and Java beans.

Server and client side applications on the Internet.

Textbook:

On-line materials.

Reference:

Schildt H., Java 2: The Complete Reference 4th ed (Osborne/McGraw Hill, 2001).

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3 hrs).

POST GRADUATE SUBJECTS

MAP 161: MATHEMATICS CE (A)

Hours per week: 2

Prerequisite: MA 335

Objectives:

To give the students additional mathematical knowledge, beyond the scope of mathematics provided in their first degree studies.

On completion of this subject students should be able to:-

1. Derive equations of planes, tangents and normal in 3D,
2. Define functions as one-to-one mappings,
3. Give an epsilon-delta definition of continuity,
4. Perform advanced differentiation and integration,
5. Find Taylor series of functions,
6. Test series for convergence,
7. Perform partial differentiation,
8. Differentiate and integrate numerically,
9. Solve 1st and 2nd order ordinary differential equations with constant coefficients.

Syllabus:

Co-ordinate Geometry: simple co-ordinate systems, planes, tangents, normalize, curve sketching.

Calculus: functions, limits, continuity, advanced differentiation and applications, implicit functions, mean value theorem, l'Hopital's rule, series, convergence tests, Taylor series.

Partial differentiation and applications, integration by parts, substitution, partial fractions and applications. Simple numerical differentiation and integration, Trapezoidal Rule, Simpson Rule, Euler Rule. Ordinary differential equations, formulation from physical problems, first-order and second-order constant coefficient equations, numerical methods.

Textbook:

Spencer A.J.M. et al, Engineering Mathematics, Vol.1 (Van Nostrand-Reinhold, 1977).

Assessment:

Continuous Assessment - 50%,
Written examination - 50% (1x3 hrs).

MAP 162: MATHEMATICS CE (B)

Hours per week: 2

Prerequisite: MAP 161

Objectives:

On completion of this subject students should be able to:-

1. Solve sets of linear equations using Gauss methods with error and conditioning
2. Manipulate matrices and determine eigen-values and eigen-vectors,
3. Understand complex numbers and their applications to engineering; use of de Moivre's theorem,
4. Find roots of algebraic equations,
5. Use numerical methods to solve problems in one and two variables,
6. Perform descriptive statistics for the centre and spread of data, t- and other statistical tests, correlation and regression.
7. Solve probability problems using Binomial, Poisson and Normal distributions.

Syllabus:

Algebra: Sets of linear equations and matrices, matrix manipulation, determinants, linear dependence, consistency and solution of simultaneous equations, Gauss elimination, pivoting. Eigen-value problem. Vector algebra, with applications to geometry. Complex numbers, de Moivre's

theorem. Roots of algebraic equations, Remainder theorem, basic interaction, Newton-Raphson, secant methods. Finite differences and interpolation. Numerical methods for differential equations.

Statistics: Classification of data, continuous, and discrete variates, histograms, etc. Mode, median, mean, variance/standard deviation. Statistical tests ,correlation, regression.

Probability: Introduction to Binomial, Poisson and Normal distributions and their applications in engineering situations..

Textbook:

Spencer, A.J.M. et al, Engineering Mathematics, Vol.1 (Van Nostrand-Reinhold, 1977).

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3 hrs).

MAP 51: REAL ANALYSIS

Hours per week: 4

Objectives:

On completion of this subject students should be able to:-

1. Apply the knowledge of limits to continuity, differential calculus and Integral calculus
2. Determine convergence of Infinite series and infinite integrals.
3. Evaluate line, surface and volume integrals,
4. Evaluate scalar and vector products; gradient, divergence and curl of vectors. Physical applications.
5. Apply the theorems of Gauss, Green, and Stokes to differential geometry, vector calculus and problems in mathematical physics,
6. Use Taylor's theorem with remainder term to solve problems in functions several variables including analytic solutions of partial differential equations.

Syllabus:

Countability of rational and real numbers, quadratic surds, The continuum, the subsets of real numbers. Definition of a limit, applications, tests for convergence of infinite series. Applications to

series solutions of differential equations.

Limits of functions of a continuous variable, continuous and discontinuous functions, Heine-Borel theorem. Continuous functions of several variables.

Differential calculus, general theorems concerning derivatives, Rolle's theorem, the mean value theorem.

Integral Calculus, general theorems concerning integration, Areas and lengths of plane curves, definite integrals.

Differentiation of functions of several variable, small increment problems, the mean value theorem for two variables. Taylor's theorem for several variables including remainder, application to maxima and minima.

Infinite integrals, absolutely and conditionally convergent infinite integrals. Infinite products: applications and convergence.

Definition, evaluation and transformations of multiple integrals, curves and arc length, surfaces and surface area; Use of Cartesian, spherical and cylindrical co-ordinates, multiple integration of vector functions. Integrals over curves and surfaces, differential forms, vector analysis, theorems of Green, Gauss and Stokes.

Idea of partial differential equations, total derivative, analytic solutions.

Textbook:

Buck R.C., Advanced Calculus (McGraw Hill, 1980).

Spencer A.J.M. et al, Engineering Mathematics, Vol.1 (Van Nostrand-Reinhold, 1977).

Assessment:

Continuous Assessment - 40%
Written Examination - 60% (1x3hrs).

MAP 52: LINEAR ALGEBRA

Hours per week: 4

Objectives:

On completion of this subject students should be able to:-

1. Perform standard vector algebra and find inner products,
2. Determine whether a given set of vectors is

- linearly independent .
- Find eigen-values and eigen-vectors and apply them to the solution of problems involving differential equations and matrices,
 - Find the matrix associated with a linear transformation.
 - Find a transition matrix with a change of basis,
 - Construct an orthonormal basis for an n-dimensional inner product space.

Syllabus:

Review of Matrix Algebra and determinants.

Vector Spaces: Fields, vector spaces, linear dependence, linear independence, basis, dimension, vector norms and inner products.

Linear Transformations: definition, the matrix of a linear transformation, transition matrix and change of basis.

The eigen-value Problem: eigen-values and eigen-vectors, Gram-Schmidt Orthogonalization process, Jordan's canonical form.

Applications chosen from the following plane geometry, equilibrium of rigid bodies, graph theory, theory of games, Markov chains, Leontiff economic models, forestry management, and computer graphics.

Textbook:

Anton, H. and Rorres, C., Elementary Linear Algebra, 6th ed (Wiley, 1991).

Reference:

Spencer A.J.M. et al, Engineering Mathematics, Vol.1 (Van Nostrand-Reinhold, 1977).

Assessment:

Continuous Assessment	- 40%
Written Examination	- 60% (1x3 hrs)

MAP 53: OPERATIONS RESEARCH

Hours per week: 4

Objectives:

To introduce students to computation mathematical methods of solution.
On completion of this subject students should be able to:-

- Solve single non-linear equations and linear and non-linear systems of equations,
- Formulate and solve linear and integer programming problems,
- Determine the minimiser of non-linear multivariate functions both with and without constraints,
- Simulate both simple and multiple server queues and apply performance measures.
- Model practical problems using computer applications.

Syllabus:

Simple iteration: Secant and Newton-Raphson methods, convergence using the contraction mapping theorem. Acceleration methods, ill-conditioning and induced instability. Systems of linear and non-linear equations, LU decomposition. Vector and Matrix norms. Iterative refinement. Ill-conditioning, induced instability. Direct and iterative methods to be analysed for stability.

Linear and integer programming: simplex method, duality, phase 1- phase 2 methods, sensitivity analysis and economic interpretation of results. Branch and Bound method and applications to scheduling, mining and small business problems. Karmarkar's algorithm.

Optimisation: minimising a function of several variables, search methods (grid, golden section, quadratic) alternating variables, steepest descent. Sensitivity analysis, Newton-Raphson, Davidon-Fletcher-Powell and other quasi-Newton methods. Minimisation with one or more constraints either inequality or equality constraints. Applications to pipe laying and marine populations.

Simulation: pseudo-random numbers, use of inverse cumulative distribution to sample from a probability distribution. Simple and multiple queues and their simulation using the language SIMIAN; simulation experiments - planning and performing these in relation to specific situations and producing recommendations based on the simulation's results. Performance measures.

The subject will be supported by computer packages in each area. No direct knowledge of programming is needed. The packages run under the GEM environment.

Reference:

M371: Computational Mathematics (Open University, 1988).

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3hrs).

MAP 54: PROBABILITY AND STATISTICS

Hours per week: 4

Objectives:

To introduce students to fundamental concepts of probability and statistics and to use a statistical package for statistical calculations.

On completion of this subject students should be able to:-

1. Use the terms: experiment, outcome, event, relative frequency, probability, independent experiments, conditional probability, and random variable,
2. Calculate probabilities associated with experiments with discrete and continuous outcomes,
3. Construct discrete and continuous probability distributions, and cumulative probability distributions,
4. Derive and use the Binomial, Poisson and Normal distributions, and be able to calculate the moments of these distributions,
5. Use descriptive statistics, and graphical and tabular presentation of data, effectively apply tests of significance for single populations,
6. Apply tests of significance for the difference between means of two or more populations using t-tests and analysis of variance,
7. Construct contingency tables, and perform tests of independence and goodness of fit,
8. Calculate correlation coefficients and linear regression line formulas, and perform tests of hypothesis on them.

Syllabus:

Probability: Experiments, outcomes, events, relative frequencies, independent experiments, conditional probability, random variables, discrete and continuous probability distributions, cumulative probability distributions, Binomial, Poisson

and Normal distributions, moments of distributions.

Statistics: Revision of descriptive statistics and graphical presentation of data. Point estimates for mean and standard deviation of Normal populations, tests of significance, the Student's t and Chi-squared distributions, interval estimates of mean and standard deviation, the F-distribution and test, comparison of variances, contingency tables and tests of goodness of fit, analysis of variance, correlation and linear regression. Some relevant applications: Analysis of experiments; Latin squares, comparison of treatments. Survey design, sampling and analysis.

Reference:

Miller I. and Freund J.E., Probability and Statistics for Engineers and Scientists (Prentice-Hall, 1994).
Walpole R.E. and Myers R.H., Probability and Statistics for Engineers and Scientists, 5th ed (Macmillan, 1993).

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3 hrs).

MAP 55: SIGNIFICANT ASPECTS OF COMPUTER SCIENCE

Hours per week: 4

Prerequisite:

Working knowledge of a high level programming language.

Objectives:

On completion of this subject students should be able to:-

1. Use the terminology and basic operating principles of a central processor,
2. Describe how the central processor communicates with peripheral equipment,
3. Demonstrate an understanding of the role of the Operating System,
4. Create algorithms and write programs using a modern programming style,
5. Develop data structures and use them in programs,
6. Write macros to operate inside an applications

program,

7. Demonstrate an understanding of the basics of data base design and development.

Syllabus:

Processor architecture: Bits, bytes, words, computer logic, control, memory. Machine code, assembly code, high level languages, 4th generation languages.

Peripheral Equipment: Input and output devices, addresses, interrupts. Fetch-execute cycle.

Operating system: File organisation, single/multi user systems, single/multi tasking.

Program design: Top down design, structure, modularity, scope of variables.

Data structures: Pointers, arrays, strings, lists and operations on them.

Data bases: Flat files and relational databases. Theory of data base design.

Additional topics: Macro programming. Expert systems. Computability.

Reference:

Date C.J., An Introduction to Database Systems, 5th ed (Addison Wesley, 1991).

Stubbs D.F. and Webre, N.W., Data Structures with Abstract Data Types and Pascal (Brooks-Cole, 1985).

Tanenbaum A.S., A structured Computer Organisation (Prentice Hall, 1990).

Assessment:

Continuous Assessment	- 50%
Written Examination	- 50% (1x3 hrs).

MAP 56: GRAPH THEORY AND APPLICATIONS

Hours per week: 4

Prerequisite: MAP 52

Objectives:

On completion of this subject students should be able to:-

1. Recognise and model real-life problems using Graph Theory,
2. Select, design and use appropriate graph algorithms to solve the problems so modelled.

Syllabus:

Graphs and sub graphs, the graph isomorphism problem, graph representation, trees, bipartite graphs.

Connectivity, Cayle's Formula, The Shortest Path problem, The Connector Problem, Construction of Reliable Communication Networks.

Eulerian Graphs, Hamilton Cycles, The Chinese Postman Problem, The Travelling Salesman Problem.

Matching edge-colourings, The Personnel Assignment Problem, Vizing's Theorem, The Timetabling Problem.

Independent sets, cliques, chromatic number, Brook's Theorem.

Planar graphs, Euler's Formula, Kuratowski's Theorem, The Four Colour Theorem.

Digraphs, di-connectivity, Networks, The Maximum Flow Problem, The Max-Flow Min-Cut Theorem, Minimum Cost Flows.

Textbook:

Bondy J.A. and Murty U.R.S., Graph Theory With Applications (North Holland, 1976).

Assessment:

Continuous Assessment	- 50%
Written Examination	- 50% (1x3 hrs).

MAP 57: SPECIAL FUNCTIONS AND METHODS OF MATHEMATICAL PHYSICS

Hours per week: 4

Prerequisite: MAP 74

Objectives:

On completion of this subject students should be able to:-

1. Use methods of mathematical physics to solve ordinary and partial differential equations,
2. Use and manipulate special functions of mathematical physics,
3. Use orthogonal expansions to solve differential equations.

Syllabus:

Fourier Series and convergence.

Laplace and Fourier transforms, inversion theorem. Dirac delta function. Convolution theorem. Applications to problems in Mathematical Physics. Idea of Asymptotic expansion; Contour Integral solutions of differential equations. Method of steepest descents and stationary phase.

Solutions of Differential Equations: Series solutions methods. Frobenius case. Bessel function and Legendre functions. Integral forms of these functions.

Hyper geometric functions: relations between different types. Solution of differential equations in terms of singularities, regular and irregular singularities. P-scheme.

Partial Differential Equations: Laplace and Wave equation; solutions in terms of cylindrical and polar coordinates.

Applications to problems in heat transfer, waves (on cylinders), potential theory.

Idea of an orthogonal set of functions, expansion in terms of orthonormal functions. Use to solve differential equations.

Textbook:

Carrier F. et. al, Functions of a Complex Variable (Mcgraw Hill 1966)

Assessment:

Continuous Assessment	- 50%
Written examination	- 50% (1x3 hrs).

MAP 58: NUMERICAL METHODS

Hours per week: 4

Prerequisite: MAP 51

Objectives:

On completion of this subject students should be able to:-

1. Solve non-linear equations and systems of equations,
2. Use numerical methods for approximation and integration,
3. Solve ordinary and partial differential equations by numerical methods,
4. Estimate errors and assess well-and ill-conditioning.

Syllabus:

Roots of transcendental and non linear equations. Systems of non- linear equations.

Approximation methods; Lagrange, Splines, Chebyshev, minimax. Integration: Newton-Cotes formulae, Gaussian Quadrature, Chebyshev. Adaptive integration.

Matrix methods for eigen-values and eigenvectors: Power method with shifting and inverse methods. QR methods. Householder transformation.

Differential Equations: predictor corrector methods, Runge-Kutta methods, global and local errors and error propagation. Adams methods.

Partial Differential Equations: five point and nine point formulae for Laplace and Poisson type equations. Crank-Nicholson and other finite difference methods. Solution of practical problems in heat flow, electrostatics and fluid flow problems.

Idea of finite element methods of solution for elliptic and parabolic equations.

Textbook:

Curtis G.F. and Wheatley P.O., Applied Numerical Analysis, 5th ed. (Addison Wesley, 1994).

Reference:

Atkinson, K.E., An Introduction to Numerical Analysis (Wiley, 1978).

Assessment:

Continuous Assessment	- 50%,
Written Examination	- 50% (1x3 hrs).

MAP 59: MECHANICS AND FLUID DYNAMICS

Hours per week: 4

Objectives:

On completion of this subject students should be able to:-

1. Apply the laws of motion to particles and rigid bodies,
2. Calculate the fluid pressure on bodies inside a liquid,
3. Represent simple flows in terms of sources, doublets, vortices and uniform flows,

4. Apply Bernoulli's and Navier -Stokes equations in practical situations,
5. Use dimensional analysis.

Syllabus:

Mechanics: Statics: Definitions, units, equilibrium conditions, friction, virtual work.

Dynamics: Newton's laws of motion, Applications, principle, momentum, impulse, moment of inertia, work and energy. Rotation, general plane motion.

Hydrostatics: hydrostatic forces on plane surfaces, curved surfaces and floating bodies, manometry, pressure distribution in a liquid, centre of pressure.

Fluid properties: viscosity, compressibility, surface tension. Velocity field, continuity, pressure, density, 2-dimensional flow of incompressible, inviscid fluids, Bernoulli's equation of motion, boundary conditions, stream function, stream lines, velocity potential, Flow past solid bodies, use of uniform flow, source and doublet elements to model flows.

Flow through pipes, open channels, weirs and apertures. Vortex flows and effects of viscosity; vorticity theorem and circulation, applications.

Navier-Stokes equations, introduction to viscous flow, special solutions of viscous flow problems. Use of dimensional analysis, Reynolds number. Compressible fluid flows, idea of lift and drag of aerofoils.

Waves: introduction to waves on strings, standing waves, D'Alembert's solution, gravity waves, waves on beaches, tsunamis.

Textbook:

Patterson A., A First Course in Fluid Dynamics (C.U.P., 1982)

Reference:

Robertson J.A. and Crowe, C.T., Engineering Fluid Mechanics, 2nd ed (Houghton-Mifflin, 1980).

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

MAP 60: OBJECT ORIENTED PROGRAMMING

Hours per week: 4

Prerequisite: MAP 62

Objectives:

On completion of this subject students should be able to:-

1. Demonstrate an understanding of the ideas of object oriented programming,
2. Develop data structures using objects and classes,
3. Design and write programs using the idea of object oriented programming,
4. Understand the object oriented software technology.

Syllabus:

Object-Oriented Programming Basics: basic concepts, classes and objects, messages, methods.

Advanced issues: dynamic objects and methods, constructors and destructors, dynamic versus static objects, dynamic binding and polymorphism, exporting classes, assigning objects, arrays of objects, compound classes and objects, accessing subclasses.

Illustration of object oriented programming using classes that model objects familiar to the computer user, such as the screen, windows, the cursor. Data structures with objects: file objects, array objects, list objects, stack objects, applications of inheritance, vector and matrix objects, polynomial objects.

One of the following three examples as an illustration of advanced object oriented programming issues and data structures with objects.

Linear regression objects: linearized regression, regression classes, enhanced-precision class, linear regression class.

Electrical circuit objects: the simplest circuit, series of resistors, mixing series and parallel resistors, circuit objects.

Calculator objects: the basic calculator, the scientific calculator and financial calculator objects.

Textbook:

Bar-David T., Object Oriented Design for C++ (Prentice-Hall 1993)

Reference:

Shammas N.C., Object-Oriented Programming With Turbo Pascal (Wiley, 1990).
Collins W.J., Data Structures: An Object-Oriented Approach (Addison-Wesley, 1992)
Ezzell B., Object-Oriented Programming in Turbo Pascal 5.5 (Addison-Wesley, 1989).

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3 hrs).

MAP 61: DATA COMMUNICATIONS AND NETWORKING**Hours per week: 4****Objectives:**

to expose the students to the fundamentals of computer networks and the principles of their use and security.

On completion of this subject students should be able to:-

1. Specify the advantages of networking,
2. Understand the ISO Open Systems Interconnection 7 layer model,
3. Choose, set up, evaluate, and manage a local area network,
4. Use local area and Internet network services.

Syllabus:

The Telephone Network principles and topologies, Exchanges, PABX. Synchronous and asynchronous communication modes.

Packet Switching, Packet assemble and disassemble.

International Standards Organisation Open Systems Interconnection 7 Layer Model. Physical, Data Link, Transport, Network, Session, Presentation, and Application layers.

Network Security principles, Network Topologies, Local Area Networks, Wide Area Networks.

Novell network and its services. System configuration, file transfer, users, accounts, applications, integrity, e-mail.

The Internet and its services: History, gopher, TCP-IP, World Wide Web, Wide Area Information Service,

Textbook:

Black U., Data Networks, 2nd ed. (Prentice-Hall, 1992).

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

MAP 62: COMPUTER PROGRAMMING**Hours per week: 4****Objectives:**

To extend students programming competence beyond traditional textbook style examples. To introduce programming techniques to solve complex problems. To provide an appreciation of programming styles other than imperative programming.

On completion of this subject students should be able to:-

1. Use all of the features of standard Pascal in the solution of programming problems,
2. Understand and use recursion, abstract data structures, and access external libraries - including O.S. routines,
3. Program and run simple programs using functional (lisp), declarative (Prolog), and object oriented programming (Turbo Pascal) models.

Syllabus:

Revision of basic Pascal features. Introduction to further Pascal constructs: functions, sets, and pointers.

Use of mini project to consolidate programming ideas, and provide basis for discussing the needs of "programming in the large".

Concepts of modularity: data hiding, data abstraction, libraries, modular programming, and finally simple object oriented programming - implementation using Turbo Pascal units.

Implementation of abstract data structures using different implementation methods (including stacks, queues, lists and trees).

Implementation of pure functional programs using Pascal, followed by implementation of the same programs in Lisp. Implementation of simple declarative programs using Prolog.

Textbook:

Buchanan W., Mastering Pascal and Delphi Programming (Macmillan, 1998).

Reference:

Dale N. and Lilly S., Pascal plus data structures, 2nd ed. (Heath, 1985).

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3 hrs).

MAP 63: OPERATING SYSTEMS**Hours per week: 4****Objectives:**

On completion of this subject students should be able to:-

1. Demonstrate an understanding of operating system kernel structure,
2. Write batch files,
3. Exploit memory management,
4. Appreciate job and process scheduling,
5. Distinguish between single-user and multi-user operating system services and requirements.

Syllabus:

Single and Multi-user kernel Structures, hardware software interface, instruction interpreter, job scheduling, I/O, virtual memory, memory management, paging.

Search paths and environment variables, virus protection, disk caching, memory management, high and extended memory. Script programs.

LAN operating systems: Security considerations, directory conventions, resource sharing.

Operating system shells: The Windows graphical interface, multi-tasking.

WAN: UNIX file structure, directories, processes and scheduling, shells, e-mail, writing shell scripts.

Textbook:

Silberschatz A. Peterson, J. and Galvin P., Operating Systems Concepts, 5th ed (Addison-Wesley, 1991).

Reference:

Dietel H.M., An Introduction to Operating System, 2nd ed. (Addison-Wesley, 1992).

Assessment:

Continuous Assessment - 50%,
Written Examination - 50% (1x3 hrs).

MAP 64: DATABASE DEVELOPMENT**Hours per week: 4****Objectives:**

To develop students' practical expertise in the use and development of database programs and to understand the theoretical basis of a relational database.

On completion of this subject students should be able to:-

1. Identify information necessary for the application,
2. Construct Entity-Attribute Relation (EAR) models and on-line Database files,
3. Normalise an EAR model,
4. Create queries and reports on the data,
5. Design and write database programs using a database programming language, SQL.

Syllabus:

What is a database? Motivation for using a database. Entities, attributes and relations between them. Converting user requirements to an EAR model. External, conceptual and internal levels of architecture. Normalising the EAR model. Data manipulation by means of SQL instructions.

Queries and reports, use of FoxPro to create and manipulate relations within a database. Other packages: Oracle, Paradox, CASE tools.

Database administration, data integrity and security, data dictionary, distributed database.

Textbook:

Date C.J., An Introduction to Database Systems Vol. 1, and Vol 2, 5th ed (Addison Wesley, 1991).

Reference:

Gorman J. and McDonald C., A Tutorial Introduction to FoxPro (1991).

Assessment:

Continuous Assessment	- 50%
Written Examination	- 50% (1x3 hrs).

MAP 65: SOFTWARE ENGINEERING**Hours per week: 4****Prerequisite: MAP 62 or equivalent****Objectives:**

To develop skills in the use of software engineering techniques, and software tools.

On completion of this subject students should be able to:-

1. Describe the concept of software engineering, the phases of the software life cycle, and the different tasks that are carried out during a software project,
2. Use software engineering techniques to develop requirements documents, write specifications, analyse and design medium-scale pieces of software,
3. Demonstrate skill in the use of software tools to support the different stages of the software life cycle,
4. Describe different ways of achieving, verifying and testing the quality of a piece of courseware.

Syllabus:

Life cycle: The stages of the software life cycle, different techniques used at each stage, and outline problems typical of each stage.

Requirements analysis: purpose, levels and approaches to analysis, prototyping, specification, practical exercises.

Types of analysis and design: The purpose of analysis and design, tree and graph notations, structured analysis and design (e.g. SSADM, Yourdon), object oriented analysis and design (Coad and Yourdon), data driven analysis and design (Jackson). Use of case studies to support understanding and application of these techniques. Discussion of software tools to support analysis and design.

Implementation, testing and maintenance: Modularity, coupling, cohesion, data abstraction, procedural abstraction. Testing techniques and

strategies. Practical exercises to test a large system. Management of maintenance projects.

Project management: purpose of project management, estimating techniques, monitoring techniques, human resource issues, quality assurance, and quality control. Use of project management software.

Textbook:

Pressman R., Software Engineering: A practitioner's approach (1992).

Assessment:

Continuous Assessment	- 50%
Written Examination	- 50% (1x3 hrs).

MAP 66: ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS**Hours per week: 4****Prerequisite: MAP 62****Objectives:**

To give students an application oriented introduction to knowledge-based systems (KBS).

On completion of this subject students should be able to:-

1. Decide on the suitability of a KBS solution for a given problem,
2. Design knowledge representations and an inference engine for a given task,
3. Implement a knowledge-based solution in a shell,
4. Discuss AI techniques and their implementation using Prolog,
5. Describe typical AI applications and the potential of AI in the future.

Syllabus:

Overview: What is knowledge? What is AI? Scope and limitations of knowledge-based techniques. Life cycle of KBS.

Knowledge Acquisition: Observation, interviews, use of protocols, selection of problems, expert programmer solutions, verification. Problems in knowledge acquisition.

Knowledge Representation: Decision trees, rules, semantic nets, frames, uncertainty, fuzzy logic,

constraints, meta rules.

Search and Inferencing Techniques: Forward and backward chaining, tree and graph searching (simple searches, hill climbing, means end), constraints, case-based reasoning, machine learning.

Implementation: Use of a rule-based shell. Examination of the pros and cons of Prolog and Lisp, KRLs. Use of Prolog.

Applications: Examples will be taken from games, education, design support, customer support, medicine, geology, equipment configuration will be used to demonstrate search, classification, intelligent checklists, decision making/advice and problem solving. The future of KBS.

Textbook:

Turban E., Expert Systems and Applied Artificial Intelligence (Macmillan, 1992).

Reference:

Ginsberg M., Essentials of AI (Morgan Kaufmann, 1993).

Jackson P. Introduction to Expert Systems (Addison Wesley, 1991).

Assessment:

Continuous Assessment - 50%

Written Examination - 50% (1x3 hrs).

MAP 67: ANALYSIS OF ALGORITHMS

Hours per week: 4

Prerequisite: MA 463 or equivalent

Objectives:

To introduce and use the main complexity classes of algorithms and the techniques used in analysing the complexities of algorithms.

On completion of this subject students should be able to:-

1. Distinguish polynomial time from exponential time algorithms,
2. Bound the complexities of their own algorithms,
3. Appreciate the complexity classes P, NP, co-NP, NP-complete and the significance of the P = NP question.

Syllabus:

Decision problems, Languages and Turing machines.

Time and space complexity of algorithms, the classes P and NP, polynomial transformations, NP-completeness.

Proving NP-completeness, standard NP-complete problems.

Complements of NP-complete problems, the class co-NP, the NP = co-NP question.

Coping with NP-completeness, performance guarantees for approximation algorithms.

Textbook:

J. van Leeuwen (Ed.), Handbook of Theoretical Computer Science, Vol. A, Algorithms and Complexity, (Elsevier, Amsterdam, 1990).

Reference:

Aho A.V. et al, The Design and Analysis of Computer Algorithms (AddisonWesley, 1974).

Assessment:

Continuous Assessment - 50%

Written Examination - 50% (1x3 hrs).

**MAP 68: SYSTEMS PROGRAMMING
WITH C++**

Hours per week: 4

Prerequisite: MAP 62

Objectives:

To develop practical expertise in the use and development of operating system utilities using C++.

On completion of this subject students should be able to:-

1. Write C++ programs incorporating functions and pointers,
2. Define and incorporate objects, private and public data and functions into an object oriented program,
3. Write shell scripts

Syllabus:

C Programming: sequence, selection, iteration.

Bit-wise operators, arrays, structures, pointers.

Functions. Files. Libraries.

C++: Enhancements to C, Streams, Objects, Public and Private data. Public and Private member functions. Inheritance. Reusability and libraries. Scripts: UNIX C shell and Shell scripts.

Textbook:

Nagler E., Programming in C++ (West, 1993).

Reference:

McDonald C., Introduction to C Programming (Unitech, 1994).

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3 hrs).

MAP 69: USER INTERFACE DESIGN

Hours per week: 4

Prerequisite: MAP 62

Objectives:

On completion of this subject students should be able to:-

1. Explain the problems of developing an effective user interface,
2. Analyse a problem for user interface requirements,
3. Describe the different development methodologies used in human computer interface design,
4. Apply user interface design techniques to a range of sample problems,
5. Test and assess a user interface for usability,
6. Use a prototyping tool.

Syllabus:

Psychological characteristics of users, types of user-computer interaction, interface models (analogies and metaphors), types of usability problem.

User population analysis, data flow analysis, data modelling, task analysis, context analysis.

User participatory design. Iterative development methods, evolutionary developments, prototyping, brainstorming. User support mechanisms (on-line help, documentation, etc).

Usability testing: timing, participants, metrics, checklists. Objective testing versus comparative testing.

Guidelines and standards for screen design, menus, dialogue box design etc.

Implementation: Use of a suitable prototyping tool such as Visual Basic, Toolbook, Macromind Director, or Authorware Professional.

Textbook:

Cox K. and Walker D., User Interface Design, 2nd ed (Prentice-Hall, 1993).

Reference:

Preece J. et al, Human Computer Interaction (Addison-Wesley, 1994).

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3 hrs).

MAP 70: REAL TIME PROGRAMMING

Hours per week: 4

Prerequisite: MAP 68

Objectives:

To provide an overview of Real Time Systems and what distinguishes them from other systems; tools and techniques. To provide a detailed examination of the classical concurrency problems. To develop practical experience of implementing real time systems.

On completion of this subject students should be able to:-

1. Explain the characteristics of real time systems,
2. Specify the requirement of a real time system,
3. Design a real time system,
4. Use concurrency classical solutions to solve data and resource sharing problems,
5. Write device driver software.

Syllabus:

Real Time System attributes and issues, embedded systems, process control, reliability, verification, timing constraints, areas of application.

Design activities, Yourdon Systems Design

Method for Real Time Systems: Concurrency and resourcing, Mutual exclusion, semaphores, monitors.

Device drivers, interrupts and polling.

Textbook:

Axford T., Concurrent Programming (Wiley, 1989).

Reference:

Goldsmith S., Real Time Systems Development (Prentice-Hall, 1993).

Assessment:

Continuous Examination	- 50%
Written Examination	- 50% (1x3 hrs)

MAP 71: COMPLEX ANALYSIS

Hours per week: 4

Prerequisite: MAP 51

Objectives:

To provide an easy introduction to the methods of the theory of functions of a complex variable. The student is assumed to have knowledge of the elements of the theory of functions of a real variable.

On completion of this subject students should be able to:-

1. Apply the concepts of limits and convergence to complex sequences. Perform tests, to determine convergence of infinite series,
2. Determine whether a complex function is differentiable and make use of analytic functions and their properties,
3. Use the theory of Riemann Integration to evaluate integrals of functions of a complex variable,
4. Represent integral and meromorphic functions as power series using Taylor's theorem and Laurent's theorem,
5. Apply the theory of residues to evaluate various complex integrals,
6. Construct integral functions with given zeroes,
7. Manipulate some important complex functions; Gamma and Elliptic functions.

Syllabus:

Complex Numbers, Basic operations, Fundamental ideas of complex analysis, limits and convergence of complex sequences, Cauchy's principle of convergence, double sequences, double series and absolute convergence of double series.

Continuity and uniform continuity, differentiability of functions of a complex variable, analytic functions, Cauchy-Riemann equations, necessary and sufficient conditions for regular analytic functions.

Conformal mapping and homographic transformations, elementary functions and their Riemann surfaces.

Integral representations of a regular function, Fundamental integral theorem of Cauchy, regularity of continuous functions in a simply connected domain, Formula of Newton and Leibnitz for regular functions, Cauchy's Integral formula, Properties of regular functions. Applications to harmonic functions. Dirichlet's first boundary value problem.

Representations of regular functions by series, Taylor and Laurent series, isolated and removable singularities, essential singularities, behaviour at infinity.

Integral functions, theory of residues and its applications.

Gamma functions, Inverse Laplace transforms and applications, Jacob's Elliptic functions

Textbook:

Wunsch A.D., Complex Variables With Applications, 2nd ed. (Addison-Wesley, 1994).

Reference:

Ahlfors K., Complex Analysis (Van Nostrand, 1961).

Copson E.T., Theory of Functions of a Complex Variable (O.U.P., 1962).

Fuchs B.A. and Shabat B.V., Functions of a Complex Variable and their Applications, Vols.1 and 2 (1964).

Assessment:

Continuous Assessment	- 50%
Written Examination	- 50% (1x3 hrs).

MAP 72: ALGEBRAIC STRUCTURES

Hours per week: 4

Prerequisite: MAP 52

Objectives:

On completion of this subject students should be able to:-

1. Define all the algebraic structures covered in the subject, e.g. group, ring, field and module,
2. Find all substructures of a given structure, i.e., find all subgroups of a given group, find all subrings of a given ring, etc,
3. Construct all quotient structures, e.g. quotient groups and quotient rings,
4. Identify the structure, from a given set of sufficient conditions,
5. Perform factorisation in commutative rings.

Syllabus:

Preliminaries: set operations and functions, partitions and equivalence relations, binary operations, the integers.

Groups: groups and subgroups, homomorphisms, Lagrange's Theorem and the Quotient set, Normal subgroups and the Quotient group, Group actions and solvable groups. Sylow theorems.

Rings: rings and subrings, homomorphisms, ideals, Quotient rings, Maximal Ideals and the Chinese Remainder Theorem, Prime Ideals, Integral Domains, and the Fraction Field.

Factorisation in Commutative Rings: Euclidean Rings and Principal Ideals, Rings, Primes and Unique Factorisation, Noetherian Domains.

Introduction to Modules. Idea of Galois theory.

Textbook:

Crown G.D. et al, Abstract Algebra (Marcel Dekker, 1986).

Reference:

Durbin J.R., Modern Algebra (Wiley, 1979).

Allenby R.B., Rings, Fields and Groups (Arnold, 1983).

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3 hrs).

MAP 73: NUMBER THEORY

Hours per week: 4

Prerequisite: MAP 51

Objectives:

To provide an introduction to Algebraic and Analytic Number Theory.

On completion of this subject students should be able to:-

1. Use the fundamental theorem of divisibility of numbers as products of prime factors, infinitude of primes, congruent numbers. Apply this to the theory of residues,
2. Apply the theory of congruences to Chinese remainder theorem, Number of roots, residual polynomials and congruences,
3. Prove the quadratic reciprocity law and apply it to integral solutions of diaphantine equations,
4. Define binary quadratic forms and their equivalence, Definite and reduced forms; to represent numbers as a sum of two squares,
5. Solve problems related to integral solutions of diaphantine equations using the methods of Euler and Lagrange,
6. Define Jacobi, Legendre, and Kronecker symbols and apply them to the theory of indefinite quadratic forms.
7. Define arithmetical functions and apply them to generate Dirichlet series,
8. Represent numbers as sums of cubes and higher powers and apply this to Waring's problem and existence of $G(3)$ and $g(3)$,
9. Use geometry of numbers and theory of lattices for applications to Kronecker's theory,
10. Define algebraic number fields and extend the fundamental theorem of arithmetic to the ring of algebraic integers.

Syllabus:

Prime numbers, Greatest common divisors, relatively prime integers, infinitude of primes, fundamental theorem of divisibility, congruent numbers, least residues, Fermat's theorem and Euler's generalisation, Euler's function, Gauss' lemma, Quadratic reciprocity law, Legendre's and Jacobi's symbols. Introduction to Diaphantine equations, equations having rational and integral

solution.

Binary quadratic forms, equivalent forms, definite and reduced forms, determination of all integral and reduced forms, automorphic transformations, numbers as sums of two squares, Kronecker's symbol, positive forms, number of representation by positive forms. Discriminant and Genus of quadratic forms.

Special diaphantine equations, methods of Euler and Lagrange, Arithmetic functions $f(n)$, $m(n)$, $s(n)$, $d(n)$, $t(n)$ Definition of Dirichlet's series, order of magnitudes of arithmetic functions.

Representation of numbers by cubes and higher powers, definition of $G(3)$ and $g(3)$, lower bounds for $G(k)$ and $g(k)$, Further problems of Diaphantine analysis.

Geometry of numbers, theorem of Minkowski, simple applications to lattice theory in n -dimensions, arithmetic proof of Kronecker's theorem.

Theory of algebraic number fields, algebraic numbers, algebraic integers, irreducible equations, degree of an algebraic number field, ring of algebraic integers, prime ideals. Generalisation of fundamental theorem of divisibility to algebraic number fields and applications to Quadratic fields.

Textbook:

Hardy G.H. and Wright E.M., An Introduction to the theory of numbers, 4th ed (O.U.P., 1959).

Reference:

Zuckermann, An Introduction to the theory of numbers, 2nd ed. (Wiley, 1968).

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3 hrs).

MAP 74: TRANSPORTATION AND NETWORK FLOW PROBLEMS

Hours per week: 4

Prerequisite: Degree with mathematics as a major component.

Objectives:

On completion of this subject students should be

able to:-

1. Use the Network Simplex Algorithm to solve transshipment problems,
2. Use network flow theory to solve unweighted bipartite matching problems,
3. Use bipartite matching theory to solve aircraft scheduling problems,
4. Apply the Critical Path Method to solve project management problems,
5. Use the Primal Dual Algorithm to solve minimum cost flow problems,
6. Apply network flow theory to optimal project selection problems.

Syllabus:

Maximum Flow Problems: Feasible flows, Cuts in networks, Flow augmenting paths.

Proof of the Max-flow Min- cut Theorem, Dinic's Algorithm. Applications to project selection and to job scheduling.

The Transportation and Transshipment Problems: An economic motivation and an algebraic description of the Network simplex Method, Decomposition into sub problems, cycling in the Network Simplex method and its prevention by Cunningham's Method, Applications to the scheduling of production and inventory.

Minimum Cost Flows: A linear programming formulation, The Shortest Path, Assignment and Transportation problems as special cases of the Minimum Cost Flow Problem, The Primal Dual algorithm for the Minimum Cost Flow Problem.

Activity Digraphs, the Critical Path Method (CPM and PERT) in project management.

Textbook:

Taha H.A., Operations Research, 4th ed (MacMillan, 1987).

Reference:

Lawler E.L., Combinatorial Optimisation: Networks and Matroids (Holt, Rinehart and Winston, 1976).

Papadimitriou C.H. and Steiglitz K., Combinatorial Optimisation: Algorithms and Complexity (Prentice Hall, 1982).

Assessment:

Continuous Assessment - 50%
Written Examination - 50% (1x3 hrs)

DEPARTMENT OF COMMUNICATION AND DEVELOPMENT STUDIES

Acting Head of Department:

Associate Professor, Sali, G., B. A. Hons. (UPNG) Ph.D. Development Sociology (VUW)

Deputy Head of Department:

Ambelye, I., MA (TESOL) (UQ), BEd (Goroka), Dip. Sec. Teaching (Goroka)

Senior Lecturer:

Aisoli-Orake, R., MLitt (Hons) (ANU), BEd (UPNG); Ph.D in Edu. (University of Newcastle).

Principal Technical Instructor:

Eva-Gwale, R., MLib (UCW); DLIS, BSc. (UPNG)

Lecturers:

Sar, L., MEd (Hons) (JCU), BEd (UPNG), Grad.Cert.Comm.Sci. & Tech (PNGUOT),)

Kehatsin, J.S., Med (Admin) (UNE), BEd (UPNG), Grad. Cert. Comm. Sci. & Tech. (PNGUOT).

Baloiloi, O.V., MEd (TESOL) (Monash), Dip. Sec. Teaching (Goroka), Grad.Cert.Comm.Sci. &Tech. (PNGUOT), (*On Study Leave*)

Winuan, M., MA (Applied Edu.), PGDip. Sec. Lang. Teach (Waikato); BEd (Hons) (Goroka); BEd (UPNG); Dip. Sec. Teaching (Goroka)

Ambelye, I., MA (TESOL) (UQ), BEd (Goroka), Dip. Sec. Teaching (Goroka)

Wallum, F. MA (TESOL), University of Melbourne.

Senior Technical Instructors:

Mitio, N., BA (UPNG), BA (Hons) (UPNG); PGDip. Sociology (Essex)

Aisi, M., BEd (University of Goroka), Dip. Sec. Teaching (GTC)

Principal Technical Officer:

Jack E., BCC, Unitech

Administrative Officer:

Vacant

Senior Secretary:

Dokta Caroline

Secretary:

Raka K. Gwenda

The Department teaches students who are enrolled in the Master of Communication Studies (MCS), Communication for Development (C4D) and students in most degree and diploma courses offered by the University. All first-year students take two subjects in Language and Communication Studies (LA101, LA102). At this level, the main objectives are to provide skills necessary to equip students to pursue their studies successfully and to introduce them to communication in the work place as a preparation for their future careers.

In addition, students enrolled in programmes in all departments take from one to three Language and Communication subjects in their subsequent years of study; these include LA204 Communication in the Workplace and LA 301 Writing a Research Paper. All these subjects are designed to meet practical and specific communicative needs, and members of the academic staff teaching them liaise closely with their counterparts in the professional departments.

Currently, the Department offers two professional courses in Communication for Development, as follows:

A Diploma course, lasting four semesters (two years), including two two-week periods of field work;

A Degree course, lasting eight semesters (four years), including three two-week periods of field work and one semester of industrial experience.

The two courses are designed to offer appropriate professional training for public relations/ community development/ liaison officers, especially for work with resource development companies, government departments or landowner associations. The courses are interdisciplinary in nature, including subjects from disciplines within the University which provide students with the relevant background expertise and knowledge in technical, scientific, commercial, legal and social fields as well as the appropriate communicative skills, techniques and strategies to carry out their work effectively. The programme combines theoretical and practical elements.

The overall aim is to integrate theory with practice. To this end there is a strong practical component in the form of periods of fieldwork and industrial experience. In addition, the teaching includes classes conducted by professional officers currently practising in the field. The programme is intended to respond to a national need for officers who can competently communicate, negotiate, disseminate information and resolve conflicts concerning the development of Papua New Guinea's natural resources.

It is hoped that students who successfully complete the courses will have, at the appropriate level, a fundamental grasp of the issues involved in community relations and liaison work and an ability to exercise the necessary judgment, flexibility, circumspection, initiative and sensitivity to cope successfully with the demands of their profession.

Candidates who are admitted into the Diploma course should meet one of the following entrance requirements:

- (a) Students who have attained a Grade 12 School Certificate with minimum B grade in English, or
- (b) Students who have passed an Adult Matriculation course with minimum B grade in English, or
- (c) Mature experienced students may be admitted on the recommendation of the Head of Department. They will normally be expected to hold a Grade 10 Certificate with minimum Credit grade in English, plus a post-secondary certificate from a course of at least two years' duration, plus a total of at least five years' service as a development, liaison, public relations or personnel officer.

All students enrolled in the Communication for Development programme should initially register for the Diploma course. Students who successfully complete their second year of studies will be awarded the Diploma. Students who do not pass the 65% pass mark in year two are also awarded the diploma and will not proceed to year 3.

In the following lists, the letters LA in subject codes indicate a service subject, and the letters CD

indicate a subject that is part of a professional course of study in Communication for Development.

THE DIPLOMA AND BACHELOR OF TECHNOLOGY DEGREE PROGRAMMES IN COMMUNICATION FOR DEVELOPMENT

Code	Subject	Average Weekly Hours
FIRST YEAR		
(Diploma and Degree)		
Year 1 First Semester		
LA101	Study Skills	3
CD151	Melanesian Society and Politics	3
BA131	Introduction to Business	3
BA141	Introduction to Law	3
SL151	Environmental Studies	1
CS145	Introduction to Communication Technology	2
		15
Second Semester		
(Diploma and Degree)		
Year 1		
Mid-year Break		
LA102	Reading and Writing Skills	3
CD112	Papua New Guinea Languages and Communication	3
CS146	Introduction to Information Technology	2
AG122	Rural Sociology	2
BA132	Principles of Management	3
SV182	Rural Valuation	3
		16
SECOND YEAR		
(for Diploma and Degree)		
Year 2 First Semester		
CD201	Reporting and Writing for Media	3
CD231	Conflict Resolution and Negotiation Skills	3
CD233	Critical Thinking	3
CD261	Training, Education & Society	3
SL221	Introduction to Law & Land Studies	3
MA243	Mathematics for Communication	2
		17
Year 2 Second Semester		
Mid-year Break		

CD281	Field Work	two weeks
LA204	Communication in the Workplace	2
CD212	Principles of Translation and Interpretation	3
CD232	Public and Community Relations	3
CD242	Land Ownership Disputes	3
BA232	Human Resources Management	3
FR204	Forestry, Forest Policy and Economics	4
		<u>18</u>

**THIRD YEAR
(for Degree)**

Year 3 First Semester

LA301	Writing a Research Paper	3
CD311	Developing Communication & Communicating Development	3
CD321	Environmental & Social Impact Monitoring	3
CD331	Social Mapping	3
CD341	Technology and Society	3
CD361	Development Studies	3
MN391	(Optional) Mining Techniques and Mining Economics	4
		<u>22</u>

Year 3 Second Semester

Mid-year Break

CD342	Communication & Media Studies	3
CD322	Social Change	3
CD352	Community Development Strategies	3
CD362	Crime and Development	3
MA342	Statistics for Communication	4
LA103	(Optional) Information Literacy	2
		<u>18</u>

**FOURTH YEAR
(for Degree)**

Year 4 First Semester

CD481	Industrial Experience	one semester

Year 4 Second Semester

CD402	Preparation of Proposals	3
CD472	Dissertation: Communication in Resource Development	8
BA447	Administrative Law	4
		<u>15</u>

**SUBJECTS TAUGHT BY THE
DEPARTMENT IN THE DIPLOMA AND
DEGREE PROGRAMMES IN
COMMUNICATION FOR DEVELOPMENT**

LA101	Study Skills
CD151	Melanesian Society and Politics
LA102	Reading and Writing Skills
LA103	Information Literacy (Optional)
CD112	Papua New Guinea Languages and Communication
CD201	Reporting and Writing for Media
CD231	Conflict Resolution & Negotiation Skills
CD233	Critical Thinking
CD261	Training, Education & Society
CD281	Field Work
LA204	Communication in the Workplace
CD212	Principles of Translation and Interpretation
CD232	Public and Community Relations
CD242	Land Ownership Disputes
LA301	Writing a Research Paper
CD311	Developing Communication & Communicating Development
CD321	Environmental & Social Impact Monitoring
CD331	Social Mapping
CD341	Technology and Society
CD342	Communication and Media Studies
CD361	Development Studies
CD322	Social Change
CD352	Community Development Strategies
CD362	Crime and Development
CD481	Industrial Experience
CD402	Preparation of Proposals
CD472	Dissertation: Communication in Resource Development

SUBJECT DETAILS

LA 101: STUDY SKILLS

Hours per week: 3

Objectives:

The subject aims to equip first year students with basic academic communication and study skills they need in order to cope with the demands of

university study. On completion of this subject, students should be able to:

- Engage in pre-lecture preparation;
- Organise their study time;
- Handle basic study problems;
- Employ efficient study strategies;
- Listen effectively and actively at lectures and take notes;
- Use the library effectively and make coherent notes from a variety of written sources;
- Demonstrate mastery of basic skills essential for effective reading, writing, speaking and listening;
- Show ability to produce spoken and written texts that are critically and logically developed;
- Use the dictionary and thesaurus efficiently for reading, writing, listening and speech purposes.
- Communicate with grammatical correctness, clarity and precision;
- Master strategies for preparing for and writing tests and examinations;
- Demonstrate ability to summarise texts of various length and complexity.

Syllabus:

Study skills: time management, effective study habit. Note-making from printed sources and note-taking from lectures.

Effective use of the library, textbooks, reference books, dictionary and thesaurus. Some study problems and how to deal with them. Pre-lecture preparation. Information literacy skills.

Reading strategies: Types of reading. Purpose of reading. Strategies in reading. Skimming, scanning, study-type reading.

Writing: The sentence in English; qualities and types of sentences. Sentence variation in writing. The Paragraph: qualities of a good paragraph, structure of a basic paragraph. The 1-3-1 short essay. Gender sensitivity in speech and writing, ethics, morality and counselling.

Textbook:

Buschenhofen, P., Ed., Academic and Professional Communication, PNG University of Technology, Department of Language and Communication Studies, Lae, 1998.

Oxford Advanced Learners Dictionary (5th edition), OUP, Oxford, 1996.

Reference:

Crystal, D., (1992), Discover Grammar, Longman: London.

Kanal, C., The Confident Student, New York: Houghton Mifflin, 1991.

Assessment:

Continuous Assessment - 100%

CD 151: MELANESIAN SOCIETY AND POLITICS

Hours per week: 3

Objectives:

To provide the students with an understanding about the diverse cultural, political and social aspects of societies within Melanesia. On completion of this subject the student should be able to:

Compare the similarities and differences of selected features of a number of Melanesian societies;

Analyse how selected societies function according to social, political and cultural norms;

Analyse the impact of economic, industrial and political development on rural life and society;

Formulate recommendations and solutions to some designated problems of development;

Prepare family genealogies for specified communities.

Syllabus:

Introduction to characteristics that distinguish Melanesia from neighbouring regions in terms of people, geography, traditions and leadership.

Societal organisation and structure: work patterns; property ownership; land-use system; food production techniques; traditional rituals, kinship and marriage; world views (what is believed and what is not).

Family and kinship structure: the bases of kinship claims, exchange and reciprocity, land tenure and inheritance, maintenance mechanisms, security and social change.

History: political and administrative development of Melanesia from colonial days until the present; the impact of colonialism & economic/industrial development on social organisation and structure.

References:

Chowning, A., *An Introduction to the Peoples and Cultures of Melanesia*, Cummings Publishing Co., Los Angeles, 1972
Crocombe, R. et al., eds., *Culture and Democracy in the South Pacific*, Institute of Pacific Studies, University of the South Pacific, Suva, 1992.
Narokobi, B., *Life and Leadership in Melanesia*, Institute of Pacific Studies, University of the South Pacific and the University of Papua New Guinea, 1983.
Pokawin, S. et al., *Politics in Melanesia*, Institute of Pacific Studies, University of the South Pacific, Suva, 1982.
Somare, M., *Sana, an Autobiography of Michael Somare*, Niugini Press, Port Moresby, 1975.
Trompf, G., *Payback: the Logic of Retribution in Melanesian Religions*, Melbourne, Cambridge University Press, 1994.

Assessment:

Continuous Assessment - 60%
Final Examination - 40%

LA 102: READING AND WRITING SKILLS

Hours per week: 3

Prerequisite: LA 101

Objectives:

This subject aims to broaden students' skills in the production of written discourse genres. It emphasizes the interdependence of reading and writing, and critical thinking in the context of reading, writing and presentation of research essays. On completion of this subject, students should be able to:

Demonstrate mastery of the phases of the writing process – prewriting, and revising actual writing;
Develop essays from the planning through outlining to the final writing stages;
Demonstrate a higher order level of reading comprehension;
Demonstrate ability to think and analyse information critically in their reading and writing;
Develop skills in composing different types of

essays;

Apply information literacy skills in their search for information for reading and writing purposes;
Apply principles of grammatical organization that characterize the styles of different writing genres;
Demonstrate audience-sensitive writing skills.

Syllabus:

Academic writing skills:

Different essay types and their functions: Argumentative, descriptive analytical, narrative, expository, research, book reviews, reports, basic business writing.

Steps in essay planning and writing: choosing a topic, narrowing down a broad topic, forming a point of view, searching for facts, analyzing and arranging the facts, drawing an outline, writing the essay;

Academic reading skills for writing: reading for basic literature review, summarizing, paraphrasing, quoting, reading for content analysis, developing reading comprehension skills, proof-reading;

Mechanical skills in writing: punctuation, capitalization, editing skills; sentence-structure, common errors in writing.

Usage: technical vs general; connotative vs denotative; Formal vs Informal. Research-based writing/Group writing projects; Oral presentation skills for research-based writing.

Textbook:

Buschenhofen, P., Ed., *Academic and Professional Communication*, PNG University of Technology, Department of Language and Communication Studies, Lae, 1998.

Oxford Advanced Learners Dictionary, 5th edition, OUP, Oxford, 1996.

References:

Crystal, D., *Discovering Grammar*, London: Longman, 1992.

Kanal, C., *The Confident Student*, New York: Houghton Mifflin, 1991.

Assessment:

Continuous Assessment - 100%

**LA 103: INFORMATION LITERACY
(Elective)**

Hours per week: 3

Objectives:

To empower students to become information literate in an academic environment, the workplace and in every-day life. On completion of the Information Literacy course students should be able to:

1. identify and analyze their information needs
2. plan and carry out a library and information research effectively.
3. identify and effectively use the catalogues, other search tools and information sources in the library.
4. access, evaluate, and use information sources in various formats, including electronic formats.
5. use information ethically
6. survey and effectively use the writing guides in the library to complete writing requirements.
7. critically review information sources in a subject.
8. trace the coverage of a subject in various sources.
9. reorganize, and present data as information
10. demonstrate mastery of information searching, evaluation, and reorganization skills.
11. identify and effectively use subject information sources of a discipline.
12. analyze and meaningfully discuss information issues.

Syllabus:

Study skills: Learning how to learn. Identifying and analyzing information needs in an academic environment. Concepts and processes of information systems and organization. Planning and carrying out a library research in the library, on the internet, and other databases following a step-by-step approach of the library and information research process. Surveying information sources in a subject and critically evaluating the information. Collecting, evaluating and organizing data in preparation for writing, including acquiring and applying knowledge and

skills in quickly extracting information. Effectively conducting online research using selected search engines and information literacy websites. Debating information issues that affect learning and ever-day life.

Textbooks:

Cheek, Julian, 1995. Finding Out: Information Literacy for the 21st Century, South Melbourne, Macmillan Education Australia.
Fenner, Peter; Armstrong, Martha C. 1981. Research: A Practical Guide to Finding. Information. California, William Kaufmann.
Lecture notes prepared by Information Literacy Section and senior staff of the Library.

References:

Ruggiero, Vincent Ryan. 2001. Beyond Feelings: A Guide to Critical Thinking. 6th ed. McGraw Hill, Boston.
Sayers, Richard. 2006. Principles of awareness-raising: Information literacy, a case study. Bangkok, UNESCO.

Assessment:

Continuous Assessment - 100%

**CD 112: PAPUA NEW GUINEA
LANGUAGES AND
COMMUNICATION**

Hours per week: 3

Objectives:

To develop students' knowledge and awareness of language and communication issues in Papua New Guinea in order to enable them to use language appropriate for particular communicative situations.

On completion of this subject, the student should be able to:

Apply principles of effective communication through language in communicative interaction;
Explain the various codes available for communication in Papua New Guinea and select ones that are appropriate to communicative purpose, age and position of the receiver and other interpersonal factors;
Describe the geographical distribution of major

language groups in Papua New Guinea;
Give an account of the historical development and spread of lingua francas in Papua New Guinea;
Select and vernaculars and lingua francas (especially Tok Pisin and Hiri Motu) as appropriate for communication in particular situations; Develop appropriate strategies for communication in a linguistically diverse society, in particular to ensure effective communication between expatriates and nationals and between professional and social groups of speakers using different codes; Use linguistic skills as a tool of employment and power; Analyse and apply basic principles of effective translation and interpretation.

Syllabus:

The use of language for communication as unique to human beings; the communication model for human interaction; language as a system of codes governed by grammatical rules for creating meaning about man and society

The use and geographical distribution of major language groups and vernaculars (tok ples languages) in Papua New Guinea; the need, growth and development of lingua francas (Tok Pisin, Hiri Motu and English) for wider national communication Problems and possibilities for communication in a linguistically diverse society; language as a tool for national development; language and employment; language repertoires, selection and choice; language and power; language and decision-making in Papua New Guinea

Textbook:

Piau, J. and Lynch, J., Communication and Language, University of Papua New Guinea Press, Waigani, 1989.

References:

Dutton, T., Police Motu, Iena Sivarai, University of Papua New Guinea Press, Waigani, 1985.

Romaine, S., Language, Education and Development: Urban and Rural Tok Pisin in Papua New Guinea, Oxford University Press, Oxford, 1992,.

Thirlwall, C. and Hughes, P.J. (eds.), The Ethics of Development, vol. 6, Language, Communication and Power, University of Papua New Guinea

Press, Waigani, 1988.

Assessment:

Continuous Assessment - 60%

Final Examination - 40%

CD 201: REPORTING AND WRITING FOR MEDIA

Hours per week: 3

Objectives:

To provide students with an understanding of how information is collected and disseminated through different mass media. They will also learn how writing for media can be developed.

On completion of this subject, the student should be able to:

Understand concepts of news, newspaper and other relevant terms;

Distinguish the sense and value of news analyzing news elements;

Learn writing of news reports;

Learn the sources and how to gather information for writing news;

Understand the basics of structure of writing news for media;

Learn writing of news reports with the help of structures;

Syllabus:

Concepts of news, feature, article, newspaper, and journalist;

Press terminologies and different components of mass media contents;

News sense and news values;

News elements; Analysis of news values by elements; News structure: Inverted Pyramid structure; Leads/Intros, types of Leads;

Media reporting: basics of reporting, sources of news, qualities of a reporter, and introduction to a newsroom;

Writing of leads/ intros and simple news reports in the local context;

Headlines: types and varieties; Writing of headlines; Code of Ethics for the press and other mass media in PNG. Re-writing simple reports

Assessment:

Continuous Assessment - 60%
Final Examination - 40%

Reference:

B. N. Ahuja – Theories and Practice of Journalism
George Fox Mott and others- New Survey of Journalism
Bastian, Cage and Baskette- Editing the Day's News
B. N. Ahuja – Theories and Practice of Journalism, 2000.
Julian Harriss and Stanly Johnson- The Complete Reporter
Melvin Mencher – Basic News Writing

CD 231: CONFLICT RESOLUTIONS AND NEGOTIATION SKILLS

Hours per week: 3

Objectives:

This subject is intended to enable students to understand the nature and types of conflicts and how they affect national development. Learn how practical skills and strategies can be used in PNG and Melanesia to resolve conflicts. Develop concepts and skills of negotiating as a means of resolving major project issues, and to apply them to contemporary situations in Papua New Guinea. On completion of this subject, students should be able to:

- Analyse and identify the nature and types of conflicts
- Determine expedient strategies for resolving conflicts
- Develop, implement and adopt appropriate practical strategies to resolve, minimize or eliminate conflicts by channeling disruptive energies into positive directions
- Practice negotiation skills through applying a basic model for negotiation
- Identify opportunities for negotiation and choose the appropriate approaches
- Plan and prepare for negotiation
- Apply a variety of negotiation strategies & tactics to meet the negotiators' needs

- Select and apply appropriate channels of communication in the negotiation process;
- Enter confidently into simulated negotiations with a win/win philosophy

Syllabus:

The nature and types of conflicts in PNG and Melanesia: Case studies of specific conflicts in Melanesia involving land disputes; negotiating resource rights and benefits. Preparing of verbal and non verbal communication; making concessions and breaking lead-locks; foreseeing problems that are likely to arise; stress management; ethics and discipline; bribery, corruption, and how to deal with them.

Accepted practical definitions of negotiation, a model for negotiation, situations and opportunities for negotiation, the give / get principle, negotiation as a means of avoiding conflicts. Defining goals and objectives, clarifying issues, gathering information, setting a humane climate, preparing for conflict, compromising and resolving issues, making and confirming agreements. Steps in negotiating, key factors in team negotiations, understanding the culture in which negotiations occur, consultation, internal politics, synergy/chaos, conflict management, roles in the negotiation process.

Selected scenarios for negotiation between landowners, government and /or resource developers involving land compensation claims, bank loans, environmental protection, oil and gas purchase, industrial relations, and practice in simulated negotiations.

Textbooks:

Fisher, R., Ury, W. and Patton, B., *Getting to Yes: Negotiating agreement without Giving in*. Houghton Mifflin, New York, 1991
Kehatsin, J., *Unlocking Problems, Disputes and Conflicts*, Unitech Press, Lae, 2000

References:

Crocomb, R. (ed.), *Land Tenure in the Pacific*, University of the South Pacific, Suva, 1987.
Brett, J.M., Golberg, S. and Ury, W., *Getting Disputes Resolved: Designing Systems to Cut the Costs of Conflicts*, New York, Bantam Books, 1988.

Ury, W., *Getting Past No: Negotiating with Difficult People*, New York, Bantam Books, 1991
Fisher, R. and Brown, S., *Getting together: Building Relationships as We negotiate*, Penguin Books, Harmondsworth, 1988.

Assessment:

Continuous - 60%
Final Examination - 40%

CD 233: CRITICAL THINKING

Hours per week: 3

Objectives:

To study various techniques of clear, logical and critical thinking.

On completion of this subject, the student should be able to:

Demonstrate an understanding of purposeful organisation of ideas.

Develop and deliver well-reasoned oral and written presentations.

Analyse the characteristics of and differences between formal and informal logic.

Apply the scientific method of reasoning to a variety of problems.

Use skills of persuasion in appropriate contexts

Distinguish between objective argument and persuasive techniques.

Explain the concept of logic as a cultural construct and demonstrate its appropriate application within a variety of contexts.

Syllabus:

Analysis of arguments, construction of well-reasoned verbal and written presentations, analysis of the procedures of formal and informal logic; varieties of arguments: the scientific method, the use of persuasive language

Applications of critical thinking to controversies, and especially to those emanating from perspectives related to Papua New Guinea's developmental activities.

The cultural construction of logic and its appropriate application within diverse social, cultural and technical contexts.

Textbook:

Allen, Matthew *Smart Thinking*, Oxford University Press, Melbourne, 1997

Reference:

Barry, Vincent E., *The Critical Edge: Critical Thinking for Reading and Writing*, Harcourt Brace Jovanovich College Publishers, Fort Worth, 1992.

Assessment:

Continuous Assessment - 60%
Final Examination - 40%

CD 261: TRAINING, EDUCATION AND SOCIETY

Hours per week: 3

Objectives:

On completion of this subject, the student should be able to:

Demonstrate an understanding of the roles and values of formal and informal education for a modern society.

Apply principles gained from a study of education in developing societies generally to analysing educational issues in Papua New Guinea.

Compare relevant problems and solutions in education and national development in Papua New Guinea with those in neighboring countries.

Devise and use appropriate teaching plans, materials and methods to ensure effective instruction in situations in which a community relations/ liaison officer is called upon to be a teacher.

Syllabus:

Definition and types of education: formal and non formal education; informal education and home training in traditional societies; the teaching of practical skills vs. theoretical knowledge.

The uses of education: roles and values of education

in modern societies; limitations of formal education; the influence of social, political and economic factors on education policies; education and national development; education and the application of technology.

Problems, principles and prospects of formal

education in developing nations: adult education and literacy; medium of instruction; the concepts of first, second and foreign language and their implications for education.

Education policies in Papua New Guinea: historical perspectives; recent developments; the way ahead; comparing issues in education in Papua New Guinea with those of neighbouring countries (South Pacific, Southeast Asia, Australia).

The practice of education: basic teaching skills, including determining needs, lesson planning, providing/maintaining student motivation, preparing and selecting materials, adopting appropriate methodology, testing and assessment, self evaluation of teacher; peer teaching and teaching supervision.

References:

- Education Sector Review, vol 1: Executive Summary and Principal Recommendations; vol. 2: Deliberations and Findings, Papua New Guinea Department of Education, Waigani, 1991.
- Laycock, D. (ed.), Papua New Guinea Education, Oxford University Press, Melbourne, 1976.
- Matene, P., A., Philosophy of Education for Papua New Guinea, Department of Education Ministerial Committee Report, Waigani, 1986.
- Smith, P., Education and Colonial Control in Papua New Guinea: a Documentary History, Longman Cheshire, Sydney, 1987.
- Speier, A., Teaching Can be Learnt and Taught, Papua New Guinea University of Technology, Teaching and Learning Methods Unit, Lae, 1990.
- Swatridge, C., Delivering the Goods: Education as Cargo in Papua New Guinea, Melbourne University Press, Melbourne, 1985.
- Thirlwall, C. & Avalos, B. (eds.), 1993, Participaion and Educational Change: Implications for Educational Reform in Papua New Guinea Press, Waigani,

Assessment:

- Continuous Assessment - 60%
- Final Examination - 40%

LC 281: FIELD WORK

Period: Two weeks during the mid-year break

Objectives:

To provide students with an opportunity to use skills and knowledge gained in the classroom, in practical on-the-job experiences in ward project planning by working with a government department in the ward of an LLG.

On completion of this subject, the student should be able to:

Apply oral and written communicative skills to contribute effectively to the solution of problems arising in the daily of the people in a ward of an LLG.

Use relevant insights gained about society, human and industrial relations, law, commerce, technology, ecology, and/or language and communication in Melanesia, in the daily work of an appropriate organisation.

Adapt effectively to the work environment with regard to punctuality, time management, productivity, treatment of clients and the public and cooperation with colleagues and supervisors .

Apply the insights gained from the field-work experience to his/her academic studies and relate theory to practice in liaison/public relations work.

Syllabus:

Supervised and guided practical experience, with an emphasis on dealing effectively with the application of language and communication skills and knowledge of relevant professional fields within an appropriate context and at the appropriate academic level.

Assessment:

Supervisor's Report - 50%

Written Report - 50%

(Note: In order to pass this subject students must receive a grade of at least 50% = Pass in both these components of the assessment.)

LA 204: COMMUNICATION IN THE WORKPLACE

Hours per week: 2

Objectives:

To widen the students' repertoire of strategic communication skills for implementing workplace policies and procedures.

On completion of this subject, students should be able to:

Select and apply with confidence appropriate modes of oral and written communication as required by a variety of workplace contexts.

Anticipate problems likely to arise in a variety of differently structured organisations, and attempt to solve these problems rationally.

Provide basic personnel counselling.

Identify and repair areas of conflict in the workplace through the process of negotiation.

Interpret and formulate various types of legal documents.

Syllabus:

Characteristics of communication according to various types of workplace Organisational structure: power, leadership and language. Face saving and politeness principles. Cross cultural misunderstandings: origins and possible resolution.

Format, content, purpose and style of various genres of written and spoken communication in the workplace: forms, memos, official letters, reports, minutes, advertisements, announcements /press releases, interviews, telephone conversations, meetings, oral addresses/presentations.

Selecting and reformulating channels of communication (including choice of language) appropriate to particular contexts and audiences.

Counselling strategies: repairing communication breakdowns between various categories of workers, national and expatriate. Implementing unpopular policies in the workplace.

Skills of negotiation and conflict resolution:

Sources of conflicts, defining goals, clarifying issues, gathering relevant information, compromising, making concessions, breaking deadlocks, stress management, ethics and discipline.

Legal texts: contracts and legislation. Developing strategies for comprehending complex lexis and syntax. Interpreting legal documents in simpler English and other PNG languages. Applying the content of such documents in specific workplace situations. The composition of basic legal texts.

Textbook:

Kehatsin, J., *Communication in the Workplace, A Guide for Papuan New Guineans*, PNG University of Technology, Department of Language and Communication Studies, Lae, 2001.

References:

Kehatsin, J.(ed), *Unlocking Problems, Disputes and Conflicts*, PNG University of Technology, Department of Language and Communication Studies, Lae, 2000.

MacIntosh, D., *English for Business*, 4th edition, Hong Kong: Hong Kong Book Marketing, 1986.

Assessment:

Continuous Assessment - 100%

CD 212: PRINCIPLES OF TRANSLATION AND INTERPRETATION**Hours per week: 3****Objectives:**

To provide students with an understanding of translation processes and to train them in oral and written translation techniques, especially those suitable for translating official, legal and technical documents from English into other languages used in Papua New Guinea

On completion of the subject, the student should be able to:

Undertake simultaneous interpretation of speeches and discussions in negotiation procedures into languages appropriate to all parties involved.

Translate official documents into appropriate languages which can be understood by all the parties whose interests are affected by them, especially by landowners and the general public.

Syllabus:

Overview of the tasks of translation and interpretation: oral interpretation versus written translation, form and meaning, semantic structure of languages, implicit and explicit meaning, literal and figurative meaning.

Lexicon: words as bundles of meanings, multiple senses of lexical items, personal reference, meaning and the context of situation, collocation, lexical equivalence, shared and unshared concepts,

translation versus explanation.

Propositions: relations within different types of propositions, skewing of illocutionary force and grammatical form, skewing between propositional structure and clause structure.

Texts: genre, cohesion, prominence, information load, information structure, schemata, top-down and bottom-up processing of information.

Practical experience: written translations of official documents, observations of court sessions, simultaneous oral interpretation of simulated meetings concerning liaison/ personnel work, interpretation and translation of technical instructions.

Textbook:

Warpin, M., Translating and Interpreting Development Issues for the Grassroots PNGUT, Lae, 2002.

Larsen, Mildred L., Meaning-based Translation: A guide to cross-language equivalence, 1984.

Bell, R.T., Translation and Translating: Theory and Practice, Longman, London, 1991.

Assessment:

Continuous Assessment - 60%

Final Examination - 40%

CD 232: PUBLIC AND COMMUNITY RELATIONS

Hours per Week: 3

Objectives:

To develop students' knowledge, attitudes and skills in public and community relations with regard to their nature, organisation and functions in Papua New Guinea.

On completion of this subject, the student should be able to:

Explain the purpose, work and functions of public and community relations departments associated with development projects and organisations in Papua New Guinea;

Establish and analyse the parameters of public and community relations work in Papua New Guinea;

Design and implement effective community relations programmes;

Apply public and community relations principles,

concept and skills to case studies from Papua New Guinea and other countries;

Discuss the work of public and community relation officers in the community affairs sections of resource development companies and government departments operating in Papua New Guinea.

Syllabus:

The theory of public relations; functions of public and community relations; establishing and maintaining contact between national, provincial and local governments, development companies, village services and landowner associations; financing public and community relations

Securing and maintaining effective lines of communication in public relations: promoting positive images and goodwill of the company/institution/ department with the community; relationships with the media, making media statements; sustaining and improving employer-employee industrial relations.

Preparing community relations programmes for land matters, negotiations, communications and liaison, business development projects, educational support, social and environmental impact monitoring; implementing and evaluating such programs

Defining, analysing, comparing and researching community relations problems: specific case studies of community relations work in various resource development projects, involving guest speakers from both management and the community affairs sections of resource development companies.

Textbooks:

Banks, Glen and Ballard, Chris (eds), The Ok Tedi Settlement: Issues, Outcomes and Implications, Australian National University, Canberra, 1997.

Toft, Susan (ed), Compensation for Resource Development in Papua New Guinea, Law Reform Commission of Papua New Guinea, Port Moresby, 1996.

Reference:

Tymson, and Sherman - The Australian Public Relations Manual, Millenium Books Pty., Sydney, 1989.

Assessment:

Continuous Assessment - 60%
Final Examination - 40%

CD 242: LAND OWNERSHIP DISPUTES

Hours per week: 3

Objectives:

To introduce students to the issues pertaining to land ownership that lead to disputes with particular reference to the development of natural resources. At the end of the course, students should be able to explain to landowners the relevant Acts and give advice on procedures for settling disputes.

Syllabus:

Relevant sections of the Land Groups Incorporation Act, Land Disputes Settlement Act, Mining Act, Petroleum Act, Fisheries Act, Forestry Act and any other Acts related to natural resource issues.

Textbooks:

Papua New Guinea Legislation for Communication for Development, compiled and supplied by the Department, Mining Act; Petroleum Act; Constitution of the Independent State of Papua New Guinea.

James, RW, Land Law and Policy in Papua New Guinea, Law Reform Commission of Papua New Guinea, Port Moresby, 1985

Scaglione, Richard, Customary Law in Papua New Guinea, Law Reform Commission of Papua New Guinea, Port Moresby, 1983

Larmour, Peter (ed), Customary Land Tenure: Registration and Decentralisation in Papua New Guinea, National Research Institute, Port Moresby, 1991.

Reference:

Mugambwa, JT and Amankwah, HA, Papua New Guinea Land Law and Policy, Pacific Law Press, Hobart. 1996,

Assessment:

Continuous assessment - 60%
Final Examination - 40%

LA 301: WRITING A RESEARCH PAPER

Hours per week: 3

Objectives:

To familiarize students with research terminology, concepts, techniques, procedures and methods enabling them to undertake a short research project and to produce a research paper under supervision, applying appropriate academic and scholarly conventions and to present the findings of the research project orally to a critical audience.

On completion of this subject, the student should be able to:

1. Justify and plan a manageable research project proposal;
2. Formulate appropriate research hypotheses and questions;
3. Determine and assess review of literature in an area of study;
4. Evaluate and select appropriate research methodologies;
5. Design appropriate research instruments;
6. Collect, select, organize and interpret data and relate them to theory;
7. Undertake and complete research projects successfully and with confidence
8. Plan, organize and write research papers, incorporating standard components
9. Apply conventions of academic writing of research reports correctly
10. Present the results of the project effectively in an academic seminar.

Syllabus:

The concept of research: terminology, different research models, methodologies and instruments for research. Research as a "contribution to scholarship" assessing their validity for particular projects and research types. Completing a research paper in conjunction with the students' own department and relevant to the students' own field of study.

Formulation of a research project: limiting the topic, forming hypotheses/research questions, selecting a methodology, enumerating requirements (including equipment and possible costing), preparing a study timeline, assessing the project's feasibility. Literature search: information retrieval, use of subject-specific library resources,

selection of information sources, recording bibliographical details, keeping records, developing a filing system. Locating the present project within the context of on-going developments in the field. Logical and clear thinking: hierarchical ranking of points, logical structuring and ordering of an argument, logical fallacies, drawing conclusions from evidence/selecting evidence to support conclusions. Relevant and irrelevant information. Specifying and generalizing.

Collecting data: quantitative and qualitative research approaches. The advantages and disadvantages of different research methods: designing questionnaires, interviews; consulting archives, making empirical observations, etc... Applications of theory to data. Selection of data in relation to purpose and argument.

Format and parts of a research paper: title page, acknowledgement, summary, table of contents, introduction, layout of chapters (numbered sections and subsections, etc.), illustrations, charts, diagrams, tables, bibliography, appendices. Attribution of sources, referencing. Consistency in format, layout and presentation. Use of numbers, figures, statistics and formulae. "User friendly" graphic and tabular presentation of statistical information.

Writing the research report in appropriate language: identifying the assumed reader and purpose of the report, using the acceptable academic style of English, "objective" and "subjective" language, first vs. third person, grammatical correctness, correct and consistent spelling and punctuation conventions, avoiding sexist and racist language, taking cognizance of readability criteria and conventions of plain English. Precision and clarity: the rationale for taking care with the use of language.

Drafting and redrafting. Revising the report in response to peer and self-evaluation. Proofreading, correcting and editing the final draft.

Making an effective seminar presentation before an audience of academics and peers, utilizing audio-visual aids and other aids as appropriate and relevant. Features of effective oral delivery. Dealing with feedback from audience.

Reference:

Cohen, M. R., Manion, L. and Morrison, K. R. B.

(2000). *Research Methods in Education* (5th edition). London: RoutledgeFalmer.

Guthrie, G. (Editor). (1987). *Basic Research Techniques*. University of Papua New Guinea, Port Moresby: Education Research Unit.

Perrin, R. (2004). *Pocket Guide to APA Style*. Boston: Houghton Mifflin Company.

Assessment:

Continuous Assessment - 100%

CD 311: DEVELOPING COMMUNICATION AND COMMUNICATING DEVELOPMENT

Hours per week: 3

Objectives:

To make an academic oral presentation of research to a critical audience: to participate effectively in an academic seminar to present business proposals: and to lead discussions. These skills are to focus on Pacific development issues.

On completion of this subject, the student should be able to:

Prepare, organise and deliver a presentation on development issues with confidence and with due consideration to audience;

Deal confidently with questions on these issues and contributions from the floor;

Develop and apply appropriate language strategies in leading and participating in academic seminars;

Explore a particular topic in all its diversity, or solve a problem successfully through discussion;

Critically evaluate his/her own communicative performance in making a presentation, leading and participating in academic seminars;

Present a project proposal in the workplace.

Syllabus:

Global aspects of speaking. Language strategies for presentation, seminar discussion and leadership in relation to Pacific development issues. Presentation skills and seminar interaction skills.

Textbook:

Aisoli-Orake, R.(Ed.), *Developing Communication and Communicating Development* - Compilation of Class Notes, PNGUT, Lae, 2002

References:

Mathews, C., and Marino, J., Professional Interactions: Oral Communication Skills in Science, Technology and Medicine, Prentice Hall, Sydney, 1990.
Tomlins, J., A Language Framework for Materials Design in Academic Discussion: Learner Development of Language Strategies, in English for Specific Purposes, 17:3, 1998.
Dwyer, J., 2000, The Business Communication Handbook. Prentice Hall, McPherson' Printing: NSW

Assessment:

Continuous Assessment - 60%
Final Examination - 40%

CD 321: ENVIRONMENTAL AND SOCIAL IMPACT MONITORING

Hours per week: 3

Objective:

To make students familiar with the legal and political aspects of the environmental protection and monitoring legislation and social impact reporting requirements in the resource extraction industries of Papua New Guinea.

Syllabus:

Introduction to the basic principles of environmental impact monitoring and social impact assessment. A detailed presentation of the various regulatory acts in force in Papua New Guinea that relate to the resource extraction industries.

A discussion of environmental politics.

Textbook:

PNG Regulatory Acts (Compiled and supplied by the Department)

Assessment:

Continuous Assessment - 60%
Final Examination - 40%

CD 331: SOCIAL MAPPING

Hours per week: 3

Objectives:

To introduce students to the concept. Methods and components of social mapping and apply their knowledge to a community/area of interest.

On completion of the course students should be aware of information systems related to:

1. The Physical landscape.
2. The Demographic landscape.
3. The Social landscape, and
4. The cadastral landscape.
5. The students should develop skills in collecting information for social mapping using Participatory Rural Appraisal (PRA) and Rapid rural Appraisal (RRA).

Syllabus:

Students will learn aspects of physical and cultural geography. Demography, ethnography, culture, oral history, genealogy and legal decisions (and customary agreements/disagreement) related to land and record them, including on maps.

Students will be taught the basics of reading and drawing maps, and where necessary be introduced to the software MapInfo. GIS and GPS. Students will learn to record information from RRA and PRA or any study such as Social and Environmental Impact Monitoring through the social mapping methods.

Textbook:

Larmour, Peter. Ed., 1991. Customary Land tenure.

Registration and Decentralization in Papua New Guinea, Monograph 29, IASER/NRI, Boroko.

Ahmed, I. and Doelman, J.A. (eds) (1995) Beyond Rio: The Environment Crisis and Sustainable Livelihoods in the Third World; New York, ILO.

Chambers, R. and Conway, G.R. (1992) Sustainable rural Livelihoods: Practical Concepts for the 21st Century, Sussex, Institute of Development Studies.

References:

UNDP. 1998, Papua New Guinea Human Development report, 1998 Port Moresby, Office of National Planning.

Galdman, D. Mowbray, D and Duguman, J. (1966)

From Rio to Rai: Environment and Development in Papua New Guinea. Vol. 1-6: Port Moresby, University of Papua New Guinea.

Environmental and Social Impact reports of various resource development projects.

Assessment:

Continuous assessment - 60%

Final Examination - 40%

CD 341: TECHNOLOGY AND SOCIETY

Hours per week: 3

Objectives:

On completion of this subject, the student should be able to:

Discuss traditional technologies and their uses in Papua New Guinea and compare them to modern technologies

Analyse the roles technology has played in the historical development of societies

Assess the advantages and disadvantages of the applications of technology in national development in Papua New Guinea.

Evaluate the uses of technology in specific cases where it has been used in Papua New Guinea.

Syllabus:

Technology as the application of scientific principles to solve social problems; the historical development of technology; how technology affects social change and how society affects technological change; case studies of the causes and effects of technological development in history.

The importation and adaptation of foreign technologies in Papua New Guinea; technology and international capitalism; the role of foreign aid in technological development.

The responsible uses of technology for managing Papua New Guinea's resources; government regulation; the development of indigenous technologies; "appropriate", "alternative" and "small scale" technologies; utilisation and management of energy sources.

The relationship of technology to major social concerns: education and training, commerce, urbanisation, employment, ecology.

Case studies of the impact of technological innovation on society in Papua New Guinea; in any one year as election to be made from three of the following topics: computers, satellite communication, mining and petroleum, hydro electric power schemes, food processing, agriculture.

Textbook:

Bhagavan, M.R., The Technological Transformation of the Third World, Zed Books, London, 1990.

References:

Florman, S.C., Blaming Technology: the Irrational Search for Scapegoats, St. Martin's Press, New York, 1981.

Johnston, A. and A. Sasson (eds.), New Technologies and Development, UNESCO, Paris, 1986.

Rochlin, G.I. (ed.), Scientific Technology and Social Change: Readings from Scientific American, W.H. Freeman and Company, San Francisco, 1974.

Sardar, Z., (ed.), The Revenge of Athena: Science, Exploitation and the Third World, Mansell Publishing Limited, London and New York, 1988.

Assessment:

Continuous Assessment - 60%

Final Examination - 40%

CD 361: DEVELOPMENT STUDIES

Hours per week: 3

Objectives:

To introduce the students to some ways of analysing Papua New Guinea society, with an emphasis on its historical development, as well as the formation and roles of pressure groups.

On completion of this subject, the student should be able to:

Analyse the political and economic developments of Papua New Guinea society and assess national, provincial and local communicative issues in light of these developments.

Explain the role of leaders in traditional society and in modern political structures.

Identify the social economic consequences of

development.

Analyse and evaluate the results of rapid development

Assess the value of sustainable development as a response to contemporary development.

Discuss steps needed to be taken to ensure positive change in Papua New Guinea.

Draw conclusions and apply lessons from the positive and negative developmental experiences of other countries.

Explain in detail legislation concerning the use, exploitation and development of Papua New Guinea's natural resources.

Syllabus:

Theories of development: incremental; residual; modernism; underdevelopment etc

Sociological development: functionalism; conflict & interactionism

Globalization: information; economic/financial; labour; production; cultural and etc

Modernization & westernization: mechanical & organic solidarity

The development of particular aspects of Papua New Guinea society from pre-colonial times to the colonial era, with special focus on social and economic change since independence.

The various levels of decision making in Papua New Guinea: village, provincial and national politics, the parliamentary system, administration and government in action.

Dilemmas facing post-colonial Papua New Guinea society as a result of rapid development in economics, politics and industrialisation.

The preconditions and consequences of proposed measures to ensure social, industrial and economic change towards a democratic, equitable and sustainable society in Papua New Guinea.

Development challenges: urbanism and rural-urban drift experience in PNG

Development challenges: the PNG crime & corruption experience

Development challenges: the PNG HIV/AIDS experience

Development challenges: the Bangladesh experience

References:

Beller, W. et al. (eds.), Sustainable Development

and Environmental Management of Small Islands, Man and the Biosphere Series, vol. 5, The Parthenon Publishing Group and UNESCO, Paris, 1990.

Dixon, J.A. et al., Economic Analysis of the Environmental Impacts of Development Projects, Earthscan Publications, London, 1988.

Fugmann, G. (ed.), Ethics and Development in Papua New Guinea, Point Series No.9, The Melanesian Institute, Goroka, 1986.

Hughes, P.J. & Thirlwall, C. (eds.), The Ethics of Development, vol.4, Choices in Development Planning, University of Papua New Guinea Press, Wagini, 1988.

Stratigos, S. and Hughes, P.J. (eds.), The Ethics of Development, vol.1, The Pacific in the Twentyfirst Century, University of Papua New Guinea Press, Waigani, 1987.

Assessment:

Continuous Assessment - 60%

Final Examination - 40%

CD 322: SOCIAL CHANGE

Hours per week: 3

Objectives:

To introduce students to the notion of social change and to relate this notion to the analysis of societies in the South Pacific in general and to Papua New Guinea in particular.

On completion of this subject, the student should be able to:

Define the concept of social change and analyse him/herself and his/her experience in terms of this concept.

Discuss views concerning the sources of social change, particularly the notions of invention and diffusion.

Outline, explain and discuss the causes of social change, the factors conducive to social change, the factors which resist social change the relationship between social change and cultural change.

Assess the role of politics and political parties in social change, with special reference to Papua New Guinea.

Explain the effects of social change on family and kinship structure, inheritance customs and

compensation claims in Papua New Guinea.
Discuss, compare and evaluate the positive and negative aspects of social change.
Explain how social change can be directed for the appropriate development of Papua New Guinea.

Syllabus:

Definitions and orientations to social change: What is social change? What is cultural change? the place of social change in sociological theory; the place of social change in cultural change; the notions of material culture and non-material culture.

Sources of social change: invention and diffusion, factors necessitating and restricting diffusion.

Factors necessitating social change: the role of demography, population growth as a cause and result of social change, the role of technology, the role of changing values, the role of “great men” in changing society.

The process of social change in the South Pacific and especially in Papua New Guinea: the introduction of a money economy, the introduction of private ownership and commercial monoculture, migration of workers and rural exodus, urbanisation, industrialisation, social change and family structure, the effect of social change on compensation claims, the effects of politics on social change.

Factors conducive to social change: cultural accumulation, contacts with other cultures, education, social disorganisation.

Factors resisting social change: habit, fear of disruption, traditionalism, vested interests, ideological resistance

Pros and cons of social change: positive aspects of social change, negative aspects of social change
Directing social change, social planning.

Textbook:

Nolan, Patrick & Gerhard Lenski, Human Societies: An Introduction to Macrosociology (8th ed.), McGraw-Hill, Sydney, 1999.

Reference:

(class sets provided):

Greicus, M(ed.). Three Short Novels from Papua New Guinea, by B. Umba, A.Kituai and J .Baital. Longman, Auckland, 1976.

O’Collins, M., Social Development in Papua New

Guinea 1972-1990: Searching for Solutions in a Changing World., Political and Social Change Monograph 18, Research School of Pacific Studies, ANU, Canberra, 1993.

Assessment:

Continuous Assessment - 60%

Final Examination - 40%

CD 342: COMMUNICATION AND MEDIA STUDIES

Hours per week:3

Objectives:

To provide students with an understanding of how communication takes place and how it affects receivers.

On completion of this subject, the student should be able to:

Understand the different types of communication, its processes and different models of communication;

Understand and analyse different mass media and interpersonal media used in Papua New Guinea, Learn the growth and development of different media,

Understand the national policy on communication and information in Papua New Guinea,

Learn different contents of mass media,

Explain, interpret and apply copyright laws,

Analyse the impact of media regulation on society, Apply the various viewing codes on a selection of films,

Detect objectivity and subjectivity in media reporting,

Compare reports of the “same” news in different media and in different sources within one medium,

Conduct media surveys.

Syllabus:

Communication - Types and Process;

Models of Communication;

Functions and characteristics of Mass Communication;

Introduction to mass media and traditional media;

Potentials, types and functions of communication media;

Chronology of communication media growth in global perspective;

Major media events and their development in Papua New Guinea;
National Communication Policy of Papua New Guinea;
Regulation of the media: freedom of the press, the responsibility of journalists, and the responsible uses of communications technology;
Information and Communication Technology Policy in Papua New Guinea
Media reception: their effects on people and culture; influence on lifestyles and on religious, ethical, political, environmental and gender attitudes;

Reference:

David K. Berlo- The Process of Communication.
National Information and Communication Policy of Papua New Guinea, Department of Information and Communication Services, Waigani, 1994.
O'Shaughnessy, Michael - Media and Society: an Introduction, Oxford University Press, Melbourne, 1999.
Robie, David (ed.). - Nius Bilong Pacifik, University of Papua New Guinea Press, Port Moresby, 1994.
Bittner, John., - Mass Communication, 6th ed. Allyn & Bacon, Singapore, 1996
David K. Berlo- The Process of Communication
James Watson- Media Communication: an introduction to theory and practice

Assessment:

Continuous Assessment - 60%
Final Examination - 40%

CD 352: COMMUNITY DEVELOPMENT STRATEGIES

Hours per week: 3

Course objectives:

Community development is concerned with empowering of people to realise their true potential in different community settings. The students are expected to demonstrate an understanding of the special knowledge, skills and practices in community development. Also, official standards used by different community organizations will be

explored. Moreover, on completion of this course, the students will:

- Define clearly the community and community development
- Understand the community development process model
- Understand the term sustainable development and its relationship between community development
- Learn the basic skills and ideas needed to work effectively with people in communities and to impart this knowledge through practical activities.
- Develop knowledge and skills in participatory development that will enable them and their communities to best use the community's resources to promote self-sufficiency.
- Know various community action groups, donors and the media as additional resources which communities can tap into to assist their development.
- Empower communities through the use and application of community development standards.
- Explain clearly the project cycle and list the characteristics of projects
- Apply the elements of the project cycle to a project situation
- Apply to donors effectively for project funding
- Plan and implement a project incorporating the skills of participatory development

Syllabus:

Understanding Community Development

The meaning of community and community development
Community Development Process Model
Principles of community Development
Introduction to sustainable Development

Community Development Skills

Information collecting and analysis
Interpersonal skills
Written and Oral Communication for Community Development

Identifying community resources

Community action resources

Working with - donors - media
Participatory Development
Community development standards
What is Participatory Development?
Participatory Development

Community Development Projects

What is a project?
Project cycle Development Cycle
Project planning

Reference:

Pastep (2002) Community Development.
Munford .R and Walsh – Tapiata .2001.Strategies
for Change. New Zealand

Assessment:

Continuous Assessment - 60%
Final Examination - 40%

CD 362: CRIME AND DEVELOPMENT

Hours per week: 3

Objectives:

The aim of this course is to examine the relationship between crime and development. On completion of the subject, the students should be able to:

- Define and understand the meaning of the term crime in both the legal and sociological context;
- Explore the character and occurrences of crime and examine how crime is reported, recorded, processed and kept as statistical information for analysis;
- Recognise how crime reported in the media can influence people's perception of crime;
- Understand and appreciate the role of the criminal justice system;
- Analyse the concomitant character of crime and development;
- Develop an understanding of the challenges of development posed by the problems of law and order, white-collar crime and transnational crime.

Syllabus:

Definition: sociological and legal definition of crime

Relativity of crime: crime is relative to place and time

Crime data: source of crime data, volume of crime, crime rate & statistics

Crime and media: reporting a crime, effects of media violence

Classical and neo-classical explanations to crime

Positivist approaches: biological and psychological theories of crime

Sociological approaches: social disorganization theory, strain theory, control theory, situational theory, labelling theory and radical theory

Feminist perspectives of crime: women and crime

Criminal justice system: police, courts and prisons

Development and crime: modernization, urbanization, unemployment and etc

Papua New Guinea's law and order problems (violent crimes, street crimes and public/social disorder), white collar crime (bureaucratic and political corruption) transnational crime (corporate crime, human smuggling, terrorism, and etc)

Textbooks:

Rob White and Fiona White, 1996. Crime and Criminology: An Introduction. Melbourne: Oxford University Press.

References:

Patricia A. Adler and Peter Adler, 2003. Construction and Deviance: Social Power, Context, and Interaction. Belmont: Thomson Wadsworth. Fourth edition

Garry Sali, 1996. Law and Order in Contemporary Papua New Guinea: An Examination of Causes and Policy Options. Unpublished Doctoral Thesis Paper, Department of Applied Social Science, Victoria University of Wellington.

Sinclair Dinnen and Allison Ley, 2000. Reflections on Violence in Melanesia. Canberra: Asia Pacific Press

Assessment:

Continuous - 60%
Examination - 40%

CD 481: INDUSTRIAL EXPERIENCE

Hours per week: Official working hours for one semester

Objectives:

On completion of this subject the student should be able to:

Meet successfully the demands of a complex work environment in the following areas:

Punctuality and time management, efficiency and effectiveness with regard to intra organisational and inter organisational communication, and attitude towards work and relations with colleagues and supervisors. Make an accurate assessment of the communicative needs in situations related to liaison/community relations work.

Keep an accurate record of his/her industrial experience over an extended period and evaluate it intelligently and productively.

Syllabus:

Supervised and guided practical participation in a work environment related to the professional duties of liaison/community relations officers in a natural resource development company, a government department or a landowners association; practical experience in all skills required for the efficient conduct of such work; adaptation to the particular requirements and contingencies of the specific work situation, so as to develop the ability to exercise the necessary judgment, flexibility, circumspection, initiative and sensitivity to cope successfully with professional demands

Assessment:

On-site supervisor's training report – 33 1/3%

Student's written report of industrial training experience – 33 1/3%

Student's oral report of industrial training experience at a seminar – 33 1/3%

(Note: In order to pass this subject students must receive a grade of at least 50% = Pass in all three components of the assessment.)

Textbooks:

Ratcliffe JI, An introduction to Town and Country Planning, 2nd edition, Huteson, London. PNG Planning Act and Regulations.

References:

De Blij H. J. and Mullar P. O., Human Geography: Culture, Society and Space, 3rd edition, John

Wiley and Sons.

Selected readings related to subject topics.

Assessment:

Continuous Assessment - 100%

CD 402: PREPARATION OF PROPOSALS**Hours per week: 3****Objectives:**

To develop students' knowledge and skills in writing proposals and their ability to articulate the reasons for any recommendations they make in their role as officers within their organizations.

On completion of the subject the student should be able to:

1. Identify issues that are worthy of management attention within their workplace.
2. Specify objectives for bringing about a change in the present conditions.
3. Specify the requirements and costs of bringing about such a change.
4. Determine appropriate realisations of the objectives
5. Describe the impact of such changes on the people, management and operations it will affect.
6. Explain how the project will be managed, implemented and evaluated.
7. Articulate the project submission in a persuasive and convincing manner to appropriate authorities for approval, support and funding.

Syllabus:

Identification of innovative ideas worthy of management attention; determining and stating project goals, objectives with their impact and implementation indicators; providing project rationales; designing and explaining project procedures for implementation' calculation the impact of the project; formulating and implementing procedures for the evaluating the project; revision of project details and making appropriate changes.

Assessment:

Continuous Assessment - 60%

Final Examination - 40%

**CD 472: DISSERTATION:
COMMUNICATION
IN RESOURCE DEVELOPMENT**

Hours per week: 3

Objectives:

Based on either one in-depth study or an in-depth comparative study using examples drawn from the resource sectors, to display an analytical understanding of the application of effective communication techniques within specific social contexts. On completion of the subject, the student should be able to:

Analyse the political, economic and environment contexts within which communication occurs in the case study (ies). Identify and analyse a communication problem or communication problems arising within the study. Identify political, economic, social and environmental factors with limit effective communication between parties. Develop social policy changes conducive to an improved communication policy to solve the problem. Choose appropriate channels and techniques of communication in order to achieve the aims and objectives.

Assessment:

Dissertation (8,000-10,000 words) - 80%
Oral Defense - 20%

**GRADUATE CERTIFICATE IN
COMMUNICATION OF SCIENCE AND
TECHNOLOGY (SCICOM)**

LS 501: COMMUNICATING WITH ADULTS

Hours per week: (A five day workshop)

Objectives:

Demonstrate understanding of the concept of 'andragogy' – the principles of adult learning and be able to apply these in a communication setting. Understand the scope of the communication needs in terms of target audiences and their context.

Understand the four basic learning styles and their implications for communication with adults.

Plan a mixture of communication methods to cater for the different learning styles.

Understand how to approach communication and learning in a gender sensitive fashion.

Understand ethical and power issues associated with communication between adults and be able to account for them.

Syllabus:

This is a foundation subject that provides a theoretical and practical base for effective communication with adults. It covers adult learning principles, their application and the importance of different learning styles in developing communication strategies. Participants coming from different experiences will expand their capacity and skill in adult learning as a precursor for developing appropriate products for communicating scientific and technological topics to adults. Four themes in the subject are:

- i. What's so special about communicating with adults?
- ii. What has learning got to do with communicating with adults?
- iii. Reducing the noise in adult-adult communication.
- iv. Dealing with gender, ethics and power.

References:

A *Book of Readings* containing supporting materials for each theme is provided.

Textbook:

Knowles, M., (1980), 'The Modern Practice of Adult Education', Prentice Hall Regent: Cambridge.

Assessment:

Participation - 20%
Group Presentation - 30%
Individual Assignments - 50%

**LS 502: LANGUAGE OF SCIENCE AND
TECHNOLOGY**

Hours per week: (A five day workshop)

Objectives:

Understand some of the important terms in the language of science.

Appreciate some of the language constraints in communicating 'science' to different groups of people.

Appreciate the methods used in natural and social sciences, their relative merits and their impacts on communication style.

Consider measures to improve scientific communication across different groups.

How to express ideas as effectively as possible.

Syllabus:

This is a foundation subject for elective subjects. It assumes that participants will have varied experiences in science and technology, and the language related to them. This is a strength that enables the subject to use experiential learning techniques to provide an appreciation of science and technology, and the components of language for effective communication. Participants will produce a personal style guide for writing scientific and technological materials in their workplace. The subject has four themes:

- Language of science and technology in the workplace
- Scientific method and its impact on language
- Communicating complex ideas and relationships
- Effective writing styles.

References:

A *Book of Readings* containing supporting materials for each theme.

Textbooks:

Participants will receive a copy of the following resources;

Snooks & Co., (2002) *Style Manual for Authors, Editors and Printers*. John Wiley & Sons Australia, Ltd., as a guide for writing style.

Bourke, RM, Allen, MG, & Salisbury, JG., (eds) 2001, *Food Security for Papua New Guinea, Proceedings of the Papua New Guinea Food and Nutrition 2000 Conference, PNG University of Technology, Lae, 26 – 30 June 2000, ACIAR.*

Assessment:

Peer Appraisal - 30%

Personal Style Guide - 70%

**LS 503: COMMUNICATION OF SCIENCE
TECHNOLOGY IN THE
COMMUNITY**

Hours per week: (A five day workshop)

Objectives:

Demonstrate an appreciation of the importance and benefits of communicating new science knowledge to a range of audiences.

Determine appropriate communication media for various audiences and identify benefits and constraints of each in the varied contexts.

Plan a communication project.

Evaluate the effectiveness of a communication project.

Produce a communication product that meets and demonstrates the criteria for effective communication through a given medium to a given audience.

Syllabus:

This subject is set within the broad context of having participants use their wide and varied experiences to appreciate the need to effectively communicate scientific information. It considers the appropriate application of different mediums for communication of scientific and technological matters through planning, selection, demonstration and evaluation. It builds on the theories and reflections of learning as adults, and the components of language for effective communication in science. During the workshop, participants are expected to produce a communication product that meets and demonstrates the criteria for effective communication through a given medium to a given audience. The four themes in the subject will be presented in an experiential learning approach:

- Scope of Communicating Science to the Community
- Planning a communication project
- Preparing a communication product
- Evaluating the effectiveness of a communication project.

References:

A book of supplementary readings containing support materials from a range of sources will be given to participants.

Textbooks:

Participants will use the following resources:
Snooks & Co., 2002, *Style Manual for Authors, Editors and Printers*, John Wiley & Sons Australia, Ltd.
Mortiss, P.D., (1993) *Extension for Rural Change*, Department of Primary Industries, Queensland Government, Australia.

Assessment:

Communication medium - 20%
Communication Product - 60%
Peer Appraisal - 20%

LS 504: WRITING SCIENTIFIC REPORTS**Hours per week: (A five day workshop)****Objectives:**

Understand the process of writing a scientific paper by using:

- % The IMRaD model of scientific reporting
- % Appropriate language for sections of a paper
- % Appropriate arrangement of ideas in a paper

Syllabus:

The ability to communicate in writing is an important role for scientists and engineers. This subject is set within the broad context of participants having a wide and varied experience in science and/or technology and their related language. This background enables the subject to use experiential learning techniques to develop capacity and skill in writing scientific reports, form a base for other reports of technical nature. It emphasizes the use of appropriate structure and language for the various sections of a research paper. It demonstrates the use of bibliographic software. Seven themes in the subject cover the main sections of a research paper:

- Introduction
- Materials & Method
- Results
- Discussion

- Abstract
- References, Acknowledgment & Appendices
- Other Scientific and Technical Reports

Participants will be required to present a draft of a research paper, or a critique or two papers to the group for peer feedback and general response, conclusions and assessment.

References:

A *Book of Readings* containing supporting materials for each theme.

Textbooks:

Participants will use the following material for reference and examples:

Lindsay, D., (1995) *A Guide to Scientific Writing*. Second Edition. Melbourne: Longman.

Snooks & Co. (2002) *Style Manual for Authors, Editors and Printers*. John Wiley & Sons Australia, Ltd.

Bourke, RM, Allen, MG, & Salisbury, JG (eds) 2001, *Food Security for Papua New Guinea, Proceedings of the Papua New Guinea Food and Nutrition 2000 Conference, PNG University of Technology, Lae, 26 – 30 June 2000, ACIAR*.

Assessment:

Documentation of your learning - 60%.
Group presentation - 20%
Peer appraisal - 20%.

The documentation of your learning from the course will take the form of either:

- A summary of your comparison of two papers using the tools of analysis introduced in the workshop, or
- A draft research paper or other scientific report as negotiated with the facilitator.

LS 505: TRANSFORMING INFORMATION INTO KNOWLEDGE**Hours per week: (A five day workshop)****Objectives:**

Demonstrate an understanding of the steps and approaches for transforming information into knowledge.

Design ways to evaluate the relevance of information within a specific context.
Appreciate techniques for critical thinking and synthesising information.
Develop a framework for managing information sources

Syllabus:

This subject presents a process for transforming information into knowledge as part of a decision making process. Gaining an understanding of the complex interactions that impact on a particular issue is the underlying principle that guides this approach to transforming information into knowledge. As an elective subject, it builds on the skills and expertise developed in the core subjects. The subject comprises six key themes that give participants an opportunity to develop their professional capacity and practice in transforming information into knowledge. The six themes of this subject are:

- Data, information and knowledge,
- The context,
- Information access
- Evaluating and managing information
- Synthesis
- Application, review and monitoring.

References:

Participants will have access to:

A *Book of Readings* with chapters and articles from recent publications relating to the six key themes described above will be provided for participants.

The bibliographic software Endnote together with a CD ROM of scientific abstracts pertaining to PNG.

Textbooks:

Snooks & Co. (2002) *Style Manual for Authors, Editors and Printers*. John Wiley & Sons, Australia Ltd.

Bourke, RM, Allen, MG, & Salisbury, JG (eds) 2001, *Food Security for Papua New Guinea, Proceedings of the Papua New Guinea Food and Nutrition 2002 Conference, PNG University of Technology, Lae, 26-30 June 2002*,

Assessment:

Peer Assessment - 20%

Group Presentation of case study - 40%
Written Report of case study - 40%

LS 506: ADVANCED ROLES FOR SCIENTISTS AND ENGINEERS

Hours per week: (A five day workshop)

Objectives:

Participants will gain an understanding of what is involved in:

- Editing and refereeing peer written articles and research reports;
- Organising and running a workshop or conference for peers;
- Achieving high quality verbal presentations;
- Mentoring PG students / researchers in the workplace;
- Managing a research project.

Syllabus:

Scientists and engineers are called upon to fulfil a number of roles for which they are often inadequately trained. These include roles such as: mentoring/supervising junior staff or post-graduate students; refereeing report from peers; organising workshops and conferences for information sharing; giving verbal presentations; and managing research projects. This elective subject consists of five 1-day workshops that combine as a week long workshop.

References:

A workbook including appropriate examples and readings will be provided to participants.

Textbooks:

Expected that participants will have read:

Stapleton, Paul (1987). *Writing Research Papers: an easy guide for non-native English speakers*. The Australian Centre for International Agricultural Research, Canberra (ISBN 0 949511 55 5).

It is also assumed that all participants have a working knowledge of:

Lindsay, David (1995) *A Guide to Scientific Writing*, Logman, Melbourne (ISBN 0 582 803128).

Assessment:

Each of the five 1-day workshops will have a separate assessment that contributes 20% of marks in LS506. The nature of assessment varies across topics, and may involve some form of peer assessment.

Verbal presentations

Individual Verbal Presentation	- 20%
Refereeing and Editing Assignment	- 20%
Supervising Post Graduate Students Assignment	- 20%
Managing a Research Project Group Presentation	- 20%
Organising A Research Conference Group Presentation	- 20%

LS 507: DIRECTED PRODUCT DEVELOPMENT

Hours per week: Workplace based over a semester period.

Objectives:

Apply principles of good scientific communication to preparation of a workplace based communication product.

This subject could well be the final subject for participants who wish to prepare:

a scientific report: LS501, LS502, LS504, LS507

an extension product: LS501, LS502, LS503, LS507

a major review: LS501, LS502, LS505, LS507.

Syllabus:

This subject provides an opportunity for participants to apply the learning, experiences and lessons across other subjects to develop a significant communication product for their workplace. It acknowledges the fact that this may take up to one semester and allows participants to work in remote locations.

The nature of the product can be wide and varied ranging from traditional scientific or technical reports to novel ways of communicating science and technology to the community. Participants will select and develop the communication product on a case by case basis after negotiations with their

employer and experienced university or industry staff.

Assessment:

Proposal	- 10%
Finished project	- 60%
Documentation	- 30%

POSTGRADUATE STUDIES**MASTER OF COMMUNICATION STUDIES (MCS)****Program Goal:**

To provide a high quality postgraduate education at the Masters level to meet the manpower needs of the government departments and non-government organisations and the private sector industries in Papua New Guinea and the wider global community particularly to the Pacific Island countries.

Program Objectives:

This program, while building on the various generic humanities and social sciences knowledge and skills attained at the undergraduate studies, is essentially to create an academic environment for the student to study critically a particular research problem at the postgraduate (Masters) level. This can be done through the following:

- To critically review the current and relevant literature on books, journals, monographs, theses, discussion papers, conference proceedings and other suitable reading materials pertinent to the research topic under investigation.
- To teach the students with a broader understanding and appreciation of the various structures and dynamics of society and their connections to patterns of human behavior and individual life changes.
- To offer various communication theories and their applications that sets forth the foundation for further analysis and research in the field of communication.

- d. To provide students appropriate communication skills and mass media as tools for development and dissemination of information.
- e. To provide knowledge and skill using mass media to complement and supplement development of human attitude and behaviour for societal progress.
- f. To provide advance training in writing by creating an academic environment for students to develop critical awareness of the organization, linguistic features and production of selected academic writing genres.
- g. To train the students not only to understand the knowledge, skills and techniques in planning and carrying out an independent research but also to grasp the key methods of data processing using a computer software.
- h. Through a semester's intensive fieldwork and research, the student is required to use research tools/instruments to collect first hand data and information as evidence to support the dissertation.
- i. To produce high quality dissertations reflected by technical competence, originality of scholarly research, critical assessment, logical structure and scholarly discussion of findings to address research questions and problems.

Rules for Masters Degree on Coursework

This program shall be offered in accordance with and within the meaning of the rules governing the University's Masters Degree through the coursework mode.

In consultation with the University Higher Degrees Committee, the department shall, from time to time, make such adjustments where necessary particularly in the program's course structures.

Teaching Program Structure and Delivery Course Structure

The candidate for the Degree of Master of Communication Studies (MCS) shall register for 9 (nine) courses and a dissertation component in two years, of which 6 (six) courses in first year and 3

(three) courses will be taken in the second year from 6 (six) optional courses. The matrix below indicates the course-structure:

Master of Communication Studies (MCS) Course Structure

Year 1 First Semester		12
Code	Subject	Weekly Hours
MCS 501	Communication Theories	4
MCS 502	Sociological Thought	4
MCS 503	Advanced Research Methods	4

Year 1	Second Semester	12
MCS 504	Media Reporting	4
MCS 505	Media Editing	4
MCS 506	Crime and Media	4

Students should select 2 (two) Courses in first semester and 1 (one) course in second semester from 7 optional courses, in addition to the dissertation in both the semesters of the Second Year.

Year 2 First and Second Semester 12+12=24

MCS 507	Public Relations, Advertising and Campaign	4
MCS 508	Health, Population and Development Communication	4
MCS 509	Advanced Writing Skill	4
MCS 510	Media Economics and Management	4
MCS 511	Creative Writing Skill	4
MCS 512	News and Video Production	4
MCS 513	Participatory Communication and Community Development	4
MCS 520	Dissertation [First semester 4 + Second semester 8]	12
TOTAL HOURS		48

Duration of the Course

Consistent with the Higher Degrees rules, the following duration of study shall apply:

- a. A full-time candidate shall normally have twenty-four calendar months. A special extension may be sought, if the student has valid reason/s for not completing his/her work. If, however, a student does not complete his/ her studies without any valid reason/s, his/her studies may be terminated by the University Academic Board upon recommendation from Higher Degrees Committee.

A part-time candidate shall normally have a minimum of twenty-four calendar months and a maximum of forty-eight months. A special extension may be sought, if the student has valid reason/s for not completing his/her work. If, however, a student does not complete his/her studies without any valid reason/s, his/her studies may be terminated by the University Academic Board upon recommendation from the Higher Degrees Committee.

SUBJECT DETAILS

MCS 501: COMMUNICATION THEORIES

Hours per week: 4

Objectives:

To provide students with an understanding about the contemporary communication theories on Eastern and Western perspectives for their concentration on the subject. This will lead the students to understand major communication theories and application in the societies with an emphasis on political economy, structuralism, post-structuralism, culturalism, post-culturalism and post-modernity.

Studies on media and society, mass culture, entertainment industries, cultural imperialism, invention of reality and the make-believe media, and some classic studies on media effects will be discussed to expand the foundation of students to keep pace with the concept of modern media use to enrich their professional capacity. Theoretical aspects on relationship between mass communication and society; effects of mass media; media and violence; and needs, expectations and

gratifications of media will be brought into discussions so that the students can plan further to take mass media channels as part of effective communication in future.

Syllabus:

Review of major communication theories: Two-step and Multi-step Flow of Communication; Magic-Bullet Theory; Cultivation Theory; Cognitive Dissonance Theory; Mass Media as Social System; Theory of Psychological Barriers of Communication; Information Theory; Social Learning Theories; Diffusion of Innovation and Communication; Critical Theories;

Mass culture; Popular culture; Cultural imperialism; Invention of reality; Effects of mass media; Media and violence; Expectations and gratifications of media; Media hegemony; Frankfurt School; Post-Modernism and Post-structuralism; Agenda Setting Function of Maxwell McCombs; Spiral of Silence of Elisabeth Noelle-Neumann; and Technological Determinism of Marshall McLuhan (Media and Culture).

Social responsibility of media; Citizen media; Alternative media (Community Radio, Rural Press) and Traditional media.

References:

- B. Ashcroft, G. Griffith & H. Diffin (eds)- The Postcolonial Studies Reader*
D. Lawrence Kincaid (ed) – Communication Theory Eastern and Western Perspective
Werner J. Severin and James W. Tankard, Jr.- Communication Theories: Origins, Methods and Uses in the Mass Media, New York: Longman, 2001
Griffin, E- A First Look at Communication Theory, 5th Edition, 2005, McGraw-Hill, Inc.
McQuil, Denis – McQuil's Mass Communication Theory, 5th Edition, (2005), Sage Publications, Thousands Oak, CA.
Cary Nelson & L. Grossberg (eds)- Marxism and the Interpretation of Culture
David Held- Introduction to Critical Theory
Edith Kurzweil- The Age of Structuralism
P.M. Rosenau- Postmodernism and the Social Sciences
Raymond Williams- Towards 2000

Padmini Mongia (ed.) – Contemporary Post Colonial Theory

Berko, W. W. – Communicating: A Social and Career Focus, Houghton Mifflin. Co. Boston, 5th Edition.

Bittner, J. - Mass Communication, Allan & Bacon Boston, 6th Edition

C. R. Berger & S. H. Chaffee (Eds.), - Handbook of Communication Research, Newbury Park: Sage.

Felipe, Korzeny and Stella, Ting-Tooney – Mass Media Effects across Culture

Kalinga Seneviratne (Ed) – Media Pluralism in Asia: The Role & Impact of Alternative Media, Singapore, AMIC

Assessment:

Examination - 50%

Continuous Assessment - 50%

MCS 502: SOCIOLOGICAL THOUGHT

Hours per week: 4

Objectives:

To widen students' understanding on the roots of sociology, classical and contemporary sociological theories are planned to highlight in the course. This will help the students to understand further the pioneering minds of Augustin Comte, Karl Marx, Emile Durkheim, and Max Weber, who developed our modern idea of society. The course also examines the major works and theoretical perspectives of the mid-twentieth century, including those of Talcott Parsons and Robert Merton. It concludes with an examination of contemporary sociological debate with a particular emphasis on modernization theory and its relevance to socio-economic and political transformation in Papua New Guinea.

After the completion of the course, the student should be able to understand the roots of sociology by exploring the classical and contemporary sociological theories of society; to enhance knowledge on the structure and dynamics of society and their connections to patterns of human behaviour and individual life changes; and to look at how various sociological theories explain the 'driving force' of social change in the contemporary Papua New Guinea

Syllabus:

Precursors to Sociological Theory: Of the social contract: Jean-Jacques Rousseau; Enlightenment: Immanuel Kant; Division of labor: Adam Smith.

Development of Sociology as a Science of Society: Augustin Comte and sociology; Perspectives of sociology; Wright Mills and sociological imagination; Social science research methodology The Sociological Theory of Karl Marx and Friedrich Engels: History and class struggle: Manifesto of the Communist Party; Capitalism and the labor process.

The Sociological Theory of Emile Durkheim: The rules of sociological method; Solidarity and modern life; The division of labor in society; Origins of collective conscience; The elementary forms of religious life; Anomie and suicide Sociological Theory of Max Weber: Objectivity' in social science; Basic sociological terms; The distribution of power within the political community; The types of legitimate domination and The ideal bureaucracy.

Structural-Functional Analysis:

Talcott Parsons: The position of sociological theory; The notion the social system Structural components of the social system

Robert Merton: On sociological theories of the middle range; Social structure and anomie

Contemporary Sociological Thought or Modern Social Theory:

Democracy: Socialism and capitalism; Modernization theory; Dependency theory: development of underdevelopment; Globalization and the global community; Social theory and social change in Papua New Guinea

References:

Cohen, P. S.- *Modern Social Theory*, Heinemann Educational Books Limited. Special Reserve, Matheson Library, Call No. 301.01 C678

LaCapra, D. (1972). *Emile Durkheim: Sociologist and Philosopher*. London: Cornell University. Matheson Library Call No. 301.092D963

McKee, J. B. (1969). *Introduction to Sociology*. New York: Holt, Rinehart and Winston, Inc.

Special Reserve, Matherson Library, Call No. 301M154

Mills, C. W. (1959). *The Sociological Imagination*. New York: Oxford University Press. Special Research, Matherson Library, Call. 301M657

Plange, N. (1996). *The Science of Society: Exploring the Links Between Science and Theories of Development*. Suva: University of the South Pacific.

Truzzi, M. (Ed.), (1971). *Sociology: the Classic Statements*. New York. Random House. Matherson Library, Call No. 301S678

Worsely, P. (Ed.), (1978). *Modern Sociology*. Middlesex. Penguin Books. Matherson Library Call No. 301M689.

Assessment:

Examination	- 50%
Continuous Assessment	- 50%

MCS 503: ADVANCED RESEARCH METHODS

Hours per week: 4

Objectives:

The course will provide and interdisciplinary understanding of media research techniques, organized complementarily the qualitative and quantitative methods. In a very practical way this course will show the students how these techniques can be made to work in practice. This course considers the theoretical perspectives of the two conceptions of interpreting social reality and their underlying assumptions to enhance the students' participation in research.

To make the students capable of undertaking independent research the course will cover following areas: planning research; various methods and styles of research; strategies of choosing topics, gathering, analyzing, interpreting and reporting data; and ethical considerations on human subjects. It will also focus on: readership research; circulation studies; readability survey; ratings and nonratings research in the electronic

media; research in media effects; semiological, organiz, and psychoanalytic approaches;

After the completion of the course, the students should be able to: muster the knowledge, skills and techniques in planning and carrying out research; competently design questionnaires and interview schedule of questions; understand the key methods of data processing using computer software; analysis and discuss the data and information collected from field research and be sensitive to ethical issues when conducting research.

Syllabus:

The Nature of Inquiry: The search for truth; Two conceptions of social reality; Strengths and criticisms of positivist and interpretive paradigms; The assumptions and nature of science.

Areas of Communication Research: Readership research; Circulation studies; Readability survey; Ratings and Nonratings research in the electronic media; Research in media effects; Semiological, organiz, and Psychoanalytic approaches

Aspects of Research: The tools of science; The scientific method; Research and evaluation; Research, politics and policy-making and Characteristics of good research, validity and reliability issue

The Ethics of Social Research: Informed consent; Access and acceptance; Ethics of social research; Sources of tension; Voices of experience; Ethical dilemmas; Privacy and anonymity; Confidentiality; Betrayal and deception and Research and regulation

The Research Process: The problem identification; Data collection and analysis; Data interpretation and reporting and Actionning research findings

Data Preparation and Analysis: Data summary and summary sheet; Tabulation and graphs; Computer software and Correlational statistics (univariate, bivariate, multivariate, and others).

Quantitative Research Methods: The survey style; The experimental style; Correlational style

and Content analysis

Qualitative Research Methods: The case study style; Observation (non-participant and participant); Ethnographic and anthropological style; Historical analysis and Action research

References:

Wimmer & Dominick- Mass Media Research
Guthrie, G. (Editor) – Basic Research Techniques, University of Papua New Guinea, Port Moresby: Education Research Unit.
Perrin, R. – Pocket Guide to APA Style. Boston: Houghton Mifflin Company.
Berger, Arthur – Media Analysis Techniques
Deacon, David et. al. – Researching Communications
Reinharz, Shulamit- Feminist Methods in Social Research
Rose, Gillian – Visual Methodologies
Cohen, M. R., Manion, L. and Morrison, K. R. B. – Research Methods in Education (5th edition)

Assessment:

Examination	- 50%
Continuous Assessment	- 50%

MCS 504: MEDIA REPORTING

Hours per week: 4

Objectives:

To provide students the art and technique of reporting for different mass media so that they equip themselves to work in media houses, public relations sections, community and communication sections of different organizations. The students will learn how to collect information, maintain relation with news sources and write news, interview people and report for print and electronic media. They will also learn the ethical, moral and legal aspects of reporting for newspaper, radio, television and on-line journalism.

Syllabus:

Review of 'straight-jacket' news and its structure. Reporting different social, economic, political and cultural events for print and electronic media.

Provide reference to report seminars, workshops, meetings, speeches, Parliament, crimes and courts. Covering Press Conference, Meet the Press, and Press Briefing.

How different types of interview to be conducted for different stories for print and electronic media.

Techniques of information gathering, and writing of investigative report, interpretative report and specialized report on different issues and areas.

Techniques for print media and electronic media will be provided.

Practical exercises will be followed by students on the major areas of reporting.

References:

Carl Warren- Modern News Reporting
Harris and Johnson- The Complete Reporter
M.V. Charnley- Reporting
Richard Critchfield – The Indian Reporters' Guide
W.A. Weed – Electronic Journalism
Brown and Jones – Radio and Television News
Patricia Holland – The Television Handbook, London: Routledge
Ivor York – Basic Television Reporting. London: Focal Press
Charles Cremer – ENG : Electronic News Gathering Television News, New York: McGraw Hill
B. N. Ahuja & S.S. Chabra- Reporting
Douglas Anderosn – Contemporary News Reporting
J. Ullamann & J. Colbert (eds.)- The Reporter's Handbook
Neil Copple – Depth Reporting
Julian Harriss, Kelly Leiter & Stanley Johnson – The Complete Repoerter: fundamentals of News Gathering, Writing, and Editing

Assessment:

Examination	- 50%
Continuous Assessment	- 50%

MCS 505: MEDIA EDITING

Hours per week: 4

Objectives:

The course is planned to develop practical skills among students on editing copies, rewriting,

translation, basic ideas about headline and designing newspaper pages, newspaper make-up styles, photo-editing and caption writing. Different types of page make-ups for newspaper will be discussed in this course. This course will help students develop their editing skills at a higher level and planning and designing newspaper pages as well as broadcast editing. Students will be asked to produce make-up pages of newspaper as exercise. Editing of radio news and television news will be provided with practical assignments.

Syllabus:

Newsroom and flow of news copy; Editing copies; Re-writing copies; headline writing; photo editing; caption writing; editing and make-up.

Different types of newspaper page make-ups: for broadsheet and tabloid. Formal balance, Contrast and balance, Circus, and Brace. Different components of make-up: balance, harmony, unity and coherence; Grid and panel of page make-up; make-up of editorial page, news page, special pages and supplements.

Editing of TV reports; news broadcast; package preparation and knowledge on script editing and video production.

Translation of news and other documents.

Writing Composite story from different materials and sources.

Knowledge of on-line editing and transmission.

Evaluation and review of make-up and contents of main stream newspapers by students.

Topics followed with exercises by the students.

References:

Floyed K. Baskette, Jack J. Scissors, Brian S. Brooks – The Art of Editing
Bastian, Case and Baskette- Editing the Day's News
Garst and Bernstein- Headlines and Deadlines
Bruce H. Westley – News Editing
G. Gilmore – Modern Newspaper Design
Martin Gibson- Editing in the Electronic Era
H. Fisher- Radio Program Idea Book
M.V. Charnley- News by Radio
W.A. Weed- Electronic Journalism

Brown and Jones- Radio and Television News

Assessment:

Examination - 50%
Continuous Assessment - 50%

MCS 506: CRIME AND MEDIA

Hours per week: 4

Objectives:

This course aims to broaden students' knowledge on the areas of classical and contemporary criminological theories and to understand the pioneering minds of sociologists and criminologists, who explained why crime in society. To enrich students' understanding, the course will discuss how these crime theories explain the criminal activities that frequently occur particularly in many developing nations. Also, the course gives special consideration to the students how the media influences crime especially through the television and movie industries. The impact of television advertising; the effects of media violence on social learning and children's learning from mass media are some of the major areas to be addressed in this course to get acquainted with the media. The social effects of mass communication on human life like education, political behaviour, economic life, regulation, crime, security, and privacy will also be discussed to expand the understanding of the students. The students will have the opportunity to examine the social and economic costs of crime and assesses how the criminal justice system attempts to prevent criminal activities. They will also understand the state responses to crime in different societies and alternative strategies aimed at preventing the occurrences of crime in the society.

After the completion of the course, students should be able to: see how various crime theories explain the law and order problems; assess the extend to which crime is prevalent in society; see how the media influences crime; evaluate how children learn from television, films and other media; understand how new communication technology influence audience; examine the social and economic costs of crime; assess how the criminal

justice system is organized to prevent crime and critically analyse current crime policy approaches and suggest constructive alternatives.

Syllabus:

Classical and Neo-Classical Theories: the classical school; new-classical school; positivist school
Individual Theories Crime: biological and psychological approaches
The Sociological Theory Theories of Crime: social Disorganization; sub-culture; social control; situational; labelling; and radical.
Modernization and Crime: organic solidarity; mechanical Solidarity; colonialism; westernism; rural-urban migration; urbanization; and squatter settlements.
Crime and the Criminal Justice System: police; courts; and prison systems
Approaches to the study of mass communication effects
Impact of television advertising
Impact of mass media on social issues like crime, violence, crisis and social disorder
Effects of media violence on the society: Hadley Cantril's study "The Invasion from Mars"
Children's learning from mass media
Media Reporting of Crime
State Responses and Crime Alternatives

References:

Jim R Macnamara – Mass Media Effects: A Review of 50 Years of Media Effects Research (2003), CARMA International, Australia.
T. Klapper – Mass Media Effects
Alexander, R. 2000. Counselling, Treatment and Intervention: Methods With Juvenile and Adult Offenders. Ontario: Wadsworth
Sali, G (1986). Law and Order in Contemporary Papua New Guinea: An Examination of Causes and Policy Options. Unpublished PhD Thesis Paper Submitted to the Department of Applied Social Sciences, Victoria University of Wellington, New Zealand.
Wilbur Schramm and Donald F. Roberts (Eds) – The Process and Effects of Mass Communication

Assessment:

Examination	- 50%
Continuous Assessment	- 50%

**MCS 507: PUBLIC RELATIONS,
ADVERTISING AND CAMPAIGN**

Hours per week: 4

Objectives:

The course will highlight three different but coordinated areas of public relations, advertising and campaign which will enhance knowledge and improve competence of students to work professionally in business organizations, media houses, government and non-government offices and public and community relations departments to deal public and community relations, advertising, and campaign activities.

After the completion of the course students will be able to: learn the art of public relations activities; understand PR ethics; solve problem and situation raised among internal publics and external publics of an organization; undertake case study on crisis and negotiation; prepare press releases and media kits for campaign.

The students will learn theoretical aspects and art of advertising for print media and electronic media. They will also practice copy writing and visualizing of display advertisement and preparation of campaign materials to work in advertising agencies.

Syllabus:

Theories and practical aspects of public relations; Building image and goodwill of organizations; Managing internal and external public(s) of organizations; Public opinion and persuasion; Looking at crisis management as PR personnel; Public Relations ethics; Studying cases of public relations and community relations problems; Preparing press releases, brochures, folders, media kits and campaign materials.

Theories of advertising; Growth and development of advertising; Practice of advertising and copywriting; Preparation of display advertisement copies; visualizing themes and layouts; Preparing radio commercials, TV advertisements and spots. Preparing campaign strategy for a product, service or a social issue; Budgeting for advertising and publicity campaign

References:

S.M. Cutlip- Public Relations

D.L. Wilcox, Philip H. Ault and Agee- Public Relations: Strategies and Tactics
Sam Black – Practical Public Relations
John E. Martson- The Nature of Public Relations
R. Simon- Perspective in Public Relations
M. Golam Rahman – Media Response and Campaign Strategy
Wright and Warner – Advertising
Sandage and Fryburger – Advertising Theory and Practice
Dirksen and Kroeger – Advertising Principles and Problems
Woodrow Wirsing – Principles of Advertising

Assessment:

Examination	- 50%
Continuous Assessment	- 50%

MCS 508: HEALTH, POPULATION AND DEVELOPMENT COMMUNICATION

Hours per week: 4

Objectives:

The course will focus on agriculture, health, population and development issues with special emphasis on communication in family planning, demographic profile of Papua New Guinea and the implication of population growth to broaden students' skill in addressing the issues.

The course aims to equip the students to understand and analyse national population policy, action and strategies; aspects of population information, education and communication; cultural aspect of communication on health and population; recent media responses and behaviour change communication (BCC) through mass media on health, nutrition and agriculture.

The course is also intended to enable students to understand the key issues like adolescent, sex education, drug prevention, safe water, reproductive health, mother and child health and HIV/AIDS from the point of communication and media use; Development of message and also layout strategies for motivation and campaign on population, health and development using interpersonal and mass media channels are planned to address in this course to facilitate the students

professionally.

Syllabus:

Reviewing the issues of health, population and development of PNG; Communication in Family Planning; Demographic data and development of PNG; Features of National Population Policy; Population information, education and communication (IEC); Cultural aspects and taboos on health and population communication; Media responses on health, population and development issues; Communicating issues like adolescent, sex education, drug prevention, reproductive health, mother and child health (MCH), HIV/AIDS, safe water and common diseases. Development of messages and materials on health and population problems; preparing campaign strategies on health and population issues; and communication component for agricultural extension work are major areas of the course. Activities will be followed by practical work by the students.

References:

Everett M. Rogers- Communication Strategies for Family Planning
Collins O. Airhihenbuwa – Health and Culture: Beyond the Western Paradigm
M. Golam Rahman – Communication in Bangladesh: Media Responses & Campaign Strategy
P.T. Piotrow, D.L. Kincaid, Jose G. RimonII, & W. Rinehart – Health Communication
Government of Bangladesh- A Communication Population Strategy for Bangladesh
W.B. Johnson, Dona J. Boguc et. Al- Information, Education and Family Planning
Communication and Family Study Center- Communication Family Planning to Rural Guatemala

Assessment:

Examination	- 50%
Continuous Assessment	- 50%

MCS 509: ADVANCED WRITING SKILLS

Hours per week: 4

Objectives:

This subject provides advanced training in writing by creating an enabling environment for students to develop critical awareness of the organization, linguistic features and production of selected academic writing genres. The subject emphasizes accurate production of text types and it uses a combination of genre and outcomes-based approaches to achieve this goal. It also presents relevant theoretical foundations of the writing process so that students can see and know the theory that informs their writing practice.

On completion of this subject, the student should be able to analyse the linguistic and structural characteristics of various text types; discuss the writing process and apply this knowledge in real-life writing; produce grammatically accurate written products; apply the principles of genre analysis in writing; discuss and produce accurately the sections of a Master's dissertation as genre; produce texts that show higher degree of linguistic complexity than at undergraduate level and use appropriate language and style in writing

Syllabus:

Writing and learning

The writing process: pre-writing and actual writing phases; developing a voice in writing

Academic writing: process and product viewpoints
Trends in writing instruction. On the use of models in writing instruction

Writer-oriented vs. Reader-oriented writing

Language and style: coherence, fragments vs. complete sentences, subordination, dangling modification, sentence variation, faulty parallelism, wordy phrases and expressions, obscure words, sexist language, etc.

Argumentation: claims, arguments, support, counterarguments, refutation.

Substantiation: use of sources, citations, status of claims, the concept of face, politeness strategies

Discourse Elements: signposting, topic development, cohesion, grammatical choices, lexis.

Approach to genre analysis: Linguistics and genre analysis; Sociology and genre analysis, cross-cultural factors in genre analysis

Language description of written products, direction words in writing

Editing: grammatical forms, spelling, punctuation,

redundancies, capitalization, etc.

Research genres in academic settings: research article abstracts, research article introductions, etc.

Genre analysis in action: job application letters, newspaper editorials, project proposals, assignments and term papers, etc.

Paragraph/Essay patterns: analytical, comparison and contrast, evaluative, etc.

References:

Bhatia, V. K. - Analysing Genre: Language Use in Professional Settings,

Longman Group UK Limited.

Swales, J. - Genre Analysis., Cambridge University Press.

Swales, J.M. & C.B. Feak - Academic Writing for Graduate Students: A Course for Nonnative Speakers of English, The University of Michigan Press.

Assessment:

Examination - 50%

Continuous Assessment - 50%

MCS 510: MEDIA ECONOMICS AND MANAGEMENT**Hours per week: 4****Objectives:**

The course is intended to enable students to understand the management theories and different media organizations, and their structures. Unique characteristics of media companies, media companies as manufactures, media company's mission and goals, working with people, marketing perspective for the media, market analysis and product planning, promotion and sales of media products, human resource development for media organizations and financial management will be discussed to get insights on the subject so that the students acquire professional competencies in relevant areas of work. To supplement knowledge on economics of media industry and operations will be highlighted in the course. Students will be able to understand the techniques of running the media industry; human resource development of media and marketing of media. To get into the business the students should acquire modern trend

of media business and market research in the course.

Syllabus:

Management theories, unique characteristics of media companies, media companies as manufactures, media company's mission and goals, planning and decision-making, working with people, leadership style, marketing perspective for the media, market analysis and product planning, promotion and sales of media products, human resource development for media organizations and financial management.

Media circulation and distribution and their development

Newspaper economics; budget process, evaluating and financing newspaper organizations, pricing and costing of newspaper.

Management of radio and television set ups.

Aspects of media research, audience survey and case studies.

References:

John M. Lavine and Daniel B. Wackman – Managing Media Organization

Frnak W. Rucker and Herbert L. Williams – Newspaper Organization and Management

Conrad C. Fink- Strategic Newspaper Management

Alan B. Albarran – Management of Electronic Media

Trilok N. Sindhwani- Newspaper Economics and Management

Robert G. Picard- Media Economics

Joseph R. Dominick- The Dynamics of Mass Communication

Jack R.Meredith – The Management Operations

Kenneth L. Bernhard .- Marketing Management

James B. Dilworth- Production and Operation Management

Assessment:

Examination - 50%

Continuous Assessment - 50%

MCS 512: CREATIVE WRITING FOR MEDIA

Hours per week: 4

Objectives:

Writing to fascinate audience and making it a profession will be the objective of the course. This course aims to broaden students' skills in the production of written discourse genres with an emphasis on theoretical aspects on editorial, column, feature, article and review writing. Creative writing for conventional media like magazines, periodicals and booklets will be provided to the students so that they can develop skills. The course is intended to review the existing trends in national, regional and international media; and the contemporary trend of writing and publishing to enable the students get insights for sharpening their writing skills. Students will be able to develop writing skills to contribute to different media on the completion of the course. They also can earn living at their home by writing at their leisure. The course will be highly exercise oriented to equip the students professionally.

Syllabus:

Theoretical aspects of editorial, feature, article, columns, etc;

Structure of editorial, feature, article and column;

Distinction between feature and news;

Distinction between feature and article;

Collecting information and researching before creative writing;

Interviewing personality and stars;

Writing on contemporary issues;

Techniques of reviewing books;

Reviewing films and TV programmes;

Reviewing cultural events;

Traditional and non-traditional writing for magazines and periodicals: Short Takes, One-pagers, Humour, Opinion pieces, Profiles, Kid staff etc.

References:

Connie Emerson – The 30-Minute Writer: How to Write and Sell Short Pieces, Ohio: Writer's Digest Books

John E. Drewry – Writing Book Reviews, Boston, The Writer Inc Publisher

S. Burack (Ed) – The Writer's Handbook, Boston, The Writer Inc Publisher

Patterson – Writing and Selling Feature Articles

Campbell and Wolsely - Newsman at Work.

O.P. Mehta – Introduction to Mass Communication in India

Assessment:

Examination - 50%
Continuous Assessment - 50%

MCS 512: NEWS AND VIDEO PRODUCTION

Hours per week: 4

Objectives:

To develop students' knowledge and skills the course is designed to the preparation of television scripting of programs and writing screenplay, portraying them into videos and editing them for broadcast. The students will be able to understand newsroom- structure, functions, culture, tools of news gathering etc and work for electronic media. Knowledge of news production and presentation for radio and television will be provided in this course to get practical orientation by the students. This course will enable students to use audio and video recorders and other related equipment. Knowledge on online editing and transmission will be given so that the students get equipped to enter electronic media. Students will be assigned on practical production of spots/ promotions/ programmes etc on local development themes/ issues for their capacity building.

Syllabus:

Introducing video camera, its use and operations, accessories and peripherals; Brief history and evolution of radio and TV; Pre-production research; Tools of news gathering; Difference between print media and electronic media; Writing scripts for radio and TV for different types of programmes/documentaries; Knowledge on lights and shooting for TV production; Knowledge on covering news for electronic media; Writing of news for radio and TV; Knowledge on interview and talk show; Online editing and transmission. Production of spots/ promotions/ programmes on development or other issues / themes.

References:

Gerald Millerson – Effective TV Production
T. Burrows, D. Wood & L. Gross – Television

Production: Disciplines and Techniques

David French & Michael Richards (eds) –

Contemporary Television

Stinson - Video: Communication and Production

Degen – Understanding and Using Video

Assessment:

Examination - 50%
Continuous Assessment - 50%

**MCS 513: PARTICIPATORY
COMMUNICATION AND
COMMUNITY DEVELOPMENT**

Hours per week: 4

Objectives:

The course discusses theoretical perspectives of participatory development communication and to define the role of communication and participation in community. It further attempts to apply principles of adult learning theories relevant to participatory development communication approaches emphasising dialogue across disciplines as central to development. Furthermore, the course make efforts to design communication strategies using action research and participatory action research for sharing and exchange of knowledge and as well as for community empowerment.

Syllabus:

Review of modernization theory in relation to development communication focusing on rural peoples' knowledge, participation and empowerment. Discussions will be on concepts such as development communication, development, participation and action-research. Role of various stakeholders will also be defined in using communication to facilitate community participation within specified contexts.

Explore how the concept of adult learning can be applied to enable people to discuss developmental issues and to strengthen decision making at the community level. Participants of this course will draw from experiential learning, social learning and community learning theories to facilitate dialogue in transdisciplinary teams to build

capacity of communities to use communication and other essential services to improve their own livelihoods.

Introduce approaches for planning communication strategies and to facilitate the active involvement of different groups in the local community, to collectively identify problem situations and the potential and seek potential solutions. The process involves critical analysis of the community livelihood issues followed by planning, implementing, monitoring and evaluating and sharing and using of information derived from the communication program. Discuss some communication tools within the participatory approaches for multi-stakeholder learning to enable changes in the local community.

References:

- Bessette, G (2004). Involving community. A guide to participatory development communication. Ottawa, International Development Research Centre
- Chambers, R (1987). Sustainable livelihoods, environment and development: Putting rural people first. Brighton, England, Institute of Development Studies, University of Sussex.
- Chambers, R. (1997). Whose reality counts? Putting the first last. London, ITDC.
- Dick, B. (1997). Action learning and action research [online] Available at <http://www.scu.edu.au/schools/gcm/ar/arp/actlearn.html>
- Freire, P. (1973). Education for the critical consciousness. New York: The seabury press.
- Kolb, D. A. (1994). Experiential learning. Experience as the source of learning and development. Englewood Cliffs, Prentice-Hall.

Assessment:

Examination	- 50%
Continuous Assessment	- 50%

MCS 520: DISSERTATION

Hours per week: 4 (first semester) + 8 (second semester) =12

Objectives:

Based on scientific research in-depth the students

should be able to produce a high quality dissertation reflected by their technical competence, originality of scholarly research, critical assessment, logical structure and scholarly discussion of findings to address research questions and problems. The object of the dissertation is to build a clear argument in a logical and orderly progression.

Instructions:

The students will be supervised by department approved faculty and to complete with in the stipulated time and submit a dissertation for the partial fulfillment of a Master of Communication Studies (MCS). They will select topic, finalize methodology and complete literature review in the first semester to present them at a seminar. The remaining part of the research such as data collection, analysis, and writing should be completed and presented at a seminar and submit the dissertation at the end of the second semester of second year.

The candidate will be provided with specific instructions on dissertation style, methods, techniques, contents, volume and other details to support him/her in writing the dissertation. The "Rules for the Form of Thesis" of Calendar 2010-2011 of the University to be followed, until any updates available, to accomplish the research work and submission of dissertation by the students.

References:

- Perrin, R. (2004). Pocket Guide to APA Style. Boston: Houghton Mifflin Company.
- Wimmer & Dominick- Mass Media Research
- Guthrie, G. (Editor) – Basic Research Techniques, University of Papua New Guinea, Port Moresby: Education Research Unit.
- Perrin, R. – Pocket Guide to APA Style. Boston: Houghton Mifflin Company.
- Berger, Arthur – Media Analysis Techniques
- Deacon, David et. al. – Researching Communications

Assessment:

External Examiners Report	- 75%
Oral defense	- 25%

MASTER OF ARTS (M A) IN ORGANISATIONAL LEADERSHIP

Program Mode

Distance Education (Blended Learning)

Program Goal

To provide a high quality postgraduate education at the Masters level to significantly enhance the effectiveness and integrity of Christian leaders in various institutions and organizations in order to maximize the quality, relevance and value of the products and services they deliver. Additionally, to provide an educational experience which results in a qualitative change in the leader's life, relationships, and leadership practices.

Program Objectives

This program prepares candidates to create and lead transformative organizations that improve the well-being of all stakeholders in terms of Kingdom values by means of a cohort-based Christian education that emphasizes:

- a. Value-based leadership competencies required for envisioning and leading performance-oriented organizations;
- b. Team-oriented managerial competencies that create well-run systems to serve the organization mission and the well being of all stakeholders;
- c. The professionalism of the leader/manager through enhanced mission competence, commitment, and vision as well as problem solving abilities;
- d. A worldview and understanding that is grounded in biblical foundation for critical reflection, ethical integrity, thoughtful integration and personal spiritual growth and character development of the leader in Christian discipleship and maturity;
- e. An interactive forum in which curricula matters are focused on understanding one's organization and context so as to be able to apply what is learned to one's current work setting; and
- f. A social network of peers and mentor supporting the leader in the task of developing the skill and wisdom essential for navigating

the sometimes chaotic and confusing environment of their world.

Program Partners

This program is initially the proposal of four partnering institutions/organizations, and these are:

- a. The Papua New Guinea University of Technology (PNG Unitech)
- b. Development Associates International (DAI)
- c. The Christian Leadership Training College of Papua New Guinea (CLTC)
- d. Pioneers of Australia

In partnership with DAI, CLTC and Pioneers of Australia, the program is expected to be offered through the PNG University Technology housed by the Language and Communication Studies Department.

Program Delivery Method

Today there are a wide range of different distance learning models; from paper based correspondence courses to completely online web-based e-learning. This program is somewhere in between. This program is usually called hybrid or blended learning. The candidates will complete the program based on a cohort learning model. That is a group of participants who stay together through out a degree program. The cohort model brings students together in a collaborative, team-focused learning experience, with the goal of developing a learning community. This model encourages participants to draw upon both their peers and instructors for support. The program will be delivered as follows:

- a. Participants will come together for a residency 2 times per year for a total of two weeks (one week each residency)
- b. All courses are completed via the appropriate distance education curricular formats. These methods will incorporate course workbook, readers and other additional materials.
- c. Dialogue with course teachers, supervisors and students will be by a variety of means including face to face meetings, e-mail, telephone and fax according to the location of participants and institutions.
- d. Institution mentors are responsible for coaching and facilitating the dialogue with

- their cohort group, both individually and collectively, during this specific course period.
- e. Participants have practical projects where they have to apply what they are learning to their current leadership role, as well as teach it to others and complete written assignments and course papers.
 - f. The participants should be able to produce a high quality dissertation reflected by his technical competence, originality of scholarly research, critical assessment, logical structure and scholarly discussion of findings to address research questions and problems. The dissertation must be a coherently organized sequence of chapters that should show clear headings and sub-headings. In all, the object of the dissertation is to build a clear argument in a logical and orderly progression.

Program Coordination

CLTC will assist UNITECH to provide the program coordination which includes:

- a. Marketing and Communication
- b. UNITECH will provide the teaching location in Lae
- c. CLTC will provide the teaching location in Port Moresby
- d. UNITECH will arrange collection of tuition, accounting and distribution of those funds to partners

Rules Governing this Program

This program shall be offered in accordance with and within the meaning of the rules governing the University's Masters Degree program.

In consultation with the stakeholder partners (PNG Unitech, DAI and CLTC) the LCS Department shall, from time to time, make such adjustments where necessary particularly in the program's course structures.

Exams and Marking

Assessment of the students will be based on 60% continuous assessment and 40% examination administered in each semester.

The current grading system used by PNG UNITECH will be applied for processing the marks and grades. The LCS Department will

submit the marks and grades for record keeping purposes.

Quality Assurance Strategy

The program shall be reviewed after its first academic year, and thereafter three years, to assess its relevance, suitability and quality. The LCS Department with its partners shall form the review committee. In the review processes, other stakeholders from government and industries shall be consulted as a means of wider community participation in the program.

13.

Admission to Candidature

In accordance with the Unitech's rules governing the Masters program, an application for admission to candidature in this program shall have:

- a. A Postgraduate Diploma of the University or of a tertiary institution approved by the Higher Degrees Committee; or
- b. A Bachelors Degree of the University or of a tertiary institution approved by the Higher Degrees Committee in any field of study; or.
- c. In all a and b above, the candidate must have the potential to provide significant leadership in their organizations or communities.

An application for admission into candidature for the degree of MAOL shall be approved by the Higher Degrees Committee only on the recommendation of the Head of Department in consultation with its program partners.

Duration of the Course

Consistent with the Higher Degrees rules, the following duration of study shall apply: The candidate shall have 36 calendar months (3 years) for this program. A special extension may be sought, if the student has valid reason/s for not completing his/her work. If, however, a student does not complete his/her studies without any valid reason/s, his/her studies may be terminated by the University Academic Board upon recommendation from the Higher Degrees Committee in consultation with CDS Department and its partners.

Teaching Program Structure and Delivery Course Structure

The candidate for the Degree of Master of Arts in Organization Leadership (MAOL) shall register for 11 (eleven) courses and a dissertation component in 3 years, of which 3 courses will be taken in the third year from 6 (six) optional courses. The matrix below indicates the course-structure.

Code	Subject	Average Weekly Hours

Year 1 First Semester

MOL511	Leadership: Making Human Strength Productive	4
MOL512	Teaching and Learning for Impact	4

Year 1 Second Semester

MOL513	Strategic Thinking	4
MOL514	Women in Leadership	4

Year 2 First Semester

MOL521	Integrity and Financial Management	4
MOL522	Research Methodology	4

Year 2 Second Semester

MOL523	Spiritual Formation	4
MOL524	Conflict Management and Resolution	4

Three courses to be taken from optional courses in year 3 during semester 1 and 2, and dissertation is obligatory.

Year 3 First Semester

MOL531	Ethics for Decision Making	4
MOL532	Development and Social Change	4
MOL533	Mentoring	4

Year 3 Second Semester

MOL534	Culture, Ethnicity and Diversity	4
MOL535	Fundraising	4
MOL536	Partnership	4
MOL611	Dissertation	8

TOTAL HOURS 52

SUBJECT DETAILS

MOL 511: LEADERSHIP – MAKING HUMAN STRENGTH PRODUCTIVE

Hours per week: 4

Objectives:

- Explore and critique the traditional understanding of leadership in the participant's context.
- Develop a thorough understanding of servanthood in the theological and historical context of Jesus
- Apply and evaluate the application of the foundational principles of servanthood in across a range of core issues related to leadership in an organisation.
- Critically evaluate the application of leading as a servant to the present context of the participant's leadership role.

Christian agencies worldwide are facing growing challenges to an effective ministry in a rapidly-changing world. When asked what the root causes are, the most often given answer focuses on ineffective leadership. The felt need for change in this crucial area is widespread, especially among younger, emerging leaders. For this to happen, however, existing theological premises, cultural mores, and leadership practices must be challenged radically from scriptural perspectives as well as the learned lessons from the broader world of management and the behavioral sciences. The servant leadership exemplified by Jesus Christ is the central organizing paradigm for this module.

Syllabus:

Unit 1: Can I Be a Leader?
Unit 2: Leader - Know Yourself
Unit 3: Power
Unit 4: Leading Change
Unit 5: Setting Vision
Unit 6: The Right Person for the Right Job
Unit 7: Motivating Individual Excellence and Fulfillment
Unit 8: Developing Others
Unit 9: Team Building
Unit 10: Organizational Accountability

References:

Other readings are incorporated into the units of this course:

Foster, R J., “Destructive Power” from *Money, Sex & Power*

Engel, J F., “Clarification of Mission”

Engstrom, T and Dayton, E., *Christian Leadership Letter*

Job Descriptions, Feb, 1975; Motivation, July/August 1975; “...a Word of Appreciation, Dec, 1974

Henderson, D., *Through the Dust*, Chapter 1

Hayes, E., “Effective Boardmanship”

D’Souza, A., *Being a Leader* (Africa Christian Press, 1990)

Assessment:

Examination - 40%

Continuous Assessment - 60%

MOL 512: TEACHING AND LEARNING FOR IMPACT

Hours per week: 4

Objectives:

- Plan, prepare and facilitate a learning experience for a group of at least 8 learners
- Evaluate what we can learn about teaching methods from Jesus and describe how we can apply them in our own facilitation of learning
- Identify and describe the five key factors that make learning happen and demonstrate how as a facilitator of learning you can help your learners address each of these factors
- Explore why selecting learning outcomes is important in the learning process, and how to express and evaluate effective learning outcomes
- Understand and critique a variety of different methods which are available to the facilitator of learning and assess when it is appropriate to use a particular method
- Research a variety of different settings for the learning environment and be able to select an appropriate approach for the learning outcomes which have been selected

The purpose of this course is to prepare Christian

leaders to facilitate training like DAI’s course material in their own context so that it results in changed hearts and practice that is consistent with an adult learning methodology. Part of the job of a leader is to enable others and to help them grow. Teaching adults is not simply about passing on the information and knowledge that we have but primarily about enabling and empowering others.

Syllabus:

Unit 1: Introducing Teaching and Learning

Unit 2: What we know about adult learners

Unit 3: Understanding Learning Styles

Unit 4: Factors underpinning Effective Learning

Unit 5: Facilitating Effective Learning

Unit 6: Communication and Learning Methods

Unit 7: Designing and Delivering Learning

Unit 8: Listening and Asking Questions

Unit 9: Learning through Feedback

Unit 10: Evaluating Learning

References:

Race, P., *Making Learning Happen*, Sage Publications, London, 2005

Assessment:

Examination - 40%

Continuous Assessment - 60%

MOL 513: STRATEGIC THINKING

Hours per week: 4

Objectives:

- Discover the roots of management and strategic thinking that lie within the Scriptures.
- Develop a positive attitude toward strategic thinking as a God-led process seeing our ministry and work as based upon a creative partnership between God and an innovative decision maker.
- Be able to outline, explain, and critique the various elements of the strategic thinking process.
- Develop a strategic statement for their own organisation on the basis of the steps and process learned in the course.

- Evaluate their own approach to strategic thinking, focusing on those areas where they need the most insight, so as to change their patterns of engaging in work or ministry.

Evaluate your approach to strategic thinking, focusing on those areas where you need the most insight, so as to change your pattern of engaging in work or ministry. Strategic thinking is concerned with discovering those paths and actions that an organization and a leader can take that will bring them successfully to their major goals and objectives. It answers the question: what are we to do so that the future is changed in ways that conform to what we believe to be God's will for us and our organization? How do we manage the opportunities, capitalize on our strengths, compensate for our weaknesses and address the threats to our best future? Strategic thinking is discovering, through a disciplined pattern of thinking, what we together believe is God's best future and the steps and resources needed to move from where we are to where we believe God wants us to be.

Syllabus:

Unit 1: What Strategic Thinking is All About

Unit 2: Mission, Vision and Purpose

Unit 3: Research the Situation

Unit 4: What Resources Do We Have?

Unit 5: Strategy and Action

Unit 6: Evaluation

References:

Dayton, E. and Fraser, D., Planning Strategies for World Evangelization, "Perspectives," "Assumptions"

Engel, J., "Doing the Right Things to Extend Christ's Kingdom on this Earth"

Engel, J., "Clarification of Mission"

Engel, J., "The Spiritual Decision Process"

Engel, J., "Audience Receptivity"

Engel, J., "Using Survey Research to Help Understand Your Target Audience"

Rickett, D., "Seven Mistakes Partners Make and How to Avoid Them"

Engel, J. and Dyrness, W., "A Preoccupation with Numerical Success"

Plueddemann, J., "Measurable Objectives, No! Faith Goals, Yes!"

Engel, J., "Best Practices in Evangelism: An Evaluation Tool"

Engel, J. and Morey, J., "Impact Evaluation of the Jesus Film Project: Executive Summary"

Assessment:

Examination - 40%

Continuous Assessment - 60%

MOL 514: WOMEN IN LEADERSHIP AND GENDER ISSUES

Hours per week: 4

Objectives:

- Explore assumptions about what the Bible says about women.
- Study the importance of the authority of scripture, yet some of the challenges of interpreting it.
- Learn that changing ones beliefs can be biblical.
- Understand the importance of studying the biblical role of women.

Among other issues this course deals with women and their role in leadership. It asks the student to think through personal beliefs about God's original plans and purposes in creating man and woman. It allows one to explore reasons behind their beliefs and consider making changes. We believe it sets the stage to discover God's purposes for the Church and His Kingdom here on earth as it relates to the different genders.

Syllabus:

Unit 1: Choosing the Better Part

Unit 2: God's Perfect Plan for Relating and Working Together

Unit 3: God's Perfect Plan for Us to Rule His Garden

Unit 4: Tragedy and Redemption

Unit 5: How Do We Interpret God's Word for Today?

Unit 6: First Timothy

Unit 7: First Corinthians 7, 11 and 14

Unit 8: Ephesians 5

Unit 9: How Do I Choose the Better Part?

References:

Readings in this course are incorporated in the Module Units:

Cunningham, L. and Hamilton, D., Why Not Women? Chapters 1, 12, 16, 17

Articles found at www.cbeinternational.org

Christians For Biblical Equality: Statement on Men, Women and Biblical Equality, taken from www.cbeinternational.org

Giles, K., "The Doctrine of the Trinity and Subordination"

Bilezikian, G., Beyond Sex Roles, Chapter 1, God's Creation Design

The Place of Women in the 21st Century—Reports from around the world

Gill, D., God's Women Then and Now, Chapters 6, 9 and 10

Fee, G. & Stuart, D., How to Read the Bible for All It's Worth, Second Ed., A Guide to Understanding the Bible Chapter 1: Introduction: The Need to Interpret

Fee, G., "The Cultural Context of Ephesians 5:18–6:9. Is there a divinely ordained hierarchy in the life of the church and home that is based on gender alone?"

Tucker, R., Women in the Maze: Questions & Answer on Biblical Equality, Chapters 20-23

Assessment:

Examination - 40%

Continuous Assessment - 60%

**MOL 521: INTEGRITY AND FINANCE
MANAGEMENT**

Hours per week: 4

Objectives:

- Articulate the need for integrity in society and the life of the Christian organizations.
- Define integrity and show how it is relevant to many contexts of life, including finances.
- Explore how one can develop a character of integrity that is biblically based.
- Discern and discuss the enemies of integrity and how to avoid them.
- Create and interpret a basic budget.

- Understand and be able to interpret the meaning of basic financial spreadsheets and financial ratios.

Most who find themselves in positions of Christian leadership throughout the world have little or no background in managing personal and organizational finances from a scriptural perspective. The purpose of this module is to develop scriptural principles of integrity and financial stewardship so as to apply to both personal and organizational financial contexts. The learner will develop competencies in understanding basic book keeping, interpretation of financial statements, financial integrity and credibility.

Syllabus:

Unit 1: The Importance and Meaning of Integrity

Unit 2: Values: The Foundation of Integrity

Unit 3: Conscience: The Inner Compass to Keep us on the Track of Integrity

Unit 4: Personal Accountability

Unit 5: Motivation and Rewards for Integrity

Unit 6: Leading with Integrity

Unit 7: Money and Stewardship

Unit 8: Debt and Contentment

Unit 9: Financial Policies, Procedures and Statements

Unit 10: Financial Planning and Budgeting

References:

Kouzes, J. and Posner, B., Credibility, Jossey Bass, 2003

Freeman, J., Living with your conscience without going crazy, 1989

Josephson, M. & Hanson, W., The Power of Character, Jossey Bass 1998

Josephson Institute for Ethics, The Six Pillars of Character:

<http://www.josephsoninstitute.org/MED/MED-6pillars.htm>

Center for Character Development: <http://www.charactercenter.com>

The Content of our Character Project: <http://www.contentofourcharacter.org/toolkit.html>

Verhey, A., Remembering Jesus, Erdmans 2002

Leading with Integrity: <http://www.teal.org.uk/dl/integrity.htm>

Assessment:

Examination	- 40%
Continuous Assessment	- 60%

MOL 522: RESEARCH METHODOLOGY

Hours per week: 4

Objectives:

- Explore the value and components of empirical, field research.
- Demonstrate the basic skills of field research by writing a mini-project involving all the elements of the research process.
- Position yourself to write the final Master's thesis project.

Research Methodology develops practical skills that help students become informed researchers in the process of strategic planning and evaluation. This is accomplished through the experience of actual participation in all stages of research design. In the process students are exposed to research applications in a variety of contexts, developing practical working knowledge of research terms and concepts. Students are equipped to undertake relatively uncomplicated research studies in practical contexts.

Syllabus:

Unit 1: Starting Where You Are
Unit 2: Selecting and Clarifying the Concern Behind Your Thesis
Unit 3: Selecting a Focus for Your Mini-Project
Unit 4: Evaluating Other People's Research
Unit 5: Designing Your Strategy
Unit 6: Drafting, Refining and Testing Your Field Questions
Unit 7: Doing Your Field Research
Unit 8: Writing Your Mini-Project Research Report
Unit 9: Writing Your "So What" Document
Unit 10: Building from Your Mini-Project to Your Full Thesis
Unit 11: Ending Where You Want to Be: as a Different Kind of Leader

References:

- Nussbaum, S., Breakthrough! Steps to

Research and Resolve the Mysteries in Your Ministry (GMI, 2007)

- Sogaard, V., Research in Church and Mission (William Carey Library, 1996)
- Robson, C., Real World Research, 2nd Edition (Blackwell, 2002)

Assessment:

Examination	- 40%
Continuous Assessment	- 60%

MOL 523: SPIRITUAL FORMATION

Hours per week: 4

Objectives:

- Explore the nature and depth of the longing for God and a more vital and effective life in Christ
- Learn the complexity of the reasons Christians experience "mid-life crisis" in their spiritual lives
- Experience anew or for the first time the full range of classic spiritual disciplines
- Describe and evaluate the spiritual disciplines as hard work and as an expression of God's grace
- Begin self-examination as you begin to identify weaknesses and habitual patterns of sin
- Be able to diagnose one's 'spiritual health' and plan for regular, disciplined
- Analyze the call to discipleship by focusing on key areas where Christ calls us to continuing development and change
- Learn how to replace bad habits with new and to understand the cost such activity exacts
- Record how God's provision has been linked to your spiritual giftedness, vocation, & gift of years
- Learn to distinguish true from false forgiveness
- Explore the wholeness of life that is involved in becoming a person of integrity
- Explore catastrophic loss as God's strange means that takes us through suffering to new levels of engagement with Himself and the business of His Kingdom

- Identify six important activities that, if done regularly, would make a significant, positive difference in your spiritual and vocational life

Spiritual Formation is designed for Christian leaders who have settled many of the basic issues of Christian discipleship, who find themselves longing for increased depth and authenticity in their relationship with Christ, and who are willing to take costly steps to open themselves in new ways to allow God to meet and transform them. The units are designed to engage the learner by involving thoughtful performance in written and audio materials and the intentional practice of spiritual exercises. A weekly journal is kept and periodic reflective writing focuses and expresses new learning and commitments. (This course is designed to be taken in a 12 month period delivery.)

Syllabus:

(with associated spiritual discipline)

Unit 1: Thirsty for God: Restoring our Passion for God (Solitude and Silence)

Unit 2: Images of Spiritual Formation: What's the Goal of Life in Christ? (Study)

Unit 3: The ABCs of Spiritual Formation: Reviewing the Foundation (Prayer)

Unit 4: Obstacles: Why Aren't We Making It All the Way? (Fasting)

Unit 5: Spirituality: What It Is and What It Isn't (Service)

Unit 6: The Spiritual Aspects of the Disciplines (Meditation)

Unit 7: The Hard Work of Spirituality (Submission)

Unit 8: Person, Place and Provision (Celebration)

Unit 9: The Cardinal Sins: Radical Solutions for Radical Sins (Simplicity)

Unit 10: Forgiveness and Reconciliation: Remedies for Individuals and Communities (Confession)

Unit 11: The Life of Integrity: Discernment, Steadfastness and Forthrightness (Guidance)

Unit 12: Adversity and Crisis: Getting Ready (A week without Disciplines)

Unit 13: Getting Ready for the Rest of Life (Worship)

References:

Foster, R. and Smith, J.B., *Devotional Classics: Selected Readings for Individuals and Groups*, Revised and Expanded (Harper San Francisco, 2005)

Assessment:

Examination	- 40%
Continuous Assessment	- 60%

MOL 524: CONFLICT MANAGEMENT AND RESOLUTION

Hours per week: 4

Objectives:

- Evaluate the problems and potentials in managing and resolving conflict in the context of ministry and organizational leadership.
- Examine case studies as examples for evaluation and learning how to deal with conflict through actual events and histories that demonstrate the models used in the course. The names, locations, and some facts have been altered to protect identities.
- Examine relevant Biblical texts for the purpose of managing conflict and working toward resolution of issues from a Biblical perspective.
- Consider the significance of understanding human cultures in conflict management.

Every organization and group of people experiences conflict. To be a successful leader one needs to know how to use it constructively. This module addresses the individual and group dynamics of getting to common ground. It analyzes the nature of conflict and how it develops in individuals, relationships, and within an organization. Students examine methodologies for constructively intervening and managing conflict.

Syllabus:

Unit 1 How Should Christian Leaders Think about Conflict?

Unit 2 What Obstacles do Christian Leaders Face in Handling Conflict?

Unit 3 How Do Christian Leaders Resolve Conflict? Learning to Forgive.

- Unit 4 How Do Christian Leaders deal with Conflict?
- Unit 5 How do Christian Leaders Manage Socio-political Conflict?
- Unit 6 The Incarnation: The Supreme Model for Conflict Management & Resolution

Textbooks:

Elmer, D., *Cross-Cultural Conflict: Building Relationships for Effective Ministry*. Downers Grove: Intervarsity Press. 1993.

Osterhaus, J., Jurkowski, J. & Hahn, T., *Thriving through Ministry Conflict: Understanding Your Red & Blue Zones*. Grand Rapids, Zondervan. 2005

References:

Ford, L., *Transforming Leadership: Jesus' Way of Creating Vision, Shaping Values & Empowering Change*. Downers Grove, IL. Intervarsity Press. 1991.

Lingenfelter, S. & Mayers, K., *Ministering Cross-Culturally: An Incarnational Model for Personal Relationships*, Grand Rapids, Baker Book House. 1996.

Love, R., *Peacemaking: Resolving Conflict, Restoring & Building Harmony in Relationships*. Pasadena, CA. William Carey Library. 2001.

Palmer, D., *Managing Conflict Creatively*. Pasadena, CA. William Carey Library. 1999.

Sande, K., *The Peace Maker: A Biblical Guide to Resolving Personal Conflict*. Grand Rapids, Baker Books. 2005.

Assessment:

Examination - 40%

Continuous Assessment - 60%

MOL 531: ETHICS FOR DECISION MAKING

Hours per week: 4

Objectives:

- Explore the relationship of ethics to the Christian life
- Look at how a Christian world-view influences ethical life and leadership

- Identify the authoritative sources of ethical norms used by Jesus and the Apostle Paul
- Explore ways in which African, Islamic, secularist/postmodern world-views influence moral behavior
- Examine the work of the Holy Spirit in enabling us to live and lead ethically
- Analyze the ethical decisions of biblical characters
- Clarify your understanding of what it means to manage your body and why this is critically important
- Confront Jesus' teaching about the exercise of authority in the ministry of a Christian leader
- Consider a broad spectrum of ethical issues that need contextual clarification, appropriate decisions and sustained action by Christian communities if they are to live out the implications of the gospel
- Examine ways in which truth-telling can be compromised
- Explore ways in which conformity to the expectations of culture and submission to the authority of the State may create tensions with our commitment to obey God
- Work with an ethical decision making process tool designed to assist in positive moral action by Christian individuals and communities

This course on ethics seeks to expose the relevance, the foundations, the substance and the processes of ethical thought and action that need to be understood and practiced by leaders of integrity and spiritual maturity. This course offers insight into the contrasting visions of our world and the alternative systems of moral values resulting from these divergent world-views. An understanding of these visions and values should help Christians to better appreciate why they feel pulled morally in conflicting directions and why it is not always easy to follow Jesus in a way that is faithful to his moral teaching and example. Specific issues that Christians need to face are discussed in light of biblical teaching and practice. Yet, the actual process of choosing how to live faithfully as a follower of Jesus also requires wisdom, decision and responsible action by individual Christians and Christian communities.

Syllabus:

Unit 1: How do ethics fit into the Christian life? (The significance of Christian ethics)

Unit 2: Where do we find dependable ethical guidance? (The role and moral impact of divine revelation)

Unit 3: What is the central challenge of Christian ethics? (How we treat other people)

Unit 4: How do we live ethically in our relationships? (Loving others according to the pattern of Jesus)

Unit 5: What is critical to the ethics of leadership? (It starts with managing ourselves)

Unit 6: How do we make ethical decisions? (A process for ethical decision making)

References:

Stott, J.R.W., *Human Rights & Human Wrongs: Major Issues for a New Century*, (Baker Books, 1984, 1990, 1999).

Assessment:

Examination	- 40%
Continuous Assessment	- 60%

MOL 532: DEVELOPMENT AND SOCIAL CHANGE

Hours per week: 4

Objectives:

- Explore God's concerns for the poor and oppressed, for the entire creation, and how that should impact how we live and what we do.
- Research how scripture records that Jesus and his first disciples indeed acted upon every aspect of his mission and ways in which segments of the church through the centuries has been faithful to the mission of Jesus, in spite of the fact that much of Christendom has not.
- Evaluate how local churches in your context can respond to issues regarding the destruction of the environment, the impact of human violence and oppression, poverty, disease and human suffering and inequality and injustice in your own context.

Development and Social Change provides a study of the principles and practices of transformational development within the context of a deeper analysis of poverty and the various theories of development.

Syllabus:

Unit 1: An Introduction to Development and Social Change

Unit 2: A Theology for Christian Activism: Part 1

Unit 3: A Theology for Christian Activism: Part 2

Unit 4: In the Footsteps of Christ-God's Mandate to the Church: Part 1

Unit 5: In the Footsteps of Christ-God's Mandate to the Church: Part 2

Unit 6: In the Footsteps of Christ-God's Mandate to the Church: Part 3

Unit 7: Transformation - A Kingdom Agenda for Development and Social Change

Unit 8: Transformation – Part 1 Principles for Community Transformation

Unit 9: Transformation – Part 2 From Kingdom Theory to Kingdom Practice

References:

(excerpts and readings from the following, most included in the Units)

Arnold, E (Editor), *The Early Christians in Their Own Words*. Farmington, PA. Plough Publishing House. 1997.

Bercot, D. (Editor), *A Dictionary of Early Christian Beliefs*. Peabody, MA. Hendrickson Publishers, Inc. 1998.

Bercot, D., *The Kingdom That Turned the World Upside Down*. Tyler, TX. Scroll Publishing Company. 2003.

Biblical Worldview and Skills for Wholistic Ministry. Vision Conference Training Workbook. Harvest International and Food for the Hungry, USA, 2004

Black, M., *The No-Nonsense Guide to International Development*. Oxford. New Internationalist™ Publications Ltd. 2002.

Dayton, D., *Discovering an Evangelical Heritage*. New York. Harper & Row. 1976.

Dichter, T., *Good Intentions – Why Development Assistance to the Third World has Failed*. Amherst and Boston. University of Massachusetts Press. 2003.

Elliston, E., (Editor), *Christian Relief and*

Development – Developing Workers for Effective Ministry. Dallas. Word Publishing, 1989.

Fung, R., The Isaiah Vision. Geneva. WCC Publications. 1992

Koyama, K., No Handle on the Cross, Great Britain. SCM Press Ltd. 1976.

McCreary, A., Up-With People - Christian Aid Around the World. Great Britain. Font Paperbacks. 1979.

McLaren, B., The Secret Message of Jesus. Nashville. W Publishing Group, a Division of Thomas Nelson. 2006.

Myers, B., Walking with the Poor. New York. World Vision International, published by Orbis Books. 1999.

Philip, P., Journey with the Poor. Australia. Collins Dove. 1988.

Rickett, D., Building Strategic Relationships: A Practical Guide to Partnering with Non-Western Missions. USA. Partners International. 2000.

Sine, T. (Editor), The Church in Response to Human Need. Missions USA. Advanced Research and Communication Center. 1983.

Stark, R., The Rise of Christianity. San Francisco. HarperCollins. 1997.

In addition to the texts indicated above, several key articles were obtained from the following internet sites:

Association of Evangelical Relief and Development Organizations (AERDO). <http://www.aerdo.org>

Learning to Give. <http://www.learningtogive.org>

Sojourners Magazine. <http://www.sojournal.com>

The Micah Network. <http://www.micahnetwork.org>

Assessment:

Examination - 40%

Continuous Assessment - 60%

MOL 533: MENTORING AND COACHING

Hours per week: 4

Objectives:

- Gain a shared understanding and basic definition of mentoring.

- Explore Biblical models of mentoring, in both Old and New Testament.
- Recognize and evaluate what makes a mentoring relationship effective or ineffective
- Understand and be able to articulate the different roles that a mentor can play
- Understand the value of storytelling in mentoring
- Learn how to plot and tell your own story
- Expand mentoring skills through empathetic listening & giving and receiving feedback
- Understand how to define expectations in a mentoring relationship
- Learn how to write a development plan
- Understand your personal style of influence within the context of a mentoring relationship.
- Become familiar with and identify your strengths within the Multiple Intelligence Profile
- Evaluate different coaching models and develop your own
- Develop various worksheets used in coaching
- Define and evaluate the difference between mentoring and coaching
- Differentiate and critique the different forms of coaching
- Learn how to evaluate and choose the right coach

The course views mentoring and coaching from a biblical and management perspective. By defining the differences between mentoring and coaching it is clear that both are needed in any organization or ministry. The course identifies the roles and competencies of both mentors and mentees (which apply as well to coaching) and helps students to learn skills required in a mentoring or coaching situation, such as listening skills, giving and receiving effective feedback, and using influence and one's own story as a mentoring tool. Based on the theory of multiple intelligences it helps the student to discover his/her different learning styles. Other aspects of the course deal with successful mentoring or coaching relationships and ways to establish formal mentoring programs in an organization. In addition the course gives a clear framework for leadership coaching and many practical tools to use in a coaching relationship.

Syllabus:

Unit 1: Introduction and Case Study – Mama Mary
Unit 2: Mentoring Basics and Examples
Unit 3: Mentoring Roles and Competencies
Unit 4: Your Story as an Effective Mentoring Tool
Unit 5: Mentoring Skills
Unit 6: Mentoring Relationships
Unit 7: Tools for Mentoring and Coaching
Unit 8: Leadership Coaching: Introduction
Unit 9: Leadership Coaching: Frameworks and Outcomes
Unit 10: Leadership Coaching: Different Types of Coaching
Appendix - Developing and Implementing a Mentoring Program

References:

Mallison, J., *Mentoring to Develop Disciples and Leaders*, 1998 (Openbook)
Stanley, J. & Clinton, P., *Connecting*, 1992 (Navpress)

Assessment:

Examination	- 40%
Continuous Assessment	- 60%

MOL 534: CULTURE, ETHNICITY AND DIVERSITY

Hours per week: 4

Objectives:

- Distinguish the complex issues related to culture and ethnic identity – issues like history, sociology, and more.
- Define terms like ethnicity, ethnocentricity, and culture that will be used throughout this course.
- Review and evaluate five tragedies in recent history that have been influenced by the topic of ethnicity and diversity, especially that of intolerance of people who are different, “the Other.”
- Prepare to enter the process of asking where diversity-training fits in your overall training of others in Christian leadership as well as in your own lifestyle and obedience to Jesus’ Great Commission

Who are you? The concept of identity and its relationship to self, group, organization and culture is one of the most powerful forces leaders confront today. We see ourselves and are seen by others in a range of dynamic identities: age, gender, race, ethnicity, religion, class, nationality, etc. Identity can change over historical periods, across cultures, and through a life cycle. Managing the tensions between identity and identification is a complex and often unconscious negotiation that leaders must embrace if they are to succeed in multicultural settings and global environment. How do identities take on “currency” that either empowers or excludes? An adept leader in today’s world needs knowledge, experience and skills to facilitate work. But a world-class leader understands unconscious forces that impede work and can deploy strategies to transform them. This module helps to understand these dynamics and offers ways to build understanding and cooperation across cultural or other boundaries.

Syllabus:

Unit 1: Course Introduction
Unit 2: Creation and Fall
Unit 3: And God Created Diversity
Unit 4: Aliens and Strangers
Unit 5: Blessed to Bless All Nations
Unit 6: What Do We Do With the Past?
Unit 7: Reaching Out to the “Other”
Unit 8: The Church After Pentecost
Unit 9: A Church For All Peoples
Unit 10: Forgiveness and Reconciliation
Unit 11: One New Humanity
Unit 12: Culture, Ethnicity, and Diversity in the Future
Unit 13: Intentionality

References:

Yancey, G., *Beyond Racial Gridlock: Embracing Mutual Responsibility* (Inter-Varsity Press, 2006).
Contained in the Module Units (Partial listing)
Andrew Walls, A. (Article), “The Gospel as Prisoner and Liberator of Culture”
U.N. Universal Declaration of Human Rights
The Willowbank Report: Consultation on Gospel and Culture (Copyright © 1978, LCWE)
Biblical Language to Help Understand “Outsiders”
Christianity Today, October 2, 2000
(<http://www.christianitytoday.com/ct/2000/011/2.3>)

6.html)

Color-Blinded: Why 11 o'clock Sunday morning is still a mostly segregated hour.

(An excerpt from *Divided by Faith* by Michael O. Emerson and Christian Smith)

Case Study #1: Christian Witness and Reconciliation Initiatives in Burundi

Case Study #2: Forgiveness in Bethlehem: A Personal Experience

Case Study #3: Israel/Palestine, Reconciliation Between Women

Case Study #4: The Treatment of Australian Aborigines and the Church's Role in Reconciliation

Case Study #5: Intercession and Conflict Transformation in the Democratic Republic of Congo

Case Study #6: Nyack College, USA: Building a Multi-Ethnic Campus

Case Study #7: Kosovo, Witness, and the Orthodox Church

Reconciliation as the Mission of God

Assessment:

Examination - 40%

Continuous Assessment - 60%

MOL 535: FUNDRAISING

Hours per week: 4

Objectives:

- Explore God's Perspective on Fundraising versus our fears
- Describe the difference between begging and inviting others to participate with you in ministry
- Explore Paul's fundraising as a model providing biblical principles for our fundraising
- Learn how leadership impacts fundraising and different models of such leadership
- Understand and articulate the need to be trustworthy and how to ensure accountability, credibility and transparency
- See what scriptural models of fund raising show us about the need for leaders of character

- Understand the importance of communication in the fundraising process
- Learn the fundamental pieces of the communication process that enables relationship building and fund raising no matter who your audience
- Learn how to tell your story in a simple and straight forward way
- Learn and begin to practice the basics of "outcome-based planning for faith missions"
- Learn how to write a case statement for your own ministry
- Explore how fundraising works in your local culture and how to begin there
- Learn and be able to state ways to get your local church involved in your ministry
- Explore a variety of ways to find resources for your work besides money
- Study the biblical basis for personal support-raising and consider its benefits.
- Consider how personal support raising flows out of relationships and learn how to cultivate personal supporters through communication
- Learn about the importance of thanking personal supporters and reporting regularly
- Learn what Western Charitable Foundations expect from those requesting funds from them and find out why they say "no" and why they say "yes"
- Reflect on how cultural differences impact relationships in giving and receiving
- Understand the basic components of writing a proposal
- Practice the process of understanding the interests of a charitable foundation and how to craft a proposal to fit their interests and instructions
- Appreciate and understand the role business plays in the Kingdom of God
- Evaluate new trends to transform societies and nations through business

This course focuses on the design, implementation, and follow up of various methods of fundraising, including issues on proposal writing, and the aspects of raising support locally.

Syllabus:

Unit 1: Kingdom Foundations

Unit 2: Leadership in Fund Raising

Unit 3: Communication in Fund Raising
Unit 4: Strategy and Planning
Unit 5: Beginning Closest to Home
Unit 6: Personal Support Raising
Unit 7: Understanding the Western Donor
Unit 8: Proposal Writing
Unit 9: Business as Mission

References:

Nouwen, H., *The Spirituality of Fund-Raising, Fundraising as Ministry*
Kiiru, MacM., *How to Develop Resources for Christian Ministries* (Nairobi, 2004), Ch. 1.
Haynie, R., "The Road Less Traveled in Fundraising"
Richard, H., "WHO GIVETH THE INCREASE? Non-Profit Organizations, Business Growth and FundRaising"
Engel, J., "Your Style in Working With Others"
www.tearfunduk.org : "Roots 6: Fundraising, Section 1. Christian Fund Raising"
Downes, D. and Awuku, A., "Funding the African Missionary Movement: Fulfilling the Dream"
Ezema, R., *Sending and Supporting African Missionaries in the 21st Century*: Chs. 3, 4, 5, 6, 9, 10.
Oginga, J., "Raising Missionary / Church Worker Support in Africa", from *The Church Leader in Africa*, 2nd Quarter 2005
www.parkerfoundation.org
www.firstfruit.org
Tune, M., *Business as Mission: Holistic Transformation of People & Societies*
"The Essentials of Good Business as Mission, 10 Guiding Principles" (an extract of Lausanne Occasional Paper on Business as Mission)

Assessment:

Examination	- 40%
Continuous Assessment	- 60%

MOL 536: PARTNERSHIPS

Hours per week: 4

Objectives:

- Develop and critique the argument that working together is a biblical imperative

- Explain and evaluate the difference between a simple and complex partnership and give examples of both
- Discuss the difference between a horizontal and vertical partnership and give examples of both
- Describe and evaluate the impact of different types of ministry at different stages in the process
- Explore and critique ways in which participants could approach ministry differently as a result of new understanding about what the Scripture has to say about partnership
- Describe in outline the three stages of partnership
- Investigate and evaluate three different methods of exploring a partnership and identify success and failure factors for each one
- State the aspects and agenda for meetings to launch a partnership
- Discuss and evaluate the characteristics of effective and ineffective teams
- Describe how conflict can damage a partnership and what needs to be done to de-escalate conflict
- Evaluate ways in which cultural differences can impact a partnership and how to minimize the differences and maximize multi-cultural understanding

The course develops a comprehensive biblical and theological perspective on partnerships and the strategic importance for organizations and ministries to work together. For those organizations considering engaging in a partnership, the course gives clear and comprehensive steps on how to explore partnership opportunities and launch and develop partnerships to operate effectively. This course explores in detail issues that make partnerships work and skills to succeed such as team work, dealing with conflict, and building trust. Finally the course gives advice in evaluating partnership outcomes so as to achieve goals.

Syllabus:

Unit 1: Partnership – a theological perspective
Unit 2: What do we mean by "partnership"?

Unit 3: The strategic importance of working together in partnership
Unit 4: Exploring a partnership
Unit 5: Launching a partnership 1
Unit 6: Launching a partnership 2: a Reflection and Review
Unit 7: The Operations Stage of a partnership
Unit 8: Developing Effective Groups and Teams in partnerships
Unit 9: Partnerships and Conflict
Unit 10: Trust, Evaluation and other key issues in Partnerships

References:

Addicott, E., Body Matters – a Guide to Partnership in Christian Mission (Interdev Partnership Associates, 2005)

Assessment:

Examination	- 40%
Continuous Assessment	- 60%

MOL 611: DISSERTATION

Hours per week: 8

Objectives:

The students should be able to produce a high quality dissertation reflected by their technical competence, originality of scholarly research, critical assessment, logical structure and scholarly discussion of findings to address research questions and problems. The dissertation must be a coherently organised sequence of chapters that should show clear headings and sub-headings. In all, the object of the dissertation is to build a clear argument in a logical and orderly progression.

Instructions:

The students will be supervised by department approved faculty and to complete with in the stipulated time and submit a dissertation for the partial fulfillment of a Master of Arts in Organisational Leadership. The dissertation, which is based on the candidate's coursework and field research, is the reflection of the student's three-year study program.

The candidate will be provided with specific

instructions on dissertation style, methods, techniques, contents, volume and other details to support him/her in writing the dissertation.

References:

Perrin, R. (2004). Pocket Guide to APA Style. Boston: Houghton Mifflin Company.
Guthrie, G. (Editor) - Basic Research Techniques, University of Papua New Guinea, Port Moresby: Education Research Unit.
Perrin, R. - Pocket Guide to APA Style. Boston: Houghton Mifflin Company.

Assessment:

External Examiners Report	- 75%
Oral defense	- 25%

DEPARTMENT OF FORESTRY

FORESTRY DEPARTMENT

TARAKA CAMPUS

Acting Head of Department:

Peki, M.M., PhD (Tokyo), MSc (TUAT), BScFor (PNGUT), DipFor (FORCOL).

Deputy Head of Department:

Associate Professor

Orsak, L., PhD, UC, Berkeley, BSc. (Hon.), UC, Irvine.

Lecturers:

Lopez, C. D., PhD (Tottori, Japan), MSc (Shimane), BSc (Lima-Peru).

Mulung, K., PhD (ANU) MSc (Wales), BScFor (PNGUT), DipFor (FORCOL).

Peki, M.M., PhD (Tokyo), MSc (TUAT), BScFor (PNGUT), DipFor (FORCOL).

Maiguo, E., MFor (ANU), Grad. Dip (ANU) BScFor (PNGUT), DipFor (FORCOL), Grad. Cert. Scicom (PNGUT) on PhD study leave, University of Melbourne

Pokon, R., MPhil. (PNGUT), BScFor (PNGUT).

Edwin, P., MSc (UniMelb) BScFor (PNGUT)

Zure, D., MSc (PNGUT), BScFor (PNGUT).

Senior Technical Officer:

Tito, W., BScFor (PNGUT) – Acting Chief Technical Officer

Wanna, L., BScF (PNGUT)

Technical Officers:

Jeremiah, H., PGDag. (PNGUT), BScFor (PNGUT) – on Masters study, Beijing Forestry University, China.

Vinas, A. Herbarium Curator.

Technical Assistant:

Feriwok, C., DipFor (PNGUT)

Computer Operator:

Nona, J.,

Storeman:

Isom, Y., Cert.PETT (TFTC)

Secretary:

Thomas, J., BasicSecCert (MSTECH)

Steven, B., BasicSecCert (LTC)

BULOLO CAMPUS

Principal:

Nahuet, T., MBA (QUT), BScFor (PNGUT)

Lecturer:

Balun, L., PhD (UT), MSc (Edinburgh), BScHon (UPNG), BSc (UPNG)

Senior Technical Instructors:

Amatus, P.R., MPhil (PNGUT) BScFor (Cant., NZ), DipFor (FORCOL)

Asari, E., BScFM (PNGUT), DipFor (FORCOL)

Gusamo, B., MSc (Wales), DipFor (FORCOL)

Technical Instructors:

Bellamy, A., BScFM (PNGUT), DipFor (FORCOL)

Senior Technical Officer:

Gebia, O., DipFor (FORCOL)

Technical Officer:

Aguadi, S., BScFor (PNGUT)

Secretary

Menin, M., SecCert (LTC), Advance Cert. Computing (CTC)

Administration Staff:

Wau, J., Public Admin. Cert. (ITI, Aust.)

Santing, S., Agri. Cert. (SPC).

Sawaraba, H., Clerical Cert. (PBC)

Kwalu, L., SecCert (AS, CTC), Cert. Computing (CTC)

Gawi, R., Cert. Motor Mech. (SJTCL)

Gwaso, A., Trade Cert. Carpentry (MTECH), Cert. in Furniture (Pom Tech), Cert. Wood Machining (TFTC), Cert. Carpentry (BulTech)

Nohuan, T., Cert. Police (PolTrain)

Gwaso, Y.,

Library:

Lama, K., Cert. in Library Management (Admin Coll.), PSHC (ADCOL)

Koti, R., Dip. Library Infor. Service (VUT.), Cert. Library Infor. Service (VUT)

ABBREVIATIONS FOR UNIVERSITIES AND COLLEGES ATTENDED BY STAFF

ANU – Australian National University, Canberra, Australia
BFU – Beijing Forestry University, China.
Cant. – Canterbury University, New Zealand
FORCOL – PNG Forestry College, Bulolo,
ITI – International Training Institute, Australia
Lima-Peru – University of Peru, Lima
PNGUT – PNG University of Technology, Taraka,
QUT – Queensland University of Technology, Australia
Shimane – Shimane University, Japan
TFTC – Timber and Forestry Training College-Bumbu,
Tokyo – The University of Tokyo, Hongo, Japan
Tottori – Tottori University, Japan
TUAT – Tokyo University of Agriculture & Technology, Fuchu, Japan
UCB – University of California, Berkeley, United States
UCI – University of California, Irvine, United States
UE – University of Edinburgh, UK
UniMel – University of Melbourne, Burnley, Australia
UPLB – University of Philippines, Las Banos,
UPNG – University of Papua New Guinea, Waigani,
UT – University of Texas, United States
VUT – Victoria University of Technology, Melbourne, Australia
Wales – University of North Wales, Bangor, UK
ITI – International Training Institute, Australia
SPC – Sepik Agriculture College
PBC – Port Moresby Business College
ADCOL – Administrative College, Port Moresby
Pom Tech – Port Moresby Technical College
BulTech – Bulolo Technical School
PolTrain – Police Training, Bulolo
CTC – Commercial Training Center – Lae
SJTL – St Joseph's Technical College, Lae
MSTECH – Madang Secretarial College

LTC – Lae Technical College
AS – Alu Signs

ACADEMIC PROGRAMMES

The Department of Forestry has made a thorough review of its academic programme in 1996. The review resulted with a new integrated degree/diploma curriculum replacing the separate degree and diploma curricula under the old programmes previously offered at Unitech and Bulolo campuses respectively.

In the new curriculum, department offers the following programmes: a three year course leading to diploma in forestry which is completed at Bulolo and a four year course leading to bachelor of science degree in forestry and a two Bachelor of Science Forest Management are completed at Taraka campus.

The Department is also offering a one year Postgraduate Diploma program in Forestry and two years Masters of Science and/or MPhil in Forestry.

Integrated Degree and Diploma study programs

One of the greatest challenges in forestry education is to produce professionals, both men and women, with the necessary technical skills while at the same time providing them with liberal education. The forestry curricula at the PNG University of Technology [Unitech] have been thoroughly revised to achieve these ends and the interaction of forestry and society is stressed throughout the new programmes; this is particularly important in a society like Papua New Guinea, where customary land ownership is the norm.

Normal entry qualifications are: Grade 12 with at least grade B's in English, Mathematics - (grade A if minor), Biology and any one of the – two components of Sciences, i.e. Chemistry and Physics. The course is primarily designed to produce professional foresters who will be able to meet the managerial needs of the National Forest Authority at district, provincial and national levels,

and for the private sector forest industries. Such graduates should also be able to function effectively in other government departments such as the Office of Environment and Conservation, Wildlife and make a contribution to applied research in the Forestry Sector. The Forestry Department is also mindful of the fact that it is the only institution in the South Pacific region that offers training in tropical forestry at professional level and therefore welcomes overseas students from the South Pacific region. Students from outside this region are also accepted.

Considerable emphasis is placed on forest management, on environmental protection, on undertaking resource surveys, on wood technology and on forest industries, fields that are of importance to the country's economy. This course provides the graduate with an adequate background to take responsible positions in the timber industry, with its harvesting and processing operations, as well as in the National Forest Service. In addition to extensive fieldwork, which is part of the course, students are required to undergo one semester of supervised work experience in the private sector industry, National Forest Authority or any Non Government Organizations.

The first year is a common one for both degree and diploma programmes and is taken at Taraka (Lae) campus. It is intended to provide the student with a thorough grounding in the basic sciences: biology, physics, chemistry, mathematics and principles of geology together with study and communication skills and an introduction to information technology. An introduction to Forestry is also provided. The second year is also a common one for both programmes and is taken at Bulolo campus. It is designed to give basic practical skills, along with the essential underlying theory. Topics studied include Dendrology, Ecology and Biodiversity, Silviculture, Soils, Surveying, Mensuration, Forest Product and Industries, Business skills, and Communication and Negotiation skills. The third year of the study commences with a semester of supervised industrial work experience for both streams of students. On completion of the first semester work

experience, the study continues at Bulolo and Taraka campuses; however it is streamlined into diploma and degree courses.

For the diploma course, further studies done at Bulolo campus include Silviculture, Communication and Negotiation Skills, Forest Inventory, Timber Harvesting, Forest Engineering, Non Industrial Forestry and Forest Policy and Legislation after successful completion of which a Diploma is awarded to the students.

The degree programme continues at Taraka campus with further studies done in Silviculture, Conservation Management, Timber Harvesting, Forest Economics, Wood Science and Technology, Experimental Design and Analysis. The fourth year of the degree program includes topics, among others: and Agroforestry & Community Extension, Forest Inventory and Assessment, Forest Management Planning, Forest Engineering, Forest Product Development and Marketing, Forest Policy (formulation and analysis) and Human Resource Management.

The Department of Forestry is professionally very concerned and interested in: environment management, conservation of resources and multiple land use. Special areas of interest

Include:-

- (i) Resource survey and environmental management,
- (ii) Forest management and silviculture especially in respect of the lowland tropical forest ecosystems.
- (iii) Reforestation and Agro-forestry
- (iv) Maximising the return from the country's forest resources having regard to the economic, social and environmental impact of forestry operations.
- (v) Appropriate technology in all aspects of forestry.
- (vi) Renewable energy resources.
- (vii) Forest protection and wildlife management
- (viii) Ecosystem and watershed management
- (ix) The role of forests in climate change

In general, the course is oriented towards developing awareness among the students on the

role of forestry, as an important natural resource, and how this resource can be best utilized to achieve national goals and rural community development without impacting too much on the environment.

STRUCTURE OF COURSES

PROGRAM FOR FIRST YEAR, COMMON YEAR FOR DIPLOMA AND DEGREE STUDENTS, TAUGHT AT TARAKA CAMPUS.

Code	Subject	Average Weekly Hours
Year 1 First Semester		
MN231	Principles of Geology	3
FR111	Plant Biology	5
AS111	Chemistry I (A)	6
PH173	Physics for Natural Resources I	4
MA181	Mathematics I A & F	4
CS145	Introduction to Information Technology	2
LA101	Study Skills	3
		<u>27</u>

Year 1 Second Semester		
AG112	Animal Biology	5
AS112	Chemistry II (A)	6
PH174	Physics for Natural Resources II	4
MA182	Mathematics II A&F	
CS146	Introduction to Information Technology II	2
FR102	Introduction to Forestry	2
FR104	Forest Botany	4
		<u>27</u>

PROGRAM FOR SECOND YEAR, COMMON YEAR FOR DIPLOMA AND DEGREE STUDENTS, TAUGHT AT BULOLO CAMPUS.

Year 2 First Semester		
FD201	Business Skills	3
FD213	Forest Ecology	4

FD217	Forest Survey Theory and Skills	5
FD233	Forest Measurement Theory & Skills	5
FD235	Forest Products and Industries*	5
FD231	Fire Protection	2
		<u>24</u>

Year 2 Second Semester		
FD232	Forest Soils	4
FD222	Silviculture I*	4
FD224	Forest Biodiversity	4
FD226	Forest Practices*	5
FD228	Dendrology	5
FD234	Communication and Negotiation I	3
		<u>25</u>

* A major component of this subject is the field practical activities.

PROGRAM FOR THIRD YEAR DIPLOMA STUDENTS, TAUGHT AT BULOLO CAMPUS.

Year 3 First Semester		
FD301	Structured Work Placement 2 months (~8 weeks)	16
FD311	Timber Harvesting - 5 weeks Block training in conjunction with TFTC)	10
FD365	Forest Assessment (2 weeks)	4
		<u>30</u>

4

Year 3 Second Semester		
FD312	Silviculture II*	5
FD316	Non-industrial Forestry	3
FD318	Forest Inventory and Management	5
FD322	Forest Engineering	4
FD324	Communication and Negotiation II	4
FD328	Human Resource Management	2
FD334	Forest Policy and Legislation	3
		<u>26</u>

* A major component of this subject is the field practical activities.

**PROGRAM FOR THIRD AND FOURTH
YEAR DEGREE STUDENTS, TAUGHT AT
TARAKA CAMPUS.**

Year 3 First Semester

FD301	Structured Work Placement 2 months (~8 weeks)	16
FD311	Timber Harvesting - 5 weeks Block training in conjunction with TFTC)	10
FD365	Forest Assessment (2 weeks)	<u>4</u>
		<u>30</u>

Year 3 Second Semester

FR364	Forest Economics	4
FR366	GIS for Natural Resource Management	4
FR372	Society and Environment	4
FR374	Silviculture II*	5
FR382	Wood Science and Technology	4
FR384	Experimental Design and Analysis	<u>5</u>
		<u>26</u>

* A major component of this subject is the field practical activities.

Year 4 First Semester

FR451	Agroforestry and Community Extension	4
FR453	Forest Engineering	4
FR455	Forest Inventory and Assessment	4
FR457	Administration and Human Resource Management	2
FR459	Forest Management Planning I	5
FR480	Project	4
FR461	Field Studies in Industrial Forestry (mid semester break) 1 week	<u>2</u>
		<u>25</u>

Year 4 Second Semester

FR472	Wildlife Management	4
FR476	Forest Pests and Diseases	4
FR480	Project II	4
FR484	Forest Product Development & Marketing	4
FR486	Forest Policy	3
FR488	Forest Management Planning II	5

FR466	Forestry Extension Project (mid semester break) 1 week	<u>2</u>
		<u>26</u>

DEGREE IN FOREST MANAGEMENT

The Bachelor of Forest Management is aimed specifically at the holders of a Bulolo Forestry College diploma, with at least 3 years work experience in a relevant position.

Year 1 First Semester

FR321	Plantation Silviculture*	7
FR371	Foundations of Forestry I	6
FR455	Forest Inventory & Assessment	4
FR478	Advanced Forest Ecology	4
FD 365	Forest Assessment (2wks) *	<u>4</u>
		<u>25</u>

* A major component of this subject is the field practical activities.

Year 1 Second Semester

FR364	Forest Economics	4
FR366	GIS for Natural Resources Management	4
FR372	Society and Environment	4
FR374	Silviculture II*	5
FR382	Wood Science & Technology	4
FR384	Experimental Design and Analysis	<u>5</u>
		<u>26</u>

Year 2 First Semester

FR451	Agroforestry and Community Extension	4
FR453	Forest Engineering	4
FR457	Administration and Human Resource Management	2
FR459	Forest Management Planning I	5
FR480	Project	<u>4</u>
		<u>19</u>

Year 2 Second Semester

FR472	Wildlife Management	4
FR476	Forest Pests and Diseases	4
FR480	Project II	4
FR484	Forest Product Development & Marketing	4

FR486	Forest Policy	3
FR488	Forest Management Planning II	5

24

SUBJECTS TAUGHT BY THE DEPARTMENT

Bulolo Campus

FD201	Business Skills
FD211	Forest Systematics
FD213	Forest Ecology
FD215	Forest Soils
FD217	Forest Survey Theory & Skills
FD222	Silviculture I
FD224	Forest Biodiversity
FD226	Forest Practices
FD228	Dendrology
FD231	Fire Protection
FD233	Forest Measurement Theory & Skills
FD234	Communication and Negotiation I
FD235	Forest Products & Industries
FD301	Industrial Work Placement
FD311	Timber Harvesting
FD312	Silviculture II
FD316	Non-industrial Forestry
FD318	Forest Inventory & Management
FD322	Forest Engineering
FD324	Communication and Negotiation II
FD328	Human Resource Management
FD334	Forest Policy & Legislation
FD365	Forest Assessment

Taraka Campus

FR102	Introduction to Forestry
FR104	Forest Botany
FR111	Biology
FR204	Forestry, Forest Policy and Economics**
FR362	Forest Finance for Land Management**
FR321	Plantation Silviculture
FR364	Forest Economics
FR366	GIS for Natural Resources Management
FR371	Foundations of Forestry
FR372	Society and Environment
FR374	Silviculture II
FR382	Wood Science & Technology
FR384	Experimental Design & Analysis

FR451	Agroforestry and Community Extension
FR453	Forest Engineering
FR455	Forest Inventory and Assessment
FR457	Administration and Human Resources Management
FR459	Forest Management Planning I
FR461	Field Studies in Industrial Forestry
FR466	Forestry Extension Project
FR472	Wildlife Management
FR476	Forest Pests and Diseases
FR478	Advanced Forest Ecology
FR480	Project I & II
FR484	Forest Product Development & Marketing
FR486	Forest Policy
FR488	Forest Management Planning II

** These are 'service subjects' offered to other Departments.

SUBJECT DETAILS

FR 102: INTRODUCTION TO FORESTRY

Hours per week: 2

Objective:

To provide students with an overview of the whole field of forestry so as to prepare them to appreciate the individual forestry subjects as they are taught in subsequent years.

Syllabus:

An introduction to world climate and vegetation types, forest influences, climate, vegetation and forests of Papua New Guinea, what is forestry? assessment, management and utilisation of the forest resource, with a brief introduction to the various specialised fields in Forestry such as forest policy and law with special reference to Papua New Guinea, future trends in Forestry and the role of research.

Reference:

Anderson, D. A. and Holland I.L., (1982). *Forest and Forestry*. Interstate Printers and Publishers,

Inc., Illinois.

Shrivastava, M. B., (1997). *Introduction to Forestry*. Vikas Publishing House, PVT Ltd, New Delhi.

Tesseverasinghe, K., (1988) *Introduction to Forestry*. Unitech, Lae.

Assessment:

Continuous	- 50%
Examination	- 50%

FR 104: FOREST BOTANY

Hours per Week: 4

Prerequisites: FR 111 Plant Biology

Objectives:

This subject aims to extend further from study of FR111 Plant Biology by focusing on the taxonomy and identification of forest tree species, and on collection and mounting of herbarium specimens. It also has the objective of providing the skills needed to identify common plant species in forests, especially plants which are of economic and ecological importance.

On completion of this subject students should be able to:-

1. Use the accepted terminology to describe plant features of taxonomic importance;
2. Collect and mount specimens of a range of botanical species;
3. Use the overall appearance of the trees and the structure of their bark, leaf, and wood to identify tree species;
4. Use the herbarium specimen to identify plants and store plant materials.

Syllabus:

Introduction to herbarium, principles of taxonomy, diversity of plants, structure of flowers, primary growth in stems, secondary growth in stems, plant classification, gymnosperms, angiosperms, and plants orders.

Reference:

Conn, J. B., (1979). *Botany, Training Manual for the Forestry College, Vol. 12*, Office of Forests,

PNG.

Forman, L., and Bridson, D. (1989). *The Herbarium Handbook*. Royal Botanic Gardens, Kew, UK.

Assessment:

Continuous	- 50 %
Examination	- 50 %

FR 111: PLANT BIOLOGY

Hours per week: 5

Prerequisite: Grade 12 Biology or equivalent.

Objective:

To enable students to appreciate the extent of Biology as a theoretical and applied discipline, and the use of scientific method in its development in PNG.

Syllabus:

Plant structure and function. Classification of plants. Plant ecology, environment and evolution. Introduction to cell biology: structure and function, cell chemistry. Various metabolic and anabolic processes in plants. Micro-organisms: bacteria, virus, fungi, algae.

Textbook:

Revised by Debra Hector and Alex Sayok,

Biology Study Guide: Laboratory Manual

Roberts M.B.V., (1986). *Biology: a functional approach*. (Fourth Edition). ELBS.

Berrie, G.L., A., Berrie, and J.M.O. Eze. (1987). *Tropical Plant Science*, ELBS.

Assessment:

Continuous	- 50%
Examination	- 50%

FR 204: FORESTRY, FOREST POLICY AND ECONOMICS

Hours per week: 4

Objectives:

To provide a thorough understanding and knowledge of forestry, market economics and forest economics including concepts related to forest policy for non foresters, so that on completion of this subject students should be able to:-

- 1) Recognize the different forest types,
- 2) Understand how the forest policy works (globally and PNG in particular),
- 3) Apply some of the economic principles in forestry when dealing with community groups and their land resources.

Syllabus:

Forest as an ecosystem, forest types, types of forest industries, economic principles, market structure, appraisal and evaluation of forests, forest policy and legislation (PNG context), and stakeholder involvement in policy development.

Reference:

- Anderson, D.A., and Holland, I.I., (1982). *Forests and Forestry*. (Third Edition). The Interstate Printers & Publishers, Inc., Illinois.
- Longman, K.A., and Jenik, J., (1974). *Tropical Forest and its Environment*. Longman, London.
- Price, C. (1989). *The Theory and Application of Forest Economics*. Basil Blackwell, Oxford.
- Rees, J. (1985). *Natural Resources: allocation, economics and policy*. Methuen, London and New York.
- Shrivasta, M.B., (1997). *Introduction to Forestry*. Vikas Publishing House, PVT Ltd, New Delhi.
- Tietenburg, T. (2000). *Environmental and Natural Resource Economics*. (Fifth Edition). Addison-Wesley, Massachusetts.
- Relevant PNG Forest Policy Documents.

Assessment:

Continuous	- 50 %
Examination	- 50 %

FR 362: FOREST FINANCE FOR LAND MANAGEMENT

Hours per week: 4

Objectives:

To make the students aware of the characteristics that make forest finance differ from other finance in other sectors. To teach the students the basic skills necessary to come to valuation of forest lands, trees, and forestry projects. At the end of the course the students are expected to understand the importance of the time dimension and capital costs in the forestry sector.

They should understand the different factors that influence forestry investment in Papua New Guinea.

They are also expected to be able to value forest lands, trees and forestry activities as they can be encountered under different circumstances in Papua New Guinea.

Syllabus:

Capital in forest production. Time dimension of forest capital: the concept of compounding and discounting; cost of capital in long-term forestry projects. Forest Valuation: valuation of forest land and forest; valuation of multi-use forest appraisal of damage to forest; valuation and land use allocation. Investments in forestry: evaluation of alternative investment opportunities, comparative analysis of sustained yield and single yield forestry; comparison of multi-use forestry.

Factors influencing forest investment and development in PNG.

References:

- Duerr, W.A., (1960). *Forestry Economics*. McGraw-Hill, New York.
- Davis, L.S., and K.Johnson, (1987). *Forest Management*. McGraw-Hill, New York.

Assessment:

Continuous	- 50%
Examination	- 50%

FD 201: BUSINESS SKILLS

Hours per week: 3

Objectives:

On completion of this subject, students should be able to:-

1. Review balance sheets to understand the financial situation of a company, and monitor costs and revenues for a simple operation;
2. Prepare quotes, tenders, requests for payment, an annual budget and a plan of works;
3. Demonstrate basic office skills such as filing, telephone techniques, using telephone directories and operating a fax machine;
4. Illustrate the principles of simple and compound interest and the effects that these will have on loans or investments made;
5. Demonstrate knowledge of Papua New Guinea laws in relation to companies.

Syllabus:

Budget and expenditure reports, basic balance sheets, purchasing procedures, evaluation of quotes and tenders. Filing, telephone techniques, using a telephone directory; fax machines, Email. Interest rates, compounding and discounting. Introduction to relevant legislation. Communication models. Corporate law.

Textbook:

O'Neil, E., and Wheeler, B., (1994). *Business Practice in Papua New Guinea*. Dellasta, Melbourne.

References:

- Harcourt, A.V., (1998). *Commerce and Development in Papua New Guinea*. (Second Edition). Longman, Cheshire, Melbourne.
- O'Neil, E., and Wheeler, B., (1995). *Accounting in Melanesia*. Dellasta, Melbourne.
- Tashjian, P.C., (1989). *Business Organizations in Papua New Guinea*. Law Book Co. Ltd., Brisbane.

Assessment:

Continuous - 50%

Examination - 50%

FD 213: FOREST ECOLOGY**Hours per week: 4****Objectives:**

An understanding of ecosystems is essential for forests managers. This subject builds on a study of the interactions that occur between plants, animals and the environment, and the ways in which these interactions affect the distribution and abundance of plant and animal communities in Papua New Guinea. Students are introduced to the concept of ecology as a basis for sustainable forest management. A number of field practices are carried out so that students can see first-hand, various ecological processes found in PNG forests. As preparation for effective problem-solving in ecology and other disciplines, students are given an intensive introduction to scientific method analysis in this course. The concluding field practical involves applying scientific method analysis to a short field exploration of some aspect of local ecology.

On completion of this course students should be able to:-

1. Describe how various environmental factors affect plant community distribution and structure.
2. Discuss the process of ecological succession, including how Different plant life history strategies are expressed; describe how different forest types recover after disturbance.
3. Explain how plant growth and abundance is affected by various biotic and abiotic aspects of the environment.
4. Describe energy flow in a community through the use of food webs and food pyramids.
5. Summarizes key features of life history strategy, pollination, and seed dispersal syndromes.
6. Explain the distribution, structure and floristic of Papua New Guinea forest communities;
7. Demonstrate an understanding of the impacts that various land uses, natural events and disturbances have on forest ecosystems.

Syllabus:

Scientific method & its application to ecology; regions & ecosystems; community ecology; Tropical habitats; PNG forest types; tree growth form; forest dynamics; gap ecology; vegetation succession; life history strategies; abiotic interactions, including plant phenology and stress; biotic interactions, including invasive species ecology, mutualistic interactions, pollination ecology, seed dispersal ecology; Competitive & predatory interactions, including herbivory; food webs & production ecology; Biochemical cycling, including nitrogen & carbon cycles. Ecology as a management tool.

References:

1. Osborne, P. L. (2000). *Tropical Ecosystems and Ecological Concepts*. Cambridge Univ. Press.
2. Ghazoul, J & D. Sheil (2010). *Tropical Rain Forest Ecology, Diversity, and Conservation*. Oxford Univ. Press.
3. Pajmans, K., (Ed.), (1976). *New Guinea Vegetation*. CSIRO and ANU Press, Canberra.
4. Primack, R & R. Corlett (2005). *Tropical Rain Forests. An Ecological and Biogeographical Comparison*. Blackwell Publishing.
5. Saunders, J.C., (1993). *Forest Resources of Papua New Guinea: map with explanatory notes*, PNGRIS Publication No.2, AIDAB, Canberra.
6. Smith, T.M. & RL. (2009). *Elements of Ecology*. Benjamin Cummings, San Francisco. Seventh Edition.
7. Whitmore, T.C. (1998). *An Introduction to Tropical Rain Forests*. Oxford Univ. Press. Second Edition.

Assessment:

Continuous	- 60%
Examination	- 40%

FD 217: FOREST SURVEY THEORY AND SKILLS

Hours per week: 5

Prerequisite: MA 181 Mathematics IA & F, MA 182 Mathematics IIA & F

Objectives:

Surveying forests provides the data for plans and maps to be drawn that are essential tools for foresters. This subject trains students to prepare and interpret maps of forest types and locations, soil types, road networks, water resources, settlements, land tenure and topography. The subject focuses on practical skills and emphasises the use of surveying equipment, and the translation of maps and plans to ground surfaces. All students must reach an acceptable level of competency in the basic skills; these skills will be consolidated in other subjects and field exercises throughout the degree and diploma programs. On completion of this unit, students should be able to:-

1. Read and interpret maps and map information and select appropriate scales for maps and plans;
2. Perform the basic calculations (area, distance) needed to analyse data from maps and plans;
3. Show proficiency in the use of compasses, clinometers and survey chains; and describe the accuracy of various equipment and methods;
4. Organise a field crew to complete a basic chain and compass survey in a forest environment, and carry out closed traverses using standard recording systems in a survey book;
5. Show an awareness of the procedures used to map forests from aerial photos.

Syllabus:

Read and interpret maps. Closed and open surveys; organising a chain survey gang; use of compass, clinometer, survey chain. Measurement of slope; correction for slope. Recording data in a standard survey book. Calculation of horizontal and slope distance; correction for error. Precision and accuracy. Drafting plans from survey data. Aerial photo interpretation.

References:

- Eaton, P., (1982). *A Guide to Maps and Map Reading in PNG*.
 Wilson, R.J.P., (1983). *Land Surveying*. (Third

Edition).
Training Manual for Forestry School, Forest Surveying, Vol. 2.

Assessment:

Continuous	- 50%
Examination	- 50%

FD 222: SILVICULTURE I

Hours per week: 4

**Prerequisites: FD 211 Plant Systematics,
FD 213 Forest Ecology**

Objectives:

Silviculture is concerned with controlling the species composition, growth and regeneration of forests by the application of physiological and ecological principles. The principles introduced in FD213 (Forest Ecology) are used in this course to develop the theory and practice of managing native and plantation forests. The subject also aims to familiarise students with the range of silvicultural techniques available, and to develop the expertise and manual skills needed to apply these techniques in nurseries and plantations.

The course contains a small segment (equivalent to 1 hr/wk) designed to develop an appreciation of the role of silvicultural research, and to provide the skills needed to establish, maintain and assess simple field experiments such as species or provenance trials.

On completion of this subject, students should be able to:-

1. Define the aims of silviculture and indicate how silviculture builds on the concepts of ecology;
2. Discuss the range of artificial and natural regeneration techniques for forests and the impediments to them; and indicate to which species and forest types they are best suited;
3. Design a silvicultural plan for the establishment and management of a plantation, and schedule and supervise its implementation;
4. Illustrate how tree and crown classification

expresses competition within stands;

5. Participate in silvicultural operations including planting, tending, pruning, applying fertiliser and herbicide, and marking for thinning; and demonstrate the skills needed for these activities;
6. Show an understanding of the principles of forest protection, nursery management, tree propagation and treebreeding; and demonstrate the skills needed for the production of healthy and vigorous planting stock;
7. Exhibit a knowledge of the fundamentals of forest experimentation including:
 - procedures for laying out trial plots in the field;
 - techniques for measuring population variables such as diameter and height, and recording the data;
 - calculation of relevant statistics including the mean and standard deviation;
 - application of simple tests of statistical significance;
 - interpretation and present the experimental results in a written report.

Syllabus:

A. Silvicultural systems. Regeneration methods, natural and artificial: coppice, direct seeding, planting, enrichment planting. Plantation establishment and management: seed collection, extraction and storage; site preparation, planting, weed control, herbicide use, application of fertilisers; spacing, thinning, pruning, tree marking; use and maintenance of hand tools. Silvicultural regimes for specified end products; rotation length. Thinning theory and practice: competition; crown classification; full site occupancy, stand density. Principles of tree breeding. Forest hygiene: pest and disease control. Nursery management techniques: bed preparation, sowing, transplanting (dibbling), preparing potting mix, potting, water reticulation, watering schedules, fertilising, weeding. Propagation methods: open root and containerised seedlings; cuttings and tissue culture.

B. Hypothesis formation, observation, prediction,

sampling; problems of scale and plot size. Design and layout of simple experiments. Review of descriptive statistics. Analysis and interpretation of results; report writing.

Textbooks:

Evans, J., (1994). *Plantation Forestry in the Tropics*. (Second Edition). Clarendon Press.
Whitmore T.C., (1982). *Tropical Rainforest of the Far East*. (Second Edition). ELBS, Oxford University Press.

Reference:

Saunders, J.C., (1993). *Forest Resources of Papua New Guinea, map with explanatory notes*, PNGRIS Publication No. 2, AIDAB, Canberra.

Assessment:

Continuous	- 60%
Examination	- 40%

FD 224: FOREST BIODIVERSITY

Hours per week: 4

Prerequisite: FD 211 Plant Systematic and FD 213 Forest Ecology

Objectives:

To develop an appreciation of PNG's world class biodiversity treasure, with a focus on the living species of forest habitats. To develop a knowledge base of what biodiversity is and what factors relate to exceptionally species-rich areas, what threatens biodiversity today (especially in PNG), and what approaches exist for sustainably managing PNG's biological diversity. Students are taught the elements of a rapid biodiversity survey, from collection to data analysis, and also learn how to become effective advocates for looking after PNG's biodiversity heritage. The course involves extensive reading, and has two components: PART A comprises formal lectures and several field practices whose activities include specimen collection and preparation, visits to and investigations of various PNG conservation

initiatives, and a practical in which students teach biodiversity at local schools. Part B consists of a 1-week field exercise in which plant diversity is compared against that of another organism group for a local field site. On completion of this course, students should be able to:

1. Not only understand the concept of biological diversity in forests, and appreciate the need for its conservation; but also teach this, as appropriate, to PNG audiences;
2. Describe the nature of PNG's exceptional biodiversity treasure, and what plant and animal groups are especially unique;
3. Undertake population surveys of plants and animals make collections of representative specimens, and monitor and quantify threats to species and population survival;
4. Develop strategies and plans by which a PNG forest's biodiversity can be better secured and managed for the benefit of present and future generations.

Syllabus:

A. Intro to biological diversity; role of education in biodiversity; history of global biodiversity; global & PNG biodiversity hotspots & their designation; 6th biodiversity extinction (crisis); impact of invasive species on biodiversity; biodiversity benefits & values; non-timber forest products & biodiversity; Role of keystone, flagship, indicator & foundation species in biodiversity; history of conservation; biodiversity protection options for PNG, including protected areas; integrated conservation & development approach, including role of incentives, lessons learnt from past projects; strategies for interacting with local communities for biodiversity protection; biodiversity credits & trading; bioprospecting. threats and obstacles to conservation of ecosystems, communities, species and genes; rare and endangered species. Biological, social and economic impact of conservation areas. Conservation status of species in Papua New Guinea and the South Pacific; impacts of humans on wildlife. Wildlife assessment techniques, data

recording, censuring techniques for birds, plants, mammals, insects and other animals; collection and preservation of biological materials; animal marking.

B. Biodiversity Surveys, including Rapid Assessments; Parataxonomy & par taxonomists; Collection, preservation & roles of plant, insect & vertebrate voucher specimens; Role of university & museum biological collections; naming species; biodiversity indices and their utilization; biodiversity indicators; BUC biodiversity survey protocol.

References:

1. Department of Environment and Conservation. [DEC], (1993). *Papua New Guinea Conservation Needs Assessment, Vol.1 and 2*.
2. Ellis, J-A (1997). *Race for the Rainforest II. Applying lessons learned from Lak to the Bismarck-Ramu Integrated Conservation and Development Initiative in Papua New Guinea*. PNG Biodiversity & Resource Management Programme. PNG Dept. Environment & Conservation/UNDP – Global Environ. Facility.
3. Frankel O., Brown A. and Budon J. (1995). *The Conservation of Plant Biodiversity*, Cambridge University Press.
4. Ghazoul, J. & D. Sheil (2010). *Tropical Rain Forest Ecology, Diversity, and Conservation*. Oxford Univ. Press.
5. Groom, M.J., Meffe, G.K. & C. R. Carroll (2005) *Principles of Conservation Biology*. Sinauer Associates. Third Edition.
6. Lamothe, L., (1997). *Wildlife Training Manual for Papua New Guinea, Vol.1-3*.
7. Primack, R. B. (2008). *A Primer of Conservation Biology*. Sinauer Associates, Inc. Fourth Edition.
8. Sekhran, N & S. Miller (1996). *Papua New Guinea Country Study on Biological Diversity*. PNG Dept. Environment & Conservation, Conservation Resource Centre; Africa Centre for Resources & Environment.
9. Wells, M & K. Brandon 9with L. Hannah). (1993) *People and Parks. Linking Protected*

Area Management with Local Communities.
World Bank. World Wildlife Fund. U.S.
Agency for Int'l. Develop., Washington, D.C.

Assessment:

Continuous (including biodiversity survey) - 60%
Examination - 40%

FD 226: FOREST PRACTICES

Hours per week: 5

Prerequisites: FD 217 Forest Survey Theory & Skills, FD 233 Forest Measurement Theory & Skills

Objectives:

In Papua New Guinea, Government policy requires that timber harvesting conform with a Logging Code of Practice. The aim of this course is to ensure that students understand and are able to apply the Code of Practice in order to become effective forest managers.

On completion of this subject, students should be able to:-

1. Demonstrate familiarity with the Papua New Guinea Logging Code of Practice, and the key standards for monitoring and control of harvesting operations on which the Code is based;
2. Recognise the principles of environmental protection and their relevance to the Papua New Guinea Logging Code of Practice;
3. Indicate the legal and practical requirements of the Code of Practice;
4. Inspect and evaluate forestry operations in the field according to their compliance with the Code;
5. Grade logs according to different quality classes;
6. Estimate the volume and weight of individual logs, based on measurements of diameter and length;
7. Keep accurate log records;
8. Describe the Papua New Guinea log revenue system, and show an awareness of the means to prevent fraudulent practices and log theft.

Syllabus:

A. Key standards, environmental impact, erosion control, buffer zones; residual stand protection, directional felling, skidding damage, waste assessment. Inspection and evaluation of logging operations.

Log scaling and grading, weight scaling, log yard measurements. Record keeping, supervision, observation skills.

B. (TITC block course). National Forest Service requirements for log scalers. Log scaling: practices, equipment, procedures, reports. Practice in species identification.

Field practical activities are an important component of this subject where students are expected to take a 'hands-on' approach to their training.

References:

PNG Forest Authority & PNG Department of Environment and Conservation (1996). *Papua New Guinea Logging Code of Practice*.

Assessment:

Continuous	- 70%
Examination	- 30%

FD 228: DENDROLOGY

Hours per Week: 5

Prerequisites: FD 211 Plant Systematic,
FD 213 Forest Ecology

Objectives:

This subject aims to extend further from the study of FD211 Plant Systematic by focusing on the taxonomy and identification of forest species. Particularly, the study of field characters needed in identification of the commercial and ecologically important tree species of Papua New Guinea.

On completion of this subject students should be able to:-

1. Identify tree species using their architecture;

2. Use the overall appearance of the trees and the structure of their bark, leaf, and wood to identify tree species;
3. Use the herbarium to identify plants and store plant materials.

Syllabus:

Plant classification and division, gymnosperms, angiosperms, and order of proteales.

Reference:

Conn, J.B., (1979). *Botany. Training Manual for the Forestry College, Vol. 12*, Office of Forests, PNG.

Forman, L., and Bridson, D., (1989). *The Herbarium Handbook*. Royal Botanic Gardens, Kew, UK.

Johns, R.J., (1976). *Common Trees of PNG, Training Manual for Forestry College*.

Assessment:

Continuous	- 50 %
Examination	- 50 %

FD 231: FIRE PROTECTION

Hours per week: 2

Objectives:

To understand the ecological and environmental consequences of burning, to gain experience in fire suppression techniques, and to appreciate how fire can be used as a management tool in tropical forests.

On completion of this unit, students should be able to:-

1. Show an understanding of the role of fire in tropical ecosystems, and discuss the ecological and environmental consequences of fire in Papua New Guinea;
2. Describe the fundamentals of weather including temperature, relative humidity, pressure systems, and monsoon rainfall;
3. Outline the principles of combustion and fire behaviour, and discuss the effects of topography, fuel type and quantity, and weather;
4. Maintain and operate a weather station,

report and keep records of temperature, humidity, rainfall, wind speed and fire danger rating;

5. Show an awareness of approaches to fire suppression, and demonstrate the practical skills necessary to suppress wildfire safely;
6. Describe the ways in which fire can safely be used in site preparation and regeneration activities.

Syllabus:

Ecological and environmental consequences of fire. Weather and meteorological events, including temperature, relative humidity, pressure systems, and monsoon rainfall. Operation of a weather station, reading weather charts, keeping weather records; measuring temperature, pressure, rainfall, calculating relative humidity. Elements of combustion; fuel, fire behaviour. Effect of topography, fuel type, and weather on fire intensity and rate of spread. Fire hazard, fire risk, fire danger; calculation of fire danger rating. Approaches to fire suppression: personal protective equipment; use of rake hoe, step-up method; fire tanker operation.

References:

Luke, R.H. and McArthur, A.G., (1986). *Bushfires in Australia*, Australian Government Publishing Service.

FD 232: FOREST SOILS

Hours per week: 4

Prerequisite: MN 231 Principles of Geology

Objectives:

To provide the understanding needed by forest managers of soil forming processes, and the range of variation in soil type and how this affects soil physical, chemical and biological characteristics and forest productivity. It also aims to provide students with the knowledge to identify and map soil types, and maintain productive soils for plant growth.

On completion of this subject, students should be able to:-

1. Describe soil-forming processes and how they are influenced by climate, landscape, organisms, relief, parent material and time;
2. Show an awareness of the great variation in soil profiles and be able to identify and describe soil profiles;
3. Describe the types of soils commonly found in Papua New Guinea and their characteristics;
4. Relate soil physical, chemical and biological properties to soil stability, water retention, plant health and availability of plant nutrients;
5. Discuss soil erosion processes and methods for control or prevention of erosion in forests managed for wood production;
6. Interpret and draw soil maps.

Syllabus:

Nature and components of soil; origins and formation of soil; basis of soil classification; soil chemistry; soil microbiology; mineralisation - immobilisation processes; nutrient cycling; mycorrhiza; actinorrhiza; root nodules; soil fertility; fertilizing; soil water relationships; tropical soils; soil surveys and mapping; soil disturbance; erosion processes and their control in the field.

References:

FitzPatrick, E.A., (1974). *An Introduction to Soil Science*. Oliver & Boyd, Edinburgh.
Foth, H.H., (1990). *Fundamentals of Soil Science (Eight Edition)*. John Wiley & Sons, New York.

Assessment:

Continuous	- 50%
Examination	- 50%

**FD 233: FOREST MEASUREMENT
THEORY AND SKILLS**

Hours per week: 5

Objectives:

For effective forest management, foresters need to measure trees and forests to assess the resource.

This subject aims to enhance student understanding and appreciation of the need for quantitative data based on accurate measurements. The subject will cover measurement of single tree parameters such as height, diameter and basal area, and the calculation of stand variables such as predominant height, volume, and growth rate. All students must demonstrate competency in specified field techniques. On completion of this unit, the student should be able to:-

1. Describe basic tree geometry, stem form and taper, and know the various methods for accurately measuring and calculating volume, height, diameter and basal area for individual trees and stands;
2. Measure tree and stand parameters in the field, record the data accurately, and process it to derive stand variables;
3. Use volume tables and stand tables;
4. Recognise the accuracy level possible for various pieces of equipment and methods of computation.

Syllabus:

Tree geometry: stem form and taper. Measuring tree dimensions: diameter, dbh, bark thickness, height, basal area, volume; crown dimensions. Theory and practice of measuring a stand: top height/predominant height, basal area, stand volume, site index; crown cover. Measuring a forest: stand tables, volume tables. Establishing field plots. Recording data. Drawing maps. Use of optical wedges.

References:

Philip, M.S., (1994). *Measuring Trees and Forests*. CAB International.

Assessment:

Continuous	- 60%
Examination	- 40%

FD 234: COMMUNICATION AND NEGOTIATION I

Hours per week: 3

Objectives:

To provide students with the background to land ownership issues in Papua New Guinea and the South Pacific, and develop the skills needed for effective communication with landowners and the community. On completion of this subject students should be able to:-

1. Describe the nature of land tenure in Papua New Guinea and the South Pacific, and the problems associated with traditional ownership of land;
2. Communicate effectively with landowners and community groups such as Landowner Companies and Incorporated Land Groups, and other landowner associations to establish logging agreements;
3. Demonstrate knowledge of how to negotiate timber purchases, resolve conflicts, and provide information for community consultation processes;
4. Demonstrate awareness of the responsibility of professionals to provide correct and accurate information and objective advice to community groups and the community at large.

Syllabus:

Land ownership in Papua New Guinea and the South Pacific. Technical communication, conflict resolution, community education. Professional ethics and responsibilities.

References:

Crocombe, R. (ed.) (1987). *Land Tenure in the Pacific*. University of the South Pacific, Suva, Fiji.

Assessment:

Continuous	- 60%
Examination	- 40%

FD 235: FOREST PRODUCTS AND INDUSTRIES

Hours per week: 5

Prerequisite: PH 171 Physics for Natural Resources

Objectives:

This unit introduces students to the range of forest products, and to the industrial processes that convert roundwood, pulpwood and mill refuse into these useful products. Factors leading to the development of value-adding processes for import replacement or export are stressed. It also aims to show the influence of wood structure on the physical properties of wood, and to its susceptibility to insect and fungal decay. On completion of this subject, students should be able to:-

1. Describe the range of forest products and their properties, uses and markets;
2. Demonstrate a knowledge of the anatomy of wood and its influence on wood behaviour;
3. Describe the basic wood conversion processes;
4. Show an understanding of the grading system for solid timber, know how timber strength is tested, and demonstrate the ability to grade sawn timber in the mill;
5. Discuss strategies for waste minimisation during processing, and the utilisation of wastes;
6. Show an understanding of wood-moisture relationships and the mechanisms involved in timber drying;
7. Demonstrate a knowledge of the chemicals and methods available to treat timber with preservatives, and to indicate which timbers have natural durability and which need preservative treatment for in-ground or outdoor use.

Syllabus:

A. (1 hr/wk formal classwork plus 1 week field excursions involving inspections of wood processing plants). Wood products and their uses. Saws and sawing: cutting patterns; waste avoidance and disposal; grading. Sawmilling equipment; layout of sawmills and log yards; portable sawmills; sawmill maintenance. Waste minimisation during processing; utilisation of waste products. Adhesives, laminations; plywood

and veneer, plywood grading. Quality assurance and product labelling. Wood composites: particle and fibreboard; structural particle board; hardboard and medium density fibreboard. Pulping processes; paper manufacture;

effluent disposal. Wood preservation; natural durability; kinds of preservatives; health and safety considerations. Charcoal. Furniture. Boat building.

B. (2 week course at TITC) Log yard operations, sawmilling (including wokabout sawmills), sawdoctoring, wood machining, sawn timber grading and drying, mill yard management, wood preservation, occupational health and safety.

Textbook

Panshin, A. J., Harrar, E. S., Bethel, J.S. and Baker, W.J. (?). *Forest Products: their sources, Production and Utilisation*.

References

Wilson, K. and White, D.J.B., (1986). *The Anatomy of Wood, Its Diversity and Variabilit*. Stobart, London.

Assessment:

Continuous	- 60%
Examination	- 40%

FD 301: INDUSTRIAL WORK PLACEMENT

Hours per week: 16 (Part of the Industrial Training Program)

Objectives:

This industrial work placement is intended to:-

1. Enable the students to appreciate how easy or difficult it is to work in the field and how daily planning and organizing of activities are done.
2. Impart to students the skills and knowledge of the various forestry activities that is carried out on a day to day basis.
3. Enable students to learn by doing so that they will become better supervisors in the future.

Syllabus:

The work experience involves silvicultural activities such as nursery operations, forest establishment, forest inventory and survey, fire and roading, monitoring of logging operations, and sawmilling.

The students will be attached with timber industries, PNG National Forest Service and other collaborative partners in undertaking this industrial training work placement.

Textbook:

If required, these will be advised.

Assessment:

Continuous - 100%

FD 311: TIMBER HARVESTING

Hours per week: 10 (Block Training, jointly with TFTC, involving a lot of 'hands on' field practical as part of the Industrial Training Program).

Prerequisites: FD 222 Silviculture I

Objectives:

Harvesting must be carefully planned and executed to avoid environmental damage and promote regeneration. Students should be able to implement environmentally sound timber harvesting practices, and supervise efficient harvesting operations consistent with the Papua New Guinea Logging Code of Practice.

On completion of this subject, students should be able to:-

1. Supervise forest harvesting operations consistent with the Papua New Guinea Logging Code of Practice;
2. Carry out tree marking to achieve silvicultural objectives, and supervise directional felling to prevent damage to the residual stand;
3. Describe the various stages of harvesting: stump operations, extraction methods, landing operations, trucking and log reception at mill or log pond;
4. List the various kinds of harvesting machinery, including ground based and aerial

equipment, and discuss their capabilities, relative costs, limitations and occupational health and safety considerations;

5. Discuss the financial and engineering constraints to harvesting, and utilise engineering skills to minimise and/or correct environmental damage;
6. Outline the environmental impact of timber harvesting, and supervise the implementation of control procedures and ameliorative practices.

Syllabus:

Role of timber harvesting in the forest production cycle, engines and machines used in harvesting, wire ropes, tree felling operations and tools, systems of log movement from stump to road, log extraction with tractors, cable yarding, skylines and high lead systems, fully mechanised timber harvesting. Loading and log transportation, log handling in log yards, mills and harbours. Wood conversion in the forest as part of the harvesting operation; small scale timber felling and processing. Environmental protection, erosion control measures, non-wood values. Safety procedures and practices in timber harvesting, practical aspects of the use and maintenance of logging equipment. Principles and practice of tree marking in rainforest and plantations. Application and productivity of different harvesting systems; minimising waste. Planning and managing a harvesting operation; physical, legislative, engineering and financial constraints; maintaining environmental standards.

Textbook:

PNG Forest Authority & PNG Department of Environment and Conservation, (1996). *Papua New Guinea Logging Code of Practice*.

Assessment:

Continuous - 100%

FD 312: SILVICULTURE II

Hours per week: 5

Prerequisite: FD213 Forest Ecology,
FD222 Silviculture I

Objectives:

This course is designed to apply the principles established in FD213 and FD222 to the silviculture of native forests, and to enable students to develop an appropriate silvicultural plan for a nominated forest type. It also aims to explain how silvicultural concepts may be related to the Papua New Guinea Logging Code of Practice; and to show how timber harvesting may be used as a silvicultural tool.

On completion of this subject students should be able to:

1. Indicate an understanding of the role of disturbance - natural and man-induced - in the ecology and management of native forests;
2. Describe how the ecological requirements of species influence the choice of silvicultural systems;
3. Apply the knowledge and skills acquired in a field situation, by demonstrating the ability to treemark for election logging so as to encourage regeneration of desirable tree species, and minimise damage to the residual stand.

Syllabus:

Succession and productivity; role and management of disturbance. Relationship between harvesting and silviculture: shelterwood systems; canopy retention harvesting methods; polycyclic selection logging. Tree marking as a silvicultural tool. The PNG Logging Code of Practice.

Textbook:

Hilton, G.H., (1984). *Manual of Silviculture for the Indigenous Forests of Papua New Guinea*. PNG University of Technology.

Reference:

PNG Forest Authority & PNG Department of Environment and Conservation April, (1996). *Papua New Guinea Logging Code of Practice*.
Whitmore T.C., (1982). *Tropical Rainforest of the Far East*.

Assessment:

Continuous	- 40%
Examination	- 60%

FD 316: NON-INDUSTRIAL FORESTRY

Hours per week: 3

Objectives:

The purpose of this subject is to provide an introduction to the non-industrial uses of forests and trees including agroforestry systems. Students will be exposed to the traditional values inherent in non-industrial uses of forest plants, trees and forests. Integrated tree cropping for small scale wood production is also included.

On completion of this subject, students should be able to:-

1. Describe agroforestry systems and their expression in Papua New Guinea;
2. Show an awareness of the environmental, social and economic advantages of non-industrial forestry in Papua New Guinea;
3. Describe the management systems used in non-industrial forestry enterprises (including small scale wood production) in Papua New Guinea.

Syllabus:

Social aspects of community land use in developing economies. Ownership of land and trees. Integrated cropping systems. Management of non-commercial land use systems.

Textbooks:

Young A., (1991). *Agroforestry for Soil Conservatio*. CAB International.

Assessment:

Continuous	- 70%
Examination	- 30%

**FD 318: FOREST INVENTORY AND
MANAGEMENT**

Hours per week: 5

Prerequisites: FD 226 Forest Practices, FD 311 Timber Harvesting

Corequisite: FD 322 Forest Engineering

Objectives:

To have students conduct a forest inventory in the field; and to equip them with the knowledge and skills needed to prepare timber harvesting plans. The course is offered in two parts. Part A is a 1-week field exercise in forest inventory, carried out under the direction of PNG National Forest Service officers, and provides an estimate of the volume of standing timber available for harvest. Part B is a harvesting module (2 hr/wk plus a 1-week block) designed to acquaint students with the content of harvesting plans and how to prepare them, and is an essential background to the planning, monitoring and control procedures required to comply with the Papua New Guinea Logging Code of Practice.

On completion of this subject, students should be able to:-

1. Describe different strategies for sampling forests - random sampling, stratified random sampling, multiphase sampling, systematic sampling - and indicate in which situations each is best applied;
2. Conduct a preliminary survey to determine stand variability and hence the number of samples required per unit area;
3. Use sampling theory to ensure that the sample measured is representative of the whole population;
4. Locate and measure plots in the field, and record information in a logical, accurate and neat manner;
5. Explain how forest inventory information is acquired and stored by government organisations in Papua New Guinea;
6. Use inventory information to estimate the volume of standing timber and the size class (diameter class) distribution, and describe how it can be further used to create volume and yield tables;
7. Undertake all the measurements, surveying, drafting and mapping required to prepare a timber harvesting plan;

8. Produce a harvesting plan for a logging set-up in a nominated forest compartment, showing the location of access roads, skid trails and log landings, such that it complies with the Papua New Guinea Logging Code of Practice.

Syllabus:

A. Sampling theory: random, stratified, multiphase and systematic sampling. Sampling units: strip, plot and point (angle count) sampling. Field measurements; processing of field data. Forest inventory in Papua New Guinea.

B. Planning the timber harvest: scheduling the design, construction and maintenance of logging roads, skid trails and log landings. Site survey of logging set-ups; traversing access roads and skid trails; locating landings. Preparing the harvesting plan; use of API. Case studies.

References:

PNG Forest Authority & PNG Department of Environment and Conservation, (1996). *Papua New Guinea Logging Code of Practice*.

Assessment:

A. Continuous	- 50%
(inventory project report)	
B. Continuous	- 50%
(harvesting plan)	

FD 322: FOREST ENGINEERING

Hours per week: 4

Prerequisites: FD 217 Forest Survey Theory and Skills, FD 311 Timber Harvesting

Objectives:

To be able to design and supervise the construction of forest roads, small forest bridges, erosion control structures and small buildings, within the context of timber harvesting and forest management in Papua New Guinea.

On completion of this subject, students should be able to:-

1. Demonstrate a knowledge of basic road design principles, including allowable grade, horizontal and vertical alignment, cut and fill, small bridges, drainage and culvert design, in accordance with the Papua New Guinea Logging Code of Practice;
2. Show an appreciation of the need to be environmentally sensitive when planning road and bridge locations;
3. Explain the construction and design requirements of mountain roads, especially in areas of high rainfall prone to landslides, and describe various erosion control structures and their construction;
4. Demonstrate basic road survey skills including chain and compass surveys and slope determination, and mark out centre lines for roads and set out curves;
5. Describe basic road maintenance procedures such as grading, drainage maintenance, and selection of gravel;
6. Assess the condition of existing roads and recommend improvements to surfacing, drainage and alignment;
7. Supervise road construction and maintenance;
8. Draw plans for a simple building, and estimate quantities of building materials required and costs involved;
9. Demonstrate basic building skills, including concreting and plumbing.

Syllabus:

Basic building design, reading plans, costing of buildings, setting out site, mixing concrete, basic construction methods, roofs and drainage, basics of water reticulation, pressure and flow, basic plumbing fittings, water supply systems for simple buildings. Principles of road design, grades, horizontal and vertical alignment, designing curves by graphical method, calculating cuts and fills. Bridge, drainage and culvert design; road maintenance and grading. Measuring grades, pegging a centre line and curves, designing horizontal alignment, calculating cut and fill. Use of air photo interpretation to plan and design road

networks in environmentally sensitive areas.

Reference:

Vatasan, G.S., and Vatasan, R.N., (1981). *Practical Photo Interpretation for Foresters in Papua New Guinea*, Office of Forests, Port Moresby.

Assessment:

Continuous	- 50%
Examination	- 50%

FD 324: COMMUNICATION AND NEGOTIATION II

Hours per week: 4

Prerequisites: FD 234 Communication and Negotiation I, FD 316 Non-Industrial Forestry

Objectives:

This subject aims to involve students in land ownership issues in Papua New Guinea, and to develop the skills needed for effective communication with landowners and the community at large. It utilises the communication and negotiation skills learned in FD234 to provide forestry extension advice to resource owners.

Upon completion of this subject, the student should be able to:-

1. Exhibit an understanding of the philosophies and theories related to extension work;
2. Demonstrate an understanding of relevant theories of adult education, social influence, communication, marketing and agricultural extension;
3. Discuss the social aspects of land use in agriculture and forestry;
4. Describe the range of extension models and presentation methods available, including use of mass media, group methods, speeches, field demonstrations and excursions;
5. Organise, design and implement an effective program of information transfer (covering both non-industrial forestry issues and small-scale commercial wood production) to

- community groups and landowners;
- Demonstrate competence by planning and implementing an extension project as a team exercise.

Syllabus:

Extension models and methods. The adult learner. Introduction to sociology and applied communication. Planning and designing extension programs. Extension ethics; methods for influencing human behaviour; diffusion and adoption of innovation. Extension project.

Textbooks:

Village Development Trust, (nd). *Training and Reference Manual 1-8*, VDT, Lae.

Assessment:

Continuous	- 70%
Examination	- 30%

FD 328: HUMAN RESOURCE MANAGEMENT

Hours per week: 2

Prerequisites: FD 201 Business Skills

Objectives:

Good supervisors are essential in a productive work force. This unit aims to provide the knowledge and skills needed by supervisors to manage staff effectively and optimise human performance.

On completion of this subject students should be able to:-

- Demonstrate a knowledge of the role, skills and responsibilities of a supervisor including: goal and target setting within work plans; staff motivation; strategies for managing uncooperative or unproductive employees; understanding the causes of industrial action and the means of resolving industrial disputes; understanding organisational structure; occupational health and safety requirements.
- Participate constructively in formal and

informal meetings, and show an understanding of meetings procedures including: preparation of agenda; chairperson's duties and responsibilities; keeping of minutes.

- Discuss group dynamics, and work cooperatively in a group or team;
- Show an appreciation of basic models of work place communication and leadership.

Syllabus:

Office management, roles and responsibilities of supervisors, occupational health and safety, assertion and negotiation skills, goal setting, motivation, training skills, staff development, unions and industrial relations. Managing staff, performance planning and review, appointment procedures, disciplining and dismissal processes. Meetings procedures. Group dynamics, communication and leadership.

References:

Haiman, T., and Hiebert, R., (1987). *Supervision: Concepts and Practices for Management (4th Edition)*. South Western Publishing Co., Ohio.

Assessment:

Continuous	- 50%
Examination	- 50%

FD 334: FOREST POLICY AND LEGISLATION

Hours per week: 3

Objectives:

To familiarise students with policy and legislation relevant to the conservation and management of natural resources in Papua New Guinea and the South Pacific, and to explain how policies and laws are implemented in forest management practice.

On completion of this subject, the student should be able to:-

- Discuss legislative and policy-making processes in PNG and the South Pacific;

2. Show an understanding of the separation of powers and responsibilities between the national and provincial governments in Papua New Guinea and how this affects natural resources policy in general and forest policy and management in particular;
3. Demonstrate an understanding of how relevant policy and legislation is expressed in codes of forest practice;
4. Outline the responsibilities of field staff in relation to the enforcement of relevant policy and legislation.

Syllabus

Legislative and policy processes. Policy and legislation relevant to the conservation and management of natural resources in Papua New Guinea and the South Pacific. Statutory and regulatory responsibilities of forest and conservation agencies and their staff.

Textbooks:

Independent State of Papua New Guinea, (1993). *Forestry, Amendment Act 1993*.
PNG Ministry of Forests, (1991). *National Forest Policy, 1991*.
Village Development Trust, (nd). *Training and Reference Manual Pt 1*. VDT, Lae.

Assessment:

Continuous	- 30%
Examination	- 70%

FD 365: FOREST ASSESSMENT

Hours per week: 4 (2 weeks as part of the Industrial Training Program)

Prerequisites:

FD 217 Forest Survey Theory & Skills
FD 233 Forest Measurement Theory & Skills

Objectives:

Students will undertake field and office work in collaboration with the National Forest Authority or under supervision of Department academic staff in conducting inventory and assessment of a forest

resource. It is designed to provide practical experience in forest assessment possibly including: harvestable volume; regeneration; non-wood forest products, including general biodiversity of the forest area. Data collected in this subject may be used for analyses in FR488 (Forest Management Planning II).

Syllabus

Pre-survey planning; assessment survey; post-survey collation of data; computation of the harvestable volume of timber (and non-timber produce). Regeneration surveys. Non-timber produces.

Assessment:

Continuous.	- 100%

(Students will be assessed according to the quality of their input and the results from allocated projects).

FR 321: PLANTATION SILVICULTURE

Hours per week: 7

Objectives:

Gaining an understanding of the techniques and ideas which have evolved to enable sound management of forest plantations on a sustained yield basis. Understanding experimental methods used in the introduction of indigenous species for plantations. On completion of this subject the student should be able to incorporate field experience and be able to develop techniques for better, sustained management of forest plantations in PNG.

Syllabus:

Importance of plantations in the tropics. Plantation forestry in Papua New Guinea and South Pacific. Plantations and natural forest compared and contrasted. Choice of species. Tree seed characteristics and treatment. Nursery management and practice. Plantation establishment - site selection and preparation, planting, fertilizing, tending, thinning, pruning. Coppice stands. Stand development and rotation

length. Modifications to normal silvicultural practice especially agro forestry, forest grazing, fuelwood and pulp production, rehabilitation and reclamation. Ecological effects of plantation and overcoming problems with their management on a sustainable basis. Principles of tree improvement. Phenotype and genotypic variation in trees. Selection of plus trees. Multiplication in seed orchards. Vegetative methods of propagation including cutting, grafting and tissue culture.

Textbook:

Evans, J., (1992). *Plantation Forestry in the Tropics*. Oxford (first edition, 1982 also acceptable).

Assessment:

Continuous	- 50%
Examination	- 50%

FR 364: FOREST ECONOMICS

Hours per week: 4

Objectives:

To become familiar with economic and business principles and their applications in forestry and resource management.

On completion of this subject, students should be able to:-

1. Show an understanding of the principles of macro-economics, micro-economics and resource economics;
2. Describe the role of forests and forestry in Papua New Guinea and regional economies;
3. Discuss the concepts of discounting, risk and uncertainty relevant to typical forestry investment decisions;
4. Describe decision criteria relevant to forestry and resource management;
5. Evaluate the economics of forestry projects, investments and proposals.

Syllabus:

Scarcity, consumer choice, economic systems and resource allocation, theory of demand and supply, cost of production and economies of scale, perfect

and imperfect market structures, cost curves, production curves, elasticity, government policy, economic rent, interest, compounding, discounting, internal rate of return, present net value, forest rent, soil expectation value, national and international trade, trade barriers, utility, externalities, valuation of forests and trees, risk, alternative investment opportunities, cost benefit analysis

Reference:

FAO, (1992). *Economic assessment of forestry projects impacts*, Forestry Paper 106.

Leslie, A., (1992). *Economic Problems in Tropical Forestry*, FAO Paper FO: Misc/71/24.

Tietenberg, T., (2000). *Environmental and Natural Resource Economics*, Addison-Wesley, Reading.

Assessment:

Continuous	- 40%
Examination	- 60%

FR 366: GEOGRAPHIC INFORMATION SYSTEMS FOR NATURAL RESOURCE MANAGEMENT

Hours per week: 4

Objectives:

To provide students with the concepts of geographic information systems (GIS) and remote sensing and their application in Papua New Guinea.

On completion of the subject, students should be able to:-

1. Explain the principles and concepts of GIS and remote sensing;
2. Use a GIS for basic data manipulation and analysis, reporting, compilation of maps and spatial data statistics;
3. Describe the uses of the remote sensed datasets including airphoto interpretation;
4. Use the main natural resources databases developed in Papua New Guinea;
5. Demonstrate the application of GIS and

remote sensing in natural resources management.

Syllabus:

Geographic information systems (data input, design, output, analysis and management), remote sensing principles and application (including airphoto interpretation), use of PC vector and raster GIS. PNG geographic datasets and digital mapping sources.

Reference:

- Amando, A., (1999). *GIS Applications in Tropical Forestry*. Toowomba Distance Education Centre, Qld.
- Atkinson, P.M., (1998). *Advances in Remote Sensing and GIS Analysis*. Wiley Publications, Chichester.
- Burrough, P.A., (1986). Principles of Geographical Information Systems for Land Resources Assessment. Clarendon Press, Oxford.
- Vatasan, G., and Vatasan, N, (nd). Practical Photointerpretation for Foresters in Papua New Guinea. Forestry Department, Unitech, Lae.

Assessment:

Continuous	- 50%
Examination	- 50%

FR 371: FOUNDATIONS OF FORESTRY

Hours per week: 6

Objectives:

Achieving an elementary understanding of the scientific bases of forestry.

Syllabus:

Forestry, generally. Plant physiology and its processes. Forest hydrology and climates. Soil science. Basic statistics and its application in forestry. What is forest resources database (PNGRIS, FIMS).

References:

1. Anderson, D.A., and Holland, I.I., (1982).

Forests and Forestry. The Interstate Printers & Publishers, Inc., Illinois.

2. Shrivasta, M.B., (1997). *Introduction to Forestry*. Vikas Publishing House, PVT Ltd, New Delhi
3. Roberts, M.B.V., (1982). *Biology: a* Thomas Nelson and Sons, Ltd, London.
4. Foth, H.D., (1990). *Fundamentals of Soil Science (Eight Edition)*. John Wiley & Sons, New York.
5. Wilkins, C., (1995). *Basic Statistics*. Department of Mathematics and Computer Science, The Papua New Guinea University of Technology.
6. Longman, K.A., and Jenik, J., (1974). *Tropical Forest and its Environment*. Longman, London.

Assessment:

Continuous	- 50 %
Examination	- 50 %

FR 372: SOCIETY AND ENVIRONMENT

Hours per Week: 4

Objectives:

Achieving an elementary understanding of the social and environmental bases of forestry and communicating these to the communities.

Syllabus:

Introduction to Sociology and Applied Communication. Land Tenure Systems in the Pacific and PNG. Participatory Rural Appraisal. Social Impact Assessment (Social Mapping). Environmental Impact Assessment. Extension Models and Methods. Planning Extension Programs; Introduction to climate change

References:

1. Chambers, R., (1983). *Rural Development: putting the last first*. London Scientific & Technical, London.
2. Chambers, R., (1992). *Rural Appraisal: rapid, relaxed and participatory*. IDS Discussion Paper No. 331, Brighton, IDS, London.

3. Mayoux, L., (2001). *Participatory Methods*. EDIAIS, Manchester.
4. Nolan, P., and Lenski, G., (1999). *Human Societies: an introduction to macro sociology* (Eight Edition). McGraw-Hill College, New York,

Assessment:

Continuous	- 50 %
Examination	- 50 %

FR 374: SILVICULTURE II**Hours per week: 5****Prerequisites: FD 222 Silviculture I****Objectives:**

To develop further the principles and practice of silviculture by the application of ecological theory; and in particular, to illustrate how a knowledge of forest dynamics is used to control the growing stock in forests managed for wood production. To promote an understanding of how satisfying the silvicultural requirements of commercially desirable tree species can affect the output of non-wood goods and services from forested lands. On completion of this subject, students should be able to:-

1. Show an appreciation of the factors and processes, including the role of animals, that determine the structure and floristics of rainforest communities;
2. Demonstrate knowledge of the major formations of wet tropical rainforest and their geographical distribution;
3. Outline silvicultural systems that have been developed for use in tropical rainforests, and their application to forest management in Papua New Guinea;
4. Apply appropriate silvicultural methods within the framework provided by the PNG Code of Practice;
5. Assess the relative costs and efficiency of various silvicultural operations.

Syllabus:

Major formations of wet tropical rainforest and their geographical distribution: tropical lowland evergreen rainforest, tropical semi-evergreen rainforest, montane rainforest, heath forest, swamp forests. Structural sub-forms: primary and secondary rainforest. Regeneration strategies and species richness: ecological succession; gap-phase dynamics; relay floristics. Growth and development of stands: role of disturbance - natural and man-made - and its implications for ecosystem stability; disclimax communities; the shifting mosaic steady state. Evolution of silvicultural methods in tropical rainforests: monocyclic and polycyclic systems; canopy retention harvesting; tree marking as a silvicultural tool in selection logging. Timber stands improvement: significance of advance growth; protection of the residual stand; enrichment planting. Silvicultural practice and indigenous forest management in Papua New Guinea.

Reference:

- FAO, *Silvicultural Systems of Tropical Forests* Forestry Paper No.
- Gomez-Pompa, A., Whitmore, T.C., and Hadley, M., (1991). *Rainforest Regeneration and Management*, Man and the Biosphere Series Vol. 6, Parthenon Publishing.
- Hilton, R.G.B., (1984). *A Manual of Silviculture for the Indigenous Forest of Papua New Guinea*, Department of Forestry, Unitech, Lae.
- McKinty, M.H., (1999). *Silviculture of Mixed Tropical Forests*, Department of Forestry, Unitech, Lae.
- Smith, D., (1986). *The Practice of Silviculture*, Eight Edition, John Wiley & Sons, Canada.
- Whitmore, T.C., (1993). *An Introduction to Tropical Rainforests*. Oxford University Press, Oxford.

Assessment:

Continuous	- 40%
Examination	- 60%

FR 382: WOOD SCIENCE AND TECHNOLOGY

Hours per week: 4

Prerequisites: FD 230 Forest Products and Industries

Objectives:

To relate the anatomy, structure and chemistry of wood to its various end uses.

On conclusion of this subject, students will be able to:-

1. Identify the wood of representatives of the major groups of forest trees, both broadleaved and coniferous;
2. Demonstrate an understanding of the relationship between wood anatomy and figure in timber;
3. Explain how the structure and chemistry of the cell wall of trees affects product end use including susceptibility to insect attack and fungal decay.

Syllabus:

Macroscopic and microscopic features of wood: characteristics of broadleaved and coniferous wood; identification of major groups. Secondary growth: products of lateral meristems; cork cambium. Anatomy and structure, reaction wood. Wood chemistry and extractives. Physical properties of wood, mechanical strength. Implications of wood anatomy, structure and chemistry for end use and durability.

Reference:

Bootle, K.R., *Wood in Australia: types, properties and uses*. McGraw Hill.

Desch, H., (revised by J. M. Dinwoodie), *Timber: its Structure, Properties and Utilisation*. MacMillan.

Panshin, A.J. and de Zeeuw, C., (1980). *Textbook of Wood Technology*. McGraw-Hill, New York.

Assessment:

Continuous	- 50%
Examination	- 50%

FR 384: EXPERIMENTAL DESIGN AND ANALYSIS

Hours per week: 5

Objectives:

Foresters need to be able to appreciate the rationale for and methods of scientific research. They should be able to design and establish statistically sound experiments, collect and analyse data, and derive conclusions from experimental data. This subject provides the background and skills necessary for students to engage in design and analysis of experiments.

On completion of this subject, students should be able to:-

1. Describe the principles of experimental design and analysis;
2. Formulate a hypothesis/null hypothesis that can be tested experimentally;
3. Design simple experiments to test hypotheses;
4. Describe a range of commonly used experimental designs, particularly those used in forest research;
5. Use statistical methods to describe, analyse and report experimental results.

Syllabus:

Hypotheses, null hypotheses, experimental design, samples and populations, plot size, randomisation and replication, measurement, recording and presentation of results, probability distributions, tests of significance, mean standard deviation, standard error, confidence intervals, analysis of variance, statistical softwares, scientific research writing and publication, dissemination of information.

References:

- a. Bhattacharyya, G.K and Johnson, R.A., (1977): *Statistical Concepts and Methods*, John Wiley & Sons, New York, 639 pp
- b. Martin, P and Piece, R., (1994): *Practical Statistics for the Health Sciences*, Nelson Publishing, Melbourne.
- c. Mead, R and Currow, R.N., (1984): *Statistical Methods in Agriculture and Experimental Biology*, Chapman and Hall.

- d. Webb, M.J and Hambleton, A., (1996): Fundamentals of Research and Research Thinking, A manual on Tree Nutrition Research Methods. A Training Course, Held at the University of the South Pacific, Apia Campus, Western Samoa, 2-12 July 1996. FAO, UNDP, FORSPA. 50pp
- e. Weiss, N.A., (1999): Introductory Statistics, 5ED, Addison-Wesley Longman, Inc. New York. 988 pp

Assessment:

Practical assignments and short tests	- 60%
Examination	- 40%

FR 451: AGROFORESTRY AND COMMUNITY EXTENSION

Hours per week: 4

Objectives:

To understand the role of trees in sustainable land use systems in tropics and to develop an understanding of the social processes underlying the land tenure systems in the Pacific and PNG and how to effectively communicate technical information about forestry and the forest products industries in a Papua New Guinea context.

Syllabus:

Social aspects of Community Land Use in Developing Economies and role of Agroforestry and Community involvement in forestry related projects. Community/Agroforestry Systems in PNG and Pacific. Costs and Benefits of Agroforestry and Community Forestry Projects. Support Systems for Community Forest Owners. Role of Government, NGOs and Others in Community/Agroforestry Projects. Role of Extension in Facilitating Technical Change

References:

- Clarke, W.C., and Thaman, R.R., (Eds) (1993). *Agroforestry in the Pacific Islands: systems for sustainability*. United Nations University Press, Tokyo.
- Frost, F., Forge, K., and Balck, A.W., (2000). *Extension and Advisory Strategies for Agroforestry*. Rural Industries Research and

Development Corporation. AusAID/RIRDC Publication No. 00/184, Australia.

Lerner, D., and Schramm, W., (Eds.) (1967). *Communication and Changes in the Developing Countries*. East West Centre Press, Honolulu.

Nolan, P., and Lenski, G., (1999). *Human Societies: an introduction to macrosociology* (Eight Edition). McGraw-Hill College, New York.

Ray, G.L., (1976). *Extension Communication and Management*. R. Publishing Corp., Delhi.

Sharma, N.P., (Ed.) (1992). *Managing the World's Forests: looking for the balance between conservation and development*. World Bank, Washington, D.C.

Unasylva No. 143(36), (1984). Forestry extension, making it work, FAO (various articles).

Village Development Trust [VDT], (nd). Training and Reference Manual 1-8, VDT, Lae.

Assessment:

Continuous	- 60 %
Examination	- 40 %

FR 453: FOREST ENGINEERING

Hours per week: 4

Prerequisites: FD 217 Forest Survey Theory and Skills; FD 311 Timber Harvesting

Objectives:

To be able to design and supervise the construction of forest roads, bridges, drains and erosion control structures ensuring that constructions conform to the Papua New Guinea Logging Code of Practice. On completion of this subject, students should be able to:-

1. Design and survey road systems based on terrain, duration and intensity of use, and environmental considerations that conform to the Papua New Guinea Logging Code of Practice;
2. Show sufficient knowledge of hydrology and erosion processes to design structures that will withstand storm flows and avoid

- undue environmental degradation;
3. Design drainage structures, culverts and small bridges;
4. Recognise the trafficability and stability of soil types found in Papua New Guinea;
6. Demonstrate an understanding in the implementation road maintenance programs including: the selection, preparation and application of gravel and pavement material; road grading techniques; drainage and culvert maintenance.
7. Carry out surveys on the centre line of a road alignments and estimate construction costs, time, quantities and types of materials, equipment and machinery required;
8. Produce a flow chart of the steps involved in road design and construction.

Syllabus:

Principles of road design, grades, horizontal and vertical alignment, using API to calculate scales and design roads, designing curves, calculating cuts and fills, bridge, drainage and culvert design, road maintenance and grading. measuring grades, pegging a centre line, graphical method of designing curves, pegging curves, designing horizontal alignment, construction costs and times, road construction equipment and machinery, pavement surfaces, erosion control structures, soil and landscape analysis, hydrology, storm event return period,

Reference:

Government of British Colombia Department of Forestry, (1995). *Forest Road Engineering Guidebook* (available on Internet: <http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/road/fre-toc.htm>)

Assessment:

Continuous	- 60%
Examination	- 40%

FR 455: FOREST INVENTORY AND ASSESSMENT

Hours per week: 4

Prerequisites:

**FD 236 Forest Measurement Theory and Skills;
SL 364 GIS for Natural Resource Management.**

Objectives:

To be able to design and implement an inventory of forest resources. On completion of this subject, students should be able to:-

1. Demonstrate familiarity with different strategies for sampling forests, including random sampling, stratified random sampling, multiphase sampling, systematic sampling, 3P sampling and which situations they are best applied;
2. Carry out a preliminary survey to determine variability and the number of samples required per unit area;
3. Use inventory data to calculate volume, diameter distribution, site quality, CAI, MAI, PAI, and create volume and yield tables;
4. Show an understanding of how forest inventory and geographical (spatially referenced) data is acquired and stored by government organisations in Papua New Guinea, with particular reference to the Forest Inventory Mapping (FIM) system.

Syllabus:

Sampling theory, random, stratified, multiphase and systematic sampling. Inventory in Papua New Guinea: field equipment, field measurements (diameter, height, stocking). Processing of field data: stand mean diameter, basal area, stand height, stand volume, volume tables, annual increment, site quality, stand density, yield functions and tables. Why aerial photographs, GIS and remote sensing techniques are used in forest inventory Importance of Inventory database management:

Reference:

Brack C. (1997). *Forest Measurement and Modelling Course Notes*, Australian National University, Canberra.
Hammermaster, E.T. and Saunders, J.T.(1995). *Forest Resources and Vegetation Mapping of*

Papua New Guinea. PNGRIS Publication No. 4, AusAID, Canberra.

Assessment:

Continuous	- 50%
Examination	- 50%

FR 457: ADMINISTRATION AND HUMAN RESOURCE MANAGEMENT

Hours per week: 2

Objectives:

To understand the principles and practice of effective administration and human resource management.

On completion of this subject students should be able to:-

1. Demonstrate an understanding of the basics of strategic planning including statements of objectives, strategic plans, targets and performance indicators;
2. Describe the advantages and disadvantages of various organisational structures;
3. Discuss and define supervision styles and strategies, the characteristics of a good leader/manager and the role of supervision in maintaining effective work groups;
4. Define expectations and responsibilities of a supervisors by employers and employees including occupational health and safety considerations;
5. Show familiarity with appropriate procedures for staff selection, recruitment, performance appraisal, career development and separation processes;
6. Follow procedures for the conduct of meetings, and act as chairperson;
7. Describe the role, processes and requirements of industrial relations.

Syllabus:

Mission statements, strategic plans, performance indicators, organisation structure, role and responsibilities of supervisors, scope of authority, occupational health and safety, characteristics of an effective leader/manager, maintaining effective

work groups, motivation, delegation. Personnel management, recruitment and selection, performance appraisal, separation processes, career development, assertion and negotiation skills, conflict resolution, meeting processes, industrial relations.

Reference:

George C.G., and Cole K., (1992). *Supervision in Action: the art of managing*. (Third Edition). Prentice Hall.

Flippo, E.B., (1984). *Personnel Management*. (Sixth Edition). McGraw-Hill International Editions, New York.

Assessment:

Continuous	- 40%
Examination	- 60%

FR 459: FOREST MANAGEMENT PLANNING 1

Hours per week: 5

Prerequisite: FR 374 Silviculture II

Corequisite: FR 455 Forest Inventory and Assessment

Objectives:

To understand the principles and processes of land use planning.

On completion of this subject, students should be able to:-

1. Describe planning processes required to manage plantations and native forests in Papua New Guinea at the provincial, national, management area and logging coupe levels;
2. Compare and contrast the methods used to prepare plans at the provincial, national, management area and logging coupe levels;
3. Critically perform environmental impact assessments and the preparation of environmental plans for forestry operations in Papua New Guinea.

Syllabus:

Land evaluation: principles and procedures; land capability assessment; land suitability analysis. Land administration and land use decision-making in Papua New Guinea: customary land ownership. Environmental Impact Assessments. Hierarchy of forestry plans: strategic and operational plans; PNG National Forest Plan; Provincial Forest Plans; five-year working plans; environmental plans, harvesting plans. Case studies of selected management plans.

Reference:

Bellamy, J.A., and McAlpine, J.R., *Papua New Guinea Inventory of Natural Resources, Population Distribution and Land Use Handbook*. (Second Edition). PNGRIS Publication No.6, AusAID, Canberra.
Environmental Impact Assessments, PNG Case Studies.
PNG Provincial Forest Plans
PNG National Forest Plan
Relevant legislation
State Forests of NSW Management Plans including Grafton, MP 29, summary of MP29, Managing State Forests, Grafton, MPS-7, Eden Native Forests, MP23, various dates.

Assessment:

Continuous	- 60%
Examination	- 40%

FR 472: WILDLIFE MANAGEMENT

Hours per week: 4

Prerequisite: FD 224 (Forest Biodiversity) or equivalent

Objectives:

To develop and apply the principles of ecology to the management of wildlife in Papua New Guinea forests.
On completion of this subject, students should be able to:-
1. Demonstrate understanding of the

- ecological, cultural and economic value of wildlife to Papua New Guinea;
2. Describe wildlife conservation management methods relevant to Papua New Guinea;
3. Describe the principles of population dynamics, niches and habitat modelling;
4. Develop a preliminary conservation plan for a species.

Syllabus:

Indicator and significant wildlife in Papua New Guinea, conservation methods and processes, population dynamics, niches, habitat models, conservation strategies and plans.

References:

Bookhout T.A., (ed) (1987). *Research and Management Techniques for Wildlife and Habitats*. The Wildlife Society, Bethesda, Maryland.

Assessment:

Continuous	- 50%
Examination	- 50%

FR 476: FOREST PESTS AND DISEASES

Hours per week: 4

Prerequisites: FD 224 Forest Biodiversity

Objectives:

To develop the ability to identify forest pests and disease outbreaks and understand the life cycle of important pests and pathogens to Papua New Guinea forests.
On completion of this subject, students should be able to:-
1. Discuss the biology of some important pathogens and insect pests of forest trees in Papua New Guinea;
2. Indicate a knowledge of vertebrate pests of trees in Papua New Guinea;
3. Describe the impact of pests and diseases on wood production and forest conservation;

4. Outline appropriate preventative and ameliorative measures to maintain and/or restore the health and vigour of forests managed for wood production or biological conservation.

Syllabus:

Major groups of insects. Population dynamics. Biology of important insect pests of forest trees. Control measures: integrated pest management. Basic classification of fungal pathogens. Biology of major pathogens: host - parasite relationships. Soil-borne plant pathogens: epidemiology and control. Life cycle and control of vertebrate pests of forest trees in Papua New Guinea.

Assessment:

Continuous	- 40%
Examination	- 60%

FR 478: ADVANCED FOREST ECOLOGY

Hours per week: 4

Prerequisites: FD 213 Forest Ecology; FD 224 Forest Biodiversity

Objectives:

Students will expand on their knowledge of ecology to develop a deeper understanding of ecological principles applicable to forest communities and the effect of management practices on these communities.

On completion of this subject, students should be able to:-

1. Define and describe ecological principles including population growth, niche and habitat, density dependence, food webs and resource and niche overlays;
2. Demonstrate an understanding of the functional processes of energy flow and mineral cycling in forest ecosystems, and their interrelationship in the accumulation and turnover of biomass;
3. Show an understanding of the relationship between succession and productivity and its implications for sustainable forest

management and environmental conservation;

4. Understand the effects of forest harvesting on forest populations and its implications for sustainable forest management and environmental conservation;
5. Discuss the effect of timber harvesting on mineral cycling processes and the measures necessary to prevent disruption to the processes;
6. Discuss the implications of population ecology for reserve design and species management.

Syllabus:

Organic matter accumulation and decomposition: gross and net primary production (GP, NPP); the mineralisation - immobilisation cycle, interaction of soil mesofauna and microflora. Nutrient cycling processes: geochemical, biogeochemical and biochemical pathways. Community growth and nutrient storage: the shifting mosaic steady state. Effect of management practices on nutrient cycling: leaching, overland flow, the RATS model. Population growth, niche and habitat, graph theory and food webs, resource/niche overlay graphs. Density dependence, multi-dimensional niches, habitat and niche models. Biotic and abiotic dimensions, population distributions, logistic regression, biochemical modeling, reserve design and species management.

References:

- Akcakaya H.R., Burgman M.A., and Ginzburg L.R., (1997). *Applied Population Ecology*.
 Bormann F.H. and Likens, G.E., (1979). *Pattern and Process in a Forested Ecosystem*. Springer-Verlag, New York.
 Richards, B.N., (1987). *The Microbiology of Terrestrial Ecosystems*. Longman.

Assessment:

Continuous	- 70%
Examination	- 30%

FR 480: PROJECT

Hours per week:

4 (runs over 2 semesters at approximately 4 hours per semester for classroom instructions and the rest of the day for individual research)

Prerequisites:

FR 384 Experimental Design and Analysis, or equivalent

Objectives:

To develop research and reporting skills. Students will work individually to develop and complete a small research project on a topic relevant to forestry in Papua New Guinea. Progress will be in two stages. Initially students will prepare a proposal which must be approved before proceeding to Stage II which requires students to implement the proposal, analyze the data and report on the findings.

Stage I: Proposal. The proposal is a written document which outlines the project and the context in which it is contained in, describes the data collection and analysis to be undertaken and the expected outcomes. The proposal should be based on a statement or hypothesis which forms the foundation of the project.

Stage II: Research and Report. Undertake the preparation of a research report. The report is designed to communicate the results of the analysis of the data collected and should contain an introduction to the project, methods, results, analysis (where appropriate) and conclusions. The report should be properly referenced using an accepted referencing standard, properly presented and contain graphs and diagrams where appropriate.

Assessment:

Continuous	- 30%
Written Report	- 70%

FR 484: FOREST PRODUCT DEVELOPMENT AND MARKETING

Hours per week: 4

Prerequisites: FR 382 Wood Science and Technology

Objectives:

To discuss the principles and practices of forest product development and marketing. On completion of this subject, students should be able to:-

1. Demonstrate an appreciation of the nature of marketing in a competitive economy, and its importance to the forest products industries;
2. Discuss marketing concepts and how they relate to the goals of both private and public sector organisations;
3. Recognise the need for the development of strategies for marketing forest product based on an understanding of the structure of domestic and international markets;
4. Show an appreciation of the implications of international trade in forest products for domestic forest policy.

Syllabus:

Marketing as a management function: role of marketing intelligence in decision-making; product development, pricing and promotion. Marketing research and analysis: research methodologies; qualitative and quantitative techniques; sampling, data collection and analysis. International marketing: concepts, planning and management strategies; finding and servicing overseas markets; product quality control; cross-cultural issues and communication. World trends in wood use: supply and demand; advances in wood, pulp and paper technology. Traditional forest products and by-products: present-day range of minor forest products; future trends. Policy issues: value-adding manufacturing processes in the sawmilling, pulp and paper, and reconstituted wood and panel products sectors.

Assessment

Continuous	- 50%
Examination	- 50%

FR 486: FOREST POLICY

Hours per week: 3

Objectives

This subject provides an overview of natural resource and forest policies, the processes by which they are formulated and their expression in the form of legislation and regulation.

On completion of this subject, students should be able to:-

1. Express an understanding of natural resource and forest policies in Papua New Guinea, and the issues influencing them at a national, regional and international level;
2. Demonstrate an understanding of the roles of governments and other interested parties, including foresters, in natural resource and forest policy formation processes;
4. Explain with the structure, form and content of forest policy documents, and relevant legislation, in Papua New Guinea;
5. Describe how legislation and acts are drafted, passed and enacted;
6. Describe the log pricing and royalty system used in Papua New Guinea, and their role as instruments of forest policy.

Syllabus:

Social, political, historical, economic and environmental contexts of forestry, role of forest policy, interested parties. International treaty obligations. Log pricing and royalty systems. Structure, form and content of PNG forest policy, forest policy formulation processes, legislation relevant to natural resource and forest management in PNG.

References:

Ellefson, P.V., (1991). *Forest Resources Policy: processes, participants and programs*, McGraw Hill.
Sharma, N.P., (Ed.) (1992). *Managing the*

World's Forests: looking for the balance between conservation and development.

World Bank, Washington, D.C.

Westoby, J., (1987). *The Purpose of Forests*. Basil Blackwell Ltd, London.

Relevant PNG forest policy documents and legislation.

Assessment:

Continuous	- 60%
Examination	- 40%

FR 488: FOREST MANAGEMENT PLANNING II

Hours per week: 5

Prerequisites:

FR 459 Forest Management Planning I; FR 465 Field Studies in Forest Assessment

Objectives:

In conjunction with the National Forest Authority, prepare a management plan for an area of forest. On completion of this subject, students should be able to:-

1. Discuss the issues involved in negotiating Forest Management Agreements with resource owners including Incorporated Landowner Groups;
2. Take account of the requirements of the PNG Logging Code of Practice when formulating management plans for native forests;
3. Apply the principles of sustainable forest management to formulate a forest management plan of a designated area of Papua New Guinea Forest.

Syllabus:

Prepare a forest management plan using (where appropriate) the Papua New Guinea FIM database. The plan should include: maps of the area; a review of the timber resource; a discussion of the non-wood values of the forest including hydrological, environmental, wildlife, recreational, economic, social, cultural and spiritual values; a

discussion of problems that may be encountered including land ownership, erosion, log transport and regeneration of forest.

References:

PNG Forest Authority, (1995). *Planning, Monitoring and Control Procedures for Natural Forest Logging Operations under Timber Permit*, PNG Forest Authority, Port Moresby.

PNG Forest Authority and PNG Department of Environment and Conservation, (1995). *Papua New Guinea Logging Code of Practice*, PNG Forest Authority, Port Moresby.

PNG Forest Authority, (1996). *National Forest Plan*. PNG Forest Authority, Port Moresby.

Sharma, N. P., (Ed.) (1992). *Managing the World's Forests: looking for the balance between conservation and development*. World Bank, Washington, D.C.

State Forests of NSW Management Plans including Grafton, MP 29, Summary of MP29 - Managing State Forests, Grafton, MPS-7), Eden Native Forests, MP23.

Assessment:

Continuous - 100%
(Management Plan)

Field Trip Subjects - Taraka Based Students

FR 461: FIELD STUDIES IN INDUSTRIAL FORESTRY

Hours per week: 2

(1 week - mid-semester break)

Objectives:

To inspect large scale forestry operations and log export projects, and review their socio-economic and environmental impacts in the context of sustainable forest management.

Syllabus:

Large scale logging operations in a field operation.

Planning, monitoring and control procedures: implementation of the PNG Logging Code of Practice. Planning and implementing forestry development projects: feasibility studies; infrastructure requirements; road network; logging organisation; harbour and loading facilities. Downstream processing for export markets. Reforestation works. Integrated forest management.

Assessment:

Continuous - 100%
(Written Report)

FR 466: FORESTRY EXTENSION PROJECT

Hours per week: 2

(1 week - mid-semester break)

Prerequisites: FR 451 Agroforestry and Community Extension.

Objectives:

To provide practical experience in giving advice and guidance to landowners in the Highlands of PNG. The project is designed to improve students' communication, negotiation and extension skills, and to consolidate their knowledge of Highlands's forestry.

Syllabus:

Extension project planning and implementation, based on: a review of the ecology and silviculture of Highlands forests; knowledge of land management systems; and an understanding of the social impact of changes to land management.

Assessment:

Continuous - 100%
(Written Report)

POST-GRADUATE STUDIES IN FORESTRY

Introduction

The Postgraduate Studies in Forestry is a full-time

programme of studies extended over one-academic year – for Postgraduate Diploma. Master of Philosophy (MPhil) and a Master of Forest Science (MSc) by research will also be available for a minimum two year period. [If a candidate had already obtained a Postgraduate Diploma, they can proceed on to an MPhil/MSc for one year based on academic merit]. The Programme aims to provide advanced training in tropical forestry systems and the natural sciences, generally with specialisation in the areas of Wood Science and Technology, Forest Ecology and Management, Forest Biometrics and Mensuration and Forest Planning and Development. [Other topics of interest or importance to PNG can also be considered]. The Course is designed to meet the needs of Graduates with a general degree with the objective of being employed in various parts of the forestry and other sectors in PNG.

The Post-Graduate Diploma consists of course work for 14 and 12 contact hours per week for semester 1 and 2, respectfully, and a research project in the area of specialization for 10 to 12 contact hours per week for semesters 1 and 2 respectfully. Each candidate is required to pass the research methodology subject in Semester 1 and the Research Project subject each Semester. In addition, the candidate must pass at least five (5) subjects chosen from Schedules 1 and 2 (below), a minimum of two (2) of such subjects must be from candidates intended area of specialisation. The MPhil and MSc programmes will be research based. Candidates will be guided by their supervisors in the choice of their subjects and project topics. Details on the structure are given by the special rules set out in the Handbook on “Procedures for Higher Degree Candidates”, and in the University Calendar.

Examinations

All subjects will be examined by regular assignments, tests, fieldwork and final examinations. The dissertation based on project work and research will be examined by a minimum of two or three examiners recommended by the head of Department and approved by Higher Degree Committee.

Generalized Course Structure

First Semester

Code	Subject	Average Weekly Hours
FRP510	Research Methodology	6
FRP511	Research Project	10
FRP513	Forest Operations	4
FRP515	Community Management Of Land and Natural Resources	<u>4</u>
		<u>24</u>

Second Semester

Code	Subject	Average Weekly Hours
	Choice of three elective subjects from Schedule 2 (3 x 4)	12
FRP511	Projects (continues from Semester 1)	<u>12</u>
		<u>24</u>

(Some subjects can be shared with other Departments, e.g., Department of Agriculture, AGP10 – Research Methodology).

Schedule 1 Core Subjects – All Courses

FR510	Research Methodology
FR511	Research Project
FR513	Forest Operations
FR515	Community Management of Land and Natural Resources

Schedule 2 Elective Subjects for each Courses

Wood Science and Technology

FRP520	Mechanical and Physical Properties of Wood	4
FRP522	Timber Utilization and Technology	4

Forest Ecology and Management

FRP530	Ecological Principles of Natural Forest	4
FRP532	Forest Health and Protection	4
FRP534	Tree Physiology and Ecophysiology	4
FRP536	Forest Genetics	4

FRP538 Plantation Management 4

Forest Biometrics and Mensuration

FRP540 Forest Biometrics 4

FRP542 Forest Mensuration
and Assessment 4

Forest Planning and Development

FRP550 Forest Project Planning,
Analysis and Management 4

FRP552 Agroforestry Management 4

FRP554 Geographic Information Systems
And Remote Sensing for
Natural Resource Management 4

SUBJECT DETAILS

CORE SUBJECTS

FRP 510: RESEARCH METHODOLOGY

Hours per week: 6

Objective:

Upon completion of this subject, students should be able to: determine the best experimental design for various types of forestry and other related experiments, analyze and critically interpret different results from different experimental designs, analyze various types of qualitative and quantitative data, be able to use computer as a tool in forestry planning, management and experimentation, and also be aware of social-cultural considerations related to Indigenous Science, vs. Western Science, and be able to distinguish and be able to conduct, present and objectively present proper research results.

Syllabus

The subject is designed to give a general approach to research, analysis and evaluation procedures used in forestry experimentation. Coverage will include the planning and design of controlled field experimentation with emphasis on commercial trees and trees for agroforestry and other socio-cultural aspects of biodiversity or community-based forest management within the PNG context. This may include (but not be exclusively limited to), selection of treatments, demonstration and lay

out of designs in the field, on-field collection of qualitative and quantitative data, interpretation of experimental results, interpretation of ethnographic data (from participant observation) or other qualitative methodology. This will include the planning and implementation of semi-structured questionnaires (surveys), use of qualitative and quantitative methods for data collection from communities, villages or individuals, and subsequent analysis of results using appropriate computer software. Students will become familiar with the use of computers, analysis of results, and scientific publication submissions and presentation of good research results.

References:

Little, T. and Hills, F.J. (1989). *Agriculture Experimentation: Design and Analysis*. John Wiley and Sons, New York.

Mayan, M (2001). *An introduction to Qualitative Methods: a training manual for students and professionals*. International Institute for Qualitative Methodology, University of Alberta, Canada.

Gessesse, B. (1992). *Statistical Methods: Experimental Design and Analysis of Experiments*. Training Manual, Volume No. 20, Forestry College Bulolo, Lae

Snedecor, G.W. and Cochran, G.W. (1967). *Statistical Methods*. (Sixth Edition). The Iowa State University Press, Iowa.

Assessment:

Continuous	- 50%
Examination	- 50%

FRP 511: RESEARCH PROJECT

Hours per week: 10 - 12

Objective

Upon completion of this subject, students should be oriented and very capable of identifying the main activities of a typical forestry project involving investigation, research and or field or laboratory execution. The student should also be able to plan a detailed schedule of activities (from beginning to end), to complete and meet the project deadline. This includes its application in

forestry or the application of other social-science, cultural anthropology or engineering principles learnt in other subjects in the development of the project work. The student should also be able to write a dissertation in standard format, and present the discussions/results to prove or validate the findings scientifically. Most importantly, the student would have gained additional knowledge in a specialized area of forestry of their choice.

Syllabus

Topics of the research project will be chosen in consultation with the supervisor in the area of interest or specialization. Students are expected to prepare objectives, carry out a literature review on the topic, use appropriate reference and citation protocols (for example: APA or Chicago Style), and propose the methodology of research during the first semester. These will form the basis of a seminar presentation by the student during the semester. The project work itself will be executed by the student following a standard procedure. The student is expected to present the results of his/her work in at least one month before the 2nd Semester examinations. The dissertation will be examined by two or three examiners recommended by the Head of Department and approved by the Higher Degree Committee.

Assessment

Continuous assessment seminar,
dissertation - 100%

FRP 513: FOREST OPERATIONS

Hours per week: 4

Objectives:

To enable students to have a more indebt understanding of forest operations, which involves, resource surveying and mapping, harvesting, logging and harvesting equipment, road planning and design, building and logistics of roads, bridges and other necessary operational infrastructure, and product classification that will include forest certification and chain of custody.

Syllabus:

Basic map reading and interpretation for design of

resource surveys and preparation of annual, five yearly logging and set up plans, road alignment and construction, use of equipment for harvesting and roading, including some understanding of the operational cost of these equipments, procedures for the monitoring and controlling of timber harvesting in PNG, the PNG Logging Code of Practice, Log Export Procedures, and other guidelines as is current and applicable in PNG and internationally that relates to timber product development and marketing.

References:

- FAO (1974). *Logging and Log Transport in Tropical High Forest: a manual on production and cost.* FAO Forestry Development Paper No. 18., FAO, Rome.
- FAO (1982). *Basic Technology in Forest Operations.* FAO Paper No. 36. FAO, Rome.
- FAO, (1992). *Cost control in forest harvesting and road construction.* FAO, Forestry Paper No. 99, FAO, Rome.
- Hammermaster, E.T., and Saunders, J.C., (1995). *Forest Resources and Vegetation Mapping of Papua New Guinea. PNGRIS Publication No. 4, CSIRO, Canberra.*
- PNG Forest Authority (1995). *Planning, Monitoring and Control Procedures for Natural Forest Logging Operations under Timber Permit.* PNG Forest Authority, Hohola.
- PNG Forest Authority and PNG Department of Environment and Conservation, (1996). *PNG Logging Code of Practice.* PNG Forest Authority, Hohola.

Assessment:

Continuous - 60%
Examination - 40%

FRP 515: COMMUNITY MANAGEMENT OF LAND AND NATURAL RESOURCES

Hours per week: 4

Objectives:

At the completion of this subject, students will have a better understanding of how communities

function and how they can fully participate in sustainable land use systems, for their own livelihood and that of the economy of the country. Students will also demonstrate a sound understanding of theories underpinning community participation in management, and of processes and techniques of group facilitation, participatory appraisal, planning and collaborative management of resources.

Syllabus:

Land tenure in PNG, customary ownership of land, use rights in land (and trees), land conveyance, incorporated land group, integrated cropping systems, sustainability and productivity, philosophy and evolution of participation and community management, models of community management of forests and other natural resources, policy and institutional issues in community management, process and techniques in participatory enquiry, planning and management, forms of evaluation in community management programs and conflict management.

References:

- Crocombe, R. (Ed.), (1987). *Land Tenure in the Pacific*. University of the South Pacific, Suva.
- Frost, F., Forge, K., and Black, A.W., (2000). *Extension and Advisory Strategies for Agroforestry*. Rural Industries Research and Development Corporation. AusAID/RIRDC Publication No. 00/184, Australia.
- Lerner, D., and Schramm, W., (Eds) (1967). *Communication and Changes in the Developing Countries*. East West Centre Press, Honolulu.
- Nolan, P., and Lenski, G., (1999), *Human Societies: an introduction to macrosociology*. (Eight Edition). McGraw-Hill College, New York.
- Ray, G.L., (1976). *Extension Communication and Management*. R. Publishing Corp., Delhi.
- Sharma, N.P., (Ed.) (1992). *Managing the World's Forests: looking for the balance between conservation and development*. World Bank, Washington, D.C.
- Unasylva No. 143(36), (1984). *Forestry extension, making it works*. FAO (various articles).

Village Development Trust [VDT], (nd). *Training and Reference Manual 1-8*, VDT, Lae.

Assessment:

Continuous	- 60%
Examination	- 40%

WOOD SCIENCE AND TECHNOLOGY

FRP 520: MECHANICAL AND PHYSICAL PROPERTIES OF WOOD

Hours per week: 4

Objectives:

To able students to identify commercial wood, recommend appropriate wood (or timber) for structural and non- structural purposes, and have an understanding of interpreting wood samples and reporting its qualities and properties.

Syllabus:

Gross wood structure, anatomical features and properties including identification and measurement, wood macro-structure, mechanical and physical properties including industrial standards, testing methods, grading and evaluation of wood based materials for structural and non-structural purposes.

References:

- Desch, H.E., and Dinwoodie, J.M., (1996). *Timber: its structure, properties and utilization. (Seventh Edition)*. MacMillan Press Limited.
- Oteng-Amoako, A.A., (1974). *Macroscopic Wood Identification Manual for Papua New Guinea Timbers*. PORO Printing Co., Lae.
- Tsoumis, G., (1991). *Science and Technology of Wood: structure, properties and utilization*. Chapman & Hall.
- USDA (1987). *Wood Handbook: wood as an engineering material*, No. 72. USDA.
- Walker, J.F.C., (1993). *Primary Wood Processing: principles and practices*. Chapman & Hall.
- Wilson, K., and White, D.J.B., (1986). *The Anatomy of Wood: its diversity and variability*. Stobart & Son Ltd, London.

Assessment:

Continuous	- 60%
Examination	- 40%

FRP 522: TIMBER UTILIZATION AND TECHNOLOGY

Hours per week: 4

Objective:

To enable students to gain a better understanding of the need to produce certain forest products, its treatment and its marketability, and an understanding of the principles of timber engineering and the specifications of timber.

Syllabus:

Commercial timber species of PNG, wood quality and utilization, design and interpretation of wood quality surveys, principles of timber engineering, the design and specification of timber, timber preservation, timber drying and standards, wood chemical properties, especially for wood pulping, species selection and use of wood products in construction, clear wood sampling and strength properties, visual grading, machine stress grading, serviceability and design philosophy, types of timber products, cost of production and market structures.

References:

- Eaton, R.A. and Hale, M.D.C., (1993). Wood: decay, pests and protection. Chapman & Hall, London.
- Fengel, D. and Wgener, G., (1989). Wood: chemistry, ultrastructure and reactions. Water de Gruyter, Berlin.
- Findlay, W.P.K., (Ed.), (1985). Wood Preservation in the Tropics. Nijhoff/Junk Publishers.
- Nicholas, D.D., (1973). Preservatives and Preservative Systems: wood deterioration and its prevention by preservative treatments. Syracuse University Press.
- Richard, B.A., (1993). Wood Preservation. (Second Edition). Chapman & Hall, London.

Assessment:

Continuous	- 70%
Examination	- 30%

FOREST ECOLOGY AND MANAGEMENT

FRP 530: ECOLOGICAL PRINCIPLES OF NATURAL FOREST

Hours per week: 4

Objectives:

This subject will provide students with a more advanced knowledge of the concepts and principles of ecology in the context of tropical and subtropical ecosystems of PNG specifically. To be able to identify the varied forest ecology and design and implement an inventory of a forest area, including all biodiversity.

Syllabus:

Concepts and principles of ecology in the tropical and subtropical ecosystems, the processes occurring within these ecosystems and importance of ecology in the sustainable management of forests, assessment and management of biodiversity values of forests.

References:

- Osborne, P. L., (2000). Tropical Ecosystems and Ecological Concepts. Cambridge University Press, Cambridge, UK.
- Marius, J., (1981). The Tropical Rain Forest: a first encounter. Springer-Verlag, Berlin.
- Whitmore, T.C. and Burnham, C.P., (1984). Tropical Rain Forests of the Far East. Oxford University Press, Oxford.
- PNG, Ministry of Forests, (1973). New Horizons: forestry in Papua New Guinea. Jacaranda Press, Queensland.

Assessment:

Continuous	- 70%
Examination	- 30%

FRP 532: FOREST HEALTH AND PROTECTION

Hours per week: 4

Objectives:

To be able to identify some of the common insect pests and plant diseases so to instigate appropriate corrective measures to minimize their effect on both natural and plantation forests. To also enable an understanding of forest fire and its behaviour so to be able to institute appropriate measures to minimize its effect on the forest ecosystem.

Syllabus:

Common insect pests and plant diseases, plant pathogens and abiotic agents, population dynamics of insects and plants and integrated pest management, which may involve biological control agents. Climatic factors that affect weather patterns and fire ecology and management, as well as the use of fire as a prescribed management tool.

References:

- Blanchette, R. A., and Biggs, A.R., (1992). Defense Mechanisms of Woody Plants against Fungi. *Springer-Verlag, Berlin*.
- Bookhout, T.A., (1987). Research and Management Techniques for Wildlife and Habitats. *The Wildlife Society, Bethesda, Maryland*.
- Coates, B.J., and Peckover, W.S., (2001). Birds of New Guinea and the Bismarck Archipelago: a photographic guide. *Dove Publication, Australia*.
- Flannery, T., (1995). Mammals of New Guinea. *Reed Books, Australia*.
- Franklin, F.D., (1980). Forest Fire Protection. *Training Manual for the Papua New Guinea Forestry College, Vol. 14., PNG Forestry College, Bulolo and Office of Forests, Port Moresby*.
- Luke, R.H., and McArthur, A.G., (1986). Bushfires in Australia. *Australian Government Publishing Service, Canberra*.
- Metcalf, R. L., and Luckmann, W.H., (1982) (Eds.) Introduction to Insect Pest Management. (Second Edition). *John Wiley & Sons, New York*.
- Schneider, M. F., (1999). Entomology: Textbook for Students, Agriculturalists and Foresters in PNG. *Training Manual No. 19, PNG*.
- Shaw, D.E., (1984). Microorganisms in Papua

New Guinea. *Research Bulletin No. 33. Department of Primary Industry, Port Moresby*.

Assessment:

Continuous	- 70%
Examination	- 30%

FRP 534: TREE PHYSIOLOGY AND ECOPHYSIOLOGY

Hours per week: 4

Objectives:

To be able to investigate how environmental factors affect life functions of trees and how to respond to such factors. To be able to identify the varied soil characteristics and its capacity and capability in the growth of commercial trees and other flora.

Syllabus:

Photosynthesis, respiration, nutrient relations and water use, trees responses to stress due to environmental factors, including responses to global climate changes and carbon sequestration. Root growth of commercial timber species, fertilizer requirements of such species (natural and plantation), comparison of performance of seedlings, forest soils and nutritional recycling in natural forests and plantations.

References:

- Kozlowski, T.T., and Pallardy, S.G., (Eds). (1979). Physiology of Woody Plants. *Academic Press, San Diego*.
- Hewlett, J.D., (1982). Principles of Forest Hydrology. *The University of Georgia Press, Athens*.
- Pritchett, W.L., (1979). Properties and Management of Forest Soils. *John Wiley & Sons, New York*.
- Rowell, D.L., (1994). Soil Science: methods and applications. *Addison Wesley and Longmann Limited, Edinburg*.
- Salisbury, F.B., (1992). Plant Physiology. (Fourth Edition). *Wadsworth Publishing Company, Belmont*.
- Street, H.E., and Öpik, H., (1984). The Physiology

of Flowering Plants: their growth and development. (Third Edition). Edward Arnold, London.

Assessment:

Continuous	- 70%
Examination	- 30%

FRP 536: FOREST GENETICS

Hours per week: 4

Objectives:

At the completion of this subject, students should be able to know the principles of genetics and its application in both natural forest and plantations as well as its application in the wider ecosystem management.

Syllabus:

Principles of genetics, principles and methods of forest tree breeding, quantitative genetic approaches to tree improvement, methods, concepts and case studies in breeding for increased yield and quality of plant products, breeding for disease and insect resistance or tolerance in plants, and other genetic and breeding techniques.

References:

- Boshier, A. Y. D., (2000). *Forest Conservation Genetics Principle and Practice*. CSIRO, Australia.
- Wright, J. W., (1976). *Introduction to Forest Genetics*. Academic Press, New York.

Assessment:

Continuous	- 70%
Examination	- 30%

FRP 538: PLANTATION MANAGEMENT

Hours per week: 4

Objectives:

To enable students to have a greater understanding of the principles and practices of the development and management of plantation and its role in

sustainable forest management.

Syllabus:

Designs of plantation; plant propagation, covering seedling production; vegetative and tissue culture; growth and development of stands; role of disturbance (natural and man-made); ecosystem stability and evolution of silvicultural methods in tropical rainforests.

References:

- Evans, J. (1992). *Plantation Forestry in the Tropics*. ELBS, Oxford.
- Fenton, R., Roper, R. and Watt, G.R., (1977). *Lowland Tropical Hardwoods: an annotated bibliography of selected species with plantation potential*. External Aid Division, Ministry of Foreign Affairs, New Zealand.
- Nambiar, E.K., and Brown, A.G., (Eds), (1997). *Management of Soil, Nutrients and Water in Tropical Plantation Forests*. ACIAR, Canberra.
- Neilsen, W.A., (ed). (1990). *Plantation Handbook*. Forestry Commission, Hobart.

Assessment:

Continuous	- 70%
Examination	- 30%

FOREST BIOMETRICS AND MENSURATION**FRP 540: FOREST BIOMETRICS**

Hours per week: 4

Objectives:

Biometrics is the field of development and application of statistical techniques to data analysis problems in the biological sciences. A simple description of undergraduate biometrics is "data analysis". For this subject, students are expected to use statistics methods and computers to analyze data and interpret its application and how it could be applied.

Syllabus:

Elementary descriptive statistics, basic probability theory, random variables and their basic properties,

standard probability distributions: *Binomial*, *Poisson*, uniform, normal, the Central Limit Theorem, point and interval estimation of parameters of probability distributions, hypothesis testing: critical region, size and power, applications of the normal, *t* and X^2 distributions, linear regression and an introduction to multiple regressions, analysis of variance and the Kruskal-Wallis test, design of experiments: one- and two-way classification, factorial designs, and analysis of residuals, and use of the computer in statistical analysis, with special reference to the statistical package (e.g. Microsoft Excel, MINITAB e.t.c.).

References:

- Bhattacharyya, G.K., and Johnson, R.A., (1977). Statistical Concepts and Methods. John Wiley & Sons, New York.*
- Clarke, G.M., (1980). Statistics and Experimental Design. (Second Edition). Edward Arnold, London.*
- Martin, P. and Pierce, R., (1994). Practical Statistics for the Health Sciences. Nelson Publishing, Melbourne.*
- Mead, R. and Currow, R.N., (1984). Statistical Methods in Agriculture and Experimental Biology. Chapman and Hall.*
- Prodan, M. (1968). Forest Biometrics. Pergamon Press, Oxford.*
- Weiss, N.A., (1999). Introductory Statistics. (Fifth Edition). Addison Wesley Longmann, Inc., Reading.*

Assessment:

Continuous	- 70%
Examination	- 30%

FRP 542: FOREST MENSURATION AND ASSESSMENT

Hours per week: 4

Objectives:

On completion of this subject, students should be able to use all standard forest measurement equipment effectively; able to evaluate and minimize various sources of error; able to measure tree and stand values for diameter, height, volume, defect; able to construct and evaluate volume

tables and yield tables; familiar with basic growth and yield equations; able to develop simple models for tree and stand growth and yield; able to apply standard statistical techniques to sampling, to the evaluation of tree and stand variables, and to the development of basic growth and yield models.

Syllabus:

Tree measurement techniques (dbh, height, bark and crown), defects, geometry of stem volume, stem analysis, volume increment, stand basal area and volume, density, volume tables, yield tables, explanatory and predictive models for tree and stand growth, parameter estimation, site quality, sampling techniques (random, stratified and systematic samples).

References:

- Avery, T.E., and Burkhardt, H.E., (1984). Forest Measurements. McGraw-Hill, Inc., New York.*
- Carron, L.T., (1968). An Outline of Forest Mensuration with special reference to Australia. Australian National University Press, Canberra.*
- Husch, B., Miller, C.I., and Beers, T.W., (1982). Forest Mensuration. (Third Edition). John Wiley & Sons, New York.*

Assessment:

Continuous	- 70%
Examination	- 30%

FOREST PLANNING AND DEVELOPMENT

FRP 550: FOREST PROJECT PLANNING, ANALYSIS AND MANAGEMENT

Hours per week: 4

Objectives:

To enable students to broaden their understanding of forest development planning, where they are able to identify costs and benefits in forestry development projects and use appropriate analytical tools in evaluating such projects. Students will also broaden their understanding of

the principles of economics and the wider market influences on the production and marketability of forest produce so to make rational decisions about investments using such resources.

Syllabus:

Project identification, formulation, analysis, documentation, appraisal, implementation and review; the need for undertaking environmental impact statements (EIS) and social impact assessment (SIA) in forestry development projects, financial analysis of forestry projects; values of other environmental goods and services; and the impact of government regulation.

References:

- Buongiorno, J. 2003. *Decision Methods for Forest Resource Management*. Academic Press, New York.
- Davis, L.S., and Johnson, K., (1987). *Forest Management*. McGraw-Hill, New York.
- Duerr, W.A., (1960). *Forestry Economics*. McGraw-Hill, New York.
- FAO, (1992). *Economic assessment of forestry projects impact*, *Forestry Paper 106*. FAO, Rome.
- Horton, F. W., (1995). *Information Management Workbook*. (Fourth Edition). Prentice Hall, New York.
- Leslie, A., (1992). *Economic Problems in Tropical Forestry*. *FAO Paper FO:Misc/71/24*.
- Tietenberg, T., (2000). *Environmental and Natural Resource Economics*. (Fifth Edition). Addison-Wesley, Massachusetts.

Assessment:

Continuous	- 70%
Examination	- 30%

FRP 552: AGROFORESTRY MANAGEMENT

Hours per week: 4

Objectives:

To enable students to broaden their knowledge and understanding in the principles for managing agroforestry systems in order to enhance crop and livestock productivity and resilience. Furthermore, students will be able to provide assistance to

community groups to engage in agroforestry, which may provide for their daily livelihood, and at the same time contribute to sustainable forest management.

Syllabus:

Agroforestry management principles, crop and livestock production systems, fuel wood plantations, shade, shelter, nutrient, soil stability, organic matter, timber sales, processing and sales of small woodlot produce, problems with managing community forests, community consultation and participation, land protection, tree and crop combinations, community forestry, costs and benefits of community forests and support systems for community forest owners.

References:

- Clarke, W.C., and Thaman, R.R., (Eds) (1993). *Agroforestry in the Pacific Islands: systems for sustainability*. United Nations University Press, Tokyo.
- Power, A., (nd). *Land Group Incorporation: a management system*. A Train-the-Trainer Workbook, Part Two. AusAID.
- Ray, G.L., (1976). *Extension Communication and Management*. R. Publishing Corp., Delhi.
- Sharma, N.P., (Ed.) (1992). *Managing the World's Forests: looking for the balance between conservation and development*. World Bank, Washington, D.C.
- Unasylva No. 143(36), (1984). *Forestry extension, making it works*. FAO (various articles).
- Village Development Trust [VDT], (nd). *Training and Reference Manual 1-8*, VDT, Lae.
- Young, A. (1991). *Agroforestry for Soil Conservation*. CAB International, Oxford.

Assessment:

Continuous	- 60%
Examination	- 40%

FRP 554: GEOGRAPHIC INFORMATION SYSTEMS AND REMOTE SENSING FOR NATURAL RESOURCE MANAGEMENT

Hours per week: 4

Objectives:

To broaden the students knowledge of the concepts and application of geographic information systems (GIS) and other appropriate software and remote sensing in the management of the forest and other natural resources.

Syllabus:

Geographic information systems, as in data input, design, output, analysis and management, remote sensing principles and application – including air photo interpretation, use of PC vector and raster GIS, and PNG geographic datasets and digital mapping sources and their applications.

References:

- Amando, A., (1999). *GIS Applications in Tropical Forestry*. Toowomba Distance Education Centre, Qld.
- Atkinson, P.M., (1998). *Advances in Remote Sensing and GIS Analysis*. Wiley Publications, Chichester.
- Berry, J. K., (1995). *Spatial Reasoning for Effective GIS*. Colo GIS World Books, Forth Collins, USA.
- Burrough, P.A., (1986). *Principles of Geographical Information Systems for Land Resources Assessment*. Clarendon Press, Oxford.
- Montgomery, G.E., (1993). *GIS Data Conversion Handbook*. Colo GIS World Books, Fort Collins, USA.
- Vatasan, G., and Vatasan, N, (nd). *Practical Photointerpretation for Foresters in Papua New Guinea*. Forestry Department, Unitech, Lae.

Assessment:

Continuous	- 70%
Examination	- 30%

DEPARTMENT OF SURVEYING AND LAND STUDIES

HEAD OF DEPARTMENT & PROFESSOR:

Pal D K., Ph.D (IIT), M.Sc (CU); B.Sc (Hons.) (CU), ISRSML, INCALM

DEPUTY HEAD OF DEPARTMENT:

Mr. Antonio W., MSIS.(UTAS), PGD Surv. Science (UTAS), PGDLS (PNGUT), B.Tech.Cart. (PNGUT), MIMSSIPNG

SENIOR LECTURER:

Mr. Suat J., MGIS, PGDipMapSurv.(UQ), PGDLS, B.Tech.Surv.(PNGUT), MASPNG, MIMSSIPNG

LECTURER-II:

Dr. Jana S K., Ph.D (VU), M.Sc.

Mr. Tevita M., B.Tech.Surv (PNGUT), M.Sc (UK)

Mr. Antonio W., MSIS. (UTAS), PGD Surv. Science (UTAS), PGDLS (PNGUT), B.Tech.Cart. (PNGUT), MIMSSIPNG

LECTURER-I:

Mr. Pai A., M.Sc. (UQ), B.Tech.LandMgmt. (PNGUT), Reg. Val. (PNG), MPNGIVLA

Mr. Samanta S., M.Sc. (VU)

Mr. Gupta Samudra, M.Sc. (VU)

Mr. Kari L., MSST (USQ), B.Tech.Cart. (PNGUT)

SENIOR TECHNICAL INSTRUCTORS:

Mr. Pasen P., B.Tech.Surv. (PNGUT)

Mr. Rosa R., B.Tech.Surv. (PNGUT)

Mr. Popeu, M., B.Tech Surv., (PNGUT)

CHIEF TECHNICAL OFFICER:

PRINCIPAL TECHNICAL OFFICER:

SENIOR TECHNICAL OFFICER:

Mr. Tine S., B.Tech. Surv., (PNGUT)

TECHNICAL OFFICERS:

Risiepa A., B.Tech.Cart. (PNGUT)

SUPPORT STAFF:

Ms. Angeline Senginawa
Senior Secretary

Ms. Tanyah Tenaen
Junior Secretary

Ms. Maida Bonga
Survey Store Person

Mr. Philip Kambu
Cleaner

Mr. Pius Lyin
Cleaner

DEPARTMENT OVERVIEW

The department is primarily involved in the process of developing human resources adept in the holistic management of land resources. Papua New Guinea is endowed with enormous land resources (vis-à-vis population); which are grossly under-utilized.

Here is the relevance of the department that produces the entire gamut of land professionals – starting from the discipline of ‘Surveying’, Geographical Information Science / Systems to the property management / valuations experts.

The human resources developed in the department have a wide exposure to the state of the art technology (e.g. recent developments in the field of Remote Sensing, GIS, GPS, use of latest Total Stations and allied implements of the digital era) in their respective disciplines. The application of technology is emphasized, as is the role of the professionals in the development of PNG. The Department has been producing graduates for about four decades and many graduates occupy senior positions in Government and the private sector in PNG and the Pacific Region.

The courses of the Department are specific but considerable overlapping of discipline areas is encouraged with the aim of producing broader

based graduates. The Department has good facilities including a comprehensive digital mapping, geographic information systems and remote sensing laboratory, state of the art global positioning systems technology and software, a spatial information science/cartographic processing laboratory and automated surveying systems in addition to the traditional surveying and mapping facilities.

The department is also involved in a number of research programs including measuring crustal deformation to establish a geocentric datum in PNG, GIS, remote sensing, and cartographic communication through development of thematic maps for PNG, property valuation and land management research programs as well as student projects.

The Department prides itself on its involvement in Community Development Projects and student projects often are geared to supporting these projects.

SURVEYING PROGRAM

The degree course has the following aims:-

1. To provide a sound foundation in the principles of surveying and spatial measurement and assessment;
2. To prepare graduates in the application of techniques etc. to activities such as land, engineering, mining and hydrographic surveys, land administration and property development;
3. To develop an appreciation of the factors affecting land use decisions in Papua New Guinea;
4. To prepare graduates to be able to communicate effectively with other professionals and the community;
5. To prepare students for professional and academic development and,
6. To educate students so that after a period of training they can play an effective role in the practice and development of surveying in Papua New Guinea.

The Diploma course has similar aims but emphasizes field and office techniques.

GISci PROGRAM

The discipline of Geographic Information Science is a science which develops and manages geographic information systems infrastructure to address the problems related to geo-science and engineering. The three fundamental activities of geographic information science are:-

1. Development and management of geographically referenced database.
2. Analysis and modeling of geographic data.
3. Development and integration of specific disciplines in surveying, mapping and cartography, and technologies in geographic information systems, computing, remote sensing, global positioning systems and photogrammetry for the first two activities.

The discipline aims at integrating the emerging state-of-art technologies of data acquisition (remote sensing and digital photogrammetry), digital cartography and mapping, geographic information systems, Global Positioning System (GPS), electronic publishing, web and multi-media cartography and information technology.

The diploma graduates are GIS Technicians who will be basically GIS and CAD users and operators. They will be involved in the surveying and GIS data capture, data manipulation, data display and production of quality output. On the other hand, the degree course will prepare students for GIS management positions. The course focuses more on GIS design, development and management. Excellent employment opportunities for GIS graduate exist in the traditional sectors (surveying and mapping) and other areas such as education, engineering, agriculture, forestry, environmental science, legal arena and business.

PROPERTY STUDIES PROGRAM

The present level of developments in the private and public sectors of the country and abroad has created a high demand for good property managers, asset managers, land managers, valuers, property investment analyst, property developers and land administrators. The course structure is a proactive and strategic approach to fully integrate all aspects of property to enable the graduates to take on the challenges in the market of this

country, other South Pacific nations and also the global property market.

The course prepares students for a variety of vocations whose interests' center on land. Graduates may be found in organizations such as banks, property development and valuation firms, estate and plantation management and various government bodies.

In particular, more emphasis is now placed on the use of computers for such activities as report generation, computerized property appraisal, statistical and financial analysis, property development and investment analysis and automated property management and maintenance. A number of customized and general computer software packages have been acquired to assist in the effective teaching of these courses. Basic instruction in geographical information systems and remote sensing is incorporated in the course to give students an appreciation of the range of technological tools available to assist in decision-making processes for effective property management and development.

POSTGRADUATE STUDIES

The Department encourages Bachelors degree graduates with satisfactory academic records to return for postgraduate studies. Graduates may enroll in either of the three programs offered by the department; an existing postgraduate diploma program, and two new postgraduate programs recently approved by the academic board.

1. Post graduate diploma in Land Studies (Surveying, Geographic Information Systems, Land Management – the existing program)
2. Master of Technology (M. Tech) in Geomatics (for general students – a new program) or
3. Post graduate diploma in Surveying practice (for students of surveying discipline with a minimum of 2 years of industrial experience – a new program)

Candidates seeking admission to a postgraduate course should write to the Registrar for an application form or contact the Head of

Department for further information. Further details are given under the course schedules and in the University Calendar. At present there is no deadline for the submission of these applications.

COURSES DETAILS

The courses being offered by the Department of Surveying and Land Studies in 2011 are as follows:-

A. SURVEYING

1. A four-year degree course leading to a Bachelor of Surveying.
2. A two-year diploma course leading to a Diploma in Surveying.

B. GEOGRAPHIC INFORMATION SCIENCE (GISci)

1. A four-year degree course leading to a Bachelor of Geographic Information Science (BGISci).
2. A two-year diploma course leading to a Diploma in Geographic Information Science (DipGISci).

C. PROPERTY STUDIES

1. A four-year degree course leading to a Bachelor of Property Studies (B. Prop. Studies specialization - land administration / property management or valuation/ property management).
2. A two-year diploma course leading to a Diploma of Property Studies (Dip. Prop. Studies).

ENTRY REQUIREMENTS

These differ for each course. Students enrolling in Surveying, GISci and Property Studies must in the first instance, enroll in the Diploma in Surveying or GISci courses. There are entry requirements for students wishing to pursue the degree programs in these areas.

Diploma in Surveying and Diploma in Geographic Information Science

Entry is normally at Grade 12 higher school certificate level (or equivalent) with B grades in Major Mathematics, English, Physics and Information Technology.

Diploma in Property Studies

Entry to the course requires B Grades in English and Social Science along with a pass at B level in Minor/Major Mathematics.

Bachelor of Surveying and Bachelor of Geographic Information Science

Applicants must satisfy the following criteria for entry to the Bachelor of Surveying or Bachelor of GISci degree programs or Bachelor of Property Studies: - passing grades in all subjects and a grade weighted average of 65% or better in Departmental subjects in year two of the Diploma in Surveying or Diploma in GISci respectively.

Bachelor of Property Studies

Applicants must satisfy the following criteria for entry to the Bachelor of Property Studies: - passing grades in all subjects and a grade weighted average of 65% or better in Departmental subjects in the two years of the Diploma in Property Studies OR for entry into the degree level for all programs.

In the case of applicants who have not met the above criteria, admission will be subject to the production of documentary evidence of a minimum of two years of appropriate post diploma professional experience and a successful interview with the Head of Department and the relevant course Director.

Special Rules

Bachelor of Surveying and Bachelor of Geographic Information Science

Students must accumulate twelve weeks of industrial experience; ten weeks of which must be in an organization approved by the Department. A diary of industrial experience must be maintained and presented.

In special circumstances the full requirement may be waived upon approval of the Head of Department. Students are encouraged to seek vacation employment in suitable organizations early in the program and should not wait until year three to seek the required industrial experience.

Bachelor of Property Studies

Students are required to undertake professional work experience in suitable organizations in the

first semester of the 4th year of the degree program. A diary of work experience must be maintained and presented together with monthly reports.

For all programs candidates are required to satisfy the examiners in each year of the course, as prescribed in the Schedule of subjects, before they are permitted to proceed to the following year of the course. All university examination rules apply in this regard.

STRUCTURE OF COURSES

In 2009 the Department commenced a thoroughly overhauled new course structures which were produced from a major courses review undertaken over two years. The major courses review has resulted in name changes to the Cartography and Land Studies courses to Geographic Information Science and Property Studies respectively, while the Surveying course retains its original name.

The new courses' structures which are being introduced in the first three years are quite different to the old, which would gradually be phased out in 2012. The course structures below therefore reflects, the introduction of the new courses in the three years of the two courses (Surveying & Property Studies) and for Geographic Information Science, the Cartography course is now phased out.

SURVEYING

DIPLOMA IN SURVEYING (NEW COURSE)

Year 1		Hours
First Semester		
LA101	Study Skills	3
PH103	Physics for Surveyors I	3
MA163	Fundamentals of Comp. Science A	6
MA151	Mathematics IS	3
SL103	Introduction to Surveying A	5
SL105	Survey Computations A	2
SL113	Fundamentals of Geog Info Science	3
SL151	Environmental Studies I	1
Total		26

Year 1

Second Semester

LA102	Reading & Writing Skills	3

PH104	Physics for Surveyors II	3
MA164	Fundamentals of Comp. Science B	6
MA152	Mathematics IS	3
SL104	Introduction to Surveying B	5
SL106	Survey Computations B	2
SL114	Fundamentals of Remote Sensing	3
SL152	Environmental Studies II	1
	Total	26

SURVEYING

DIPLOMA IN SURVEYING (NEW COURSE)

Year 2

First Semester

SL203	Automated Survey Systems I	3
SL205	Introduction to Engineering Survey	3
SL213	Geographic Information Systems	6
SL221	Introductory Law, Land Studies	3
CE231	Geotectonics I	3
MA251	Mathematics IIS	3
		21

Year 2

Second Semester

LA204	Communication in the Workplace	2
SL204	Automated Survey Systems II	3
SL206	Intro. Global Positioning Sys	2
SL208	Cadastral Surveying	2
SL214	Remote Sensing	6
SL222	Principles of Cadastral Surveying	5
MA252	Mathematics IIS	3
		23

BACHELOR OF SURVEYING (NEW COURSE)

Year 3

First Semester

LA301	Writing a Research Paper	3
SL305	Construction Surveying	4
MA351	Mathematics IIS	3
SL321	Stats. for Surveying & Mapping	2
SL317	Spatial Modeling and Analysis	3
SL307	Global Positioning Systems	4
		19

Year 3

Second Semester

SL322	Database Management	3
SL306	Adjustments of Survey Meas.	3
SL332	Valuation for Surveyors	3
MA352	Mathematics IIIS	3
SL304	Introduction Geodetic Surveying	3
		15
SL342	Field Trip I - Two Weeks	

BACHELOR OF SURVEYING (EXISTING COURSE)

Year 4

First Semester

SL401	Surveying V	10
SL437	Survey Practice I	2
SL457	Subdivisional Principles	3
SL467	Project I	6
BA4x1	Basic Accounting for Small Business	4
		25

Year 4

Second Semester

SL402	Surveying VI	10
SL438	Survey Practice II	2
SL444	Special Topics	2
SL458	Subdivisional Design	3
SL468	Project II	6
		23
SL442	Field Trip III (Two Weeks)	

GEOGRAPHIC INFORMATION SCIENCE (GISci)

DIPLOMA IN GISci (NEW COURSE)

Year 1

First Semester

LA101	Studies Skills	3
PH103	Physics for Surveyors I	3
MA163	Fundamentals of Computer Science (A)	6
MA151	Mathematics IS	3
SL103	Intro. to Surveying A	3
SL105	Survey Computations A	1
SL113	Fundamentals of Geo. Info. Science	3
		22

Year 1

Second Semester

PH104	Physics for Surveyors II	3
LA102	Reading & Writing Skills	3
MA164	Foundation of Computer Science (B)	6
MA152	Mathematics IS	3
SL104	Introduction to Surveying B	3
SL106	Survey Computations B	1
SL114	Fundamentals of Remote Sensing	3
		22

Year 2

First Semester

SL213	Geographic Information Systems	6
SL221	Introductory Law, Land Studies	3
SL235	Geodesy for GIS	2
SL241	Map Projections & Geo-Referencing	2
MA251	Mathematics 2 S (A)	3
SL263	Cartography I	3
SL281	Geography I	2
SL251	Fieldwork I (One Week)	
		21

Year 2

Second Semester

SL214	Remote Sensing	6
LA204	Communication in the Workplace	2
SL208	Cadastral Surveying II	2
SL282	Geography II	2
MA252	Mathematics 2 S (B)	3
SL264	Cartography and Computer Drafting	6
		21

Year 3

First Semester

LA301	Writing a Research Paper	3
SL323	Geo-processing & Statistics	3
SL317	Spatial Modelling & Analysis	3
SL313	Photogrammetry	3
MA261	Data Structures & Algorithms	5
MA351	Mathematics 3SV	4
		21

Year 3

Second Semester

SL364	Cartography II	6
SL316	Digital Image Processing	4
SL322	Database Management	3
SL318	Geovisualisation	4
MA352	Mathematics 4SV	4
		21
SL352	Fieldwork II (One Week)	

BACHELOR OF GEOGRAPHIC INFORMATION SCIENCE (NEW COURSE)

Year 4

First Semester

SL423	GIS/Remote Sensing (RS) Project (A)	6
SL413	Managing GIS/RS Projects (A)	3
SL415	Web Cartography/GIS	5
BA4x1	Basic Accounting of Small Business	4
SL417	Digital Photogrammetry	4
		22

Year 4

Second Semester

SL424	GIS/Remote Sensing Project (B)	6
SL414	Managing GIS/RS Projects (B)	3
SL426	Applied Geo-image Processing	5
SL416	GIS Applications and Development	5
SL418	Remote Sensing Applications	5
		24

PROPERTY STUDIES (NEW COURSE) AND LAND STUDIES (EXISTING COURSE)

DIPLOMA IN PROPERTY STUDIES (NEW COURSE)

Year 1

First Semester

PS 101	Land Tenure	3
LA101	Studies Skills	3
PS 103	Land Admin Process & Documentation	3
BA 141	Introduction to Law	3
CS145	Introduction to Information Tech.	3
MA 111	Quantitative Methods 1	3
BA 161	Basic Economics 1	3
BA 131	Introduction to Business	3
		24

Year 1

Second Semester

PS 102	Intro. to Property Management	3
PS 104	Real Estate Valuation 1	4
PS 106	Intro. to Resource Management	3
LA102	Reading & Writing Skills	3
MA112	Quantitative Methods 2	3
CS146	Intro. to Information Tech	3
BA 162	Basic Economics 2	3
		22

Year 2		
Semester 1		
PS 201	Real Estate Valuation 2	3
PS 203	Land Investn & Acquisition Settn	3
PS 205	Real Estate Management & Agency	4
SV 233	Surveying for Property Managers	4
BA 243	Commercial Law	3
BA 182	Financial Management & Account	4
BL 231	Building Construction for Property	4
		25

Year 2		
First Semester		
PS 202	Conveyancing & Land Dispute	3
PS 204	Real Estate Investment	3
PS 206	Property Law	2
BL 232	Building Construction for Property	
	Managers & Valuers 2	4
BA 244	Commercial Law 2	4
LA 204	Communication in the Workplace	2
MA 212	Quantitative Methods	3
SV 234	GIS and Remote Sensing	4
		25

BACHELOR IN PROPERTY STUDIES (NEW COURSE)

LAND ADMINISTRATION/PROPERTY MANAGEMENT

Year 3		
First Semester		
PS 301	Land Policy Theory	4
PS 303	Law of Land Use	3
PS 305	Land Economics	3
PS 307	Real Estate Development	3
PS 309	Demography & Social Mapping Studies	3
PS 311	Urban and Reg. Planning Studies	3
BA 231	Principles of Marketing	3
LA301	Writing a Research Paper	2
		24

Year 3		
Second Semester 2		
PS 302	Land Policy and Reform	4
PS 304	Property Taxation	3
PS 306	Property Research Proposal	2
PS 308	Land Resource Mgt	4
PS 312	Commercial Property Mgt	4

SL 322	Database Management	3
MA 316	Quantitative Methods5	4
		24

PROPERTY VALUATION/PROPERTY MANAGEMENT

Year 3		
First Semester 1		
PS 305	Land Economics	3
PS 307	Real Estate Development	4
PS 311	Urban and Reg. Planning Studies	3
PS 313	Property Investment Analysis	4
PS 315	Real Estate Valuation 3	4
PS 317	Property & Business Forecasting	3
BA 231	Principles of Marketing	3
LA301	Writing a Research Paper	2
		26

Year 3		
Second Semester		
PS 304	Property Taxation	3
PS 306	Property Research Proposal	2
PS 308	Land Resource Management	2
PS 314	Commercial Property Management	4
PS 316	Real Estate Valuation 4	4
SL 322	Database Management	4
MA 316	Quantitative Methods 5	4
		23

BACHELOR IN LAND STUDIES (EXISTING COURSE)

Year 4		
First Semester		
SV411	Professional Work Experience	

Between the end of the third year and the second semester of the fourth year, the students will be placed in employment with a view to obtaining professional work experience. The intention is that this exposure will lay down a foundation of practice to which the student will be able to relate to the more advanced studies of the second semester.

Year 4		
Second Semester		
IS213	Database Processing	4
SV442	Prof. Practice and Office Manage	4

SV452	Land Development Management	6
SV464	Investment and Property Appraisal	6
		20

SUBJECTS TAUGHT FOR OTHER DEPARTMENTS

LMC13	Map Reading	3
SV182	Rural Valuation	3
SV-291	Surveying for Engineers-I	3
SV-292	Surveying for Engineers-II	3
BL-362	Construction Surveying II	3
SV-399	Mine Surveying	4
		23

SUBJECTS TAUGHT BY THE DEPARTMENT

PS101	Land Tenure
PS102	Introduction to Property Management
PS103	Land Administration Processes & Documentation
PS104	Real Estate Valuation I
PS106	Introduction to Resource Management
PS 201	Real Estate Valuation 2
PS 202	Conveyancing & Land Dispute
PS 203	Land Investn & Acquisition Settlement
PS 204	Real Estate Investment
PS 205	Real Estate Management & Agency
PS 206	Property Law
PS 301	Land Policy Theory
PS 302	Land Policy and Reform
PS 303	Law of Land Use
PS 304	Property Taxation
PS 305	Land Economics
PS 306	Property Research Proposal
PS 307	Real Estate Development
PS 308	Land Resource Mgt
PS 309	Demography & Social Mapping Studies
PS 311	Urban and Reg. Planning Studies
PS 312	Commercial Property Mgt
PS 313	Property Investment Analysis
PS 314	Commercial Property Management
PS 315	Real Estate Valuation 3
PS 316	Real Estate Valuation 4
PS 317	Property & Business Forecasting
SV 233	Surveying for Property Managers
SV 234	GIS and Remote Sensing
SV311	Valuation III
SV343	Land Economics I

SV351	Compulsory Acquisition
SV457	Subdivisional Principles
SV323	Land Management Project I
SV352	Land Taxation
SV362	Organization of Government
SV372	Valuation IV
SV344	Land Economics II
SV324	Land Management Project II
SV458	Sub divisional Design
SV442	Prof. Practice and Office Manage
SV452	Land Development Management
SV464	Investment and Property Appraisal
SL103	Introduction to Surveying A
SL104	Introduction to Surveying B
SL105	Survey Computations I
SL106	Survey Computations II
SL113	Fundamentals of Geog. Info. Science
SL114	Fundamentals of Remote Sensing
SL151	Environmental Studies I
SL152	Environmental Studies II
SL203	Automated Survey Systems I
SL204	Automated Survey Systems II
SL205	Intro. to Engineering Surveying
SL206	Intro. Global Positioning Systems
SL208	Cadastral Surveying
SL213	Geographic Information Systems
SL214	Remote Sensing
SL221	Introductory Law, Land Studies
SL222	Principles of Cadastral Surveying
SL235	Geodesy for GIS
SL241	Map Projections & Geo-Referencing
SL263	Cartography I
SL264	Cartography and Computer Drafting
SL281	Geography I
SL282	Geography II
SL301	Surveying III
SL302	Surveying IV
SL304	Introduction Geodetic Surveying
SL305	Construction Surveying
SL306	Adjustments of Survey Meas.
SL307	Global Positioning Systems
SL311	Introduction to GIS
SL312	Introduction to Remote Sensing
SL313	Photogrammetry
SL316	Digital Image Processing
SL317	Spatial Modeling and Analysis
SL318	Geovisualisation
SL321	Statistics for Surveying & Mapping
SL322	Database Management
SL323	Geo-processing & Statistics

SL332	Valuation for Surveyors
SL342	Field Trip I
SL364	Cartography II
SL401	Surveying V
SL402	Surveying VI
SL413	Managing GIS/RS Projects A
SL414	Managing GIS/RS Projects B
SL415	Web Cartography/GIS
SL416	GIS Applications and Development
SL417	Digital Photogrammetry
SL418	Remote Sensing Application
SL423	GIS/Remote Sensing Project A
SL424	GIS/Remote Sensing Project B
SL426	Applied Geo-image Processing
SL437	Survey Practice I
SL438	Survey Practice II
SL444	Special Topics
SL457	Subdivisional Principles
SL458	Subdivisional Design

Existing Postgraduate Subjects

SLP01	Advanced Surveying I
SLP02	Surveying, Special Topics
SLP03	Information Systems for Land studies I
SLP04	Information Systems for Land Studies II
SLP05	Advanced Geographic Data Handling
SLP06	Geographic Information Systems, Special Topics
SLP07	Advanced Land Management I
SLP08	Land Management, Special Topics
SLP11	Advanced Cartography
SLP12	Special Topic in Land Studies
SLP21	Research Project Part A
SLP22	Research Project Part B

SUBJECT DETAILS OF THE COURSES

LMC 13: MAP READING

Hours per week: 3

Objective:

On completion of this subject, students should be able to:-

1. Study and interpret meanings of map symbols;
2. Describe natural and cultural landscapes from topographic maps and aerial photographs;

3. Carry out landscape analysis from maps and aerial photographs;
4. Carry out landscape interpretation from topographic maps and aerial photographs.

Syllabus:

Scales and the computation of areas and distances from maps; Compass bearings and directions; Interpretation of relief; Gradients and profiles; Land use; Aerial photo-interpretation.

Textbook:

Eaton, P., A Guide to Map Reading in Papua New Guinea, National Mapping Bureau, Port Moresby.

Assessment:

Continuous Assessment - 100%

PS 101: LAND TENURE

Hours per week: 3 Hours

Prerequisite: Nil

Objectives:

To introduce students to land tenure and the factors influencing land tenure and appreciate the need for registration of interests in real property.

On completion of the subject, students should be able to:-

1. Explain land tenure and the factors influencing it to change and its relationships to people in different societies;
2. Justify the need to register interests held in land as well as the appropriate method of land registration technique to use;
3. Assist and use appropriate land registration documents to register interests in land using the registration process;
4. Demonstrate an understanding of the issues facing land tenure and registration in Papua New Guinea and the Pacific.

Syllabus:

People and the Land, Land Tenure Systems, Land Tenure System in Papua New Guinea and the Pacific; Issues in changing tenure, land tenure and development, Population and social changes, Land

Registration Concepts and principles, land registration systems, Land Registration System in Papua New Guinea, Land registration process in PNG, Features of land registration, Advantages and disadvantages of land registration,

Reference:

Crocombe, R., Land Tenure in the Pacific, University of South Pacific, 1977.

Assessment:

Continuous Assessment - 100%

PS 102: INTRODUCTION TO PROPERTY MANAGEMENT

Hours per week: 3 Hrs

Prerequisite: PS 101

Objectives:

To introduce students to the general principles of property management and the management skills necessary for effective management of property assets.

On completion of the course, students should be able to:-

1. Familiar with the general principles of property management;
2. Identify the different estates and apply the correct management principles in managing them;
3. Evaluate the different roles and responsibilities of a property manager;
4. Specify the objectives of property investment and its linkages to property management;
5. Undertake management of small residential properties.

Syllabus:

Urban estates – development, growth and types of urban estates; Urban real estate - nature, characteristics, theory and current scope of urban real estate, management of urban estates, public and private estates and current issues in PNG; Property investment; Aims of property ownership; Property management, real estate cycles and

relationship to property management; Nature of property, Property Markets,

Property Management – need for, objectives of and types of property management, functions of property management, tenant moving and moving out of property; Property Manager – roles and responsibilities, property mismanagement

References:

Departmental Modules

Assessment:

Continuous Assessment:	- 50%
Written Examination	- 50%

PS 103: LAND ADMINISTRATION PROCESS AND DOCUMENTATION

Hours Per week: 3 Hrs

Prerequisite: Nil

Objectives:

To introduce students to the process and procedure of land administration process the government agency responsible for land administration in Papua New Guinea.

On completion of the course, students should be able to:-

1. demonstrate an understanding of the organizational structure, functions and procedures of various sections of the main government department which administers land in Papua New Guinea;
2. Assist in the land administration process and practice to complete appropriate documentations in certain land dealings;
3. Communicate effectively with respective sections within the government agency which administers land and to complete specific documentations in the land administration process;
4. Demonstrate some level of professional approach to land administration work on operational and administrative matters.

Syllabus:

Land administration in PNG; Function of Department of Lands and Physical Planning (DLPP), DLPP relationship and linkages to other government agencies in land administration.

Land administration process: the land administration procedure, the different forms (documents) used, what is required at each stages. Land acquisition: types of land acquisition, process of acquisition; Land board: membership and function, state leases, role of minister, land allocation administration of state leases. Conveyance: conveyance procedure, Title registration. Overview of reforms in land administration process.

Reference:

Land Act No.45 of 1996.

Assessment:

Continuous Assessment: - 50%
Written Examination: - 50%

PS 104: REAL ESTATE VALUATIONS 1

Hours per week: 4 Hrs

Prerequisite: PS 101, PS 102

Objectives:

To introduce students to the basic concepts and basic valuation approaches to assess the value of interests in real property and to promote and facilitate students' understanding of the links between society, valuation and other subjects in the course.

At the completion of the subject, students should be able to:

1. Explain the basic valuation and economic concepts and their relationship to understanding valuation and other applied land administration and property management;
2. Prepare and use sketch plans, simple drawings and use maps to locate property; measure and calculate land and floor areas from plans;
3. Search and obtain information from a range of prescribed sources and be aware of others;

interpret the information collected at an appropriate level;

4. Assess market value of interest in simple real property using basic valuation approaches;
5. Demonstrate an appreciation of the nature and purpose of a valuer's education.

Syllabus:

History of valuation: global and local scene, professionalisms in valuation, Introduction to the valuation of real property: - the nature of the profession; the property market, market structure; Factors affecting value; Basic concepts used in valuation: anticipation, substitution, highest and best use, concept of value, hope value, cost, market, theory of interest, law of diminishing return, bundle of rights theory, depreciation, replacement cost. Basic Valuation Methods: introduction, valuation defined, Basic valuation approaches- comparison approach, summation, Comparison sales, Valuation process – data collection, data analysis, report writing.

Assessment:

Continuous assessment: - 50%
Written Examination - 50%

References:

1. J. K. Eckert, Property appraisal and assessment administration; International Association of Assessing Officers, Chicago, USA, 1990.
2. F. Millington, An introduction to property valuation - 4th edn., Estates Gazette, London, 1995.
3. M. Squirrell (ed.), Readings in Property Economics, AIVLE, Sydney, 1997.

**PS 106: INTRODUCTION TO
RESOURCE MANAGEMENT**

Hours per week: 3 hrs

Prerequisite: PS 101

Objectives:

To introduce students to the principles and operations of the natural environment and its interrelationships with each other and their relations to resource development and human life.

This raises the importance of environmental ethics and proper planning for sustainable resource development and management in a developing economy.

At the completion of the subject, student should be able to:-

1. Define the natural environment, relationship of natural ecosystems, major biomes and ecological factors in the natural environment and their relationship to human life;
2. Specify and relate the roles of all stakeholders to addressing environmental issues both the global and local scale;
3. Demonstrate an understanding of the principles of environment management, resource planning and sustainable development and address the social, economical and political impact on the environment with respect to resource development;

Syllabus:

Principles of environment management, planning, natural and renewable resources, environment ethics, preamble of the national constitution, environmental factors, biomes of the world, ecological factors, principles of sustainable development, environmental stewardship and custodian, rural land planning, principles of urban environmental management, principles of rural environmental management, principles of land management, principles of environmental conservation, role of state, developers, non government organizations and landowners in resource development. Resource development and environment exploitations and their impacts.

Reference:

Enger, D. E. et. al., Environmental Science, 1989.
Department modules

Assessment:

Continuous Assessment - 100%

PS 201: REAL ESTATE VALUATION 2

Hours per week: 3 Hrs

Prerequisite: PS 104

Objectives:

To introduce students to the general principles of valuation and the application of different valuation approaches ascertain market values of both rural and urban real properties.

At the completion of this subject, students should be able to:-

1. demonstrate an understanding of the conventional principles and methods of valuation and practice in rural and urban properties;
2. exhibit a sound understanding of the residential property market and rural property markets;
3. justify the choice of the appropriate method of valuation to value a particular a class of real property and value that property with some level competency;
4. Prepare and present report of high standard of the analysis and valuation to communicate effectively with a client;
5. Familiar with the process and procedure in the registration of valuers and the requirements of the Valuers registration Board of Papua New Guinea.

Syllabus:

Valuation Methods applicable for valuation of urban real properties: Comparison method; Summation method, Income method, Hypothetical method: Valuation methods applicable in valuation of rural real properties: Hectare Method, Income Producing Method;

Some general concepts: factors affecting value, principles of rural properties; principles of valuation, environment factors, trends in rural property valuation. Valuation process: Outline and detail discussion. Valuation Report: Outline, content, quality and standard. of valuers, Registration of valuers: legal requirements, training, experience and other requirements, Roles and responsibilities Professional ethics;

References:

American Appraisal Institute, *The appraisal of real estate – 11th edn.*, Appraisal Institute, Chicago, USA, 1998.

Australian Institute of Valuers and Land Economists, *Valuation principles and practice*, AIVLE, Canberra, 1997.

A.F. Millington, *An introduction to property valuation*, Estates Gazette, London, 1995

R.T.M. Whipple, *Property valuation and analysis*, Law Book Co., Sydney, 1995.

Assessment:

Continuous assessment - 50%

Examination - 50%

PS 202: CONVEYANCING AND LAND DISPUTE SETTLEMENT

Hours per week: 3 Hrs

Prerequisites: PS 101, PS 103

Objectives:

To familiarize students with the specific procedures and practice of conveyance and the land disputes and settlement processes in Papua New Guinea.

At the completion of the subjects, should be able to:-

1. Develop some understanding of the conveyance procedures and documentation and assist in vendors and purchasers of real properties in Papua New Guinea;
2. Develop some understanding of the nature of land disputes and the manner in which they are settled in Papua New Guinea and assist in settling land disputes.
3. Identify and explain the type of documents used in the conveyance process and land dispute settlement process;
4. Perform conveyance duties at an appropriate level of competency;
5. Participate and/or advice in a land dispute settlement process with some level competency.

Syllabus:

Types of conveyance, Nature & function of conveyance, Conveyance documents, Conveyance procedures, structure & function of Registrar of Titles, title transfer, stamp duty. Role of stakeholders in conveyance: landowners, purchasers, lawyers, government agencies, financial institutions.

Nature, types and causes of land disputes, dispute settlement process in PNG, Legal, administrative and institutional aspects of land disputes settlement, current issues in land dispute settlements. Role of stakeholders in land dispute settlement: courts, landowners, mediators, government agencies,

Reference:

Land Registration Act Chapter 191

Customary Land Registration Act (ENBP & ESP)

Land Dispute Settlement Act, Chapter 45

Assessment:

Continuous Assessment - 50%

Written Examination - 50%

PS 203: LAND INVESTIGATION AND ACQUISITION

Hours Per week: 3 Hrs

Prerequisite: PS 101, PS 103

Objectives:

To introduce students to the land investigation and acquisition procedures and processes in Papua New Guinea which should help them to participate in the process.

At the completion of the subject, students should be able to:-

1. Develop some understanding and explain the nature, scope and procedure of land investigation and land acquisition in Papua New Guinea;
2. Conduct land investigations at an appropriate level of competency;
3. Perform land acquisition duties at an appropriate level of competency;

4. Formalize customary land for development purposes.

Syllabus:

Land Investigation Process: nature, the need/purpose, types, processes, problems encountered and resolutions.

Land acquisition Process: Nature, the purposes for land acquisition, types of land acquisition, customary & alienated land, problems encountered and ways to address them.

Landowner identification study Process: principles and reasons for landowners identification study, components of landowners identification study, process of landowner identification, introduction to land groups.

Preparation of reports: An outline of report on land acquisition, report preparation. Role of government lead agencies in land acquisition, land investigation, Formalizing land for development purposes.

References:

Land Act No.45 of 1996

Lakau, A.L., (1991), Acquisition of Customary Land for Public Purposes - Technical Report Series, Department of Surveying and Land Studies, PNG University of Technology, Lae.

Appropriate sections of the Oil and Gas Act 1998.

Other appropriate acts of Parliament

Assessment:

Continuous Assessment - 100%

PS 204: REAL ESTATE INVESTMENT

Hours Per week: 3 Hrs

Prerequisite: PS 102

Objectives:

To introduce students to the financial analysis techniques used in business to evaluate investment

proposals and also to assess the performance of such investments and companies which make such investments.

At the completion of the subject, students should be able to:-

1. Explain the time value of money concepts and their relevance to investment decision making;
2. Carry out computations of initial yields, equity returns, capitalization rates, potential for capital growth and risks and show their relationship between these ate of returns;
3. Describe the different capital budgeting techniques, their advantages (strengths) and deficiencies and their relevance to project analysis;
4. Carry out computations of financial ratios and explain their significance in analyzing financial statements;
5. Identify all the sources of finance and lending institutions with their requirements.

Syllabus:

Investment: investment opportunities, speculation, uncertainty and risks, risk and return profile, investment and financial markets;

Mathematics of finance: present and future of single and series of payments, over view of investment analysis; valuation versus financial analysis; Rates of returns: capitalisation rates, initial yields, equity returns, capital growth.

Capital budgeting techniques: payback period, accounting rate of return, net present value, net terminal value, internal rate of return profitability index;

Financial institutions: types of financial institutions and their requirements, sources of finance, financial instruments, lending policies and procedures, amortization of loans, loan security and monitoring of performance,

References:

Lawrence, D. M., Modern Methods of Valuation, Estate Gazette, London, 1980.

Isaac, D. Steley, T. Property valuation Techniques, Macmillan Education Ltd, London, 1991

Assessment:

Continuous Assessment	- 50%
Written Examination	- 50%

**PS 205: REAL ESTATE MANAGEMENT
AND AGENCY PRACTICE**

Hours Per week: 4 Hrs

Prerequisite: PS 102, PS 103

Objectives:

To enable students to acquire the knowledge and skills to manage a real estate agency practice professionally. At the completion of the subject, students should be able to:-

1. Use appropriate general management principles to manage a real estate agency effectively within a proper legal, institutional and functional framework;
2. Prepare marketing and sales plans for real estate sales or leasing;
3. Undertake marketing and sales of real estate professionally;
4. Uphold professional association's code of conduct and standards in carry out real estate agencies activities;
5. Manage trust accounts professionally

Syllabus:

Principles of marketing – marketing plan, market research, buyer behavior, market segmentation, targeting and promotion; Principles of salesmanship – qualities of an effective salesman.

Marketing and sales of property – sales methods, property listing, sales procedure, settlement procedure; Real Estate Practice – legal, institutional, functional, and managerial aspects, office setup and management;

Accounts management: planning and budgeting, accounting, trust accounts;

Starting up a real estate practice; Feasibility of starting a real estate agency practice.

References

Departmental Modules

Assessments

Continuous Assessment:	- 50%
Written Examination:	- 50%

PS 206: PROPERTY LAW

Hours Per Week: 2 Hrs

Prerequisite: Nil

Objectives:

To provide students with a sound overview of the main principles of the law of Property so that they can identify legal issues and analyse them properly.

At the completion of the subject, students should be able to:-

1. understand the basic nature of the main interests in land and the original theory of landholding on which English, Australia and PNG is based which would help to understand occasionally an owner of land does not have complete and absolute rights;
2. understand the rules relating to the law of fixtures and able to determine when an item attached to the land passes when it does not pass on transfer;
3. understand the principles and remedies available with legal and equitable estates;
4. understand the real property law and the basic tenets of Torrens Titles system;
5. understand caveats, encumbrances, mortgages, easements and other restrictive covenants and their discharge process and their meanings;
6. understand the nature of a lease, major aspects of a lease, states lease and their forfeitures;
7. appreciate other aspects of law such as torts, trespass, nuisance, negligence, adverse possession, strata titles, gifts and wills as they relate to real property.

Syllabus:

The nature of real property: the doctrine of tenure and estates in land, basic forms of estates such as fee simple, fee tail, life estates, other forms of estate such as leaseholds estates, mortgagee, joint tenants;

Fixtures and fittings: laws and rules relating to law of fixtures.

Legal and equitable estates: the law of equity, equitable interest versus legal estates, common law.

Real property law: Torrens title system, doctrine of indefeasibility of title, deed system and its issues; Restrictions and covenants; caveats, its natures and effect, contents of caveat, encumbrances, easements and restrictive covenants; mortgages and charges and their removals, roles and powers and duties of mortgagees and mortgagors.

Leases: nature and characteristics, major aspects of a lease, types of leases and tenancies, forfeitures of leases, states leases and their types, allocation process and administration in law.

Introduction to Land Law: Nature and Types of Interests in Land, Co-Ownership of Land, Introduction to Contract, Leases, State Leases, Mortgages, Registration of Leases.

Overview of torts, nuisance, trespass, gift, will and negligence and relation to real property.

References:

Revision of Laws of Papua New Guinea.

Mugambwa, J. & Amankwah, H. (2002). *Land Law and Policy in Papua New Guinea*. London, Cavendish Publishing Ltd. 2nd ed.

Greenwood, D. (1982), Land Management Law- Technical Report Series, Department of Surveying and Land Studies, PNG University of Technology, Lae.

Departmental Modules

Assessment:

Continuous Assessment - 100%

PS 301: LAND POLICY THEORY

Hours per week: 4 Hrs

Prerequisite: PS 203, PS 202, PS 206,

Objectives:

To introduce students to the land policy theories and linkages to land and resource development and administration. In the process factors such as economical, political and social aspects of land management will be introduced to provide the basis for understanding land policing in the context of overall policies for sustainable development and good governance.

On completion of this subject, students should be able to:

1. demonstrate an understanding of the land policy theories and their relevance to the context of land policy development and the overall policies with respect to sustainable development;
2. apply the principles and strategies of good land policy to develop a comprehensive land policy;
3. identify effective instruments for implementation of land policies in the overall development framework and programs;
4. identify and assess the economic importance, incentive functions and process within existing institutional establishments that influence and guide land tenure development and policy initiatives;
5. understand the link between land policy objectives, strategies, instruments and other economic policies and instruments with respect to national development strategies;

Syllabus:

Land policy: Over view of land tenure, models of public decision making; land policy theories, concepts, principles of land policy, perspectives on land policy, principles and significance for development; land policy reform; land policy in the context of natural resource management; land policy in the context of good governance; land policy and land management in the context of development programs, Social aspects of land tenure and land management: planning and bottom up approaches to land administration(equal participation, inclusiveness and role of civil society); land rights as part of family and clan inheritance law; social changes and its impacts in land tenures systems and land administration, social impact of informal

land administration; Women rights and access to land, security of rights for children.

Economic aspects of land tenure and administration: role of state and civil society towards to land tenure and land administration; economic benefits and dis-benefits; land and rental markets; state intervention in the land markets.

Political aspects of land tenure and land administration: states agencies, political structure and policy making process, role of minister in good governance and legislation, political decision making and its relationships to land policy and development.

Reference:

Crocombe, R., (1975), Land tenure in the Pacific, London, Oxford (Reprinted in 1977 by University of South Pacific.

Departmental modules

Assessment:

Continuous Assessment	- 50%
Written Examination	- 50%

PS 302: LAND POLICY AND REFORM

Hours per week: 4 Hrs

Prerequisites: PS 301

Objectives:

To introduce students to the nature and scope of land reform policies and their application to practical issues to formulate appropriate land policies.

On completion of the subject, students should have be able to:

1. demonstrate an understanding of the nature and scope of land policy and land reform in relation to land administration in general;
2. familiar with the operational and management issues of land administration;
3. aware of the institutional issues and other factors changing the management of land and property information;

4. familiar with and be conversant with past and current land policies and reforms in Papua New Guinea;
5. Demonstrate an understanding of the role of political, administrative & private factors in land policy reforms to re-engineering land administration services.

Syllabus:

Nature and concept of land reform policies, land administration reform initiatives:- land redistribution, tenancy reform, land consolidation, tenure rationalization, land deregulation, land administrative and improvement program, land evaluation and improvement project, land mobilization program, land reform and economic development; roles of political institutions and administrative decision making, land policy and implementation; Operational and strategic management concerning land administration, capacity building and human resource development; re-engineering of land administration services.

Reference:

Knetsch, J. & Trebilock, M. (1981), Land Policy and Economic Development in Papua New Guinea, A Institute of National Affairs Publication, Port Moresby.

Assessment:

Continuous Assessment	- 50%
Written Examination	- 50%

PS 303: LAW OF LAND USE

Hours Per Week: 3 Hrs

Prerequisite: PS 206

Objectives:

To enable students to understand the various laws relating to the usage of land for economic and reasonable purposes to bring about changes to society .

At the completion of the subject, students should be able to:

1. understand the legislative provisions and their applications relating to land administration,

mapping, surveying and physical planning and the resource sectors including forestry, agriculture, fisheries and the mining sectors with reference to land acquisition, compensation, and development;

2. develop an introductory knowledge of land laws, legal institutions, government bodies and procedures relating to land administration, property management and valuation;
3. appreciate the different laws relating to the use of land and land resources in PNG with particular emphasis on the land administration, valuation and property management profession;

Syllabus:

Law of Land Use relating to Customary Law, Environmental, Physical Planning controls, Forestry, Agriculture, Mining, Oil and Gas and related Resource Sectors, Introduction to Laws and Regulations for Land Administrator, Surveyors / Cartographers, Valuers and other land professionals, Law of Land Use, Customary Law, Environmental Law, Land Title Laws etc. Land Act of 1996 and its relation to other related law of land use. Land Incorporation Act:-process of incorporating land groups, Plantation redistribution Act, etc.

References:

Miller, A.D. (1990). *An Introduction to the Law of Land Use in PNG*, Department of Lands.
Land Act of 1996
Departmental Modules

Assessment:

Continuous Assessment - 100%

PS 304: PROPERTY TAXATION

Hours per week: 3 Hrs

Prerequisite: Nil

Objectives:

To facilitate student learning to exhibit a professionally acceptable level of understanding for property taxation purposes.

Upon completion of this subject, students should be able to:

1. demonstrate an understanding of the principles of property taxation including relevant aspects of the legislation, property tax systems and constraints on property tax systems;
2. exhibit an appropriate professional attitude to the responsibilities and duties of a valuer/property manager in providing advice on property taxation matters;
3. relate property rating base to the overall taxation systems and the local government accounting system.

Syllabus:

Canons of taxation; Suitability of property as a tax object; Review of property based tax administration systems in developed and developing economies; Identification and perusal of appropriate legislation for property tax purposes; Underlying Legal Cases; Property ratings bases:- unimproved value, capital value, annual value, land value; property rating administration and resource requirements; Current issues in rating systems locally and internationally.

References:

J.K. Eckert (ed.) 1990, *Property appraisal and assessment administration*, International Association of Assessing Officers, Chicago, Illinois.
Organic Law on Provincial and Local Level Government
Land Act. 1996 No.45
Valuation Act CAP. 327

Assessment:

Continuous assessment	- 50%
Written Examination	- 50%

PS 305: LAND ECONOMICS

Hours Per week: 2 Hrs

Prerequisite: PS 102

Objectives

To introduce students to the applied economic

analysis principles to enable them to formulate strategies necessary for the efficient allocation and use of land resources. It is also intended to explain the behaviour of land users in selecting a location in an urban area.

At the completion of the subject, students should be able to:

1. develop an understanding of the importance of economics, social, demographic and political reasons for locational decisions in urban areas and urban growth and expansion;
2. Identify the causes of urban land use changes and the framework within which urban land development decisions are made;
3. Identify the factors which determine the location decisions of residential, commercial and industrial uses in the urban area;
4. Explain the factors influencing the urban property market and justify the government's intervention in the property market;

Syllabus:

Spatial structure and urban growth theories; location of urban land uses, factors causes urban land uses and urban growth and expansion; Economics of real estate development; urban development and planning; characteristics of urban property market; urban property market structure and functions, international property market, world cities and their characteristics; Government policies: general economic policies, urban development policies, government and urban land resources.

References:

Balchin, P. N., Urban Land Economics and Policy; Macmillan, London, 1995
Harvey, J. Urban Land Economics, Macmillan, London, 1986
Newell, M., Introduction to the Economics of Urban Land Use, Estate Gazette Ltd

Assessment:

Continuous Assessment	- 50%
Written Examination	- 50%

PS 306: PROPERTY RESEARCH PROPOSAL

Hours Per Week: 2 Hrs

Prerequisite: LA 204

Objectives:

To provide students with the fundamental research skills for the preparation of a research proposal. This will help them to develop a good research proposal on a selected topic related to land administration, property management and valuation.

On completion of this subject, students should be able to:

1. Undertake a topic analysis and decide on the best research method and its limitations to study the problem;
2. Identify through literature review and anecdotal evidence a likely valuation, land administration, land development, property management and real estate problem;
3. Explain and evaluate alternative research techniques and designs;
4. Assess published research by reference to methodologies and designs used;
5. Identify and use appropriate data analysis techniques;
6. Appreciate the role of research proposal in research and its uses;
7. Prepare a research proposal for a selected research topic which should be based on a problem.

Syllabus:

- Research methods - introduction/overview, qualitative, quantitative, survey method, field work, experimental research, laboratory research, action research, interpretative research,
- Development of a research proposal,
- Fundamentals to conducting a literature review and critically analyzing literature,
- Data presentation techniques,
- Data collection techniques and procedures,
- Data analysis, tabulation and interpretation,
- Research Ethics - ethics in research, professional standards,
- Research design - develop research design, research process,

- Research sampling- population, methods of sampling
- Questionnaire design and interview- use of language, survey versus interview, development of questionnaire, administration of survey questionnaire, telephone and personal interview

References:

Department Modules

Assessment:

Continuous Assessment - 100%

PS 307: REAL ESTATE DEVELOPMENT

Hours Per Week: 4 hrs

Prerequisite: Nil

Objectives

To provide students with an overview of the real estate development process from inception to disposal, occupancy and management from an economic and political perspective.

On completion of the course, students should be able to:

1. Demonstrate an understanding of the real estate development process;
2. Specify the roles of each development partners and their involvement as a team in the development process;
3. Undertake a feasibility analysis for a real estate development project;
4. Demonstrate an understanding of time, project budget and cost control in managing project;
5. Demonstrate an understanding that a real estate project is an economic venture in a competitive business environment.

Syllabus:

Property development/investment alternatives - property types and issues,
Statutory control of land development - underlying economic framework and politics, land use plans and approval mechanisms,
Development partners- landowners, professionals, financiers, local authority,

Project development process- identification/inception and role of market research; feasibility analysis: market analysis, financial analysis, risk analysis, contract signing and management, implementation, financing the construction, construction, project management, value engineering, project completion, handover and property management.

Textbook:

Cadman, D. & Topping, R. (1995) Property Development, E & FN Spon, London

References:

Cadman, Austin Crowe (1990) Property Development, London.
Departmental Modules

Assessment:

Continuous assessment	- 50%
Written Examination	- 50%

PS 308: LAND RESOURCE MANAGEMENT

Hours Per week: 4 hrs

Prerequisite: PS 303, PS 309

Objectives:

To enable students to be aware of need to manage land resources effectively and efficiently to accomplish project tasks for the development and wellbeing of people.

At the completion of the subjects, students should be able to:

1. demonstrate appropriate management strategies to manage land resources project;
2. demonstrate an understanding of the appropriate policies in the management and control resource projects;
3. demonstrate an effective coordination and liaison between project stakeholders;
4. exhibit correct, ethical and unbiased approach to managing resources projects;

Syllabus:

Types of natural resources and their development requirements; Preview of land and resource

tenures, Project development; resource project management, principles and aspects of project sustainability; project sustainability and their requirements; resource policies and land policies relating to resource projects; Human resource management in resource projects; Environment impact statements, resource project pre-feasibility studies; project control; project pollution and management, strategic planning and management; Environment conversation policies, Land use planning and management. Current issues in resource development; Natural disasters and resettlements; resettlements schemes and policies.

Textbook:

Various Appropriate Acts of Parliament
Department Modules

Assessment:

Continuous Assessment - 100%

**PS 309: DEMOGRAPHY AND SOCIAL
MAPPING STUDIES**

Hours Per Week: 4 Hrs

Prerequisite: PS 106, PS 202, SV 233, SV 234

Objectives:

At the completion of the subject, students should be able to be aware of importance of land and resources in the resource development projects. Students must be able to undertake landowners identification and social mapping studies and able to establish the legitimate land owners and their rights in land resources.

At the completion of the subjects, students should be able to:

1. understand the legal requirements to undertake landowners identification and social mapping studies in resource development projects;
2. demonstrate an understanding of the elements , process and procedure of social mapping studies using appropriate techniques;

3. demonstrate an understanding of the process and procedure in undertaking landowners identification studies;
4. exhibit correct, ethical and unbiased in social mapping and landowners identification studies;
5. aware of the modern and traditional political institutions and social systems and their governance;
6. aware of group dynamics and traditional migration patterns and other human settlement issues;

Syllabus:

Review of land tenure systems; resource tenure systems; organizational structures;- traditional and modern; preview of the preamble of the national goals of the national constitution; introduction of anthropology; group dynamics, cultural and social change; introduction of cultural, physical, social and geographical landscape of societies; landowner identification studies process, social mapping process; parts of the landowner identification studies; parts of the social mapping studies; adaptation and migration trends, nature of resource projects; resource policies and land policies relating to resource projects; demography and population studies, current issues. Oil and Gas Act 1997 and other Acts relating to resources and their legal requirements for specific studies. Practical application of using rural rapid and raid rural appraisal techniques.

Text Book:

Department Modules

Assessment:

Continuous Assessment	- 50%
Written Examination	- 50%

**PS 311: URBAN AND REGIONAL
PLANNING STUDIES**

Hours per week: 3 Hrs

Prerequisite: Nil

Objectives:

To introduce students to the historical background of human settlements, origins of planning theories

and reasons for planning which they can relate to and explain the importance of developing good urban and regional plans. The students are also introduced to the need for growth and expansion of existing urban and regional centres relating impacts of urbanization.

At the completion of the subject, students should be able to:

1. develop an understanding of the principles of urban and regional planning in developing good human settlement plans;
2. Explain and relate the growth of settlements and their characteristics in urban centres to the urban growth theories and structures;
3. Demonstrate an understanding of the use of the different urban and regional planning instruments and regulatory controls and their use in the land development process in Papua New Guinea;
4. Appreciate the urban and regional planning as a tool for developing better quality of life for urban and regional development centres;

Syllabus:

History and overview of human settlements in general and in Papua New Guinea; urbanization and its impacts, reasons for growth of settlements; types of settlements; aspects of settlements; Urban and Rural PNG and their aspects of built environment; rural and urban migration, urban economics, regional economics; economics of land use allocation.

Principles of urban and regional planning systems; definitions of land use plans: urban, regional, zoning plans, inner city centre development plan, urban development plan, strategic plans; Principles and purpose of these plans; scope and limitations of these plans, regional development centres as service centres; reasons for planning;

Physical planning;- principles of subdivision, subdivision, consolidation, land uses, development and zoning of land; Operation and control of development, overview of land development process; planning and development approval process in Papua New Guinea.

Infrastructure needs and planning: road, ports and air and their integration and dynamics within and

to urban and regional centres;

Information for planning: types of data: economic, political, social, environmental, infrastructure, planning for needs of people; data collection and use in planning.

References:

Buildings Act, Chapter No. 301 and Building Regulation Act,
Land Act 1996
Physical Planning Act 1989 and Physical Planning Regulation Act 1990.

Textbook:

Darling Downs Institute of Advanced Education (1989), Urban and Regional Planning (Unit 79001), Canberra.

Assessment:

Continuous Assessment - 100%

PS 312: COMMERCIAL PROPERTY MANAGEMENT

Hours Per Week: 3 Hrs

Prerequisite: PS 306, PS 307

Objectives:

To provide students with sufficient background knowledge to successfully manage complex multi-tenanted investment properties.

On completion of the subject, students should be able to:

1. demonstrate an understanding of the many roles of commercial property manager as well as the modern commercial property management principles, practices and their potential effect on property income and values;
2. prepare management plans, business plans, budget and reports and working knowledge of the financial and physical aspects of investment properties;
3. demonstrate an understanding of lease conditions and rent review;

4. demonstrate an understanding of building services and systems;
5. prepare strategic plans and performance reports for managed investment properties;

Syllabus:

Introduction to property management functions – property management, facility management, asset management, building management, maintenance management, portfolio management, building services management, total quality management; Commencing Property management:- organization and administration, prospecting, management agreements, starting new management, professional property management.

Property management economics and planning: The general business economy, real estate economy, formulating the management plan, property analysis, development of management plan.

Shopping centre management: retailing principles; retailers; customers, merchandising; controls; Intelligent buildings and management systems; Physical and financial management – understanding lease document, management of leases, assessing rentals, rent reviews and review methods, income analysis and budgets, Property management systems - recording and filling systems, reporting systems, procedural systems and accounting systems, monitoring performance, property management software. Insurance: manager's responsibilities in relation to insurance; assessing insurable assets; liability insurance.

Building maintenance and operations: repairs; maintenance and building operations; maintenance contracts and operations; Outsourcing of property management services, Strategic plans, trends and prospects in property management in the industry.

References:

Robert, C. Kyle, & Floyd M. Baird (1995), Property Management, Deaborn Financial Publishing Inc, USA, Departmental Modules

Assessment:

Continuous Assessment	- 50%
Examination	- 50%

PS 313: REAL ESTATE VALUATION 3

Hours per week: 4 Hrs

Prerequisite: PS 201

Objectives:

To provide students with the knowledge, skills and attitudes appropriate for the valuation of a range of interests relating to income producing properties. On completion of this subject, students should be able to:

1. Demonstrate an understanding of the property market process, principles and practice of valuation of investment properties;
2. Produce a series of valuation reports using appropriate traditional and computer based techniques;
3. Identify impacts of lease and lease incentives in the valuation of an range of investment properties;
4. Demonstrate an understanding of the implications of risks and real estate cycles on investment properties and their valuation;
5. Demonstrate an understanding of the economic reasons for the choice of Capitalisation and Discount rates for valuation and their used in the valuation of investment properties.

Syllabus:

Methods of investment valuation; Mathematics of valuation review; Valuation of varying and terminating incomes; Investment valuation process and application, Choice and selection of Capitalisation rates and Discount rates; Modern risk analysis and investment valuation; Real estate cycles and implications for valuation; Current rent reviews, lease incentives and inconsideration in valuation; Modern lease structure and market rents; Computer applications.

References:

A. Baum, D. Mackmin and N. Hunnington (1997), *The income approach to valuation -4th edn*, International Thomson Business Press, London.

A.F. Millington (1995), *An introduction to the property valuation – 4th edn*, Estates Gazette, London.

R.T.M. Whipple (1995), *Property valuation and analysis*, Law Book Co., Sydney.

Assessment:

Continuous assessment	- 50%
Written Examination	- 50%

PS 314: REAL ESTATE VALUATION 4

Hours per week: 4 Hrs

Prerequisite: PS 313, PS 315, PS 317

Objectives:

To introduce student to the principles and practice of statutory valuation purposes.

On completion of this subject, students should be able to:

1. demonstrate an understanding of the principles and practice of the valuation of property for statutory purposes including relevant aspects of the legislation, legal process and constraints on the system;
2. produce a range of statutory valuations at an appropriate level of competence; be able to communicate professionally with clients and as an expert witness;
3. exhibit an appropriate professional attitude to the responsibilities and duties of a valuer undertaking statutory valuations for a public and private sector clients.
4. exhibit an understanding of the process and procedure in compulsory property acquisition and compensation determination;

Syllabus:

Canons of taxation suitability of property as a tax object; review of property based tax administration in PNG. Valuation and legal principles applicable to the preparation of valuations for statutory purposes including Land leases, compulsory acquisition; rating valuation; Compensation assessment; Mass appraisal; Computer applications in rating valuation; Identification and perusal of appropriate legislation for statutory purposes; Evidence; the role of the expert witness, professional liability; legal process and constraints

References:

J.K. Eckert (ed.) 1990, *Property appraisal and assessment administration*, International Association of Assessing Officers, Chicago, Illinois. Valuation Act Organic Law Land Act. 1996 No.45

Assessment:

Continuous assessment	- 50%
Examination	- 50%

PS 315: PROPERTY INVESTMENT ANALYSIS

Hours per week: 3 Hrs

Prerequisite: PS 205, PS 214

Objectives:

To introduce students to the concepts and practice of the analysis of a range of investment graded properties for investment decision making and to assess the performance of investment properties.

On completion of this subject, students should be able to:

1. demonstrate an understanding of the principles and practice of property investment and development relevant to the economic environment in PNG and the constraints and opportunities within the system;
2. develop investment strategy to guide investment decisions linking to investment ownership objectives;
3. use appropriate capital budgeting techniques and investment performance assessment techniques to evaluate performance of investment properties;
4. undertake investment analysis and generate outcomes and interpret results to clients and other stakeholders;
5. Produce a range of investment analysis and feasibility analysis for new or existing property investments at an appropriate level of professional competence.

Syllabus:

Investment mediums; property as an investment; Factors influencing property investment; Return

and risk; Cash flow analysis; Feasibility studies, Market analysis; investment strategy, investment ranking criteria, investment analysis, risks analysis, types of risks, application of capital budgeting techniques in investment analysis; investment performance assessment techniques; Modern Portfolio Theory, Property portfolio analysis; introduction to investment analysis using computer excel spreadsheets.

References:

A. Baum & N. Crosby (1995), *Property Investment Appraisal* (3rd edn), Routledge, London.

D. Cadman & L. Austin-Crowe (1991), *Property Development* (3rd edn), E. & F.N. Spon, London

Assessment:

Continuous assessment	- 50%
Written Examination	- 50%

PS 317: PROPERTY AND BUSINESS FORECASTING

Hours per week: 3 hrs

Prerequisite: PS 201, PS 204

Objectives:

To facilitate student learning and understanding of the integration between market processes, factors affecting value and use appropriate forecasting techniques to establish and predict values as a means of determining market property values and trends. Upon completion of this subject, students should be able to:

1. demonstrate an understanding of the principles and practice of market analysis in respect of a range of and property types and purposes as applicable to property valuation, management and investment;
2. produce a range of property market analysis reports, using appropriate methods and data sources, at an appropriate level of competence, which exhibit a strengthening of initial competencies of data collection,

analysis and synthesis, and report writing and presentation skills.

3. Exhibit an understanding of the interrelationships and impacts of legal, economic, environmental and social factors etc. on the various market sectors;
4. understanding of the different forecasting techniques and apply appropriate technique to establishing and predicting market values and trends.

Syllabus:

The nature and scope of property market analysis; The nature of a market and market definition. Productivity analysis, supply and demand for property; Market analysis techniques and applications, principles of business forecasting, types of forecasting, time series analysis, application of geographic system in market analysis.

References:

S.F .Fanning, T. V .Grissom and T .D.Pearson (1994), *Market analysis for valuation appraisals*, Appraisal Institute, Chicago, Illinois, USA.

N.Carn, J.Rabianski, R.Racster and M.Seldin (1988), *Real estate market analysis - techniques and applications*, Prentice Hall, Englewood Cliffs, USA.

R.T.M. Whipple (1995), *Property valuation and analysis*, Law Book Co., Sydney, NSW.

Assessment:

Continuous assessment - 100%

SL 103: INTRODUCTION TO SURVEYING A

Hours per week: 5 (2,3)

Objective:

To introduce students to the theory and basic techniques in surveying and mapping. On completion of this subject, students should be able to:-

1. Measure sides and angles of an irregular polygon;
2. Carry out collimation tests of a 20 second theodolite and calibrate measuring tapes;
3. Perform simple survey calculations;

4. Locate and remove systematic errors in survey measurements;
5. Use and maintain basic drafting instruments;
6. Develop and use basic principles of good drafting techniques;
7. Interpret and describe symbols and features shown on maps;
8. Carry out landscape interpretation and analysis on topographical maps.
9. Plot traverse surveys by polar and rectangular methods using CAD packages;

Syllabus:

Surveying: Surveying instruments, their types, care, adjustments and use. Surveying theory and techniques. Recording of observations. Systematic errors in survey observations. Survey computations and field exercises.

Traversing; open and close traverses, calculation and distribution of angular errors, calculation and distribution of linear misclosures.

Map Reading and survey drafting: Use and types of maps, scales, symbols, coordinates and north point. Directions and compass bearings. Computation of areas and distances from maps. Interpretation of relief, gradients, profiles and land use.

Textbook:

Musket, J., Site Surveying, BSP, Blackwell Science Ltd., 2Edition, 1995

Reference:

Whyte, W., Revision Notes on Plain Surveying, Newnes-Butterworths, London, 1971.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 104: INTRODUCTION TO SURVEYING B

Hours per week: 5 (2,3)

Objective:

To introduce students to the theory and basic techniques of engineering and topographical surveying and mapping. On completion of this subject, students should be able to:-

1. Perform and plot tacheometric surveys;
2. Determine the distance between two non intervisible points to a prescribed accuracy;
3. Test the adjustment of tilting and automatic levels;
4. Explain the process of route surveying;
5. Perform simple surveys, eg. those of roads and building constructions;
6. Compute and construct grid lines;
7. Plot traverse surveys by polar and rectangular methods using CAD packages;

Syllabus:

Surveying: Types of levels, their use and adjustments. Recording and reduction of height of collimation and rise and fall methods; precautions in fieldwork and two peg-test; procedures for long and cross-sections; grid levelling, Contouring, direct and indirect methods of contouring; interpolation of contours; grid layout and applications in engineering surveys. Tacheometric surveying, theory, methods used. field procedures, recording and reduction of observations. The theory and use of barometric heighting. The theory and applications of vertical and circular curves.

Survey Drafting: grid construction, plotting traverses; plotting by coordinates. Preparation of detail and contour plans from tacheometric surveying field notes.

Textbook:

Musket, J., Site Surveying, BSP, Blackwell Science Ltd., 2Edition, 1995.

Reference:

Shepherd, F.A., Surveying problems and Solutions, Latest edition, Arnold, London.

PNG Department of Works, Standard Survey Instructions.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 105: SURVEY COMPUTATIONS I

Hours per week: 2(1,1)

Objective:

To introduce students to basic survey calculations in applying geometry and trigonometry in plane surveying and mapping using programmable scientific calculators. On completion of this subject, students should be able to:-

1. Explain the difference bearings and angles
2. Compute and distribute angular misclose.
3. Compute and distribute linear misclose.
4. Compute proportional misclose.
5. Compute an area of irregular polygon.
6. Compute coordinate of unknown points.
7. Carry out basic calculator programming.
8. Carry out simple survey computation on a Microsoft Excel.

Syllabus:

Angles, bearings. Compute bearings from angles, angle from bearings, angular misclose, linear misclose, proportional misclose.

Coordinates from; open and closed traverses. Area by Double Meridian and co-ordinate methods

Programmable scientific calculator; stacks storage registers; conversion from polar to rectangular and visa versa. Calculator programming; conversion from polar to rectangular, coordinates and area from open and closed traverses.

Microsoft Excel; conversion from polar to rectangular, coordinates and area from open and closed traverses.

Textbook:

Bannister, A., and Raymond, S., Surveying, Pitman, latest edition, London.

Shepherd, F.A., Surveying Problems and Solutions, Arnold, latest edition, London.

Departmental Module.

Assessment:

Continuous assessments - 100%

SL 106: SURVEY COMPUTATIONS II

Hour per week: 2(1,1)

Objective:

To expand students knowledge in computing

missing elements of a polygon in plane surveying and mapping.

On completion of this subject, students should be able to:

1. Compute missing bearing and distance.
2. Compute two missing distances
3. Compute two missing bearings.
4. Compute simple horizontal and vertical curves
5. Compute reduce levels from tacheometric surveys.

Syllabus:

Polygon with; missing bearing and distance, two missing distances, two missing bearings. Circular curves; by offsets from chords and major chord, by deflections angles and by radiation from a single point, from two or more points. Vertical curve; summit and sagging curves.

Reduced levels from tacheometry survey and EDM tacheometry. Create calculator routines to solve the above problems.

Textbook:

Bannister, A., and Raymond, S., Surveying, Pitman, latest edition, London.

Shepherd, F.A., Surveying Problems and Solutions, Arnold, latest edition, London.

Departmental Module.

Assessment:

Continuous assessments - 100%

SL113: FUNDAMENTALS OF GEOGRAPHIC INFORMATION SCIENCE

Hours per week: 3 (1,2)

Co-requisites/prerequisite:**Synopsis:**

Principles, functions and components of GIS, characteristics of spatial data, their representation, issues in developing, implementing and using various types of GISs. Laboratory sessions will focus on acquiring basic skills using GIS software with real data.

Objectives:

On completion of the course, the student should;

1. develop an understanding of the concepts, theory and issues involved in the development of GIS applications
2. develop an appreciation of the processes involved in the development of GIS applications
3. develop an appreciation of the various applications of GIS
4. develop an understanding of how GIS can be used to solve geographic problems
5. develop skills in the use a GIS software (MapInfo)
6. develop skills in the visualization and analysis of geographic information

Syllabus:

Introduction to concepts and principles of GIS, the functions and components of GIS, Characteristics of geospatial Data, Representation of geographical phenomena, methods of data capture and data conversion, sources of data and issues of accuracy, data manipulation and making data useable, basic spatial analysis, GIS output, visualization and presentation.

Textbooks and Materials:

Departmental course modules and GIS manuals

References:

Geographic Information Systems and Science (2nd Ed), (2005), Longley, P. A., Goodchild, M.F., Maguire, D.J., and Rhind, D.W., John Wiley and Sons Ltd, Chichester

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 114: FUNDAMENTALS OF REMOTE SENSING

Hours per week: 3 (1,2)

Objective:

To provide the students with theoretical and practical knowledge of remote sensing and its applications. On completion of this subject,

student should be able to:-

1. Assess the practicality of utilising remotely sensed data in applications;
2. Provide specifications for the ordering of remotely sensed data from international and local agencies;
3. Differentiate between the various available data sets, their accuracies, applications and appropriateness;
4. Be familiar with the concepts and basic operations in digital image processing;
5. Have basic hands on experience with a typical image processing system.

Syllabus:**Physics of Remote Sensing:**

Definition and Stages, Electromagnetic radiation, Electromagnetic Spectrum, Radiation Laws, Interaction Mechanism with Earth Features and Atmosphere, Atmospheric Windows and bands, Spectral Reflectance Curve, Real and Ideal Remote Sensing Systems.

Platform and Sensors:

Orbital Characteristics and coverage, Spectral, Spatial, Radiometric and Temporal Resolution, Photographic Systems, Optical Mechanical Scanners, Pushbroom Scanners, Multi-band concepts – False Colour Composites, Imaging and non-imaging Sensors, Active and Passive Sensors, Microwave Remote Sensing.

Characteristics of various Satellite Systems:

LANDSAT Series, SPOT, IRS, IKONOS, Quick bird, Orbview, ESA, Radarsat, NOAA. Future trends.

Textbook / References:

Richards, J. A. and X. Jia (2005). Remote Sensing Digital Image Analysis: An introduction 4th ed. Springer. ISBN: 3540251286
Lillesand & Keifer, (2000) "Remote Sensing and Image Interpretation", Published by Wiley and Sons ISBN 0-471-45152-5

Departmental Modules

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL: 151: ENVIRONMENTAL STUDIES I

Hours per week: 1

Objective:

To develop students ability to address the social, economic and political impacts on resource management and exploitation. On completion of this subject, students should be able to:-

1. Explain ecological concepts such as environment, limiting factors, habitat and niche; explain the role of natural selections;
2. Explain various kinds of organism, community and ecosystem interactions, especially concerning energy flow and nutrient cycling;
3. Define the use of an environmental impact statement.

Syllabus:

Human impact on the environment; Resource exploitation, side effects of resource exploitation, social; political impact aspects of resource exploitation, Environmental impact statements.

Reference:

Ender, D.E., et al, Environmental Science, W.C. Brown, 1989.

Assessment:

Continuous assessment - 100%

SL 152: ENVIRONMENTAL STUDIES II

Hours per week: 1

Objective:

To expand students knowledge in addressing the impact of resource development. On completion of this subject, students should be able to:-

1. Analyse an ecosystem;
2. Explain succession and give examples of the characteristics of the major biomes of the world.;
3. Demonstrate an understanding of political, economic and environmental impact of various forms of deforestation on both global and local scale, especially as it relates to the lives of local people;
4. Demonstrate an understanding of global

warming and its impact everywhere.

Syllabus:

Limiting factors, habitat and niche; Natural selection, organism (predator/prey), community and ecosystem interactions, energy flow and nutrient cycling (carbon cycle); Analysis of an ecosystem; Succession, the major biomes of the world. The political, economic and environmental impact of various forms of deforestation at both a global and local scale in PNG. The Barnett report. Global warming, its impact locally and globally.

Reference:

Enger, D. E., et al, Environmental Science, W.C. Brown, 1989.

Assessment:

Continuous assessment - 100%

SL 203: AUTOMATED SURVEYING I

Hours per week: 3 (1,2)

Objective:

To introduce students to theory and basic techniques in the acquisition and processing field data using automated survey systems in plane surveying. On completion of this subject, students should be able to:-

1. Assess a Total Station for calibration and construction errors;
2. Perform basic error analysis;
3. Manual acquisition, recording and processing of field data.
4. Acquire, download and process field data using data loggers.
5. Edit and prepare final plots.

Syllabus:

Principles and use of EDM for short and medium range measurement

Automated Surveying: the use of relevant computer hardware and software requirements, creation of job files and extensions

Total stations, their types care, use and adjustments, raw data acquisitions, downloading and editing of field data, stringing and feature coding, hardware and software requirements;

surveying and associated software packages, digital terrain modeling, types of plotters and their requirement, preparation of plot parameter files, preparations and printing of final plan, preparations title blocks.

Textbook:

Bannister, A., and Raymond. S., Surveying, Pitman, latest edition, London.
Shepherd, F.A., Surveying Problems and Solutions, Arnold, latest edition, London.

Departmental Modules.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 204: AUTOMATED SURVEYING II

Hours per week: 3 (1,2)

Objective:

To introduce students to a more advanced techniques and specialised equipment and expand their knowledge in automated surveying. On completion of this subject, students should be able to:

1. Read and edit raw data files.
2. Edit survey plots and associated files.
3. Create longitudinal and cross section plots to carryout road design.
4. Demonstrate the creating and editing of existing files to carry out sub-divisional, road and drainage design.
5. Transfer Civilcad plot file to other CAD packages.

Syllabus:

Field data acquisition, down loading, processing. editing and manipulation of raw data files. Creation, editing of plot and DTM files, conversion of files to AutoCAD and other mapping packages, design of subdivisions, roads and drainage.

Preparation of plot parameter files, preparations and printing of final plan, preparations title blocks. Resection and trilateration techniques of co-ordinating points. Uploading of data from the

computer to data recorder.

Textbook:

Bannister, A., and Raymond. S., Surveying, Pitman, latest edition, London.
Shepherd, F.A., Surveying Problems and Solutions, Arnold, latest edition, London.

Departmental Modules.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

**SL 205: INTRODUCTION TO
ENGINEERING SURVEYS**

Hours per week: 3 (1,2)

Objective:

This subject will expand the student's knowledge in more specialised areas of plane surveying. On completion of this subject, students should be able to:-

1. Assess any survey instruments for calibration and construction errors;
2. Perform basic error analysis;
3. Document the application of quality control to surveying;
4. Observe precise levelling network;
5. Observe and compute trigonometric levelling;
6. Set out basic engineering works and computations required to determine volumes of earthworks;

Syllabus:

Adjustments and calibration of instruments. Interpretation of plans. Theory, detection and analysis of errors in survey measurements. Accuracy specifications.

Survey procedures and operations. Quality control of surveys. Precise levelling and trigonometric heighting. Engineering construction surveys and computations, setting out building sites, horizontal and vertical curves.

Textbook:

Bannister, A., and Raymond. S., Surveying,

Pitman, latest edition, London.
Shepherd, F.A., Surveying Problems and Solutions, Arnold, latest edition, London.
PNG Department of Works, Standard Survey Instructions.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 206: INTRODUCTION TO GLOBAL POSITIONING SYSTEMS

Hours per week: 2 (1,1)

Objective:

To introduce students to the theory and basic techniques in using Global Positioning Systems in surveying and mapping. On completion of this subject, students should be able to:-

1. Explain the differences between the various types of GPS receivers
2. Explain the basic principles of Global Navigation Satellite Systems (GNSS).
3. Explain the major segments of GPS.
4. Carry out field observations using handheld GPS receivers.
5. Carry out co-ordinate transformation from geographic to grid.
6. Explain the theory of map projections;
7. Explain concepts of great circles and small circles;
8. Develop comprehension of the earth's spherical and plane co-ordinates system;
9. Use the major maps projections, and their characteristics;
10. Undertake basic graphical construction of major map projections

Syllabus:

Principles and use of Global Navigation Satellite Systems. History of surveying by satellites. GPS technology; GPS constellation, control system, orbit characteristics, Federal navigation plan, signals, datum. GPS data; position and time, receiver position, velocity and time, carrier phase tracking, source of error. Geometric dilution of precision; position, horizontal and vertical components and time.

Observation techniques; static, rapid static, stop-and-go, kinematic, real time kinematic, on the fly ambiguity resolution.

Field observations using hand held GPS receivers.
Basic coordinate systems and geodetic datums.
Map Projections: Earth's form and dimensions, basic graphical construction of conic, Mercator and azimuthal projections advantages and disadvantages. Basic theory of UTM, its construction and use as a mapping projection.

Textbook:

Bannister, A., and Raymond. S., Surveying, Pitman, latest edition, London

Departmental Modules

Reference:

Clark, D., Plane & Geodetic Surveying, Vol.1,2, Constable, latest edition, London.
Departmental Modules.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 208: CADASTRAL SURVEYING II

Hours per week: 2 (1,1)

Objective:

This subject will introduce students to practical aspects of cadastral surveys, use of total stations and associated software packages. On completion of this subject, students should be able to:-

1. Perform cadastral surveying;
2. Acquire and process field data using total stations and associated software packages;
3. Carry out azimuth observation using GPS and;
4. Carry out a small sub-divisional survey;
5. Apply standards specified in the Survey Direction, 1990.

Syllabus:

Property surveys: Observational procedures and records of property surveys, location and resurvey of old boundaries. Excess and shortages. Obtaining azimuth; between fixed points, sun observation theory and practical and GPS observation.

Accuracies different classes of surveys. Maintaining accuracy. Field notes, standards, reductions. Setting out marks. Small sub-divisional design, and setting-out. Road reserve surveys.

Textbook:

Department of Land and Physical Planning, Survey Directions, Port Moresby, D.L.P.P, 1990.

Departmental Modules.

Reference:

Bennet G.C., & Freislich J.G., Field Astronomy for Surveyors, NSW University Press, Sydney, 1979.

Willis, R.W., Notes on Survey Investigation, Registrar General of NSW, Sydney, 1982.

Manual of Total stations and software packages and Global Positioning Systems.

Plan examination; noting, field books, survey calculations, standard specifications, azimuth and coordinate datums...etc.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 213: GEOGRAPHIC INFORMATION SYSTEM

Hours per week: 6 (2,4)

Objectives:

On successful completion of this unit students will be able to:-

1. Understand the concept of spatial and geographic information systems.
2. Be aware of the applications of GIS to a wide range of circumstances and understand the potential of GIS for information management and analysis.
3. Have a basic familiarity with a GIS software package.
4. Be capable of preparing an initial design and identifying the information requirements for a geographic information system.

5. To perform basic spatial data modeling and analysis.

Syllabus:

Concepts of information systems and information management. Management of spatial information and sources of GIS data. Hardware and software components of GIS. Capture and conversion of spatial data for a GIS. Analysis and modelling technique using geographic information systems. Preparation of products from GIS output, cartographic elements of map. Availability of spatial data, data quality, assessment of data accuracy. Interpolation of spatial data, classification of geographical data sets. Designing and managing a geographic information system, choosing a GIS. Advances in information system technology decision support system and expert systems. Applications of GIS.

Textbooks and Materials:

SL213 Geographic Information Systems, study notes, Departmental Publication.

References:

Students will be referred to appropriate reference material during the study.

Assessment:

Continuous Assessment	- 50%
Written examination	- 50%

SL 214: REMOTE SENSING

Hours per week: 6 (2/4)

Objective:

To provide the students with theoretical and practical knowledge of remote sensing and its applications. On completion of this subject, student should be able to:

1. Assess the practicality of utilising remotely sensed data in applications;
2. Provide specifications for the ordering of remotely sensed data from international and local agencies;
3. Differentiate between the various available data sets, their accuracies, applications and appropriateness;

4. Be familiar with the concepts and basic operations in digital image processing;
5. Have basic hands on experience with a typical image processing system.

Syllabus:

Overview of remote sensing technology and its applications; Visual interpretation of satellite imagery, Microwave Remote Sensing, thermal infrared Remote Sensing, colour infrared imagery, image processing and conventional photography; Basic digital image processing; use of data in GIS and mapping; satellite platforms, spectral signatures and field truthing; PNG applications.

Data Processing: Initial data statistics, Radiometric and Geometric Corrections, Elements of image interpretation, Visual and digital interpretation techniques, their advantages and Limitations, Ground truth Collection.

Applications: Mapping and non-mapping applications, Integration with GIS. Application in PNG.

Textbook / References:

Richards, J. A. and X. Jia (2005). Remote Sensing Digital Image Analysis: An introduction 4th ed. Springer. ISBN: 3540251286

Lillesand & Keifer, (2000) "Remote Sensing and Image Interpretation", Published by Wiley and Sons ISBN 0-471-45152-5

Aronoff, S. (2005). Remote Sensing for GIS Managers. ESRI Press.

Departmental Modules

Reference:

Appropriate references will be provided in class. Computer aided Learning, What is Remote Sensing, AKCLIS, 1994.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

**SL 221: INTRODUCTION TO LAW,
LAND STUDIES**

Hours per week: 3 (2, 1)

Objective:

To introduce students to the legal system and laws in PNG; with particular emphasis on the surveying profession.

The principle objective is to acquaint students with an introductory knowledge to legal institutions and procedures relating to land use and surveying PNG.

Syllabus:

The Nature of Law & Legal System - Definition
Origins and sources of Law, Constitutional Law and Constitutional Legislation, Functions and forms of Legislation, The legal system in PNG, Introduction to contract, Law of Land Use, Customary Law, Environmental Law, Land Title Laws etc., Introduction to Laws and Regulations for Surveyors

Textbook:

Chalmers, D.R.C. & Paliwala A.H., An Introduction to Law in PNG, The Law Book Company, 1984.

Miller, A.D., An Introduction to the Law of Land Use in PNG, Department of Lands, 1990.

Reference:

Revision of Laws of Papua New Guinea, Chapt. 185.

Assessment:

Continuous assessments - 100%

**SL 222: PRINCIPLES OF CADASTRAL
SURVEYING**

Hours per week: 5 (2,3)

Objective:

To provide students with an understanding of land and land tenure systems, the provisions of registration of customary land, & introduce them to the legal basis of property surveys, laws and regulations for surveyors. On completion of this

subject, students should be able to:-

1. Define and differentiate between the land tenure systems and customary land tenure systems in PNG and the Pacific;
2. Acquire and understand the concepts of property surveys and legalisation to registration of Land;
3. Document the organisation and operations of Departments of Land and Physical Planning;
4. Explain the surveyor's role in land and land dealings.

Syllabus:

Land Tenure: Man and the land, tenure systems, aims and achievement of tenure systems, customary land tenure systems in PNG and the Pacific.

Cadastral Survey Theory: Cadastral survey systems, survey directions, legal basis of property surveys, registration of customary land, surveys by certified measurers, survey examination. Organisation and operations of the Department of Lands, Laws and Regulations for Surveyors.

Textbook:

Crocombe, R., (ed), Land Tenure in the Pacific, London, Oxford, 1957. Reprinted by University of the South Pacific, 1977.

Department of Lands and Physical Planning, Survey Directions, DLPP, Port Moresby, 1990. Departmental Modules

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 235: GEODESY FOR GEOGRAPHIC INFORMATION SCIENCE

Hours per week: 2 (1,1)

Objectives:

To introduce students to basic concepts of geodesy, computations on the spheroid, computations in static and pseudo-static modes using GPS equipment. On completion of the subject, students should be able to:-

1. Explain the physical relationship between the geoid, spheroid and projections.

2. Carry out computation on the PNG Map Grid (PNGMG).
3. Carry out computation on the National spheroid.
4. Transform geographic co-ordinates to grid and vice versa.
5. Carry out GPS measurements using various techniques and compute co-ordinates from the data.

Syllabus:

Concepts of geodesy; size and shape of the Earth; geoid and ellipsoid; terrestrial, celestial and orbital co-ordinate systems; co-ordinate transformations; computations of positions in three dimensions; computations of positions on the ellipsoid and on a conformal mapping plane; azimuthal, conic and cylindrical projections, UTM; P.N.G.s horizontal and vertical datum; height determination.

Static and kinematic positioning with the Global Positioning System (GPS). Elements of inertial positioning; time systems; astronomic positioning; VLBI positioning; orbit computations; satellite laser ranging. Horizontal, vertical and three-dimensional networks; pre-analysis and post-analysis; theory of heights; gravimetry; global and local geoid determination; astrogeodetic, gravimetric and combined methods; levelling by GPS and the geoid.

Textbooks and Materials:

Departmental Course Module.,

References:

As prescribed by the subject lecturer

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 241: MAP PROJECTIONS AND GEO-REFERENCING

Hours per week: 2(1,1)

Objectives:

After completing this subject, the students should be able to:-

1. Garner a good understanding of the theory and mathematical principles of map projections.
2. Construct a map frame using a particular projection.
3. Use geo-computation software to do geodetic computations.
4. Understand the different geo-referencing systems used in maps and GIS.

Syllabus:

Introduction to map projection; mathematical principles, terminology. Types of projection; azimuthal, conic and cylindrical projections. Special emphasis to Mercator's, Universal Transverse Mercator's, Lambert Conical Conformal, Polyconic, Mollweide's, PNG's map projection. Geodetic computations. Geo-referencing systems.

Textbooks and Materials:

Departmental course modules

References: To be provided by the teacher

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 251: FIELDWORK I

Hours per week: One week

Syllabus:

This fieldwork forms an essential part of the study of geography. Appropriate practical work is indicated by the general objectives of geography courses. The equivalent of one-week field excursion & fieldwork is undertaken during the second semester.

Assessment:

Continuous assessment - 100%

SL 263: CARTOGRAPHY I

Hours per week: 3 (1/2)

Objective:

On completion of this subject, students should be able to:-

1. Document history & development of their profession;
2. Be proficient in map reading;
3. Explain the principles of map projections & their applications;
4. Define the principles of conventional cartographic techniques;
5. Document the principles of computer graphics & electronic publishing systems.

Syllabus:

History of Cartography and Mapping; The Cartographic & Mapping Professions; Map Reading & Utilisation; Map Projections; Principles of Manual Cartographic Artwork & Reprography; Computer Graphics & Electronic Publishing.

Reference:

Robinson, H.A., et.al, Elements of Cartography, 1984.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

Students must pass both assessment components.

SL 264: CARTOGRAPHY AND COMPUTER DRAFTING

Hours per week: 6 (2,4)

Objectives:

On completion this subject, students should be able to:-

1. Undertake map and survey plan design and layout
2. Skilfully plot and cartographically enhance all types of survey plan from field notes according to specifications using applied and generic CAD system.
3. Demonstrate a good understanding of the theory and mathematical principles of map projections.
4. Construct a map frame using a particular projection.

5. Use geo-computation software to do geodetic computations.
6. Understand the different geo-referencing systems used in maps and GIS.
7. Demonstrate theoretical and practical knowledge of topographic mapping processes.
8. Digitally produce and publish topographic map on CAD and map publishing systems.
9. Develop understanding of map printing technologies.

Syllabus:

Overview of CAD/CAM Systems hardware & software components; Basic drawing/graphic elements, text, edit and element manipulation functions; Introduction to map projection; Concepts of geodesy; size and shape of the Earth; geoid and ellipsoid; mathematical principles, terminology. Types of project; azimuthal, conic and cylindrical projections. PNG's map projection. Geodetic computations. Geo-referencing systems. Preparing the system for drawing; Creating a drawing on the system; Use of reference manual and context help; PNG survey plan drafting standards and plan drawing; Cadastral mapping system of PNG; digital topographic mapping; Preparation of Base map from Survey of PNG Toposheet: Morphometric analysis, Relative Relief (RR), Dissection Index (DD), Ruggedness Index (RI), Average Slope (S), Drainage Density (DD), Stream Order (μ), Bifurcation Ratio (Rb); Electronic publishing; Map and plan printing technologies

Textbooks and Materials:

Departmental Course Modules

Reference:

As prescribed by the subject lecturer

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 281: GEOGRAPHY I

Hours per week: 2 (1, 1)

Objective:

On completion of this subject, students should be able to:-

1. Explain general physical geography of the world and PNG;
2. Define interrelationship of terrain, climate, geology, soil & vegetation;
3. Document the processes which have formed the physical environment;
4. Explain identification of common landforms from maps, photographs, diagrams and in the field.

Syllabus:

An Introduction to geographical study, main physical elements of the world's and PNG's physical landscapes and environments including examination of interrelationships between terrain, climate, geology, soil and vegetation. A compulsory full-day field excursion will be held mid-way through the semester.

Textbook:

Briggs, D. & Smithson, P., Fundamentals of Physical Geography, 1985.

Reference:

Students will be referred to appropriate material during the lectures.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 282: GEOGRAPHY II

Hours per week: 2 (1,1)

Objective:

On completion of the subject students, should be able to:-

1. Explain basic human, settlement and economic geography of the world and PNG;
2. Explain global and PNG's perspective on population, resources, culture and settlement systems;
3. Demonstrate contrasts between western and non-western societies in the Asia-Pacific region.

Syllabus:

Geographical Studies in Human, Settlement and Economic Systems: Global perspective on population, resources, culture and settlement systems; Human-environment relationships and spatial analysis; population & resources, cultural geography & settlement systems. Special attention is paid to contrasts between western and non-western societies in the Asia-Pacific region.

Textbook:

De Blij, H.J. and Muller, P.O., Human Geography: culture, society and space, Wiley, 1996.

Reference:

Students will be referred to appropriate material during the lectures.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 304: INTRODUCTION TO GEODETIC SURVEYING

Hours per week: 3

Objective:

To introduce students to basic concepts of geodesy, calculate on the spheroid and carry out measurement and computations in static and pseudo-static modes using GPS equipment. On completion of this subject the students should be able to:

1. Explain the physical relationship between the geoid, spheroid and Projections;
2. Explain the properties of a spheroid;
3. Document and explain the requirements and techniques involved in establishing higher order control network;
4. Carry out computation on the Australian Map Grid (AMG)

Syllabus:

Concepts of geodesy, the geometry of the spheroid. The figure of the earth. Geodetic surveying specifications, horizontal and vertical control. Mapping surveys, photo control, remote sensing. Introduction to Projections, the Universal

Transverse Mercator (UTM) Projection. The Australia Map Grid calculation of convergence, scale factors for line, point etc., Primary traversing. Establishment of higher order control surveys. reconnaissance, error propagation. Short line computations: traversing on PNG94.

Textbook:

Bannister, A and Baker, R., Solving Problems in Surveying, Longman Scientific and Technical, J. Wiley & Sons, Inc., New York.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 305: CONSTRUCTION SURVEYING

Objective:

To expand students knowledge in the applications of the principles and techniques for construction surveying as applied to a range of engineering projects.

1. Carry out control networks observation using conventional techniques and GPS observations;
2. Explain the contractual arrangements between the client and contractor.
3. Explain the planning stages in the execution of such surveys.

Syllabus:

Precision engineering surveys; planning, designing, calculation and setting out surveys of roads, drainage, pipelines and transmission lines. Calculation and setting out transition, compound horizontal and vertical curves. Contractual arrangements. Road reserves calculations and pegging; roads of equal and varying widths.

Textbook:

Bannister, A., and Raymond. S., Surveying, Pitman, latest edition, London
Departmental Modules

Reference:

Clark, D., Plane & Geodetic Surveying, Vol.1,2,

Constable, latest edition, London.
Departmental Modules.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

**SL 306: ADJUSTMENT OF SURVEY
MEASUREMENTS**

Hours per week: 3 (2, 1)

Objective:

To provide the students with extended knowledge of analysis and adjustments of survey measurements and stochastic techniques in surveying and mapping. On completion of the subject, students should be able to:

1. Explain the theory of least square adjustments, having one variable or multi-variables.
2. Apply Matrix algebra.
3. Apply weights to survey measurements.
4. Carry out adjustments of Indirect Observation and Adjustments by observation techniques

Syllabus:

Matrix algebra; transpose, inverse. Theory of least squares. Distribution Least square adjustments, adjustment of indirect observation and adjustment by observation methods. Adjustments of correlated and uncorrelated observations; distances, angles and levelling.

Textbook:

Bannister, A and Baker, R., Solving Problems in Surveying, Longman Scientific and Technical, J. Wiley & Sons, Inc., New York.
Departmental Modules

Reference:

Clark, D., Plane & Geodetic Surveying, Vol.1,2, Constable, latest edition, London.
Departmental Modules.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 313: PHOTOGRAMMETRY

Hours per week: 3 (1,2)

Objectives:

On completion of the course, the students will be able to:-

1. Gain basic knowledge and skill of airphoto interpretation.
2. Make measurements on the air photos.
3. Use parallax bar and pocket stereoscope to measure distances on the airphotos.
4. Carry out field truthing to assess the accuracy of interpretation and measurements.

Syllabus:

Overview of Aerial photography, aerial camera technology, manual photo interpretation, Principal Photogrammetric activities, Aerial photo scale, Elements of visual interpretation from air photo, Height from single photo, measurement and feature extraction, Stereoscopy, Parallax, 3-D airphoto interpretation and measurement, applications of photography, accuracy assessment. Concept of soft copy photogrammetry

Textbooks and Materials:

Departmental Course Modules.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 316: DIGITAL IMAGING PROCESSING

Hours per week: 4 (2, 2)

Objectives:

At the end of the course, students should be able to:-

1. Develop and overview of the field of image processing.
2. Undertake the fundamental analytical/numerical image processing algorithms and how to implement them.
3. Gain practical experience in applying image-processing algorithms to real world problems.

Syllabus:

Basic physical principles of Electro-optical, infra-red and microwave remote sensing; space- and air-borne sensor systems, active and passive sensors; properties of digital image data; radiometric processing including correction of instrumental artifacts and atmospheric corrections; geometric corrections and registration. Concepts of terrain extraction from space-borne sensors. Image statistics. Radiometric enhancement including histogram matching; Fourier representation of image data; image pyramids; geometric enhancement including spatial filtering, edge detection and enhancement; multi-spectral transformations including IHS, principle component analysis and vegetation indices; overview of remote sensing image interpretation; thematic classification and clustering; supervised classification including minimum distance and maximum likelihood classification; accuracy assessment of classification.

Textbooks and Materials:

Departmental course module.

References:

Appropriate references will be prescribed by subject lecture.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 317: SPATIAL MODELLING AND ANALYSIS

Hours per week: 3 (1,2)

Objectives:

1. Recognise the importance of spatial analysis and modelling for GIS applications;
2. Define the concepts and techniques involved in spatial analysis and modelling;
3. Choose and apply appropriate analytical operations and techniques needed for a particular GIS/LIS applications;

4. Make appropriate use of a GIS software supporting spatial analysis and modelling functions; and
5. Critically evaluate the relevance and validity of results from a specific spatial analysis and modelling task.

Syllabus:

Topics include: spatial statistics; overlay analysis; map algebra and cartographic modelling; spatial interpolation; surface analysis and terrain modelling; proximity analysis; network analysis; fuzzy sets; and spatial analysis issues and trends. Emphasis will be placed on how spatial analysis and modelling is used in practical applications, and as a functional component of a modern GIS. Use of GIS software to demonstrate and reinforce the various analytical and modelling concepts.

Textbooks and Materials:

Departmental Course Module

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 318: GEO-VISUALISATION

Hours per week: 4 (1,3)

Synopsis:

Principles, functions and components of GIS, characteristics of spatial data, their representation, issues in developing, implementing and using various types of GISs. Laboratory sessions will focus on acquiring basic skills using GIS software with real data.

Objectives:

On successful completion of this unit students will be able to:-

1. develop an understanding of the concepts, theory and issues involved in the development of GIS applications
2. develop an appreciation of the processes involved in the development of GIS applications

3. develop an appreciation of the various applications of GIS
4. develop an understanding of how GIS can be used to solve geographic problems
5. develop skills in the use a GIS software (MapInfo)
6. develop skills in the visualization and analysis of geographic information

Syllabus:

Introduction to concepts and principles of GIS, the functions and components of GIS, Characteristics of spatial Data, Representation of geographical phenomena, methods of data capture and data conversion, sources of data and issues of accuracy, data manipulation and making data useable, basic spatial analysis, GIS output, visualization and presentation

Textbooks and Materials:

SL318 Geo-visualisation, Departmental Course Module.

References:

Geographic Information Systems and Science (2nd Ed), (2005), Longley, P. A., Goodchild, M.F., Maguire, D.J., and Rhind, D.W., John Wiley and Sons Ltd, Chichester

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 321: STATISTICS FOR SURVEYING AND MAPPING

Hours per week: 3 (2, 1)

Objective:

To provide the students with extended knowledge of statistical and stochastic techniques in surveying and mapping. On completion of the subject, students should be able to:-

1. Apply statistical tests to data to assess precision and accuracy of single and groups of linear measurements;
2. Use partial differentials to derive error analysis of linear and non-linear functions;
3. Apply statistical methods for the definition of

specifications;

4. Apply basic statistical analyses for thematic mapping and spatial data aggregations, generalisations and polygon manipulations.

Syllabus:

Types of error. Measures of central tendency and dispersion. Propagation of systematic error, grouping of data propagation of random errors, the normal and t distribution; confidence limit and rejection of observations. The Chi-square and F distribution and acceptance of observations. Planning of survey measurements to achieve a specification. Aggregation, generalisation and dispersion theory for spatial data sets. Use of partial differentiation and the propagation of random errors,; introduction to least squares.

Reference:

Cooper, M.A.R., Fundamentals of Survey Measurement and Analysis.

Departmental Module

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 322: DATABASE MANAGEMENT

Hours per week: 3 (1,2)

Objectives:

On completion of the subject students will be able to:-

1. Construct database files
2. Create query and view files and demonstrates their uses.
3. Design and write programs using the database.
4. Evaluate the application of database technology for a given situation.
5. Determine the most suitable database structure for a given application.

Syllabus:

Introduction to database. Entities and attributes; conventional files Vs database, characteristics of database; Introduction to database design, logical database design and data mode; database system

design approach; The hierarchical database, the network database, the relational database. Introduction to SQL (Structural Query Language) to retrieve information and update database. Integrity and security of database.

Textbooks and Materials:

Departmental Course Notes.

Bradley, J., Introduction to Database Management in Business, Second Edition, Holt Riverhart & Wilston, New York, 1987.

References:

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 323: GEO-PROCESSING AND STATISTICS

Hours per week: 4 (2,2)

Objectives:

At the end of the course, students should be able to:-

1. Acquire knowledge in the applications of geo-processing and statistics in various fields.
2. Develop in-depth skills and an advanced understanding of the concepts behind modern tools for detecting, describing and estimating spatial patterns and trends.
3. Select appropriate technique to model spatial patterns and trend.

Syllabus:

Exploratory Data Analysis: Statistical summarisation, analysis; mapping of the data set, histogram and probability distribution, correlation in multivariate data, data transformations (logarithmic, indicator, normal-score, rank-order); software use and applications. Quantification of Spatial Continuity: Calculation of experimental variograms, fitting models to experimental variogram, concepts of anisotropy and nested structures in variograms, other techniques for defining spatial variability (indicator, covariance), spatial co-variability of multiple variables; application of basic variogram analysis and

modelling software. Spatial Estimation (Kriging): Review of techniques available for spatial estimation, explanation of the concepts of a 'best' linear unbiased estimate, introduction to the Kriging system of equations, use and misuse of Kriging variance, application of basic Kriging software. Stochastic Simulation: Simulation vs. Kriging, adaptation of the Kriging system of equations to simulation, theory and application of basic gaussian and indicator simulation algorithms. Scaling and Sample Support: Impacts of discrepancy between measurement and estimation scales; examples of the effects of scale, accounting for scale discrepancies with analytical techniques, numerical techniques for addressing scale issues (block Kriging, averaging techniques). Application of Analysis of Uncertainty: Concepts of probability of exceeding a threshold value and probability mapping, incorporation of spatial uncertainty into predicted outcomes of physical processes and human activities; creating probability maps through estimation versus simulation

Textbooks and Materials:

Departmental course module,

References:

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 332: VALUATION FOR SURVEYORS

Hours per week: 2 (1, 1)

Objective:

To provide surveying students with an understanding of the general principles of property valuation, the relevance of sales as evidence of value, methods and mathematics of the valuation of various interests in land.

Syllabus:

Economic theories of value, supply and demand, diminishing returns, highest and best use. Purposes of valuation: the valuation profession. Methods of valuation; inherent and external factors

affecting value, direct comparison, summation, capitalisation of profits. Analysis of sales to establish units of comparison, application of units of comparison. Interest in land and the mathematics of valuation. Statutory Valuation - Land Taxation concepts, introduction to compensation for compulsory acquisition.

Reference:

Rost, R.O. and Collins, H.G., Land Valuation and Compensation in Australia, Australian institute of Valuers, Sydney, 1977.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 342: FIELD TRIPS II

Hours per week: Two weeks full time

Syllabus:

Carry out field exercise in control surveys and computations on the spheroid. Trigonometric heighting.

Assessment:

Continuous assessment - 100%

SL 352: FIELDWORK II

Hours per week: One week full time

Objective:

This fieldwork is an essential part of SL364 and SL316 which is aimed at giving the student practical experience in Field Data Collection and verification techniques of gathering and processing remote sensing data and for thematic mapping.

Syllabus:

Practical work in design of household & field surveys, implementation, analysis and presentation of the results.

Assessment:

Continuous assessment - 100%

SL 364: CARTOGRAPHY II

Hours per week: 6 (2,4)

Objectives:

At the end of the course, students should be able to:-

1. Intelligently discuss the theoretical and cognitive issues of cartography.
2. Fluently discuss thematic mapping processes.
3. Skilfully use GIS to create cartographic database and cartographic products.

Syllabus:

Cartographic Communication V's Visualisation and semiology, Cognitive issues in cartography. Spatial arrangement of geographic phenomena, levels of measurement, visual variables, thematic mapping techniques, Statistical and graphical foundation, Data classification, the theory of colour and colour schemes for maps, Bivariate and multivariate mapping, data exploration, animation and electronic atlases.

Textbooks and Materials:

SL364 Cartography II, Departmental Course Module:

References:

Terry, A., Slocum, 1998, Thematic Cartography and Visualisation, Prentice Hall, Upper Saddle River, New Jersey 07458, (ISBN 0-13-209776-1)

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 401: SURVEYING V

Hours per week: 10 (5, 5)

Objective:

To expand students knowledge in space geodesy, global positioning systems and introduce them to least square adjustments. On completion of this subject, students should be able to:-
Carry out control network observation using GPS;
Perform least square adjustments by indirect and

direct observation methods.

Syllabus:

Satellite geodesy. Global Positioning Systems (GPS), Orthometric heighting, deformation monitoring, Transfer of tidal information, acquisition, analysis and adjustment of GPS data. Least square adjustments, adjustment of indirect observation and adjustment by observation methods.

Reference:

Clark, D., Plane & Geodetic Surveying, Vol.1,2, Constable, latest edition, London.
Departmental Modules.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 402: SURVEYING VI

Hours per week: 10 (5, 5)

Objective:

To introduce and expand students' knowledge to a more specialised fields in surveying. On completion of this subject, students should be able to:-

1. Carry out precision engineering surveys;
2. Explain the inertial survey systems;
3. Carry out various surveying techniques involved in surface and underground mining operations and evaluate the advantages and disadvantages of each technique;
4. Explain the general purpose of conducting hydrographic surveys and various components in facilitating the survey to be carried out.

Syllabus:

Precision engineering surveys. Inertial surveys systems. Mining surveys. Hydrographic surveying.

Textbook:

Departmental Modules.

Reference:

Ingam, A. E., Hydrography for the Surveyors and Engineers, Granada, latest edition, London, 1984.

Wells, D., (Comp.), Guide to Position Fixing New Burns wick, G.P.S. Association, Canada, 1986.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 413: MANAGING GIS/RS PROJECTS A

Hours per week: 3 (1, 2)

Objective:

On completion of this subject, students should be able to:-

1. Explain and apply critical path methods in GIS/RS projects;
2. Explain and utilize project planning, scheduling and costing;
3. Document quality control issues in work environment.

Syllabus:

Overview of management aspects of GIS/RS projects including; user needs analysis, institutional and organisational aspects, GIS & RS system selection; Project Planning including; design, production planning, critical path analysis, work scheduling, costing, controlling and progress reporting.

Textbook:

Departmental Module

Reference:

Students will be referred to appropriate reference material during the lectures.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 414: MANAGING GIS/RS PROJECTS B

Hours per week: 3 (1, 2)

Objective:

On completion of this subject, students should be able to:-

1. Discuss the professional working environment and services in the Spatial Information Technology industry;
2. Undertake contract negotiation & job tendering processes;
3. Apply basic management functions to work situations.

Syllabus:

Professional practice including; professional service, professional societies, standards & ethics, conditions & terms of engagement and level of fees, professional liabilities; Contract negotiation & job tendering processes;

Principles of Management including; planning, problem solving & decision making, organising, staffing, development & change, conflict & creativity, motivation, leadership & controlling.

Textbook:

Departmental Modules

Reference:

Appropriate references will be given in class

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 415: WEB CARTOGRAPHY GIS

Hours per week: 3 (1/2)

Objectives:

To introduce the fundamental principles of publishing map and GIS products on the World Wide Web (WWW). On completion of the subject students should be able to:

1. Explain how GIS functionality can be developed in local Intranet and the Internet.
2. Compare the strengths and weaknesses of different strategies in providing GIS functionality in the Web.
3. Choose and defend a strategy for developing Web-based GIS application.
4. Develop a Microsoft WWW server and design WWW home page for personal use

Syllabus:

Introduction to Web Cartography and GIS. The potential of map servers and Web GIS. Server-side and client-side strategies. Combination and hybrid strategies. Multimedia and interactive cartography. Virtual Reality, hand-held and mobile technologies. New tools and skills for cartographers and geographic information scientists.

Textbooks and Materials:

Departmental modules: SL415 Web Cartography and GIS

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 416: GIS APPLICATIONS AND DEVELOPMENT

Hours per week: 3 (1, 2)

Objectives:

On completion of this subject students should be able to:

1. Develop practical skills in the application of GIS technology to real environmental problems.
2. Design and develop prototype GIS for specific application. Student will develop practical experience in contemporary programming in visual basic for GIS customisation and development.

Syllabus:

Theory and practice of design, development and use of GIS for wide range of applications including; LIS, environmental management, natural resources, agriculture, business, etc.

Textbooks and Materials:

Appropriate reading material will given to individual student.

References:

Students will be referred to appropriate references during the class.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 417: DIGITAL PHOTOGRAMMETRY

Hours per week: 3(1/2)

Co-requisites/prerequisite:

Objectives:

On completion of the subject students will be able to:

1. Gain knowledge and skills in analytical/numerical photo restitution, block adjustment, digital terrain modelling and digital photogrammetric system.
2. Acquire knowledge in the principles of photogrammetric data capture and photogrammetric map compilation.
3. Orthophoto mapping
4. Digital Photogrammetry applications.

Syllabus:

History of photogrammetry, basic concepts of photogrammetry, Airborne, space and terrestrial data acquisition systems. Metric and non-metric cameras, digital cameras, linear sensors, and non-conventional imagery. Fundamental co-ordinate systems and mathematical relationships between image, model and object space. Direct and inverse problems of projective and similarity co-ordinate transformations. Correction of photogrammetric measurements. Geometry of vertical and tilted aerial photographs. The collinearity and coplanarity conditions; analytical space resection and space intersection. Interior and exterior orientation; relative and absolute orientation of single model; stereomodel formation and error analysis. Flight project planning. Multi-image processing, mathematical models for image-triangulation for strip and block adjustment including self calibration and direct geo-referencing. Concepts of terrain extraction from airborne sensors. Principles of digital photogrammetry, digital image acquisition, scanning and sampling; resampling, image enhancement; image matching, spatial filtering, stereo-vision techniques; digital rectification and

orthorectification and their error analysis.

Textbooks and Materials:

Departmental course notes.

References:

Moffit H., Francis and Mikhail, M., Edward, Photogrammetry, 3rd Edition, 1980, Harper & Row Publishers, New York.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 418: REMOTE SENSING APPLICATIONS

Hours per week: 3 (1/2)

Objectives:

On completion of the subject students should develop practical skills in the application of remote sensing technology to resolve real environmental problems.

Syllabus:

Application of satellite remote sensing technology; this include application in environment and earth resources management, topographic thematic mapping, physical and socio – economic planning, disaster mitigation and so on.

Textbooks and Materials:

Appropriate reading material will be given to individual student.

References:

Students will be referred to appropriate references during the class.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

**SL 423: GIS/REMOTE SENSING (RS)
PROJECT A**

Hours per week: 6

Objectives:

On completion of the project, the student should be able to:

1. Produce a well-constructed articulated research project proposal.
2. Discuss the research or project with the supervisor and make a final articulate verbal and written presentation of the proposal.
3. Demonstrate the ability to carry out a defined literature review on a subject or topic.

Syllabus:

Student to investigate and identify a project, outlines its goals, objectives and hypotheses if appropriate and research into the intellectual aspects of the project. This will involve: Development of a research or project proposal, literature reviews, set readings and abstracting; Data Collection and Fieldwork as appropriate; Data analysis; Project Planning and Design; Write-up and make a verbal presentation of the project proposal. The work will be undertaken with the guidance of a supervisor or supervisors, at least one of whom will be appointed from the academic staff of the Department. Sponsors and Supervisors external to the Department may also be involved.

Textbooks and Materials:

As prescribed by individual supervisor.

References:

As prescribed by individual supervisor.

Assessment:	Continuous assessment	- 100%
	Verbal	- 25%
	Written report	- 75%

**SL 424: GIS/REMOTE SENSING (RS)
PROJECT B**

Hours per week: 6

Objectives:

On completion of the subject students will be able to:

1. Develop the student's self-confidence in handling technical problems and/or situations in Geographic Information and Mapping Sciences.

2. Develop in the student those attitudes and personal skills necessary to "get the job done" within specified time and resource constraints which includes documentation to an appropriate professional standard.
3. Demonstrate the integration of all sections of the student's formal education and bring them to bear on a substantial task.
4. Provide the student's with opportunities to innovate by means of original design, analytical, experimental or research work and hence to demonstrate ability contributes to the disciplines of spatial sciences at a high level.
5. Provide experience in the presentation of technical work in the form of an academic dissertation.

Syllabus:

Prototype construction and testing. Simulation and modelling. Financial analysis. Project report and presentation. The work will be undertaken with the guidance of a supervisor or supervisors, at least one of whom will be appointed from the academic staff of the Department, Sponsors and Supervisors external to the Department may also be involved.

Textbooks and Materials:**References:**

Assessment:	Continuous assessment	- 100%
	Verbal	- 25%
	Written report	- 75%

**SL 426: APPLIED GEO-IMAGE
PROCESSING****Synopsis:**

Practical Applications of image processing for analysing images from both passive and active remote sensing systems. Techniques applicable to optical, thermal and microwave methods are covered but greatest emphasis is given to optical techniques. Emphasis is placed on gaining a practical understanding of the principles behind each method and a practical understanding of their appropriateness in different applications. Practical experience in the use of remotely sensed data and

image processing techniques will be gained using ER Mapper and other image processing software. Emphasis will also be placed on the importance of image interpretation

Objectives:

On completion of the course the student should be able to;

1. Apply knowledge on principles of remote sensing, sensors, how remotely sensed images are acquired, and methods of images processing to various applications
2. Understand and apply visual image interpretations
3. Undertake image enhancement and statistics
4. undertake image transformation and classification
5. Integrate remote sensing data with GIS
6. Undertake context analysis

Syllabus:

Overview of applications of remote sensing, visual interpretation, image rectification and restoration, image enhancement, image statistics, overview of digital image processes, RS and GIS integration, image transformation, image classification, context analysis

Textbooks and Materials:

Departmental course modules and Manual.

References:

Students will be referred to appropriate references during the class.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 437: SURVEY PRACTICE I

Hours per week: 2

Syllabus:

Relationships with clients. Management of a practice. Financial records. The professional institution and ethical behaviour. Business planning.

Textbook:

Blume K., Gibbons K. and Gill M., Surveyors and their Professional Liability, Sydney Institute of Surveyors, Aust. N.S.W. ,latest edition.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 438: SURVEY PRACTICE II

Hours per week: 2

Syllabus:

Forms of business organisation. Industrial awards. Employment legislation and the responsibilities of both employer and employee. Taxation and government fees. Decision theory and critical path methods.

Reference:

Tashjian Peter C., Business Organizations in PNG

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 442: FIELD TRIPS III

Hours per week: Two weeks camp.

Syllabus:

Test of competence and project field work to consolidate the year's work and to enable students to gain competence in the motor skills of instrument handling and the associated calculations.

Assessment:

Continuous assessment	- 100%

SL 457: SUBDIVISIONAL PRINCIPLES

Hours per week: 3

Syllabus:

Rural/urban relationships, Urban growth, planning

for needs of people, infrastructure standards and costs, allocation of space, zoning, plot and road design.

Textbook:

Venn J.N.B. (ed.), Manual of Residential 'A' Layout

Design, Papers of the Queensland Urban Design Advisory Council 1985 Seminar, U.D.A.C., Brisbane, 1985.

Darling Downs Institute of Advanced Education,

Land Development, Study Book I (Unit 77419), D.D.I.A.E., Toowoomba, Australia, 1989.

Reference:

Census Report

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SL 458: SUBDIVISIONAL DESIGN

Hours per week: 3

Syllabus:

Plot and road design. Subdivisional project for 2500-5000 people.

Textbook:

Venn J.N.B. (ed.), Manual of Residential 'A' Layout Design, Papers of the Queensland Urban Design Advisory Council 1985 Seminar, U.D.A.C., Brisbane, 1985.

Darling Downs Institute of Advanced Education, Land Development, Study Book I (Unit 77419), D.D.I.A.E., Toowoomba, Australia, 1989.

Reference:

Census Report

Assessment:

Continuous assessment - 100%

SL 467: PROJECT I

Hours per week: 6

Objective:

Students propose and discuss the research topic approved by the Head of Department with the supervisor and submit the final proposal. The progress of work is discussed under the supervision of academic staff on a regular basis. On completion of the subject the student should be able to:-

1. Produce a well constructed research proposal;
2. Conduct a Departmental seminar on the selected topic;
3. Demonstrate the ability to carry out a defined literature review.

Syllabus:

Development of a research proposal, literature review and abstracting, data collection techniques, field work as appropriate; set readings.

Assessment:

Continuous assessment - 100%

SL 468: PROJECT II

Hours per week: 6

Objective:

The objective of the subject is to produce appropriate project outcomes. These will include a significant report and a departmental seminar. The student must demonstrate a capacity to convert the first semester data collection and literature review into a well constructed and clear report.

Syllabus:

Data analysis, presentation techniques, research methods and project management skills. Project will be presented in a seminar and in report form including maps and computer demonstrations as required.

Reference:

Students will be referred to appropriate references during the project.

Assessment:

Continuous assessment - 100%

SV 233: SURVEYING FOR PROPERTY MANAGERS

Hours per week: 4 (1, 3)

Objective:

To provide a basic knowledge of surveying principles and skills in reading, surveying measurements and calculation and basic drafting. On completion of this subject, students should be able to:-

1. Carry out, adjust and calculate a tape and compass traverse;
2. Calculate areas (by calculation/ plani-meter;
3. Prepare a reasonable diagram of the survey carried out;
4. Make use of maps at various scales.

Syllabus:

Measurements, compass and pace, tape, chain traversing. Types of meridian, declination, variation, Bowditch (graphical and numerical) adjustment. Coordinate, area calculations. Determination of area by planimeter. Introduction to elementary drafting. Map reading.

Textbook:

Departmental Modules.

Reference:

Montgomery, D., Compass Surveying: A guide for Land Settlement Officers, DLPP, Port Moresby, 1979.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SV 234: GEOGRAPHIC INFORMATION SYSTEMS & REMOTE SENSING

Hours per week: 4 (1, 3)

Objective:

The participants should learn the basic use of the

tools of simple Geographic Information Systems (GIS), databases and Remote Sensing to enable more efficient and effective management of land.

After having completed the course the participants should be able to demonstrate an understanding of some of the applications of GIS and Remote Sensing.

The participants should be able to design a database, input, manipulate, manage and output a variety of data both descriptive and spatial.

Syllabus:

The course will be taught using a variety of methods with an emphasis on "hands-on" use of the computers.

Principles and concepts of GIS and remote sensing; basic use of PC based GIS & Information Systems.

Reference:

Sabins Floyd F. Jr., Remote Sensing Principals and Interpretation, 2nd edition, Freeman & Co., New York, 1987.

Understanding GIS, the ARC/INFO Method, ESRI, Redlands, CA, 1990.

Software Manuals, handouts and on-line help.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SV 291: SURVEYING FOR ENGINEERS I

Hours per week: 3 (1, 2)

Syllabus:

Spirit levelling. Contouring, Long and cross sections, cut and fill. Areas and volumes for earthworks. Tape and compass traverse.

Textbook:

J. Uren and W.F. Price, Surveying for Engineers, MacMillan, London, 1978.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SV 292: SURVEYING FOR ENGINEERS II

Hours per week: 3 (1, 2)

Syllabus:

Measurement of distance with bands, site plan preparation. Simple co-ordinate calculations. Measurement of horizontal and vertical angles. Traversing. Tacheometric surveying. Simple circular curves. Survey camp - Two weeks camp. Tests of competence and project field work to consolidate the year's work and to enable the student to gain competence in the motor skills of instrument handling.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SV 399: MINE SURVEYING

Hours per week: 4

Objective:

This subject introduces students to theory and techniques of surveying used in mining operations. Open cut or underground. On completion of this subject, students should be able to:-

1. Explain the terms used in a mining operation;
2. Explain the functions of a mine survey office;
3. Determine the position of bore holes/drill holes and calculate the angle of dip and the direction of an ore body, the collar and target positions;
4. Coordinate points and calculate areas and volumes of excavations;
5. Transfer vertical and horizontal datum from surface to under ground via various shaft plumbing methods;
6. Measure angles and distances using electronic theodolites and EDM Equipment.

Syllabus:

Definition of terms; main objectives of a survey office, underground environment, levelling of major drives and crosscuts, traversing methods and offsetting, slope and pay measurements, bore hole and drill holes surveys; shaft plumbing methods; co-planner, weisbach, weis, two shaft, use of gyro

theodolite; use of electronic theodolite and EDM's; methods of surveying, Field Management, Recording of results. Use of surveying software packages.

Textbook:

Mine Surveying Study Book, Darling Down, Institute of Advanced Education.

Reference:

Winiberg F., Mine Surveying, McMillan, London. Surveying Problems and solutions, latest edition, Arnold, London.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SV 411: PROFESSIONAL WORK EXPERIENCE

Duration: Whole of first semester

Prerequisite: Successful completion of BLSTIII

Objective:

Students will be placed in employment with a view to obtaining professional work experience in various areas of land management i.e., valuation, land administration and property management. The intention is that this exposure will lay a foundation of practice to which the students will be able to relate the more advanced studies of the second semester.

Assessment:

Continuous assessment - 100%

SV 442: PROFESSIONAL PRACTICE AND OFFICE MANAGEMENT

Hours per week: 4

Prerequisite: Successful completion of SV 400

Objective:

The objective of this course is to prepare students for professional practice as well as give them an

insight into the management of professional real estate practices. At the end of the course, the students should be capable of managing private consultancies as well as bidding and undertaking private assignments. The course is divided into two sections: Professional Practice, Office Management.

Syllabus:

Professional Practice

Scale of fees and professional charges, Professional Indemnity, Law involving land manager and client. Image and status, Bidding for consultancies, Negotiation skill development, Arbitration and Expert Witness;

Office Management and Procedures Management Concepts in real estate Office Administration Staff Recruitment and Training Trust Accounts, Management of records and accounting, Insurance, Cash flow and Credit.

Textbook:

Stapleton, J, Estate Management Practice, The Estates Gazette Limited, London, 1986.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

**SV 452: LAND DEVELOPMENT
MANAGEMENT**

Hours per week: 6 (3, 3)

Objective:

The objective of this subject is to give students an understanding of the land development process from both an economic as well as a political perspective. At the end of the subject, the students should be able to appreciate the role of the land manager and other professions in land development and property management in PNG.

Syllabus:

Structure, Operation and Control of Land Development, underlying politics and economic framework; Land Use Plans and Approval mechanism; Financial Aspects of Development Projects; Trends and prospects in housing

development; Project Development Process from inception to occupancy; role and importance of property management; legal and physical parameters governing the establishment, holding use and income generation of property assets; Property Maintenance, Project Management.

Textbook:

Cadman, Austin-Crowe, Property Development, 3rd Edition, 1990.

Reference:

Taylor, Development Site Evaluation, 1991.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SV 457: SUBDIVISIONAL PRINCIPLES

Hours per week: 3

Syllabus:

Rural/urban relationships, urban growth, planning for needs of people, infrastructure standards and costs, allocation of space, zoning, plot and road design.

Textbook:

Venn J.N.B., (ed.), Manual of Residential 'A' Layout Design, Papers of the Queensland Urban Design Advisory Council 1985 Seminar, U.D.A.C., Brisbane, 1985.

Darling Downs Institute of Advanced Education, Land Development, Study Book I (Unit 77419), D.D.I.A.E., Toowoomba, Australia, 1989.

Reference:

Census Report

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

SV 458: SUBDIVISIONAL DESIGN

Hours per week: 3

Syllabus:

Plot and road design. Subdivisional project for 2500-5000 people.

Textbook:

Venn J.N.B., (ed.), Manual of Residential 'A' Layout Design, Papers of the Queensland Urban Design Advisory Council 1985 Seminar, U.D.A.C., Brisbane, 1985.

Darling Downs Institute of Advanced Education, Land Development, Study Book I (Unit 77419), D.D.I.A.E., Toowoomba, Australia, 1989.

Reference:

Census Report

Assessment:

Continuous assessment - 100%

SV 464: INVESTMENT AND PROPERTY APPRAISAL

Hours per week: 6 (3, 3)

Prerequisite: SV 245, Financial Analysis

Objective:

The objective of this subject is to offer an in-depth understanding of the investment cycle, investment alternatives and the analysis of investment properties. At the end of the subject, the students should be able to differentiate between various risky projects and be able to undertake the analysis of property investments.

Syllabus:

Who invests in property, why invest in property, alternatives to property investment, is property good investment, measurement of risk, modern portfolio theory; investment principles and strategy; property investment financing and evaluation; property investment market; feasibility studies; market analysis; investment analysis (mortgage/equity, contemporary and modern

methods, effects of taxation etc.), introduction to risk and uncertainty; risk analysis applied to property; Computer applications.

Textbook:

Rowland, P.J., Property Investment and Their Financing, The Law Book Company Ltd, 1993.

Assessment:

Continuous assessment	- 50%
Written examination	- 50%

THE POSTGRADUATE PROGRAMS DETAILS

1. POSTGRADUATE DIPLOMA IN LAND STUDIES

(Surveying, Geographic Information Systems, Land Management) – the existing Postgraduate Program.

SPECIAL RULES FOR THE POSTGRADUATE DIPLOMA IN LAND STUDIES

GENERAL

In these rules, unless the contrary intention appears, the "Department" means the "Department of Surveying and Land Studies", the "Diploma" means the "Postgraduate Diploma in Land Studies" and the "Committee" means the "Higher Degrees Committee".

The Postgraduate Diploma in Land Studies award will show in brackets the field of specialisation i.e. Postgraduate Diploma in Land Studies (Surveying) Postgraduate Diploma in Land Studies (Geographic Information Systems) Postgraduate Diploma in Land Studies (Land Management).

The course of study and individual subject requirements must be done in consultation with the Head of Department

ADMISSION TO CANDIDATURE

An applicant for admission to candidature for the Postgraduate Diploma shall have:

Either a Bachelor's degree in Surveying,

Cartography or Land Management of this University or another tertiary institution approved by the Committee.

OR

A Bachelor's degree in another land-associated discipline approved by the Committee together with appropriate industrial or professional experience approved by the Committee.

OR

In special circumstances the Higher Degrees Committee may admit a candidate who has considerable professional experience and professionally recognised certification and can demonstrate the capacity to undertake the program.

ENROLMENT

No applicant may enroll who is already enrolled for a degree or diploma at this University or another institution;

No candidates may enroll for any other degree or diploma at this University or any other institution during the period of candidature.

COURSE OF STUDY

The course of study leading to the Postgraduate Diploma in Land Studies may be taken as a full-time course of two semesters' duration or as a part-time course of four semester's duration. In exceptional circumstances the duration of the course may be extended.

A candidate shall follow and obtain a minimum of 180 credit points (four credit points being equivalent to one hour per week of lecture, tutorial, practical or project classes for one semester) in the course of study set out below:

Credit Point Minimum

(i) SCHEDULE A	
Core Subjects	60
(ii) SCHEDULE B	
Professional Subjects	40
(iii) SCHEDULE C	
Research Project	50
(Compulsory)	

Such subjects and project topic to be selected by the candidate subject to the advice of the Head of Department of Surveying and Land Studies and approved by the Higher Degrees Committee provided that the Committee on the advice of the Head of Department of Surveying and Land Studies may substitute a subject or subjects for

those prescribed. The research project is comprised of first and second semester subjects on the same research topic.

TERMINATION OF REGISTRATION

After taking into consideration the recommendation of the Department, and after giving the candidate an opportunity to be heard, the Higher Degrees Committee may terminate a candidate's registration at any time on grounds of unsatisfactory performance or failure to comply with these rules

ASSESSMENT

Subject assessment is as shown in the subject descriptions. Overall assessment takes into account the overall performance of the candidate in assessments, tests, final examinations and the project.

AWARD OF THE DIPLOMA

The Higher Degrees Committee shall consider the recommendation of the Department and decide whether or not the candidate has satisfied the requirements for the Diploma. If the candidates work is adjudged to be of sufficient merit, he or she shall be recommended to the Academic Board for award of the Diploma.

FEES

A candidate for the Diploma shall pay such fees as may be determined by the Council from time to time in terms of the Fees Statute.

SCHEDULE "A" CORE SUBJECTS

Code	Subject	Hrs Per Wk	Credit Points
SLP01	Advanced Surveying I	5	20
SLP02	Surveying, Special Topics	5	20
SLP03	Info. System for Land Stud. I	5	20
SLP04	Info. Systems for Land Stud. II	5	20
SLP05	Adv. Geog. Data Handling	5	20
SLP06	GIS, Special Topics	5	20
SLP07	Adv. Land Management I	5	20
SLP08	Land Manage., Special Topics	5	20
SLP11	Adv. Cartography	3	10
SLP12	Special Topic in Land Stud.	3	10

SCHEDULE "B" PROFESSIONAL

SUBJECTS

Subjects are selected from those currently offered on the campus and must be approved by the Head of Department of Surveying and Land Studies. Subjects undertaken in other Departments must be approved by that Department.

SCHEDULE "C" RESEARCH PROJECT

Code	Subject	Hrs Per Hrs/Wk	Credit C/Points
SLP21	Research Project Part A	5	20
SLP22	Research Project Part B	8	30

DETAILS OF THE POSTGRADUATE DIPLOMA IN LAND STUDIES SUBJECTS

SLP 01: ADVANCED SURVEYING I

Hours per week: 5 (20 credit points)

Objective:

The student undertakes a program of study in a number of advanced surveying fields. The study program includes a review of recent developments in surveying and mapping technology. The opportunity is also provided for the students to refresh their knowledge in advanced surveying techniques, and to bring themselves up to date with the latest developments in surveying methods, practice and technology. On completion of the subject, students should be able to:-

1. Demonstrate a comprehensive knowledge of the latest surveying and mapping methods;
2. Apply the latest surveying methods to achieve solutions in a variety of practical situations;
3. Demonstrate how these new methods and technology can be applied for the benefit of industry.

Syllabus:

History of development of current surveying technology; review of advanced surveying, field and office methods, equipment, computations and analyses. Application of methodologies. Some specific project work will be required.

Reference:

Appropriate references will be provided.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1x3 hrs)
Students must pass both assessments.

SLP 02: SURVEYING, SPECIAL TOPICS

Hours per week: 5 (20 credit points)

Prerequisite: SLP 01

Objective:

The student selects a special topic in surveying, after consultation with the Head of Department and Surveying section leader. The topic will be substantive, one of the core areas of surveying, and encompass significant studies. On completion of the subject, students should be able to:-

1. Demonstrate a comprehensive knowledge of the selected study area;
2. Document the procedures involved in application of the topic to industry.

Syllabus:

History of development in the topic area, applications and procedures, computations, analysis and reporting. Selected readings will be given as well as individual research programs. Project work may be required.

Reference:

Appropriate references will be provided.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1x3 hrs)
Students must pass both components.

SLP 03: INFORMATION SYSTEMS FOR LAND STUDIES I

Hours per week: 5 (20 Credit Points)

Objective:

Overview/Review of information technology. Provide an appreciation of applications of information technology in land studies. On completion of this unit, the student should be

able to:-

1. Layout spreadsheets using text, numbers, variables and formulae;
2. Develop spreadsheet applications;
3. Use and competently develop simple databases;
4. Explain the nature of data and information;
5. Use databases specially aimed at land studies;
6. Document the principles of the various computer operating systems and hardware platforms;
7. Explain the differences between spatial and non-spatial systems.

Syllabus:

Introduction to spreadsheet and database applications; issues and problems associated with modeling of land related data; spatial data modeling; introduction to LIS and GIS; use of PNG land related databases; overview of operating systems and hardware platforms; generation of output and data integrity and analysis.

Reference:

Appropriate references and texts will be provided.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1x 3hrs)
Students must pass both assessments.

SLP 04: INFORMATION SYSTEMS FOR LAND STUDIES II

Hours per week: 5 (20 credit points)

Prerequisite: SLP 03

Objective:

Application of databases for Spatial Information Systems. On completion of the unit, the student should be able to:-

1. Explain and apply the concepts of data modeling for land information systems;
2. Design and develop a simple land information system database;
3. Demonstrate the use of various database analysis techniques especially for spatially related data.

Syllabus:

Databases and database management systems; levels of data modeling in the design of an information system, basic entity - relationships conceptual modeling; analysis of spatially related data. Application of a typical database in a project.

Reference:

Appropriate references will be provided.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1x3 hrs)
Students must pass both components.

SLP 05: ADVANCED GEOGRAPHIC DATA HANDLING

Hours per week: 5 (20 credit points)

Objective:

The student undertakes a program of studies relating to geographical data handling in a number of related technologies such as remote sensing (RS) geographic information systems (GIS) and computer mapping (CM). The study program includes a review of recent developments in the new technologies with the aim to bring the student up to date with the latest developments in these technologies. On completion of the subject, the student should be able to:

1. Demonstrate a good knowledge of the past and present data handling issues associated with GIS, RS and CM.
2. Choose and apply one or combination of these technologies to achieve solutions to a number of practical situations in geographical data handling.
3. Demonstrate how these new methods and technology can be applied for the benefit of the industry.

Syllabus:

This course will cover a variety of topics associated with geographic data.

These will cover the issues relating to problems of data capture: error analysis, accuracy analysis, data display, storage and manipulation, system design and development, and cartographic display.

Reference:

Appropriate references will be provided.

Assessment:

Continuous assessment - 50%
Written Examination - 50% (1x3 hrs)
Students must pass both components.

SLP 06: GEOGRAPHIC INFORMATION SYSTEMS, SPECIAL TOPICS

Hours per week: 5 (20 credit points)

Objective:

The student selects a special topic in GIS, after consultation with the Head of Department and nominated subject supervisor. On completion of the subject, the student should be able to:-

1. Demonstrate a comprehensive knowledge of the selected study area;
2. Document the procedures involved in application of the topic to industry in PNG.

Syllabus:

History of development in the topic area, applications and procedures, computations, analysis and reporting. The selected topic may be pursued in the form of formal lectures, individually supervised readings and assignments. Project work may be required.

Reference:

Appropriate references will be provided.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1x3 hrs)
Students must pass both components.

SLP 07: ADVANCED TOPICS IN LAND MANAGEMENT I

Hours per week: 5 (20 credit points)

Objective:

The student undertakes a program of study in a number of advanced land management fields. The study program includes a review of recent

developments in valuation, property management and land administration technology. On completion of the subject, students should be able to:-

1. Demonstrate a comprehensive knowledge of the latest valuation, property management and land administration methods;
2. Apply the latest land management methods to achieve solutions in a variety of practical situations;
3. Demonstrate how these new methods and technology can be applied for the benefit of industry.

Syllabus:

A selection of advanced topics in the areas of property valuation, property management and land administration. The approach will be practical, accompanied by in-depth treatment related to changing land management theory. The topics offered will reflect the expertise of the academic staff as well as the needs of the students. Attention will be directed to current trends and developments.

Reference:

Appropriate references will be provided.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1x3 hrs)
Students must pass both components.

SLP 08: LAND MANAGEMENT, SPECIAL TOPICS

Hours per week: 5 (20 credit points)

Objective:

The student selects a special topic in land management, after consultation with the Head of Department and nominated subject supervisor. On completion of the subject the student should be able to:-

1. Demonstrate a comprehensive knowledge of the selected study area;
2. Document the procedures involved in application of the topic in PNG.

Syllabus:

History of development in the topic area, applications and procedures, analysis and reporting. Selected readings will be given as well as individual research programs. Project work may be required.

Reference:

Appropriate references will be provided.

Assessment:

Continuous assessment - 50%
Written examination - 50% (1x3 hrs)
Students must pass both components.

SLP 11: ADVANCED CARTOGRAPHY

Hours per week: 3 (10 Credit Points)

Objective:

On completion of this subject, students should be able to:-

1. Demonstrate a good understanding of basic and advanced cartographic principles;
2. Develop awareness of advances and new areas of conceptual research in cartography;
3. Apply and document cartographic knowledge and technology in new application areas.

Syllabus:

Review of cartographic principles and methodologies, digital mapping advances, readings on applied and conceptual research in cartography and exploration of new areas of application of cartographic knowledge and technology. Some specific project work will normally be required.

Reference:

Appropriate references will be provided.

Assessment:

Continuous Assessment - 50%
Written examination - 50% (1x3 hrs)
Students must pass both components.

SLP 12: SPECIAL TOPICS IN LAND STUDIES

Hours per week: 3 (10 credit points)

Objective:

The student undertakes a program of study in a field in land studies. The field may vary from year to year depending on the staff expertise available. The topics will be of relevance to PNG and the subject can be taken by students in any of the postgraduate diploma discipline area. The topic is chosen after consultation with the Head of Department and nominated subject supervisor. On completion of the subject, students should be able to:-

1. Demonstrate a comprehensive knowledge of the selected study area;
2. Document the procedures involved in application of the topic to industry in PNG.

Syllabus:

History of development in the topic area, applications and procedures, computations, analysis and reporting, as appropriate. Selected readings will be given as well as individual project work. Where possible cross discipline project work will be promoted.

Reference:

Appropriate references will be provided.

Assessment:

Continuous assessment - 100%

SLP 21: RESEARCH PROJECT PART A

Hours per week: 5 (10 credit points)

Objective:

Students propose and discuss the research topic with the supervisor and submit the final proposal. The progress of work is discussed under the supervision of academic staff on a weekly basis and in the presence of candidates participating in the unit. At least one departmental seminar will be presented in the semester. On completion of the subject the student should be able to:-

1. Produce a well constructed research proposal;
2. Conduct a Departmental seminar on the selected topic;
3. Demonstrate the ability to carry out a defined literature review.

Syllabus:

Development of a research proposal, literature review and abstracting, data collection techniques, field work as appropriate; set readings.

Assessment:

Continuous assessment - 100%
(Seminar - 25%, Proposal - 75%)
(Examined by supervisor)

SLP 22: RESEARCH PROJECT PART B

Hours per week: 8 (30 credit points)

Objective:

The single objective of the subject is to produce appropriate project outcomes. These will include a significant report and a departmental seminar. The student must demonstrate a capacity to convert the first semester data collection and literature review into a well constructed and clear report.

Syllabus:

Data analysis, presentation techniques, research methods and project management skills. Project will be presented in a seminar and in report form.

Reference:

Students will be referred to appropriate material during the class.

Assessment:

Continuous assessment - 100%
(Seminar - 25%, Report - 75%)
(Examination will be by supervisor and one other examiner appointed by the Head of Department)

**2. POSTGRADUATE DIPLOMA IN
SURVEYING PRACTICE COURSE
(A new program)****INTRODUCTION**

This Postgraduate Diploma in Surveying Practice, a program to register and provide licensing to our graduate surveyors is a joint venture program of the Association of Surveyors of PNG, the PNG Surveyors Board and the University of Technology, Department of Surveying and Land

Studies. It is being set up as a result of the need to increase the number of qualified and registered surveyors to meet the challenge of registering 97% of our Customary Land and providing professional surveyors to meet other development needs of Papua New Guinea. This Postgraduate course structure incorporates some of the Queensland University of Technology's Postgraduate Diploma Course structure and took account of the PNG Surveyors Board registration project requirements undertaken by our graduate or cadet surveyors. Amongst other survey work it is hoped students or graduates would acquire the skilled and qualification to meet many village technical projects such as water supply, electricity and agricultural projects and so on.

The overall aim of this Postgraduate Course is to produce an objective, competent and fully qualified surveyor who would have the knowledge to plan or design and implement projects in rural and urban areas and either employed by private or government departments or run his/her (small) private survey firms in Provinces and Districts or Local Level Government areas and he is accessible to many of our people for advise and to carry out their survey work or customary land boundaries.

The Surveyor works and lives in the villages, districts or provinces and provides advice or work for Ward or Community governments, local-level governments, Joint District Planning and Budget Priority Committee or District Authority (being proposed in PNG), those bodies' services as stipulated under Section 44 of the Organic Law on Provincial Governments and Local – Level Governments.

As the National Land Development Taskforce is placing emphasis on clan registration and development of Incorporated Land Group (ILG) or registration of major clan boundaries of Customary Land groups, that surveyor should possess the types of skills or knowledge to be able to provide technical advice on land matters including designing of village resettlement schemes (for clan members to move into their own land settlement area and develop their own land under "Village Nucleus Agricultural Schemes" pattern, based on "town" concept community centre so that either government services such as water, electricity or

clinic and elementary schools are provided for these resettled people.

COURSE OBJECTIVES

The objectives of the Postgraduate Diploma in Surveying Practice (PGSP) Course are:-

1. Prepare surveying graduates for registration and practice as a Registered and Licensed Surveyor.
2. Further develop the practical skills and knowledge gained from the Bachelor's Degree in Surveying and tailors this towards the Practice of Surveying.
3. in managing Private Survey firms in PNG.
4. Emphasis in Planning and Surveying of rural community centers, rural development projects such as water supply and agricultural projects.
5. To promote a team approach and effective communication in the application of skills and knowledge of surveying; and
6. To understand the roles and responsibilities of many other professional individuals or groups engaged in any resource development projects.

ENTRY REQUIREMENTS

Normal Entry

To be eligible for consideration for entry into the course an applicant must have;

- a) A Bachelors Degree in Surveying from the University of Technology, or
- b) Hold a recognized Bachelors Degree in Surveying from other tertiary institutions as considered by the Head of Surveying Land Studies Department or an authorized Entry Committee to be at least equivalent to the Degree of Bachelor of Surveying from the Papua New Guinea University of Technology, Lae.

Prior Practical Experience

- a) An applicant must have appropriate two (2) years of field experience in surveying following graduation from the Papua New Guinea University of Technology or from other similar tertiary institutions prior to entry into the Postgraduate Diploma of Surveying Practice at the University of Technology An applicant must be an associate member of the Association of Surveyors of PNG.

Selection of candidates into the Postgraduate

Diploma program will be based on their own merits, including their academic performances in the undergraduate Bachelor of Surveying degree program

COURSE STRUCTURE

The course is designed to provide proficiency in professional practice leading to the registration and licensing of Surveyors in PNG. On completion of this a candidate will be awarded a Postgraduate Diploma in Surveying Practice, a Certificate Competency to practice as Registered Surveyor and a License to carry Cadastral Surveying.

The Course is divided into eight (8) subjects. Each unit comprises both theoretical and practical skills pertaining to professional survey practices as stipulated in the Survey Act 1969, Survey Co-ordination Act, Survey Direction 1900 (Office of Surveyor General) and Standard Survey Instruction (PNG Department of Works). The course structure is shown below:

FULLTIME ENROLLMENT

Course Structure – Full time format: One year course comprising of all core units and one elective each in both semesters.

SEMESTER 1

Core Subjects:

Subject Code	Credit Pts	Contact Hrs	Project Hrs	Total Hrs
SP711: Professional Practice Management I	4	39		
	39			78
SP713: Boundary Definition Surveys 1(Rural/Urban)	5	39		
	78			117
SP715: Surveying Computing & Processing	4	39		
	39			78

Electives: Select one subject from below.

Subject Code	Credit Pts	Contact Hrs	Project Hrs	Total Hrs
SP717: Engineering Survey I	4	39		
	39			78
SP719: Property Development Surveys				

	4	39
	39	78
SP721: Photogrammetry and Remote Sensing	4	39
	39	78

SEMESTER 2

Core Subjects:

Subject Code	Credit Pts	Contact Hrs
	Project Hrs	Total Hrs
SP716: Urban and Regional Planning	4	39
	39	78
SP720: GIS and GPS	4	39
	39	78
SP722: Project Site Surveys	4	39
	39	78

Electives: Select one subject from below.

Subject Code	Credit Pts	Contact Hrs
	Project Hrs	Total Hrs
SP712: Professional Practice Management 2	4	39
	39	78
SP714: Boundary Definition Surveys 2	5	39
	78	117
SP718: Engineering Surveying 2	4	39
	39	78

PART-TIME ENROLLMENT

Course Structure – Part time format: A two year duration comprising of all core units and an elective in each semester.

Year 1:

Semester 1: SP 713 Boundary Definition Surveys 1
SP 715 Survey Computing & Processing

Semester 2: SP 712 Project Site Surveys
An Elective

Year 2

Semester 1: SP711 Professional Practice Management 1
An Elective

Semester 2: SP 714 GIS and GPS
SP 716 Town Planning

Candidates must be registered in three (3) core subjects and one (1) elective in each semester for full-time enrollment.

CREDIT POINTS

The Postgraduate Diploma in Surveying Practice studies consists of a minimum of 33 credit points for duration of one year full-time study which may also be studied over two year on part-time. The maximum time for completion is two years for full-time student and four years for a part-time student.

Student wishing to complete Postgraduate Diploma in Surveying Practice Studies should select eight units specified in the course structure. Most of the units are four credit point units.

The credit points were determined as follows:

- One credit point is equivalent to one hour per week for thirteen weeks on theory work.
- One credit point is equivalent to three hour per week for thirteen weeks on practical work.

THE DETAILED SYLLABUS

In this section the detailed contents of the Postgraduate Diploma in Surveying Practice is provided. A review should be made regularly to either develop the contents of the subjects or introduce new subjects to allow for the changes in legislation and technology.

The following are the Guidelines for Professional Training Agreement (PTA) and the Survey Practice Course (SPC).

SP 711: PROFESSIONAL PRACTICE MANAGEMENT I

Credit Points: 4

Hours per Week: (3 + 3) hrs

Objectives:

The practice of surveying demands more than the knowledge and expertise in the technical aspects of the science of surveying. A broad understanding and competence in the operations and management of a survey office, business requirements and professional responsibilities is necessary for successful professional practice. On completion of

this subject, students should be able to:-

1. Communicate effectively, orally and in writing at a professional level. Use full a range of media options. Compile, interpret and present information. Interpret briefs and instructions. Issue a clear, accurate instructions and meaningful advice.
2. Prepare and present technical reports and papers to professional forums. Prepare position and discussion papers on surveying and allied topics.
3. Prepare and interpret professional surveying reports. Prepare specification and standards. Prepare submissions and quotations.
4. Operate in accordance with Government acts, Regulations or instructions. Enter into legal matters pertaining to land and land information with clients, colleagues and other professionals. Advise clients on legal requirements relating to land development and on land rights, land tenure and rights of entry.
5. Represent the concerns of clients and/or special interest groups to government, regulators and other stakeholders. Negotiate solutions to common problems with other parties. Contribute to intention of surveying activities with the activities of other professionals.

Syllabus:

Communicating effectively. Presenting, promoting, reporting on and advocating ideas on surveying, land development and allied areas of practice. Preparing and comprehending surveying documents. Comprehending, reporting on and discussing relevant legal matters. Collaborating with colleagues and other interested parties.

Assessments:

PTA Portfolio

1. A range of letters and reports written in relation to surveys and developments
2. A business plan for small to medium survey firm
3. A brief to a solicitor explaining the surveying background of a potential litigation
4. A short report on visit to a related matter in a court.

SPC Assessments

1. Letters and reports prepared for Boundary

Definition Surveys 1 and Property Development Surveys 20%.

2. A business plan for small to medium survey firm 40%.
3. A brief, prepared preparatory to appearance as an expert witness, in a practice court 20%.
4. Prepare Oral presentation of the above 20%.

SP 712: PROFESSIONAL PRACTICE MANAGEMENT II

Credit Points: 4

Hours per Week: (3 + 3) hrs

Objectives:

The practice of surveying demands more than the knowledge and expertise in the technical aspects of the science of surveying. A broad understanding and competence in the operations and management of a survey office, business requirements and professional responsibilities is necessary for successful professional practice. This unit is a continuation of Professional Management 1. On completion of this subject, graduates should be able to:-

1. Effectively carry out planning, organization, directing and control tasks, people and other resources of a small to medium survey firm.
2. Adopt a sound business practices including economic planning, financial management and compliance with legislative requirements.
3. Effectively manage human resources.
4. Provide training and development programs for his/her subordinates in the work place.
5. Apply and maintain project management principles.
6. Apply and maintain self-management principles.
7. Apply and maintain quality assurance principles.
8. Implement and complete all requirements of the projects that are undertaken.

Syllabus:

Planning and organization of a business firm; sound business practices. Human resource

management; subordinate training. Project management principles; self-management principles. Quality assurance principles. Project implementation.

Assessments:

PTA Portfolio

Applicant to provide a portfolio of evidence relevant to the elements listed. This might include examples of past work, client reports, referee reports, log books, diaries and the like. Applicant will be interviewed.

SPC Assessments

Applicant to provide a portfolio of evidence relevant to the elements listed. This might include examples of past work, client reports, referee reports, log books, diaries and the like. Applicant will be interviewed.

**SP 713: BOUNDARY DEFINITION
SURVEYS I**

Credit Points: 5

Hours per Week: (3 + 6) hrs

Objectives:

In any land development the practice of surveying is associated to cadastral surveying, which defines the land boundaries. It is vital that professional surveyors, registered and licensed to undertake boundary survey work, have a thorough understanding and knowledge of the survey requirements. On completion of this subject, students should be able to:-

1. Explain history of Cadastral Surveying, Land Registration, reinstatement and field procedures, keep accurate field notes.
2. Undertake search and assessment of various cadastral survey jobs to determine approach to survey.
3. Carry out suburban identification surveys and reinstatement exercises.
4. Complete a range of a cadastral surveys including surround surveys, sub-divisional pegging, building units and group title and easement surveys.
5. Prepare plan sketches suitable to final

drafting and examine final plans for registration using in-house QA system.

6. Complete reinstatement calculations under guidance of a Licensed Surveyor and complete brief reinstatement reports for at least 5 surveys.
7. Carry out research and prepare a report for presentation on the impacts of Survey Integration.
8. Carry out field work and re-instatement surveys for discussion with colleagues and Supervising Surveyor.

Syllabus:

Introduction to Land Registration and Reinstatement; searching of existing survey plans. Identification Surveys. Urban surveys. Rural Surveys. Plan preparation and Examination. Reinstatement Computations and reports. Survey Integration, Survey Co-ordination. Overview of the changes in the practice of surveying. Practical Work.

Assessments:

PTA Portfolio

The portfolio would include complete documentation of at least 3 field survey boundary reinstatement projects of moderate complexity. The Supervising Surveyor would involve the graduate in a range of re-instatement exercise

SPC Assessments

At least 3 cadastral field projects would be done in the workplace and the portfolio and supervisor's comments would be submitted to the course coordinator. (60%)
3 office based reinstatement exercises would be completed under exam conditions. (40%)

**SP 714: BOUNDARY DEFINITION
SURVEYS II**

Credit Points: 5

Hours per Week: (3 + 6) hrs

Pre-requisite: Boundary Definition surveys I.

Objectives:

This unit is a continuation of Boundary Definition I. Further, more difficult reinstatement surveys are pursued and re-establishment of previously surveyed boundaries in conjunction with mining lease surveys and easement survey are undertaken. On completion of this subject, the graduates should be able to:-

1. Carry out more complex and difficult Reinstatement exercises.
2. Carry out field survey project work associated with difficult boundary definition
3. Carry out field project associated with boundary definition for easement surveys, mining lease surveys and road surveys.

Assessments:

PTA Portfolio

The portfolio would include complete documentation of at least 3 field survey boundary reinstatement projects of moderate complexity. The Supervising Surveyor would involve the graduate in a range of re-instatement exercise

SPC Assessments

At least 3 cadastral field projects would be done in the workplace and the portfolio and supervisor's comments would be submitted to the course coordinator. (60%)

3 office based reinstatement exercises would be completed under exam conditions. (40%)

SP 715: SURVEYING COMPUTING AND PROCESSING

Credit Points: 4

Hours per Week: (3 + 3) hrs

Objectives:

The modern practice of surveying is heavily dependent on the successful application of the available technology, particularly so in the case of computing in both technical and management areas. Many hardware and software packages are available for use and a thorough knowledge of these and their application is essential. On completion of this subject, students should be

able to:-

1. Describe hardware and software and how they work together,
2. Use some standard software packages and spreadsheet,
3. Design and construct simple algorithms and structured computer program,
4. Design and construct algorithms and structured calculator program,
5. Use project management software package.

Syllabus:

Computing: operating system, word processing (Microsoft Word), AutoCAD, Survacad. Programming and use of survey packages; programmable calculators, survey software package – Civilcad, Keys, write simple computer programs. Project Management software package. Spreadsheets; Excel. Survacad.

Assessments:

PTA Portfolio

A report comparing various surveying software packages.

A small computer program.

Demonstrate knowledge of computer technology and basic computing concepts.

Participation in the use of surveying packages such as Civilcad and Survacad and project/time management packages.

SPC Assessments

A report comparing various surveying software packages. (25%)

A small computer program. (25%)

A one hour test covering various aspects of computer terminology and basic computing concepts. (25%)

Submission of a comparison and critique of various software packages available at the SPC and demonstrated to the graduates. (25%)

SP 716: URBAN AND REGIONAL PLANNING

Credit Points: 4

Hours per Week: (3 + 3) hrs

Objectives:

At the end of the course the students should be able to:-

- Demonstrate an understanding of problems of urban and rural areas
- Understand urban environment
- Understand the significance of urban and regional planning
- Understand the variety of non-urban land uses
- Develop a feel of growth, development, underdevelopment, poverty, crime

Syllabus:

Urban: Concepts and definitions: urban, urbanization and urbanism,

Origin & growth of urban settlements; bases & process of urbanization

Major influences in urban planning: ancient, oriental, European, American. Urbanization in Papua New Guinea: a historical perspective. Issues of urban environment: poverty, crime, infrastructure, sprawl, renewal, pollution & health. Urban Environmental Problems in Papua New Guinea

Theoretical framework of rural development and geographical perspective: Rural economy under different production systems – experiences of developed and developing world with examples. Dimensions of rural economy; Non-urban land use – mining, agriculture and complementary uses of land; animal husbandry, dairying, poultry, fishing, forestry, market gardening and agro-based industries; Problems of development related to labour, capital, market, scale and infrastructure. Rural labour force with special reference to gender, migration and socio-cultural dimensions. Concept of growth, development, poverty and underdevelopment Regional development perspectives: Colonial period (Dependency theories), Growth Pole theories and the developing world, Agropolitan Development, Basic Needs Approach, Regional Environmental Issues.

SP 717: ENGINEERING SURVEY I

Credit Points: 4

Hours per Week: (3 + 3) hrs

Objectives:

A large number of the practice of surveying is involved with engineering surveys for a variety of clients needs. It is important that professional surveyors involved in everyday practice have a thorough understanding and knowledge of the requirements for these surveys including the associated office work and client consultation. On completion of this subject, students should be able to:-

1. Carry out initial assessment and configuration of measuring systems.
2. Issue instructions on submission, costing, searching and organization data.
3. Carry out road surveys taking into consideration curves and battering.
4. Consider specific requirements related to long line survey control.
5. Carry out Office and Field work associated with Engineering Surveying covering a range of engineering survey tasks.

Syllabus:

Equipment and Resources: Total Stations, Data loggers, Data processing, CAD software. Project Definition and Preparation of Documentation; field requirements, field work logistics, Office completion of field surveys. Field Methods; Road Surveys, curves and battering, curves (vertical, radial and transition), batter staking and other marking for construction. Long line Survey Control. Practical components of engineering surveying; Office and Field work

Assessments:**PTA Portfolio**

A portfolio showing a variety of:-

- i. Types of construction and building control surveys and preparation of plans and specifications. Inspections of building construction sites are involved.
- ii. Receipt of instructions, documentation and communication with contractors.
- iii. Field procedures including high precision survey and error adjustment techniques involved with construction and building control survey and construction site set out calculations.

- iv. Supervising Surveyor would involve the graduate in the calculation and execution of engineering surveys.

SPC Assessments

A small calculation and setting out exercise at UOT (1 day) (20%)

A portfolio of setting out survey. (80%)

SP 718: ENGINEERING SURVEYING II

Credit Points: 4

Hours per Week: (3 + 3) hrs

Objectives:

At the end of the course the students should be able to:-

- Understand the basic concepts of construction surveying
- Able to undertake setting out works for various structures
- Use the modern instruments such as GPS and Total Station instruments in construction surveying
- Provide support in Mining surveys

Syllabus:

Concepts of construction surveying, Equipments, Methods of control provision and general principles of positioning a structure

Setting out works: Setting out works of buildings, culverts, bridges, dams, slope of earthwork, pipelines, canals

Simple horizontal curves, Transitional curves, Complex Vertical Curves

Setting out of Roads and railways

Tunnel surveys: Surface surveys and tunnel alignment, underground surveys

Use of lasers and setting out works by Total station instruments

DTM and its use in construction surveys

SP 719: PROPERTY DEVELOPMENT SURVEYS

Credit Points: 4

Hours per Week: (3 + 3) hrs

Objective:

Projects encountered by surveyors in practice involve management at various stages of the project. Good project management is essential. Most of the work of a practicing surveyor is involved development of property can be complex and extensive. This work, within a broad definition of cadastral surveying, requires a thorough understating of the requirements of applicable legislation, state and local governments authorities and the registration authorities. On completion of this subject, students should be able to:-

1. Acquire a good understanding of the legislation and its effects on property development.
2. Carry out rural subdivision and residential subdivision in utilizing subdivision application procedures for small residential subdivision and subdivision design.
3. Apply procedures involved with rezoning and subdivision applications and the complying with the Physical Planning Act.
4. Carry out office and field work associated with an estate survey and project work on a subdivision containing a minimum of 20 lots.

Syllabus:

Current Planning and Land Development legislations. Submission processes. Rezoning and Applications. Practical aspects of Property Development.

Assessments:

PTA Portfolio

Documentation relating to a rezoning application.

Design of small subdivision.

Documentation of a building units or group title project.

Documentation (perhaps using appropriate software) of stages and required inputs to a moderate land development project.

These projects would normally be jobs coming through the firm and supervised and assessed by the supervising Surveyor.

SPC Assessments

Preparation of the documentation from a rezoning application. (20%)

Design of a small subdivision. (20%)

Lots calculations for the above. (20%)
A computer based analysis of a land development project. (20%)
These projects would be set, issued and assessed within the SPC.

SP 720: GIS AND GPS

Credit Points: 4

Hours per Week: (3 + 3) hrs

Objectives:

It is important that the use and application of “state-of-art” technological advancement in the field of spatial sciences, with particular emphasis to obtaining measurements in space in aerial photography, photogrammetric mapping and tools such as Geographic Information Systems and Global Positioning System are understood and are able to be utilized. On completion of this subject, students should be able to:-

1. Compile map specifications and plan mapping projects in Photogrammetric Mapping.
2. Prepare flight planning and costing exercise.
3. Prepare brief, invitation to tender and interviews.
4. Carry out stereo plotting.
5. Compare GPS theory and practical applications of the methods to conventional surveying.
6. Consider LIS/GIS technology and its practical application in conventional surveying practice.
7. Digital photogrammetry applications

Syllabus:

Maps and Aerial Photographs; specifications, planning and resources. Aerial Photography; flight planning and costing, ground control, targeting and photo identification, planning flight lines and aero triangulation. Brief and Invitation to Tender; initial consideration, preparation for interview, Client interviews, photography, field compilation. Quality control, reproduction, and Production specification. Stereo Plotting. Planning and costing a project. Control Surveys using GPS. LIS/ GIS.

Assessments:

PTA Portfolio

Documentation of a mapping project.

Documentation of a GPS project.
Documentation of a GIS project.

SPC Assessments

A mapping project would be set, issued and assessed. (33 1/3%)

A GPS project would be planned, executed and processed. (33 1/3%)

A GIS project would be set using in-house software and data sets. (33 1/3%)

SP 721: PHOTOGRAMMETRY AND REMOTE SENSING

Credit Points: 4

Hours per Week: (3 + 3) hrs

Objectives:

At the end of the course the students should be able to:-

- Demonstrate an understanding of use of aerial photographs in mapping,
- Define the geometry of aerial photographs
- Prepare plans and maps using aerial photographs and Digital Photogrammetry
- Understand the basic Remote Sensing Concepts
- Use satellite images for mapping the topography as well as land use

Syllabus:

Physics of Remote Sensing: Definition and Stages, Electromagnetic radiation, Electromagnetic Spectrum, Radiation Laws, Interaction Mechanism with Earth Features and Atmosphere, Atmospheric Windows and bands, Spectral Reflectance Curve, Real and Ideal Remote Sensing Systems.

Platform and Sensors: Orbital Characteristics and coverages, Spectral, Spatial, Radiometric and Temporal Resolution, Photographic Systems, Optical Mechanical Scanners, Pushbroom Scanners, Multi-band concepts – False Colour Composites, Imaging and Sensors, Active and Passive Sensors, Microwave Remote Sensing.

Characteristics of various Satellite Systems: LANDSAT, SPOT, IRS, IKONOS, Quick bird, Orbview, ESA, Radarsat, NOAA etc.

Digital Image Processing: Statistics extraction,

Radiometric and Geometric Corrections, Image enhancement, Information extraction with specific reference to supervised classification for land use/land cover.

Platforms for Aerial Photography, Classification of aerial photographs, Aerial Camera its components and types, Camera calibration, Types of films, Photographic processing, Digital aerial photography, Flight Planning Photogrammetric Applications and products.

Geometry of Aerial Photographs: Relief and tilt distortions, Rectification and ortho-rectification, Planimetric map compilation. Stereo Photogrammetry: Binocular and stereoscopic Vision, Photographic Overlap, Height determination from stereo pairs – parallax equation, Photogrammetric Instruments, Aerial triangulation for control extension. Digital photogrammetric system, DEM generation, digital orthophoto production.

Application of Photogrammetry and Remote Sensing in PNG, Integration with GIS

SP 722: PROJECT SITE SURVEYS

Credit Points: 4

Hours per Week: (3 + 3) hrs

Objectives:

A number of project work undertaken by practicing surveyors involves the acquisition of comprehensive information about a variety of sites prior to development and construction. On completion of design work and approval, surveyors are also involved at critical stages in the construction process. It is essential that professional surveyors involved in everyday practice have a thorough understanding and knowledge of the requirements for these types of surveys including the associated office and client consultation. On completion of this subject, students should be able to:-

1. Describe the equipment and techniques in acquisition of field data and data transfer to an appropriate computer software package using Total Stations.
2. Prepare specifications and cost estimates.
3. Carry out detail survey field project work.

4. Process field data and preparation and presentation of \$plan and written report.

Syllabus:

Detail Surveying; methods, equipment, data requirements and data transfer. Specifications and costs. Projects, instructions, documents. Communication, plan and Specifications.

Assessments:

PTA Portfolio

A portfolio of a detail DTM Survey

SPC Assessments

A Detail/DTM survey and setting out survey would be done in the workplace and the portfolio and supervisor's comments and assessments would be submitted to the course coordinator. (100%)

Assessment of students is continuous and is partly by the practicing surveyors and partly full-time staff of the Department. Both written work and field performance is assessed. Practical and oral test is done at the end of the year and may be in conjunction with the PNG Surveyors Board representatives.

As the course is project orientated, students complete tasks under practical conditions that are comparable to those performed in practice, thereby making the course relevant to the current surveying practice and maintaining a high professional standard. Files on each job are opened and maintained by individual students during the duration of the course. In this way students develop systematic methods of dealing with jobs and carrying it through to completion. Such records can assist students when they apply for jobs/employment after graduation.

Students should be provided with practice notes and specimen file or plans in respect of each topic or job that is discussed. Discussions and exercises are conducted and overseen by practicing, licensed surveyors on the staff of the Department of Surveying and Land Studies and prepare practice papers as part of their appointments to the Surveying Department and can be recruited full time staff or contracted as consultants (should be

discussed by all stakeholders).

The Council of the Association of Surveyors, the PNG Surveyors Board and the Surveying Department should review this Post Graduate Course annually or during the Board of Surveying Studies of the University of Technology meeting, where the representatives of the PNG Surveyors Board, the Lands Department and private sectors meet.

3. MASTER OF TECHNOLOGY (M. Tech) Course in Geomatics (A new program)

OUTLINE OF THE PROGRAMME

Geomatics is the modern scientific term referring to the integrated approach of measurement, analysis, and management of the descriptions and locations of Earth-based data, often termed geo-spatial data. These data come from many sources, including earth-orbiting satellites, air and sea-borne sensors and ground based instruments. It is processed and manipulated with state-of-the-art information technology.

Geomatics has applications in all disciplines which depend on spatial data, including forestry, environmental studies, planning, engineering, navigation, geology and geophysics. It is thus fundamental to all areas of study which use spatially related data, such as Surveying, Remote Sensing and Photogrammetry, Cartography, Geographic Information Systems, Property or Cadastral Studies and Global Positioning.

It is commonly defined as "hunter and gatherer" to include the tools and techniques used in land surveying, remote sensing, Geographic Information Systems (GIS), Global Positioning System (GPS), and related forms of earth mapping. Originally used in Canada, because it is similar in French and English, the term geomatics has been adopted by the International Organization for Standardization, the Royal Institution of Chartered Surveyors, and many other international authorities, although some (especially in the United States) have shown a preference for the term "geospatial technology".

A number of University Departments which were once titled Surveying, Survey Engineering or Topographic Science have re-titled themselves as Geomatics or Geomatics Engineering. The rapid progress, and increased visibility, of Geomatics since 1990s has been made possible by advances in computer technology, computer science, and software engineering, as well as airborne and space observation technologies.

The undergraduate program of the department was started way back in 1967 in order to provide the next generation of quality professionals. During the program's development period, the surveying profession was and still continues to be of immense support. Employers recognize the rapidly changing technology and have enthusiastically employed graduates where available. Students graduating from the program with a Bachelor's degree / diploma receive multiple job offers with attractive starting salaries.

Although the undergraduate programs keep running successfully since inception, the Masters or Ph.D. program is yet to get a shot in the arm even after a lapse of about four decades. The state of affairs renders the country heavily dependent on the expertise of expatriates for its ongoing education and other development programs. The current endeavor if implemented successfully would go a long way in generating self-sufficiency within the nationals of Papua New Guinea to move into academic careers or key leadership positions in government or industry.

Program Objectives

1. Enhance the professional status and instill a sense of professionalism in future leaders of Geomatics.
2. Expand the role of Geomatics in the spatial information community.
3. Play a leadership role in the implementation of new ideas and methods through research and the dissemination of research results.
4. Expand the diversity of the Geomatics profession (students, faculty, practitioners).
5. Help satisfy the public and private sector employment demand for Geomatics professionals.
6. Improve the competitiveness of our graduates

by providing them with quality knowledge base and lifelong learning skills.

7. All in all metamorphose the current state of near status quo that existed for almost four decades, to one of conspicuous self-sufficiency amongst the Papua New Guinean with in-house proficiency for higher studies.

Eligibility of the entrants to the Course

Aspirant students from diverse fields shall be input for the program. Students having Bachelors degree from many diverse backgrounds such as: Applied Physics, Applied Science, Applied Mathematics, Civil Engineering, Mining Engineering etc. shall also be admitted. Many will come from the surveying practicing community, while others will have transferred into Geomatics from other departments, such as geography, forestry, geology, agriculture, computer science or engineering. Worldwide an increasing number of high school students are choosing studies in geographic information sciences. Student activities give further learning opportunities. Our outstanding student chapter shall carry on the learning process through community service projects, trips to state and national meetings, social events, regular meetings, and invited speakers. Students are slated to develop managerial and leadership abilities through these activities.

Geomatics areas of Study

Professional Surveying & Mapping Geodesy
Satellite Positioning Systems (e.g. GPS)

- Photogrammetry
- Cartography
- Geographic Information Sciences (GIS) & Systems
- Remote Sensing
- Integrated Land Studies
- Land Development
- Environmental Assessment

Geomatics - An Excellent Career Choice

Excellent careers await young people with proper academic preparation in the broad range of geographic information sciences.

Established in 1967 to serve the needs of the land surveying profession, time is now rife to advance and reschedule the program so as to encompass a

broad range of disciplines in the geographic information sciences and the mapping profession. As such the young professionals shall have a plethora of career choices in the broad range of geographical information sciences.

Surveying and mapping technologies have undergone dramatic transformation during the past few decades. Surveying, once viewed as the work of technicians, is now considered a profession of high-tech multi disciplines having focus and application in land-related issues. Land administration, land development planning, geographic information systems, environmental assessment and professional surveying and mapping using technical advances in spatial information databases, geodesy, photogrammetry, land surveying, digital mapping, remote sensing, and cartography are areas being focused on. Each of these disciplines shall employ state-of-the-art equipment and resources at the forefront of emerging technologies. It is no longer a profession hindered by ground-level measuring through many obstructions, but a group that challenges to conquer time and space by techniques considered impossible just a few years ago.

Applications

There is a plethora of applications of the learnings for management of natural and man-made resources. Although not exhaustive, some may be mentioned below:

- Agricultural planning
- forestry
- rangeland
- the environment
- land management and reform
- urban planning
- subdivision planning
- infrastructure management
- natural resource monitoring and development;
- coastal zone management and mapping
- archaeological excavation and survey for GIS applications
- disaster informatics for disaster risk reduction and response

Course Duration

Regular students are expected to complete this course in 2 years time (in four semester, 24 credits

+ a compulsory research project dissertation). In extraordinary circumstances (especially for employed candidates), flexibility shall be granted when the degree can be accomplished in more than 2 years, but a maximum of 2 subjects can be taken in a semester.

COURSE STRUCTURE

Core Subjects

Six subjects are to be taught as core subjects. The subjects carry variable credits ranging from 3 to 4. A student has to earn 20 credit points from the core subjects. The core subjects will be taught in all 4 semesters.

Elective Subjects

Elective subjects encompass various specialized application field and some current advanced technology, which are grouped in 12 subjects. A candidate has to choose 2 subjects and earn a total of 4 credit points. The elective subjects shall be taught in the 1st semester of the 2nd year.

Dissertation

Each student is required to take up a compulsory research project during the 2nd semester of 2nd year. He/She has to complete a dissertation, which will be followed by a grand Viva. The student has to earn 4 credit points altogether after a satisfactory certification by the academic supervisor and the chief examiner. The problem of project has to be chosen by the student in consultation with the academic supervisor. The project should be selected from the recent developments in the field of Geomatics.

Degree Requirements

Each student is expected to earn 24 credit points to complete the degree requirements (6 core subjects + 2 elective subjects), in addition to one compulsory dissertation.

Course Examination

The End of Semester examination will take place when the students return to university for subsequent instruction periods. The award of the Degree of Master of Technology will be made in accordance with rules of the University Higher Degree Committee in vogue.

SUBJECT TITLES

Core Subjects

- GM 001 Surveying & Advanced Cartography
- GM 002 Geodesy & Satellite Positioning; Photogrammetry
- GM 003 Remote Sensing Fundamentals; Digital Image Processing
- GM 004 Geographic Information System; Statistics
- GM 005 Remote Sensing in Land and Water Management; Geo-Informatics and Spatial DSS
- GM 006 Research Methodologies, Project Management And Computer Application

Elective Papers (2 Papers To Be Selected From 12 Options)

- GM 007 Advanced Photogrammetry (Only For Those Having Mathematics in Graduation)
- GM008 Advanced Remote Sensing (Mathematics in Graduation Desirable)
- GM009 Geoinformatics in Coastal Management
- GM010 Geoinformatics in Earth Sciences
- GM011 Geoinformatics in Forest Management
- GM012 Geoinformatics in Disaster Management
- GM013 Geoinformatics in Agriculture
- GM014 Geoinformatics in Urban, Rural Development & Regional Planning
- GM015 Geoinformatics in Environmental Science & Management
- GM016 Geoinformatics in Resource Management
- GM017 Geoinformatics in Transport Network Analysis
- GM018 Geoinformatics in Utility Management

Important Note:

- Total intake capacity of the Department (SEM-I) every year is 20 candidates at present.
- The intake capacity of each special paper (2nd Yr. SEM-I) will be decided by the Departmental Committee before commencement of 2nd Yr. SEM-I classes.
- Pass mark is 50 %, Grades will be awarded as per the university policy.

- Class attendance marking shall be: 10= $\geq$ 85%; 8= 70-84%; 5=50-69% and 0= $\leq$ 50%
- Field work is compulsory for Students wherever necessary
- Students may have to carry out Dissertation works in an outstation institution at their own expenses.
- Grand viva will be based on the overall understanding of the subject.

SUBJECT DETAILS

GM 001: SURVEYING & ADVANCED CARTOGRAPHY

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

Surveying Fundamental concepts

Definition, Plane and Geodetic Surveying, Classification, Principles of Surveying, Stages of survey work.

Survey Instruments

Chains, Tapes and optical squares, the magnetic and prismatic compass, Theodolites, Levels, EDM instruments, Global positioning systems, Total stations.

Surveying methods

Chain surveying, Leveling, Plane Table Surveying, Tacheometric surveying, Triangulation, Trilateration and Traversing, Calculation of areas and volumes.

Cadastral surveying

Objectives, classification of cadastral system, Methods of survey, Accuracy requirements, Legal Characteristics of records. Boundary surveys, Cadastral survey in Papua New Guinea.

Engineering Surveys

Curves (circular, transition and vertical), Setting out of curves, transfer of control in mining operations, Mapping of open pits and underground mines

Topographic surveys

Topographic data contents, Scales for topographic maps, Data collection methods, Representation of relief.

ADVANCED CARTOGRAPHY

Basic concepts

Map and its Basic Characteristics, Cartography, History and nature of cartography, Scales of maps, Classification of maps, Maps and Plans, Utility of maps, Principles of map making.

Reference Surfaces, Coordinate Systems and Map Projection

Physical Surface of the Earth, Geoid, Reference Spheroid and Geodetic datum, Geographical Coordinate System, Map Projection, Grid coordinate System, Datum and Coordinate transformations, Angles and Directions.

Map Design and Layout

The graphic outline (the title, legend and scale), Marginal and Border Information, Lettering and Toponymy, Cartographic Generalization, Map Numbering System, Map Reproduction.

Topographic and Thematic Cartography

Definition and scales of topographic maps, Topographic data Content, Representation of Relief (Benchmarks, Trigonometrical stations, contours, Spot heights, form lines, relief orientation, layering, hill shading, hachuring, bathymetric relief and plastic relief maps). Data collection methods, Map Revision, Topographic data Presentation, Cadastral Surveys.

DIGITAL CARTOGRAPHY

Basic Concepts

Definition, Data Source and Capture Methods, Data Processing and Presentation, Advantages and Limitations, GIS and Digital Cartography.

Digital Representation of Cartographic Data

Positional and Attribute data, Point, line and area features, Vector and Raster Representation,

Map Digitization

Manual, Semi-automatic and automatic digitization, Accuracy requirements

Transformations

Scale, Projection, Generalization, relation between various coordinate systems.

Digital Elevation Models

Definition, Arrangement of points, Utility, Data source, Derived products

Computer assisted statistical and thematic mapping

Automatic annotation. Computer-aided mapping systems

Visualization - Visualization of geospatial data

Design aspects, dissemination of (visualized) geospatial data, data products, use and users of products, 3D Visualization, Various issues in map visualization, Interactive Cartography

Surveying (Practical)

Plane table survey for cadastral and large scale Mapping, Theodolite traverse and triangulation, Spirit Leveling, use of Dumpy level, Prismatic Compass, use of total station and preparation of a road map.

ADVANCED CARTOGRAPHY (PRACTICAL)

Construction of different types of scales e.g. Diagonal Scale. Construction of different types of map projection: Conical projection, Cylindrical Projection, Zenithal Projection, Preparation of UTM grid, Base Map, Designing and Symbolization, Map digitisation

Textbook:

Elementary Surveying, 8th edition, Effeck, M.E., Fryer, J.G., Brinker, R.C. and Wolf, P.R. 1995, 8th edition, Harper Collins Publishers, London

Singh, N. Surveying, Tata McGraw-Hill Publishing Company Ltd., New Delhi
Basic Cartography, Vol. 1, 2nd ed., Elsevier Applied Science Publishers, London. Anson, R.W. & Ormeling, F.J. (1993),
Departmental Lecture Notes

GM 002: GEODESY & SATELLITE POSITIONING

Credits: 3

Hours per week 15: (A maximum of 45 hours)

GEODESY

Geometrical Geodesy: Geoid, Mean Sea Level and the Reference Spheroid, Geodetic datum, Geodetic Cartesian and natural coordinates, Geoidal parameters (Orthometric and Geodetic heights) and their relationship, Deviation of vertical, Geodesics, Datum and coordinate transformations, Horizontal and vertical datum of Papua New Guinea.

Physical Geodesy: Gravity and Gravity Potential, Gravity anomaly

Geodetic Astronomy: Celestial Sphere and related Concepts, Celestial Latitude and Longitude system, Concept of Time (Sidereal time, Solar apparent time, Mean Solar time, Standard time), Determination of Latitude, Longitude and Azimuth by Astronomical Observations.

SATELLITE POSITIONING

Conventional Positioning Methods

Astronomical methods, Triangulation, Trilateration, Leveling, Echo sounding.

Satellite positioning

GPS and GLONASS - History and Developments, System Components, Signal Structure

GPS positioning

Positioning concept (resection from space), Point positioning, Relative positioning, Static positioning, Kinematic positioning, Limitations

Surveying and Mapping Applications

Control Surveys using static and rapid static positioning, Cadastral Surveys using stop and go positioning, Kinematic positioning Surveys.

Reference station, reference equipments and radios: Selection of Reference Station, Reference Station Equipment: GPS receiver, GPS antenna. Radio and its types, Radio Antenna

Mobile mapping and other applications: Mobile Mapping basic concepts and Applications

Navigation Military, Location Based Services, Vehicle tracking, Seismic Applications- Crustal deformation and tectonic movements

PHOTOGRAMMETRY

Basic Photogrammetry

Introduction:

Definition and Historical Development, Platforms for Aerial Photography, Classification of aerial photographs, Aerial Camera its components and types, Camera calibration, Types of films, Photographic processing, Photographic Resolution, Photogrammetric Applications and products.

Geometry of Single Aerial Photographs

Basic definitions, Relief and tilt distortions, Rectification and ortho-rectification, Planimetric map compilation.

Stereo Photogrammetry

Binocular and stereoscopic Vision, Photographic Overlap, Height determination from stereo pairs – parallax equation, Coordinate Systems used in Photogrammetry, Flight Planning.

Analog Photogrammetric Instruments in Mapping

Introduction to stereo plotters, Orientation concepts: Inner, Relative and Absolute Orientation, Map compilation, Aerial triangulation for control extension. Introduction to analytical photogrammetry

Digital Photogrammetry

Definition of digital image, Source of Digital images, Photogrammetric Scanners, Digital Photogrammetric workstations.

Digital aerial triangulation, Automatic image matching, Production of Digital Elevation Models (DEM), Digital orthophotos and digital contours. Digital Line mapping (in 2 D and 3 D mode).

Geodesy and Satellite Positioning (Practicals)

Gravity observation and reduction. GPS and Total station for control extension and cadastral surveys

Photogrammetry (Practical)

Air photo Interpretation for Terrain Evaluation and thematic mapping, Object height measurements by

Parallax bar, Stereo plotting with photogrammetric Instruments. Photo control, Aerial triangulation, Production of DEM, orthophotos and line maps in digital photogrammetric environment.

Text Books

American society of photogrammetry (ASP), Manual of remote sensing, second edition, ASP, Falls church,VA,1983

Leicka. A.: GPS Satellite Surveying, John Wiley & Sons, use. New York

Global Positioning System, Principle and Applications -Sathish Gopi , Tata Mcgrow Hill, 2005

Departmental Lecture Notes

GM 003: REMOTE SENSING FUNDAMENTALS

Credits: 4

Hours per week: 20 (A maximum of 60 hours)

FOUNDATION OF REMOTE SENSING

Physics of Remote Sensing

Definition and Stages, Electromagnetic radiation, Electromagnetic Spectrum, Radiation Laws, Interaction Mechanism with Earth Features and Atmosphere, Atmospheric Windows and bands, Spectral Reflectance Curve, Real and Ideal Remote Sensing Systems, Ground truth.

Platform and Sensors

Ground based, air and space borne platforms, Satellites and its orbital mechanics, Sensors: Imaging and non-imaging sensors, Active and Passive Sensors, Photographic Systems, Optical Mechanical Scanners, Pushbroom Scanners,

Image interpretation

Multi-band concepts – False Colour Composites, Multi-resolution- Spectral, Spatial, Radiometric and Temporal Resolution, Elements of image interpretation, Visual and digital interpretation techniques, their advantages and Limitations,

Ground truth Collection.

Characteristics of some Remote Sensing Satellites

LANDSAT Series, SPOT, IRS, IKONOS, Quick bird, Orbview, ESA, Radarsat, NOAA, KOMPSAT, Future trends.

Applications

Mapping and non-mapping applications, Integration with GIS

ADVANCED TOPICS

Thermal Remote Sensing

Fundamentals, Radiant Temperature, Black body Radiation, Radiation from real materials, Atmospheric effects, Interaction of Thermal Radiation with Terrain Elements, Thermal Energy Detectors, Thermal Radiometers, Thermal Scanners, Interpreting Thermal Scanner imagery, Geometric Characteristics of Thermal Scanner Imagery, Temperature mapping with Thermal Scanner Data.

Microwave Remote Sensing

Fundamental of microwave Remote Sensing, SLR System operation, Spatial Resolution of SLR systems, Geometric and Electrical Characteristics of SLR imagery, earth surface feature characteristics influencing Radar returns, Interpretation of SLR imagery. Microwave Remote Sensing from space: Seasat, ERS, Radarsat, Shuttle Imaging Radar. Elements of Passive Microwave Sensing, Passive Microwave Sensors, Applications of Passive Microwave Remote Sensing.

Hyper-spectral Remote Sensing

Concepts, advantages and limitations.

Lidar: Brief Introduction to Lidar

DIGITAL IMAGE PROCESSING

Image Pre-processing and Enhancement

Introduction

Digital Image, Source of data, Data formats

Image Pre-processing

Initial Statistics Extraction, Radiometric Corrections, Geometric Corrections, Geo-referencing Methods, Radiometric re-sampling

Image Enhancement

Image reduction and magnification, Contrast enhancement, Ratioing and Spatial filtering, Edge Enhancement, Special transformations, Image fusion.

Information Extraction

Supervised and Un-supervised Classification Techniques for landuse land cover, mapping, Pattern recognition technique, Classification accuracy assessment, Change detection, ground truth, data filtering, output generation, Advanced techniques in information extraction.

Image Processing System Considerations

Hardware Requirements (CPU, Operating System, Data Storage, Display Resolution, Colour Resolution), Software considerations and Analysis of commercial software.

Visual Image Analysis (Practical)

Interpretation of satellite images for landuse/landcover mapping

Digital Image Processing (Practical)

Geo-referencing, Statistical analysis, image enhancement, digital classification.

Text Books

John, R. J., Introductory Digital Image Processing – A Remote Sensing Perspective, Prentice Hall Series

Joseph, George, (2003), Fundamental of Remote Sensing, University Press (India) Pvt. Ltd, Orient Longman Pte. Ltd., Hyderabad, India
Lillesand, T.M. and Kieffer, R.W., 2003. Remote Sensing and Image Interpretation, 5th Edition., Wiley, New York

Departmental Lecture Notes

GM 004: GEOGRAPHIC INFORMATION SYSTEM & STATISTICS

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

FUNDAMENTAL CONCEPTS OF INFORMATION SCIENCE

Basic Concepts and Historical Development

An overview the development of the GIS field , GIS defined, Components, Feature types – points, lines and areas

Data Sources

GIS Data Requirement, Primary sources - Photogrammetry, Satellite Positioning Systems, Remote Sensing, Secondary sources - Maps, Field survey records

Data Capture Methods

Manual digitization, heads up digitizing , Scanning, automatic vectorization, Errors of digitization, Conversion from Other Digital Sources, Attribute data input and management, Edge matching, Remote sensing; GPS; data exchange; metadata ;Different Kinds of geospatial data, , Detecting and Evaluating Errors, Data Quality Measurement and Assessment, digital output options;

Implementing geographic concepts in GI systems & Data structures

Fundamentals of Data Storage, Information Organization and Data Structure, Basic File Structures; Tabular Databases; Advantages of Databases, Types of Databases- hierarchical systems, network systems, relational systems and Object-oriented database systems (OODS), Data Models-Entity Relationship model, Relational Model, Adapting database to GIS use; Data Structures; Raster Structures, Vector Structures, Hybrid Model, Non-spatial Database Models, data modeling

Data storage & exploration

Image storage formats, Data retrieval, Data compression, Supplying the data; Public access to geographic information; Digital Libraries, NSDI,GSDI; geographic information in decision making; human resources and education; Interactive data exploration, Vector & Raster data

query, Geographic visualization.

Hardware and software Configuration

Basic configuration structure of a GIS

Review of GIS software

Evolution of GIS software. Commercial software analysis

DATA ANALYSIS TECHNIQUES

Raster data analysis

Data base and structure, Local operations, Neighborhood operations, Zonal operations, Distance measure operations, Spatial auto correlations, DEM generation, Spatial Modeling, combining data; terrain mapping finding and quantifying relationships; generalization; spatial statistics; geo-statistics; spatial interpolation; Artificial Neural Networks for Spatial Data Analysis, interoperability; knowledge base and expert systems; collaborative spatial decision making

Vector data analysis

Vector data base , topological Relationships; Creation of Topology and Error Correction; Accuracy and Precision; The Importance of Error, Accuracy, and Precision, types of error, sources of error, data quality, Spatial interpolation, Overlay Operations and Buffering, Neighborhood functions Distant Measurement , Map Manipulation, Network analyses,

Data integration and management

GIS and Remote Sensing data Integration, Thematic Mapping , GIS and Integration of other types of data, Virtual GIS and SDSS, Project design and management, need assessment; conceptual design of the GIS; survey of available data; database planning and design; pilot studies ; GIS system integration; GIS application development; GIS use and maintenance

STATISTICS FOR GEOMATICIANS

Theory of errors and Adjustment Computations

Basic Statistics

Samples and population mean, variance, standard deviation and correlation, Normal distribution &

Theory of Probability, Testing hypothesis, Chi square test & Student's t-test, Confidence intervals and statistical tests,

Theory of Errors

Types of Errors, Error law, System of linear equations, Linearization techniques, Least square Adjustment, Weights, Rejection criteria, Error ellipse.

Geo-statistics & Statistical applications in GIS

Mean centre of population & settlement and their temporal shift, Locational Quotient (LQ), Lorenz Curve & Gini's Coefficient of Correlation, Standard Score / Z-Score, Nearest Neighbour analysis &, Population Potential, Rank Size Rule, Bi-variate & Multiple correlation and regression, Correlation analysis Scatter Diagram & Residual mapping, Principal & conical Component analysis, Spatial autocorrelation & Joint count statistics. **Geographic Information System (Practical)** Hands on training related to GIS software: Basics commands to work; Digitization using digitizer; Making spatial data usable – construction of topology, error identification, error correction, reconstruction of topology; Entry of Non-spatial data. (attributes); Linking of Spatial & Non-spatial data; Transformation of Co-ordinates/ Projections; Buffer Analysis; Overlay Analysis; Network Analysis; Digital elevation models generation via point interpolation techniques and interpolation of contour lines.

Statistics For Geomaticians (Practical)

Mean centre of population & settlement and their temporal shift, Locational Quotient (LQ), Lorenz Curve & Gini's Coefficient of Correlation, Standard Score / Z-Score, Nearest Neighbour analysis &, Population Potential, Rank Size Rule, Bi-variate & Multiple correlation and regression, Correlation analysis Scatter Diagram & Residual mapping, Principal & conical Component analysis, Spatial autocorrelation

Text Books

Principles of Geographic Information System : Peter A. Burrough and Rachael A. McDonnell- Oxford
DeMers, M.N., Fundamentals of geographic information system, Wiley, New York, 1997

Statistical Methods for Geographers, Longman; Gregory, S. (1978):

Departmental Lecture Notes

GM 005: REMOTE SENSING IN LAND & WATER MANAGEMENT AND GEO-INFORMATICS & SPATIAL DSS

Credits: 3

Hours per week: 15 (A maximum of 45 hours)

LANDUSE, HYDROLOGIC AND WATER RESOURCE PLANNING

Landuse/landcover Planning

Different levels of mapping, Definition of land use/land cover categories

Basic Hydrologic Concepts

Hydrologic cycle- Role of Remote Sensing in evaluating hydrologic features and elements. Estimation of precipitation, evaporation- evapotranspiration, interception & run-off.

Water Resources

Surface water-ground water, water deciphering, quality inventory and monitoring, quantity assessment – Parametric watershed modeling – dimensional consideration of basic dynamics – evaluation of hydrologic parameters.

Watershed Management

Concept of watershed, Morphometric Analysis, Hydro-morphogeologic interpretation techniques for targeting ground water potential zones in alluvial, sedimentary and hard rock areas, location of aquifer, watershed management, techniques of soil and water conservation.

Remote Sensing in Water resource Evaluation

Drought & flood Assessment, flood plain mapping, soil moisture, water quality, snow & cloud mapping. Estimation of Aquatic biodiversity, Runoff and soil loss estimation. Site location for storage and diversion projects, dam

site selection, tunnel and canal alignment, Case Studies.

APPLICATION OF GEO-INFORMATICS AND SPATIAL DECISION SUPPORT SYSTEMS

Application of Geo-informatics

Introduction

Emergence of geoinformatics technology in application areas, understanding potentials of geoinformatics in allied sectors, geoinformatics advantage over conventional techniques. Indian satellite missions with focused applications, Recent trends in geoinformatics application

Applications

Application in Land Resource Application in Water Resources, Application in Disaster Management, Application in Urban Planning, Application in Geo-technical Engineering & Application in Environmental Management.

Spatial Decision Support Systems

Introduction

GIS and decision support systems, SDSS Definition and characteristics, Introduction to decision making process and decision support systems, Introduction of a frame work for planning and decision making, Spatial Decision Making, SDSS Architecture.

Database management system

Model based management system, Graphical and tabular report generator, User interface.

Principles and components of multiple-criteria decision making, Main multiple-criteria evaluation methods/techniques

Spatial multiple criteria decision making, Multiple-criteria decision making in spatial data analysis, Spatial multiple criteria evaluation in planning and decision making.

Development of DSS, Technology levels, Functions and roles, Status of SDSS

Interface development GUI, Tools, Programming languages, Spatial and Non Spatial analysis Modelling.

Remote Sensing in Land and water Management (Practical)

Morphometric analysis: Relative Relief (RR), Drainage Density (DD), Dissection Index (DI), Ruggedness Index (RI), Average Slope (S), Stream order(μ), Bifurcation Ratio(RB), and Hypsometric Curve. Satellite image based hydro-geomorphological interpretation for ground water targeting. Runoff & Soil Loss estimation based on empirical models. Digital terrain models for selection of dam site, road, and canal construction.

Application of Geo-Informatics and Spatial Decision Support Systems

Practical on Application of Geo-informatics & Spatial decision support system will be based on field work.

Text Books

Schultz, G. A. and Engman, E. T. 2000. Remote Sensing in Hydrology and Water Management, Springer-Verlag, Berlin, Germany.

Murthy, J. V. S. 1994. Watershed Management in India. Wiley Eastern Ltd., New Delhi.

Todd David Keith. 1980. Groundwater Hydrology, John Wiley & Sons, New York, Second Edition.

Lillisand, T. M. and Keifer, R. W. 2005. Remote Sensing and Image interpretation', John Willey and Sons, New York, Fifth Edition

Jenson, J.R. 2000. Remote Sensing of the environment – An Earth Resource Perspective, Prentice Hall Inc.

Bonczek, R.H., C.W. Holsapple, and A.B. Whinston, 1981. Foundations of Decision Support Systems, Academic Press, New York. Basic text on DSS.

Geoffrion, A.M., 1983. "Can OR/MS evolve fast enough?" Interfaces 13:10. Source for six essential characteristics of DSS.

House, W.C. (ed.), 1983. Decision Support Systems, Petrocelli, New York. Basic DSS text.

Sprague, R.H., 1980. "A framework for the development of decision support systems," Management Information Sciences Quarterly 4:1-26. Source for DSS development model.

Sprague, R.H., and Carlson, E.D., 1982. Building Effective Decision Support Systems, Prentice-Hall, Englewood Cliffs NJ. Basic DSS text.

GM 006: RESEARCH METHODOLOGY, PROJECT MANAGEMENT AND COMPUTER FUNDAMENTALS

Credits: 4

Hours per week: 20 (A maximum of 60 hours)

Research Methodology & Project Management

Problems of GI research. Identification of problems of regional and Local level, geographic data sources and natures of data to be used. Hypotheses and Models, Formulation of research schemes. Preparation of research projects and writing of reports, Preparation of field reports, spatial data, classification and sampling problems. Need for sampling, types of sampling, sample size, sampling area. Project Definition, Importance of Projects and Project Management, Project Management context. Basics of project management, Project formulation, Time management, Budget estimates, Cost-benefit calculation techniques. Project bidding, Project plan, Task Definition, Project Resource, Scheduling, line Management, Project Team. Managing the Projects Activities, Project Administrator, Classification of Projects. Product Management, Problems and opportunities in Projects. Tools & Methods: Project Communications and Presentation, Project Management Software, Project Administration. Evolution, Revolution, & Termination of Project, Project Change, End of Projects, Project report preparation.

Computer Fundamentals

Basic Computing, Introduction to Programming, Programming languages, Basics of C language, Visual Basic 6.0 language

Text Books

W.E. Huxold & A.G. Lerinsons Aronoft.S.(1989) Managing Geographic Information Projects.

Earickson, R., and Harlin, J. (1994) Geographic Measurement & Quantitative Analysis

Macmillan, N.York

E Balaguruswamy “ Programming in ANSI C ” TMH 2nd Edition 2000

Rajaraman Y., “Fundamentals of Computers”, Prentice Hall of India, New Delhi, 1999.

Mohammed Azam “ Programming with VB 6.0 ”, Vikash Publishing House Pvt. Ltd.

Evangelos Petroustos “Mastering Visual Basic 6.0” , BPB Publications, Edition 1998

GM 090: RESEARCH PROJECT DISSERTATION

Synopsis consisting of relevance of the problem to be studied and its aims and objectives, Methodology adopted to study such problem

Chapter Scheme, Review of Literature, Preliminary base work carried out, Presentation

On satisfactory completion of the taught component of the course, students will normally proceed to the M. Tech. Research Dissertation which must be completed by the end of 2nd Semester of 2nd year. This should be a substantial piece of research work, which both reinforces the skills learned in the taught component of the course and provides a genuine opportunity to undertake valuable research. Each student is required to defend his / her thesis through a presentation followed by a GRAND VIVA in front of the departmental committee constituted by the Head of the Department.

ELECTIVE SUBJECT DETAILS

Any Two Electives from List Below:

GM 007: ADVANCED PHOTOGRAMMETRY

Analytical & Digital Photogrammetry

Comparators and Photo co-ordinates, Sources of error, Analytical orientations (collinearity and coplanarity conditions), Space resection and

intersection techniques, Analytical Plotters.

Digital Images, Photogrammetric Scanners, Soft copy photogrammetric work stations, Digital aerial triangulation, Digital orthophotos and Digital Elevation Models (DEM)

Satellite Photogrammetry (20 marks)

Celestial mechanics, modeling of satellite based stereoscopic image data. Ortho-rectification of monoscopic images.

Advanced Photogrammetry (Practical)

DEM and Orthophoto generation using aerial photographs, ortho-rectification of satellite images.

Text Book:

American society of photogrammetry (ASP), Manual of remote sensing, second edition, ASP, Falls church,VA,1983

Avery,T.E.,and G.L.Berlin, Fundamental of remote sensing and airphoto interpretation,5th ed, Macmillan, New York,1992

GM 008: ADVANCED REMOTE SENSING

Thermal and Hyper-spectral Remote Sensing Thermal Sensing

Introduction, Across-Track Thermal Scanning, Thermal Radiation Principles, Interpretation of Thermal Scanner imagery, Geometric Characteristics of Across-Track and Along-Track imagery, Radiometric Calibration of Thermal Scanners, FLIR Systems

Hyper-spectral Sensing and Ultra-spectral Sensing

Scope, Sensors, Potential Applications

Microwave Remote Sensing

Introduction

Microwave Remote Sensing and its advantages, Active and Passive systems, Platforms and sensors, Mathematical formulation for microwave radiation and simulation, Measurement and analysis of brightness temperature. Applications in various fields: Oceanography and Meteorology.

Active Microwave Systems

Basic Principles of Radar, Side Looking Radar System (SLAR) Operation, Synthetic Aperture Radar (SAR), Radar equation, resolution, Range, Phase and Angular measurements, Transmission characteristics of Radar Signals, Microwave scattering and measurement, Relation between scale and sensor parameters, Radar Remote Sensing from Space, Imaging systems- Imagery, their characteristics and interpretation.

Important Satellite missions

Seasat, SIR, Almaz, ERS, Envisat, JERS, ALOS, Radarsat, LightSAR

Passive Microwave Sensing

Scope, Sensors, Potential Applications

Lidar

Scope, Application in various fields- land use / land cover, soil/rock, Hydrology.

Microwave Interferometry

Theory and Mathematical background, differential Interferometry, Applications – DEM generation, Glacial Movement, Land slides, Snow, Avalanches, Hydrology.

References:

1. American society of photogrammetry (ASP), Manual of remote sensing, second edition, ASP, Falls church,VA,1983
2. Townshend, J.R.G. (ed.) Terrain Analysis and Remote Sensing, Allen & Unwin, London; Boston, pp. 59-108
3. Ulaby, F.T., Moore, R.K. and Fung, A.K. (1981) Microwave Remote Sensing, Active and Passive, Volume I, Fundamentals and Radiometry. Addison-Wesley, Reading, Massachusetts; London.
4. Ulaby, F.T., Moore, R.K. and Fung, A.K. (1982) Microwave Remote Sensing Active and Passive, Volume II, Radar Remote Sensing and Surface Scattering and Emission Theory. Addison-Wesley, Reading, Massachusetts; London.

GM 009: GEOINFORMATICS IN COASTAL MANAGEMENT

Theoretical Considerations

1. Coastal morphodynamics: Micro, macro and biogenic forms. Systems of change in coasts: cyclical and progressive. Classification of coasts based on processes and sediment characteristics.
2. Coastal biogeography with special reference to sea weeds, mangroves, dune vegetation and corals.
3. Natural coastal hazards and their management: Sea level rise, erosion, sedimentation and tropical cyclones.
4. Techniques of monitoring changes in coastal processes and landforms.
5. Human utilisation of coasts, environmental impacts and management: Navigation, mining, fishing and fish-processing, off-shore oil exploitation, reclamation and tourism.
6. Coastal engineering and its impacts: Ports and harbours, measures for prevention of erosion and sedimentation.
7. Coastal pollution: Sources, impacts and management.
8. Integrated Coastal Management: Concepts, techniques and applications.

Potential Application areas of RS /GIS

West Bengal coast: Major environmental issues, problems and their management
Application of Remote Sensing with special reference to Fishery
Monitoring Surface waters in Coastal Regulatory Zone (CRZ) Study of Suspended mineral in water
Study of Chlorophyll in water
Measurement of Sea Surface Temperature (SST)

References:

1. Garrison, T. 1993. Oceanography: An Invitation To Marine Science, Wadsworth Pub. Co., Belmont: 540 P. [Topics 4.1, 4.2, 4.3]
2. Pethick, J. 1984. An Introduction To Coastal Geomorphology, Edward Arnold, London: 259 P. [Topics 2.3, 4.4]

GM 010: GEOINFORMATICS IN EARTH SCIENCES

The Earth System

Concept of Earth System, lithosphere, biosphere, hydrosphere & atmosphere, plate tectonic theory and its relationship to earthquakes, and volcanic activity.

Rock Types Type of rocks

Igneous, sedimentary and metamorphic rocks, their characteristics, types and forms, delineation on satellite images.

Rock Structures

Folds, faults, joints and lineaments, field characteristics, delineation on satellite Images and analysis.

Geomorphology

Fundamental concepts, geomorphic agents and processes, drainage patterns, classification of landforms. Image characteristics of major landforms.

Visual/ Digital Satellite Image Interpretation

Elements of image interpretation, Digital image enhancement techniques for lithological discrimination. Application of Filters for lineament and structural mapping.

Multivariate data modeling

Concept and application in geosciences: Disaster Management, Landslide hazard zonation, mineral targeting. Rock Information System.

Case Studies

GPS in plate tectonic studies in Himalayas, Predicting seismicity in peninsular region through lineament studies, GIS based multivariate analysis in mineral targeting.

Textbook:

Murk & Skinner. 1999. Geology Today- Understanding our planet, John Wiley and Sons Inc, New York

Lillisand, T. M. and Keifer, R. W. 2005. Remote Sensing and Image interpretation', John Willey and Sons, New York, Fifth Edition

Pandey, S. N. 1987. Principal and applications of photogeology. New Delhi: Eastern Wiley.

GM 011: GEOINFORMATICS IN FOREST MANAGEMENT

Introduction of conventional classification
Inventory of forest land Temperate and Tropical zones, Forest resources of India, state wise status of forests

Forest Classification, Sensor Requirements, Forest mapping needs and remote sensing – national, regional and local level

Forest inventorying through remote sensing – techniques, processes and methods, Visual and digital analysis

Forest management, Damage assessment Fire Identification and control Disease detection storm damage - role of geoinformatics

Forest planning, information generation and updation through geoinformatics

Forest and Wildlife Management, Forest resources and wildlife habitat assessment, Wild life management Case Study of India and abroad, Forest recreation

Mapping of forest density and type using optical and microwave remote sensing, issues in forest management

Textbooks:

1. Baretl, E.C. and Culis I.F. Introduction to Environmental Remote Sensing, Second edition, Chapman and Hall, New York, 1993.
2. Simmons, T.G. The Ecology of Natural Resources, Edward Arnold, London, 1974.

GM 012: GEOINFORMATICS IN DISASTER MANAGEMENT

Introduction

Fundamental concepts of hazards and disasters, their types, and characterization, zonation of hazards, natural and human induced disasters. Disaster and National losses, historical perspective of disasters in India.

Disaster Management

Fundamental concept of Disaster Management,

government, NGOs and peoples participation disaster management. Existing organization structure for managing disasters in India. Geoinformatics in disaster mitigation.

Geological Hazards

Landslide, Earthquake, Mining hazards (subsidence, flooding etc.), Volcanic hazards, Groundwater hazards, Glacial hazards

Hydro meteorological Hazards

Flash floods, River floods, Dam burst, Cloud burst, Cyclones, Coastal hazards and Drought

Environmental hazards

Forest hazards (Deforestation, Degradation and Forest fire), Land, soil degradation, desertification and Pollution (Water, air and soil)

Geoinformatics Applications

Geoinformatics models in managing forest fires, floods, landslides, cyclone and earthquake, multiple hazard mapping

Case Studies

Earthquakes in India, Floods in Indo Gangetic plains, Landslides in Himalayan region, **Drought in Indian plateau regions.**

Textbook:

P.S. Roy (2000). Natural Disaster and their mitigation. Published by Indian Institute of Remote Sensing (IIRS), 2000.

Reference book:

Spatial Technologies for Natural Hazard Management. Proceedings of ISRS National Symposium, Nov. 21-22, 2000, IIT, Kharagpur.

GM 013: GEOINFORMATICS IN AGRICULTURE

Crops, Introduction – Yield parameters- spectral properties of crops- identification of crops and acreage estimation

Vegetation indices production forecasting through digital analysis monitoring and condition assessment – case studies.

Soils, Introduction –Soil Survey methods- soil Classification – land Evaluation- Saline, alkaline soils- mapping using RS data. Problems soil identification and mapping – Soil sedimentation and erosion- Soil conservation case studies.

Damage assessment, Detection of pest and diseases- damages due to droughts and floods – water-logging and salinity- stress detection.

Integrated surveys, Integrated surveys for sustainable development – watershed approach – Agriculture and forest development, GIS for drawing out action plans- case studies and recent development in Agro- climatic modelling – watershed planning.

Textbooks:

Steven, M.D. and Clark, J.A. Application of Remote Sensing in Agriculture, Butterworths, London, 1990.

Ghassem Asrar, Theory and application of optical remote sensing. John Wiley & Sons, New York, 1989.

Space Applications Centre- Manual of procedure for Forest mapping and Damage Detection using satellite data, Report No. IRS-UP/SAC/FMDD/TN/16/90, 1990:pp-58.

Space Applications Centre –Status Report on Crop Acreage and Production Estimation, Report No. RSAM/SAC/CAPE/SR/ 25/90, October 1990, pp-253.

GM 014: GEO-INFORMATICS IN URBAN, RURAL DEVELOPMENT AND REGIONAL PLANNING

Theoretical Considerations

Concepts and definitions: urban, urbanization and urbanism, Origin & growth of urban settlements; bases & process of urbanization, Major influences in urban planning: ancient, oriental, European, American. Urbanization in India: a historical perspective Features of metropolitan development (with special reference to India) Issues of urban environment: poverty, crime, infrastructure, sprawl, renewal, pollution & health. Urban Environmental Problems in West Bengal

Theoretical framework of rural development and geographical perspective: Rural economy under different production systems – experiences of developed and developing world with examples.

Dimensions of rural economy; Non-urban landuse – agriculture and complementary uses of land; animal husbandry, dairying, poultry, fishing, forestry, market gardening and agro-based industries; Problems of development related to labour, capital, market, scale and infrastructure.

Rural labour force with special reference to gender, migration and socio-cultural dimensions. Concept of growth, development, poverty and underdevelopment Regional development perspectives: Colonial period (Dependency theories) Growth Pole theories and the developing world, Agropolitan Development, Basic Needs Approach, Regional Environmental Issues.

Potential Application areas of RS / GIS

Analysis of rural settlement: Cause and effect associations, distribution of rural settlement with special reference to size and spacing; Rural service centres – Nodal settlement of market centres and growth centres – Studies on rural urban continuum.

Brief introduction of Remote Sensing applications on Urban landscape

Population estimates, housing quality studies, site selection processes, traffic and parking studies, Urban & rural change detection studies, Remote sensing applications in Biological systems.

Reference:

Brench M.C., City Planning and Aerial I information, Harvard University, Cambridge, 1971

GM 015: GEOINFORMATICS IN ENVIRONMENTAL SCIENCE & MANAGEMENT

Water and the environment, R.S. of fluorescence-water quality- water pollution- pollution sources-water runoff, Remote Sensing and Water quality management –snow surface cover- flood prediction. Soils and land forms- insects and

disease- soil erosion- salinity- flood damage- soil limitation –soil degradation using Remote Sensing and GIS.

Urban environment, General consideration rural structure- urban areas- Impact of industrial pollution- chemical effluents, land reclamation- disposal of solid waste- mining pollution

Ecology and ecosystem, Conservation and resource management – spectral reflectance from vegetated surface- Stress monitoring- forest conservation- wild life studies- GIS for monitoring non print source pollution.

Marine environment, Sensors for environmental monitoring sensors – visible and outside visible wave length – absorption spectrometers – selection of ground truth sites- sea truth observations –Radar techniques for sensing ocean surfaces- thermal measurements – application of sensing, mapping oil slicks – Chlorophyll detection- Fisheries resources- Coastal marine studies- determination of temperature and sea state.

Air pollution and global climatology, R.S. technique for Air quality monitoring- case studies- weather forecasting and climatology- emissivity characteristics.

Measurement of atmospheric temperature- composition- constituent distribution and concentration- composition- constituent distribution and concentration- wind flows and air circulation- Hurricane tracking – meteorological satellite systems.

Textbooks:

Baretl, E.C. and Culis I.F. Introduction to Environmental Remote Sensing, Second edition, Chapman and Hall, New York, 1993.

Lintz, J. and Simonent, D.S. Remote Sensing of environment Addison Wesley, Rading mars, 1976.

**GM 016: GEOINFORMATICS IN
RESOURCE MANAGEMENT**

Concepts in Resources

Resources classification systems, natural and cultural resources, renewable and non-renewable resources.

Resource Conservation

Remote sensing based Land use- Land cover mapping for resource monitoring and management Sustainable development of natural resources.

Land Resources

Introduction to soil, mineral resources, remote sensing in mapping soil degradation, impact of surface mining on land resources,

Bio-Resources

Remote sensing application in agriculture, forest resources and wildlife habitat assessment. Mapping of forest density and type, issues in forest management.

Water Resources

Remote sensing application in surface and sub surface water resources evaluation, water mining and pollution, issues in water resources management.

Energy Resources

Coal, oil and nuclear energy, non conventional energy resources, future potential and requirement of energy resources. GIS in energy resources management.

**Geoinformatics Models in Resource
Management**

Forest Fire Modeling, Wild Life Habitat Assessment Modeling, Soil Erosion Modeling, Land Resources Development Prioritization Modeling.

Textbooks:

Miller, R. W. and Donahue, R. L. (1990): Soils, Prentice-Hall of India

Lillisand, T. M. and Keifer, R. W. 2005. Remote Sensing and Image interpretation', John Willey and Sons, New York, Fifth Edition

Simmons, T.G. The Ecology of Natural Resources, Edword Arnold, London, 1974.

GM 017: GEOINFORMATICS IN TRANSPORT NETWORK ANALYSIS

Introduction

Introduction to Transportation Planning, Behavioral Issues in Transportation Studies, Public Transportation Operations and Technology

Transportation Systems

Mass Transportation Systems, Traffic Studies and Capacity, Transportation Economics and Finance, Traffic Safety and Control

Network Analysis And Transportation

Concept of networks and Network models, Network analysis, Important applications, utilities and transportation, using network model in GIS, Multi-modal Freight Transportation Systems Analysis

Transportation Modelling

Transportation Models, Simulation Analysis , Discrete Choice Modeling for Travel Demand Forecasting

Intelligent Transportation Systems

Urban Transportation Networks , Geometric Design of Transportation Facilities, Transportation Design

Planning And Execution

Airport Design and Planning , Port Design and Planning , Urban Transport planning

Applications

Case studies

Textbooks:

Network Analysis in Geography. St Martin's Press
Haggett P, Chorley R J

Spatial Processes: Models and Applications. Pion
Cliff A D, Ord J K

GM 018: GEOINFORMATICS IN UTILITY MANAGEMENT

Utility, Description of all essential services and utilities, Database development and Data Acquisition, Acquiring and integrating geospatial

data, Spatial Data Bases

Spatial Data Manipulation and Analysis, Geospatial system analysis and design, Geospatial technology project , management ,Query Processor and Visualization, Applications and Problem solving with GIS Electricity, Gas, Water supply, Sewerage system Solid waste disposal, Telecommunication, Public health and safety, Crime analysis Modelling in utility applications, Infrastructure aims and objectives, Environmental law and regulations governing infrastructure utilities, Modern infrastructure tools
Case study

Textbooks:

Harries K (1999) *Mapping Crime: Principle and Practice*. Washington, DC: Crime Mapping Research Center, Department of Justice

Hodder I, Orton C (1979) *Spatial Analysis in Archaeology*. Cambridge: Cambridge University Press

Escritt, L. B., Water Supply and Building Sanitation, 4th Ed., Mac Donald and Evans Limited, 1972

Hammer, Mark J., Water and wastewater Technology, 2nd Ed., John Willey and Sons Inc., 1986.

PRACTICAL ON ELECTIVE PAPERS

Based on primary or secondary data case studies to be generated on respective themes

Validation of the output based on post field data

Output generation - finalization