Gujarat Technological University
BE- Sem - I

Mathematics-I

- Review of limits, continuity, differentiability.

- Mean value theorem, Taylors Theorem, Maxima and Minima.

- Riemann integrals, Fundamental theorem of Calculus, Improper integrals, applications to area, volume.

- Convergence of sequences and series, power series.

- Partial Derivatives, gradient and directional derivatives, chain rule, maxima and minima, Lagrange multipliers.

- Double and Triple integration, Jacobians and change of variables formula.

- Parametrization of curves and surfaces, vector Fields, line and surface integrals.

- Divergence and curl, Theorems of Green, Gauss, and Stokes.

Texts/References

1. Hughes-Hallett et al., Calculus - Single and Multivariable (3rd Edition), John-Wiley and Sons (2003).

2. James Stewart, Calculus (5th Edition), Thomson (2003).

3. T. M. Apostol, Calculus, Volumes 1 and 2 (2nd Edition), Wiley Eastern 1980.

4. G. B. Thomas and R. L. Finney, Calculus and Analytic Geometry

Chemistry

1. **Water Technology :**
Introduction, sources of water Impurities in water, hard and soft water, Degree of hardness, Types of hardness, Scale and sludge formation in boiler Boiler corrosion. Caustic embrittlements, Priming and Foaming, Softening of water. Potable water, Break point of chlorination, Desalination of Brackish water etc.

2. **Metals and alloys :**
Introduction, Physical properties of metals, cast iron, wrought iron, steel, Heat treatment of steel. Definition of alloy, purpose of making alloys. Classification of alloys. Alloys of steel and its applications. Non-Ferrous alloys and its industrial applications.

3. **Corrosion and its inhibition :**
Introduction, Theories of corrosion, Types of corrosion, Protection of metals from corrosion – organic and inorganic materials, Inhibitors, Cathodic protection.

4. **Fuels and Combustion :**
Definition, types of fuel – solids, liquids, gaseous and Nucleon fuels. Calorifio Value, Characteristics of good fuel. Solid fuels – coal, coke. Analysis of coal – ultimate and proximate Liquid fuel – Petroleum. Refining of Petroleum by Fractional distillation. Gaseous fuel – coal-gas, bio gas produces gas and water gas. L.P.G. & CNG.

5. **Lubricants :**
Definition : Types of lubrication, classification of lubricants and their properties. Functions of lubricants.

6. **Cements :**
Introduction Manufacturing of Lime, Gypsum and Cement and their properties. Manufacturing of Portland cement, chemical composition of cement chemical constituents of Portland cement, Setting and hardening of cement.

7. **Polymers and Plastics :**
Introduction, Definition of Polymer. Types of Polymers, Types of Polymerization reactions and their mechanism. Plastics, Classification of plastics – Thermo plastics and Thermo setting plastics. Molding constituents of plastics Engineering properties and uses of plastics.
Definition of Rubber, Types of Rubber, Vulcanization of rubber. Application of Rubber.

8. **Multidisciplinary nature of Environment Study :**
Introduction, Nature of environment and its problem due to over utilization of natural sources. Environmental degradation Green house effect, acid rain, Ozone depletion, Photochemical smog. Environmental problems in India, Environment management and laws. Public awareness.

9. **Natural and Synthetic Fibers :**
   Introduction Definition of Fiber, Types of fibers – Natural, semi synthetic, synthetic fibers. Physical properties of fibers. Essential requirement for fiber for formation. Preparation, properties and uses of Cellulose acetic, Viscose Rayon, Nylon, Polyesters acrylic, Glass fibers etc. Differentiate between wool and silk fibers. Spinning processes – Melt and Wet spinning.

10. **Chemical aspect of Biotechnology :**
    Definition, Benefits through biotechnology – Agriculture, Food quality, Medicines etc. Fermentation, Fermentation processes, Enzymes and its application in industries. Bio fuels and Bio membrane.

11. **Protective Coatings :**
    Introduction, Types of protective coatings – metallic, chemical, organic, electroplating. Paints and varnishes – Ingredients, properties and uses, Enamels, Lacquers etc.

12. **Renewable and Non-renewable energy of sources :**
    Resources of energy, Appraisal resources problems, classification of Natural and renewable resources. Destruction and Conservation.

13. **Refractories, Abrasives and Insulators :**
    Definitions of refractories, Abrasives and insulators. Properties of refractories. Classification of refractories.
    Classification, properties and uses of abrasives. Classification, properties and uses of Insulators.

14. **Analytical Techniques :**
    Introduction Types of analysis – Physical, Chemical and instrumentation.
    Physical analysis – Specific gravity, Melting point, Boiling point, Crystallization. Purification of compounds etc. Chemical analysis – Quantitative and Qualitative analysis of organic and inorganic compounds.
    Instrumental analysis – Spectroscopic, Chromatographic PH measurement, Conductinity, Turbidity etc.

- The topics No. 12, 13 and 14 are to be taught during practical hours as a part of tutorial.

References :
1. Engineering Chemistry by Jain and Jain Publisher Dhanpat Rai Publishing Co.
2. Engineering Chemistry by Dr. O.P. Agrawal Khanna Publishers Delhi
3. Engineering Chemistry by N. Krishnamurthy, P. Vallinaygam and D. Madhavan Publisher – Prentice – Hall of India Pvt. Ltd. New Delhi
4. Engineering Chemistry by R. Gopalan, D. Venkappaya and Sulochana Nagarjan
5. Engineering Chemistry by C. Parameswara Murthy, C.V. Agrawal and Andra Naidu, B.S. Publication, Hyderabad – A.P.

6. Environmental Science by Y. Anjaneyulu B.S. Publishers, Hyderabad – A.P.
7. Environmental Studies and Disaster Management by S.G. Shah, S.G. Shah and Gopal N.Shah
8. Engineering Chemistry by B. Sivsankar The M.C. Grawhill Companies, New Delhi

Physics

1) **Architectural Acoustics**
   Classification of Sound : Loudness – Weber – Fechner law Decibel – Absorption Coefficient – Reverberation – Saline's formula – Factors affecting acoustics of buildings and their remedies.

2) **Ultrasonic**
   Introduction, production, properties and detection of ultrasonics. Determination of velocity and application of ultrasonic in Engineering.

3) **Crystal Physics**
   Introduction and classification of solids-crystal structure – The crystal systems and Bravias Lattice – Space Lattices of cubic systems – Miller Indices – Relation between Interplanner Distance and cubic Edge and Laws Formula.

4) **Band theory of Solids**
   Based theory of Solids – Classification of solids – Energy band structure of conductors, insulator and semi conductions types of diodes (simple diode, Zener diode, varactor diode, LED Solar cells, photovoltaic cell, Photo Conductivity, Hall effects.

5) **LASERS :**
   Introduction and properties of Lasers, Stimulated and instantaneous emersion – Relation between Ecienstein's 'A' and 'B' Coefficients-Population Inversion – Optical – Pumping – Nd-Yag Laser and CO_2 Laser – Application of Laser in Material Processing – Holography – Application of Lasers

6) **Optical** – Fibre Communication Introduction – Fibre – Optic System – advantages of Fibre optics – Basic principle – Acceptance angle and Numerical Aperture – Types of optics preparation through optical fibre

7) **Conducting Materials :**
   Introduction – conduction in Metals, Electron theory Q.M. treatment – Free electrode theory of metals – Electrical Conductivity – Thermal Conductivity – Wildemann – Franz law – Drawbacks of classical free electrode theory

8) **Super Conducting Materials**
   Introduction to super conductor – properties of super conductor Type I and Type II super conductor – Comparision between I and II – High T conductors – Application

9) **New Engineering Materials**
   Introduction – Metallic glasses, types, properties, preparation and its application – Introduction to nano technology – method of producing, properties and its application – shape memory alloys – types – shape Memory effect – Pseudo

elasticity – properties – application – Bio-materials – General information – Biomedical compatibly of Ti-Al-Nb alloys for implant application.

10) Non-Destructive Testing
Introduction – The objective of NDT – Types of Defects – Methods of NDT (Liquid Penetrate – Dye Penetrate Radiographic) x X-ray Radiography – X-ray Fluoroscopy – Ultrasonic Inspection method – Pulse Echo System – Visual Display units.

Reference Books :
1) Engineering Physics   K. Rajagopal Prentice-Hall of India Pvt. Ltd.,
     New Delhi
2) Engg. Physics   G. Vijayakumari   Vikas Publishing House Pvt. Ltd.
3) A Text book of Engg. Physics   M.N. Aavadhalula   S. Chand
     P .G. Kshirsagar
4) Engg. Physics   Abhijit Nayak   S.K. Kataria & Sons., Delhi.

MECHANICS OF SOLIDS

Description

1. **Introduction:** Scalar and Vector Quantities, composition and resolution of vectors, system of units, definition of space, time, particle, rigid body, force.

2. **Fundamentals of Statics:** Principles of statics, coplanar, concurrent and non-concurrent, parallel and non-parallel forces, composition and resolution of forces, moments & couples - their properties, combination of coplanar couples and forces, equilibrant, equilibrium, free body diagrams, analytical conditions of equilibrium for coplanar force systems.

3. **Truss:** Simple determinate plane trusses and analysis for member forces using methods of joints and methods of sections.

4. **Distributed forces, center of gravity and moment of inertia:** Center of gravity of lines, plane   areas, volumes and bodies, Pappus – Guldinus theorems, moment of inertia, polar moment of inertia & radius of gyration of areas, parallel & perpendicular axes theorems.

5. **Friction:** Theory of friction, static and sliding friction, laws of friction, angle and coefficient of friction, inclined plane friction, ladder friction, wedges, belt and rope friction.

6. **Simple Machines:** Velocity ratio, mechanical advantage, efficiency, reversibility of machines, simple machines such as levers, pulley and pulley blocks, wheel and differential axle, Single purchase/double purchase crab, compound screw jacks.

7. **Physical & Mechanical properties of structural materials:** Properties related to axial, bending, and torsional & shear loading, Toughness, hardness, proof stress, factor of safety, working stress, load factor.

8. **Simple stresses & strains:** Elastic, homogeneous, isotropic materials; limits of elasticity and proportionality, yield limit, ultimate strength, strain hardening, section of composite materials, prismatic and non-prismatic sections.
    Strains: Linear, shear, lateral, thermal and volumetric, Poisson's ratio.
    Stresses: Normal stresses, axial – tensile & compressive, shear and complementary shear, thermal and hoop,. Applications to composite material stepped & tapered bars.

9. **Beam:**
     (a) Types of loads, Types of supports, Types of beams, Support reactions for statically determinate beams
     (b) Bending moment and Shear force , Bending moment and shear force diagrams for statically determinate beams subjected to couples,

concentrated forces, uniformly distributed loadings, relation between bending moment, shear force and rate of loading, point of contra-flexure.

10. **Stresses in beams:** Theory of simple bending, bending stresses and their distribution, moment of resistance, modulus of sections, distribution of shear stresses in different sections.

11. **Principal stresses and strains:** Compound stresses, analysis of principal planes and principal stresses, principal strains, angle of obliquity of resultant stress, principal stresses in beams.

BOOKS :
1. Engineering Mechanics (Statics)   Beer and Johnston
2. Applied Mechanics   S. B. Junnarkar & H. J. Shah
3. Mechanics of Structure Vol. I   S. B. Junnarkar & H. J. Shah
4. Mechanics of Materials   Beer and Johnston.

Engineering Graphics

1.   Introduction to Engineering Graphics, Drawing instruments and accessories, BIS - SP 46. Use of plane scales and Representative Fraction.

2.   Engineering Curves: Classification of Engineering Curves, Construction of Conics, Cycloidal Curves, Involutes and Spirals.

3.   Loci of Points: Path of the points moving on simple arrangements and simple mechanisms, slider crank mechanism, four bar chain mechanism etc.

4.   Projections of Points & Lines: Introduction to principal planes of projections, Projections of the points located in same quadrant and different quadrants, Projections of line with its inclination to one reference plane and with two reference planes. True length of the line and its inclination with the reference planes.

5.   Projections of Planes: Concept of different planes, Projections of planes with its inclination to one reference plane and with two reference planes. Concept of auxiliary plane method for projections of the plane.

6.   Projections of Solids & Section of Solids: Classification of solids. Projections of solids like Cylinder, Cone, Pyramid and Prism with its inclination to one reference plane and with two reference planes. Section of such solids and the true shape of the section.

7.   Development of Lateral Surfaces: Concept of development of the different surfaces. Parallel Line Development and Radial Line Development.

8.   Orthographic Projections: Principle of projection, Principal planes of projection, Projections from the pictorial view of the object on the principal planes for View from Front, View from Top and View from Side using first angle projection method and third angle projection method, Full Sectional View.

9.   Isometric Projections and Isometric View or Drawing: Isometric Scale, Conversion of orthographic views into isometric projection, isometric view or drawing.

NOTE: Topic No. 1, 8 and 9 of the above syllabus to be covered in Practical Hours.

Text Books:
1.   A Text Book of Engineering Graphics By P.J.Shah
        S.Chand & Company Ltd., New Delhi
2.   A Text Book of Machine Drawing By P.J.Shah
        S.Chand & Company Ltd., New Delhi
3.   Elementary Engineering Drawing By N.D.Bhatt
        Charotar Publishing House, Anand
4.   Geometrical and Machine Drawing By N.D.Bhatt
        Charotar Publishing House, Anand

Reference Books:

1.   Engineering Graphics – I and II By Arunoday Kumar
       Tech – Max Publication, Pune
2.   Engineering Drawing & Graphics using Auto CAD 2000 By T. Jeyapoovan
       Vikas Publishing House Pvt. Ltd., New Delhi
3.   A text book of Engineering Drawing By R.K.Dhawan
       S.Chand & Company Ltd., New Delhi
4.   A text book of Engineering Drawing By P.S.Gill
       S.K.Kataria & sons, Delhi
5.   Engineering Drawing with an Introduction to AutoCAD By D.A.Jolhe
       Tata McGraw-Hill Publishing Co. Ltd., New Delhi
6.   Computer Aided Engineering Drawing, S. Trymbaka Murthy
       I.K.International Publishing House Pvt. Ltd., New Delhi

Computer Programming and Utilization

1   **Introduction to Computer & Programming:** Introduction, Basic block Diagram and functions of various components of computer. Concept of Hardware and Software. Concept of basic types of software. Introduction to programming and programming languages. Flow charts and algorithms.

2   **Introduction to C Language:**

I   **Fundamentals of 'C':** Data types in 'C'. Operators and their hierarchy, Concept of header files, I/O functions, control structures in C, looping structures in C, arrays and strings.

II **Functions and recursion:** Concepts of functions with various types of parameters. Various types of parameter passing mechanisms. Recursive functions and implementation of these concepts in 'C'.

III **Pointers and structures:** Concepts of pointers and simple programs using pointers. Introduction to simple structure and its implementations.

3   **Introduction to C++ language**

I   Principles of object oriented programming, Comparison with procedural languages, Tokens, expressions and control structures

II Introduction to functions, classes, objects, constructors, destructors in C++. Classes and Objects: Declaring classes, defining member functions, Making an outside function inline, nesting of member functions, private member functions, Arrays with in a class, Memory allocation of objects, static data members, static member functions, arrays of objects, objects as function arguments, friend function, returning of objects, const member function.

Text books:
   1. Title :   Programming in ANSI C, 4th edition
      Author: Balagurusamy E
      Publisher: Tata McGraw-Hill Publishing Company limited
   2. Object oriented programming with C++, 3rd edition
      Author: Balagurusamy E
      Publisher: Tata McGraw-Hill Publishing Company limited

Communication Skills

Unit – 1   Communication skills
            Process, types and levels of communication.
            Technical Communication and General Communication. Factors to be considered in technical communication.

Unit – 2   Verbal and non-verbal communication (kinesics)
            Components of Non-verbal Communication (Kinesics)
            Barriers to effective communication. (Noise in oral and written communication) Communication across cultures.

Unit – 3   Listening skills - Types of Listening Active Listening V/s Passive Listening Empathetic Listening. Traits of a good listener, barriers in effective listening, Tips for effective listening.

Unit – 4   Effective presentation strategies. Defining purpose, analysis of audience and locate, organizing contents. Preparing an outline of the presentation. Visual aids, nuances of delivery, Body language and effective presentation.

Unit – 5   Interviews
            Introduction, General preparations for an interview, Types of questions generally asked at the interviews. Types of interviews, Importance of non-verbal aspects.

Unit – 6   Group Discussions
            Introduction, Group discussions as a part of the selection process, guidelines for group discussion. Role functions in group discussion.

Unit – 7   Paragraph Development, Introduction, Topic sentence and supporting sentences. Attributes of a good paragraph. Types of paragraphs.

Unit – 8   Letter - Writing
            Business Letters, Structure and types of a business letter, Letter of Inquiry, Letters of complaint, regret and adjustment.

Unit – 9   Technical reports
            Introduction, types of reports, structure of reports, objectives and characteristics of reports.

Unit – 10   Technical Proposals
            Definition, Purpose, Types, Characteristics, Structure, Style and appearance.

Unit – 11   Technical Descriptions

Introduction, Definition of an object or a process. Guidelines for writing good description - organization, content, structure.

Unit – 12   Effective Reading Skills
Purpose of reading, skimming and scanning. Tips for improving comprehension skills.

Unit – 13   Job application
Essential parts - Cover Letter and the 'resume'. Types of 'resumes' (Curriculum Vitae) Chronological 'resume', functional 'resume'.

Unit – 14   Grammar and Vocabulary
Tense and the concept of Time. Passive Voice, Conditionals Prepositions, Concord. Idioms, Confusables, one-word substitutes, homonyms, homophones eponyms.

Reference books:

1.   Technical Communication
      Principles and Practice
      -    Meenakshi Raman, Sangeeta Sharma (OUP)

2.   Personality Development, Harold Wallace and Ann Masters, Cengage Publishers.

3.   Basic Communication Skills for Technology
      Andrea J. Rutherford (Pearson Education)

4.   Communication Skills for Technical Students
      T.M. Farhathullah (Orient Longman)

5.   A Textbook of English for Engineers and Technologists.
      Prepared by Humanities & Social Sciences Division.
      Anna University, Chennai. (Orient Longman)

6.   Communication Skills for Engineers
      -    Sunita Mishra, C, Murali Krishna (Pearson Education)

7.   English for Technical Communication
      -     K.R. Lakshminarayanan
       (Scitech Publications, Chennai.)

8.   Basics of Management and Communication Skills
      -     Dr. P.C. Shejwalkar (Everest Publishing House)

9.   Business Communication Strategies
     -       Matthukutty M. Monippally
             (Tata – McGraw – Hill)

10. Body Language
     -       Allan Pease
             (Sheldon Press, London)

11. A Communicative Grammar of English
     -       Geoffrey Leech, Jan Swartvik (ELBS – with Longman)