CENTURION UNIVERSITY OF TECHNOLOGY & MANAGEMENT
ODISHA-761211, INDIA,

Web Site: -www.cutm.ac.in

B.Tech Programme in Engineering & Technology – New Regulation

(2012 – 13 Admitted Batch onwards)

Branch: Electrical & Electronics Engineering

CENTURION UNIVERSITY OF TECHNOLOGY &MANAGEMENT:ODISHA
B.TECH PROGRAMME IN ENGINEERING & TECHNOLOGY –New Regulations

(2012-13 Admitted Batch onwards)

ELECTRICAL & ELECTRONICS ENGINEERING:: B.TECH II YEAR

3rd Semester				*4th Semester*			
Theory				*Theory*			
Code	*Subject*	*L-T-P*	*Credits*	*Code*	*Subject*	*L-T-P*	*Credits*
BTMA 2201	*Mathematics-III (Common to all branches)*	*3-1-0*	*4*	*BTCH 2101*	*Environmental Science (Common to all branches)*	*3-1-0*	*4*
PCEE 2102	*Electrical Circuits & Systems*	*3-1-0*	*4*	*BTEE 2202*	*Electro Magnetic Theory (Common with ECE & EE)*	*3-1-0*	*4*
BTEE 2103	*Electrical & Electronic Measurements*	*3-1-0*	*4*	*PCEE 2203*	*Electrical Machines-1 (Common with EE)*	*3-1-0*	*4*
PCEC 2103	*Analog Electronics Circuits (Common with ECE)*	*3-1-0*	*4*	*PCEC 2203*	*Digital Electronics Circuits (Common with ECE)*	*3-1-0*	*4*
	Management core - I	*3-1-0*	*4*		*Management core - II*	*3-1-0*	*4*
Total Theory		*15-5-0*	*20*	*Total Theory*		*15-5-0*	*20*
Practical/Sessional				*Practical/Sessional*			
PLEE 2106	*Electrical Circuits & Systems Lab*	*0-0-3*	*2*	*PLEE 2206*	*Electrical Machines-1 Lab (Common with EE)*	*0-0-3*	*2*
PLEE 2107	*Electrical & Electronic Measurements Lab*	*0-0-3*	*2*	*PLEC 2206*	*Digital Electronics Circuits Lab(Common with ECE)*	*0-0-3*	*2*
PLEC 2106	*Analog Electronics Circuits Lab (Common with ECE)*	*0-0-3*	*2*	*BLHU 2109/ PLEE 2109*	*Corporate Readiness Lab LAB/ Electrical AUTOCAD Lab*	*0-0-3*	*2*
PLEE 2109/ BLHU2109	*Electrical AUTOCAD LAB/Corporate Readiness lab*	*0-0-3*	*2*				
BLHU 2110	*Life Skills Development**	*0-0-2*	*1*	*BLHU 2210*	*Life Skills Development**	*0-0-2*	*1*
Total Practical/Sessional		*0-0-14*	*8*	*Total Practical/Sessional*		*0-0-11*	*6*
TOTAL SEMESTER CREDITS			*28*	*TOTAL SEMESTER CREDITS*			*26*
TOTAL CUMULATIVE CREDITS			*84*	*TOTAL CUMULATIVE CREDITS*			*110*
Total Contact Hours.			*34*	*Total Contact Hours.*			*31*

**** Not to be counted for CGPA computations***

SYLLABUS

3rd SEMESTER

BTMA 2201 MATHEMATICS-III (3-1-0)CREDITS: 4
(Common to all branches)

MODULE-I (15 Hours)

Partial Differential Equation of First Order, Linear and Non-linear Partial Differential Equations, Charpit's Method, Homogeneous and Non-homogeneous Linear Partial Differential Equations with Constant Coefficients, Cauchy Type Differential Equation, Solution of Second Order Partial Differential Equation.

MODULE-II (15 Hours)

Complex Analysis: Analytic Function , Cauchy-Riemann Equations, Laplace Equation, Harmonic Function, Linear Fractional Transformation , Line Integral in the Complex plane, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivatives of Analytic Function.

MODULE-III (10 Hours)

Power Series,Taylor's Series, Maclaurin Series, Laurent's Series, Singularities and Zeroes, Residue Theorem, Residue Integration Method, Evaluation of Real Integrals.

Text Books:

1) Higher Engineering Mathematics by B.V. Raman Publisher: TMH
   Chapters : 18(18.1 to 18.8, 18.10)
2) Advanced Engineering Mathematics by E. Kreyszig Publisher: Johnwilley & Sons
   Inc-8th Edition Chapters : 12 (12.1 to 12.4, 12.9) ; 13, 14 (14.2,14.4) & 15.

Reference Books:

1) Advanced Engineering Mathematics by P.V. O'Neil Publisher: Thomson

2) Fundamentals of Complex Analysis(with Applications to Engineering and Science)
   by E.B. Saff & A.D. Snider Publisher: Pearson

PCEE 2102 ELECTRICAL CIRCUITS & SYSTEMS (3-1-0) CREDITS: 4

MODULE- I (17 Hours)

NETWORK TOPOLOGY: Graph of a network, Concept of tree, Incidence matrix, Tie-set matrix, Cut-set matrix,

NETWORK THEOREMS & COUPLED CIRCUITS: Reciprocity theorem, Maximum power transfer theorem, Tellegen's theorem, Millman's theorem, Compensation theorem, Coupled Circuits, Dot Convention for representing coupled circuits, Coefficient of coupling-multi winding coupled circuits , Band Width and Q-factor for series and parallel resonant circuits.

LAPLACE TRANSFORM APPLICATION: Application of Laplace transform: Circuit Analysis (Steady State and Transient for different inputs

MODULE- II (17 Hours)

TWO PORT NETWORKS: z, y, ABCD, h and g-parameters, Reciprocity and Symmetry, Interrelation of two-port parameters, Interconnection of two-port Networks, Network Functions, Significance of Poles and Zeros, Restriction on location of Poles and Zeros, Time domain behavior from Pole-Zero plots.

NETWORK SYNTHESIS: Hurwitz polynomial, Properties of Hurwitz polynomial, Positive real functions and their properties, Concepts of network synthesis, Realization of simple R-L, R-C and L-C functions in Cauer-I, Cauer-II, Foster-I and Foster-II forms.

MODULE- III (16 Hours)

Signal systems : Signals, Classification of signals– Periodic and a periodic even – odd – energy and power signals – Deterministic and random signals – Causal and non causal signals and anti causal signals -- complex exponential and sinusoidal signals, Transformation of independent variables, Basic continuous time signals, Basic discrete time signals, systems, classification of systems, properties of systems.

LTI systems: Singularity functions, representation of Signals in terms of impulses, discrete time LTI system, the convolution sum, Continuous time LTI systems, the convolution integral, systems described by Differential and difference equations, properties of systems, causality and stability Sampling theorem, shifting and scaling operations

Text Book:

1. Network Theory –A K Chakraborty –Dhanpat Rai Publication.
2. Signals and Systems – A Nagoor Kani, TMH

Reference Book(s):

1. Network Analysis – M E Van Valkenburg – Pearson Education.
2. Network Synthesis – M E Van Valkenburg – Pearson Education.
3. Engineering Circuit Analysis-M.H.Hayt,JR.J.E.Kemmerly Tata McGraw Hill

BTEE 2103 ELECTRICAL & ELECTRONICS MEASUREMENTS

(3-1-0) CREDITS: 4

MODULE- I (17 Hours)

Basics of Measurements. Accuracy, Precision, resolution, reliability, repeatability, validity. Errors and their analysis. Standards of measurement.

GALVANOMETER: Construction, Theory and Principle of operation of D'Arsonval, Vibration (Moving Magnet & Moving Coil types), and Ballistic Galvanometer, Influence of Resistance on Damping, Logarithmic decrement, Calibration of Galvanometers, Galvanometer Constants, Measurement of Flux and Magnetic Field by using Galvanometers.

Bridge Measurement: DC bridges – Wheatstone bridge. AC bridges – Kelvin, Hay, Maxwell, Schering and Wien bridges.

AMMETER and VOLTMETER: Induction type Ammeters and Voltmeters.

Measurement of earth resistance-Earth Megger.

MODULE- II (17 Hours)

Instrument Transformers: Potential and current transformers, ratio and phase angle errors, phasor diagram, methods of minimizing errors; testing and applications, Capacitance Voltage Transformer and its use

POTENTIOMETER: Construction, Theory and Principle of operation of DC Potentiometers (Crompton, Vernier, Constant Resistance, & Deflectional Potentiometer), and AC Potentiometers (Drysdale-Tinsley & Gall-Tinsley Potentiometer).

MEASUREMENT OF POWER, ENERGY, FREQUENCY and POWER FACTOR: Measurement of single phase and three phase power by wattmeter, Construction, Theory and Principle of operation of Induction type Wattmeters, (b) Frequency Meters, and (d) Power Factor Meters.

Trivector Meter-Basic principles.

MODULE- III (16 Hours)
Electronic Instruments for Measuring Basic Parameters: Amplified DC meter, AC Voltmeter, True – rms responding Voltmeter. Vector Voltmeter.

Oscilloscopes: Cathode Ray Tube, Vertical and Horizontal Deflection System, Delay lines, Probes and Transducers. Specification of an Oscilloscope. Oscilloscope Techniques.
Signal generator: Function Generators.
Signal Analysis: Spectrum Analyzer.

Text Books:

1. Modern Electronics Instrumentation & Measurement Techniques , by Albert D. Helfrick and William D. Cooper. Pearson Education.
2.Electronic Instrumentation, H.S. Kalsi, Tata McGraw-Hill Publishing Company Limited, New Delhi.
3.Electrical Measurements and Measuring Instruments – Golding & Widdis – 5th Edition, Reem Publication

Additional Reading :

1. Electronics Instruments and Instrumentation Technology – by Anand , PHI
2. Elements of Electronics Instrumentation and Measurement – 3rd Edition by Joshph J. Carr. Pearson Education .
3. A Course in Electrical and Electronic Measurements and Instrumentation – A K Sawhney – Dhanpat Rai & Co

PCEC 2103 ANALOG ELECTRONICS CIRCUITS (3-1-0) CREDITS: 4
(Common with ECE)

MODULE – I (16 Hrs)
1. Small Signal Modeling of BJT and Analysis : The re transistor model, hybrid model, graphical determination of h-parameters. Low frequency small signal analysis of CE, CC and CB configurations without feedback.

2. Small Signal Modeling and Analysis of FETs : Small Signal Model, Analysis of JFET C-S and C-D configuration. Analysis of E-MOSFET and D-MOSFET configurations.

3. System Approach - Effects of RS and RL : Two-port system, Individual and combined effects of RS and RL on CE, Emitter follower and C-S networks.

MODULE – II (17 Hrs)

4. BJT and JFET Frequency Response: General frequency considerations. Low-frequency analysis of R-C combination in single stage BJT or FET amplifier - Bode Plot. Lower Curt Off frequency for the system. Low frequency response of BJT and FET amplifiers. Miller Effect Capacitance. High - frequency modeling of BJT and FET. High frequency analysis of BJT and FET amplifiers - Bode plot.

5. Compound Configurations : Cascade, Cascode and Darlington connections, C-MOS Circuit, Current Source Circuits, Current mirror ckt, Differential amplifier circuit.

6: Feedback and Oscillator Circuit : Feedback concept, Type of feedback circuits, Practical feedback circuit. Analysis of only voltage-series feedback type amplifier. Effects of negative feedback. Positive feedback, Barkhausen Criterion of Oscillation. Oscillator Operation. R-C phase shift oscillator. Crystal Oscillator.

MODULE - III (17 Hrs)

7. Ideal Operational Amplifiers: Differential and Common mode operation, OP-AMP basics. Equivalent Circuit Analysis of Inverting and Non - inverting OP - AMP circuits. Input impedance.

8. Practical OP-AMPS: OP-AMP Specifications, DC offset parameters, frequency parameters, gain - bandwidth. OP-AMP applications on constant gain multiplier, Voltage summing, Integrator,

Differentiator and Controlled sources. Instrumentation Amplifier and Active Filters-low, high and band pass.

9. Power Amplifiers: Definition of A, B and C types. Conversion efficiency, Distortion analysis. Push - pull configuration.

TEXT BOOK

1. Electronic Devices and Circuit Theory By - Robert L. Boylestad and Lewis Nashelsky. 8th Edition Pearson Publication.

REFERENCE BOOKS :

2. Electronic Design - By Martin S. Roden etl. Fourth Edition, SPD Publication.
3. Integrated Electronics - By Millman & Halkias, Mcgraw Hill Internation students Edition.
4. Electronic Devices and Circuits By David A. Bell, 4th Edition, PHI.

MANAGEMENT CORE -I (3-1-0) CREDITS: 4

Common to all Branches. Syllabus as prescribed by School of Management.
Refer Annexure -I for list of subjects and syllabus

PLEE 2106 ELECTRICAL CIRCUITS & SYSTEMS LABORATORY (0-0-3) CREDITS: 2

1. Verification of Super Position theorem & Norton Theorems
2. Verification of Maximum Power Transfer Theorem
3. Verification of Reciprocity Theorem.
4. Verification of compensation theorem
5. Study of DC Transients for RL, RC, RLC series Circuits.
6. Study of AC Transients for RL, RC, RLC series Circuits
7. Transient response of RLC Parallel circuit.
8. Determination of Impedance (Z) and Admittance(Y) parameters of two port network
9. Determination of circuit parameters: Hybrid & Transmission Parameters.
10 .To plot frequency response of a series resonant circuit.
11. To plot frequency response of a Parallel resonant circuit
12. Determination of Self-inductance, mutual inductance and coupling coefficient of 1-Ø transformer representing coupled circuit.

PLEE 2107 ELECTRICAL & ELECTRONICS MEASUREMENTS LAB (0-0-3) CREDITS: 2

1. Measurement of Low Resistance by Kelvin's Double Bridge Method.
2. Measurement of unknown capacitance using WIEN BRIDGE
3. Measurement of capacitance using SCHERING BRIDGE.
4. Calibration of the 1Φ energy meter.
5. Measurement of Iron Loss from B-H Curve by using CRO.
6. Measurement of power and power factor in a 3-Ø AC circuit by two wattmeter.
7. Measurement of R, L, and C using Q-meter.
8. Measurement of power in a single phase circuit by using CTs and PTs.
9. Strain Gauge Application and Measurement of Unknown Load.
10. Measurement of inductance using MAXWELL BRIDGE.
11. Measurement of inductance using ANDERSON'S BRIDGE.
12. Study of CRO and lissajous pattern.

PLEC 2106 ANALOG ELECTRONICS CIRCUIT LABORATORY
(0-0-3) CREDITS: 2
(Common with ECE)

List of Experiments {Minimum 12 experiment should be conducted}

(At least 6 experiments should be done with software and 6 with hardware)

1. BJT bias circuit – Design, assemble and test.
2. JEET/MOSFET bias circuits – Design, assemble and test.
3. Design, assemble and test of BJT common-emitter circuit – D.C and A.C performance: Voltage gain, input impedance and output impedance with bypassed and un-bypassed emitter resistor.
4. Design, assemble and test of BJT emitter-follower – D.C and A.C performance: A.C. voltage gain, input impedance and output impedance.
5. Design, assemble and Test of JFET/MOSFET common-source– D.C and A.C performance: Voltage gain, input impedance and output impedance.
6. Design, assemble and Test of JFET/MOSFET common-drain– D.C and A.C performance: Voltage gain, input impedance and output impedance.
7. Frequency response of a common-emitter amplifier: low frequency, high frequency and mid frequency response.
8. Study of Darlington connection and current mirror circuits.
9. OP-Amp Frequency Response and Compensation.
10. Application of Op-Amp as differentiator, integrator, square wave generator.
11. Square wave testing of an amplifier.
12. R.C phase shift oscillator/Wien-Bridge Oscillator using OPAMP.
13. Class A & Class B power amplifier**.**

PLEE 2109 ELECTRICAL AUTOCAD LABORATORY / BLHU 2109 CORPORATE READINESS LAB@ (0-0-3) CREDITS: 2

Note: @ Particulars of Corporate Readiness Lab given in 4th Semester.

PLEE 2109 ELECTRICAL AUTOCAD LAB (0-0-3) CREDITS: 2

1. Introduction to AutoCAD Electrical, Drawing Files, Electrical Components and Wires
2. Project Files, Project Manager Interface, accessing Project File
3. Add a drawing to project file, managing drawings in projects.
4. Single wires and components, insert wires, edit wires.
5. Point to point wiring drawings.
6. Multi wire and Circuits, dashed link lines
7. Three phase components & three phase wire numberings
8. Panel drawing
9. Terminals, insert terminal symbols, multiple level terminals.
10. PLC Symbols
11. Insert Individual PLC input output points.
12. Symbol creation.

BLHU 2110 LIFE SKILLS DEVELOPMENT LABORATORY (0-0-3) CREDITS:0

Common to all Branches. Will be conducted from 1st to 6th Semesters for all branches. No credits added but the students are required to get qualified as prescribed by the T & P cell for being able to and considered for placement. The exercises to be carried out shall be decided as per the industry's requirements from time to time.

4TH SEMESTER

BTCH 2101 ENVIRONMENTAL SCIENCE (3-1-0) CREDITS: 4
(Common to all branches)

MODULE- I (15Hrs)

Environment and its multidisciplinary nature; Need for public awareness; Renewable and non-renewable resources – forest, water, mineral, land, food and energy resources; Structure and function of ecosystems of forest, grass land, desert and aquatic types;

MODULE -II (16Hrs)

Biodiversity and its conservation; Biodiversity at global, national and local levels; Threats to biodiversity- Habitat loss; wild life poaching and man-wildlife conflicts; Endangered and endemic species; conservation measures.

Causes, effects and control measures of pollution, air, water, marine thermal and noise pollution; Nuclear hazards; solid-waste management – Causes, effects and control measures; Management of disasters due to natural causes of floods, earthquakes, cyclones and landslides.

MODULE -III(16Hrs)

Social issues and the environment; Sustainable environment, Water conservation measures; Rain water harvesting; Resettlement and rehabilitation of people; Climate change and global warming; Acid rain; Ozone layer depletion; water land reclamation; Consumerism and waste products;

Features of Environment Protection Act, Air pollution and Control of Pollution Acts; Water Pollution and its Control Act. Effects of Pollution explosion on environment and public health; Need for value education to Protect environment and resources.

Text Book:

Anubhav Kaushik & C.P. Kaushik : Environmental Studies - New age International Publishers

Reference Books:

1. Benny Joseph : Environmental Studies - Tata Mac Graw Hill
2. E. Bharucha : Text book of Environmental Studies for Under graduate courses – Universities Press. (Book prepared by UGC Committee.

BTEE 2202 ELECTROMAGNETIC THEORY (3-1-0) CREDITS: 4
(Common with ECE & EE)

MODULE-I (15 hours)

The Co-ordinate Systems; Rectangular, Cylindrical, and Spherical Co-ordinate System.Co-ordinate transformation.Gradient of a Scalar field, Divergence of a Vector field and Curl of a Vector field. Their Physical interpretation.The Laplacian. Divergence Theorem, Stokes' Theorem. Useful Vector identifies.

Electrostatics

The experimental law of Coulomb, Electric field intensity.Field due to a line charge, Sheet Charge and Continuous Volume Charge distribution.Electric Flux and Flux Density; Gauss's law.Application of Gauss's law. Energy and Potential .The Potential Gradient.The Electric dipole.The Equipotential surfaces. Energy stored in an electrostatic field. Boundary Conditions.Capacitors and Capacitances.Poisson's and Laplace's equations. Solutions of Simple Boundary value problems. Method of Images.

MODULE-II (18 hours)

Steady Electric Currents: Current densities , Resistance of a Conductor; The Equation of Continuity . Joules law.Boundary Conditions for Current densities.The EMF.

Magnetostatics:

The Biot-Savart law. Amperes' Force Law . Torque exerted on a current carrying loop by a magnetic field. Gauss's law for magnetic fields. Magnetic Vector Potential .Magnetic Field Intensity and Ampere's Circuital law.Boundary conditions. Magnetic Materials . Energy in magnetic field .Magnetic circuits.Application to cathode Ray Oscilloscope.

MODULE-III (17 hours)

Faraday's Law of Induction; Self and Mutual inductance .Maxwell's Equations from Ampere's and Gauss's Laws.Maxwell's Equations in Differential and Integral forms; Equation of Continuity.Inconsistency of Amperes law, Concept of Displacement Current.Electromagnetic Boundary Conditions.

Poynting'sTheorem , Time – Harmonic EM Fields . Application to Transformer.

Plane wave Propagation:

Helmholtz wave Equation.Plane wave solution. Plane wave propagation in lossless and lossy dielectric medium and conducting medium . Plane wave in good conductor, surface resistance, depth of penetration. Polarization of EM wave - Linear, Circular and Elliptical polarization. Normal and Oblique incidence of linearly Polarized wave at the plane boundary of a perfect conductor, Dielectric – Dielectric Interface . Reflection and Transmission Co-efficient for parallel and perpendicular polarizations ,Brewstrangle.

Text Book:

1. Electromagnetic Field Theory, Fundamental by B. S. Guru &Huseyn R. Hiziroglu. Publication : Thomson Asia Pte. Ltd. Singapore.Vikas Publishing Home Pvt. Ltd. New Delhi.
2. Electromagnetic waves and Radiating Systems E. C. Jordan & K. G. Balmain, 2nd Edition. PHI Pvt. Ltd.

Reference Books :

1. Elements of Electromagnetic by Mathew N. O. Sadiku, Publisher: Oxford University Press.
2. Fields and Wave Electromagnetics, By David K. Cheng, 2nd Edition,

PCEE 2203 ELECTRICAL MACHINES - I (3-1-0) CREDITS: 4 (Common with EE)

MODULE- I [16 hours]

1. DC GENERATORS:

Construction, working principle, Armature Windings (Simplex Lap and Simplex Wave), Methods of Excitation, Expression for EMF Induced, Armature Reaction, Commutation, Interlopes, Compensating Windings.

2. DC GENERATOR CHARACTERISTICS:

Characteristics for Separately Excited DC Generator (No-Load and Load), Conditions for Self Excitation, Critical Resistance and Critical Speed, Characteristics for Self Excited DC Shunt Generator (No-Load and Load), Voltage Regulation, Parallel Operation of DC Shunt Generators and DC Series Generators.

MODULE- II [17 hours]

3. DC MOTOR CHARACTERISTICS: Characteristic for Speed~Armature Current, Torque~Armature Current and Speed~Torque of (i) Separately Excited DC Motor, (ii) DC Shunt Motor, (iii) DC Series Motor, and (iv) DC Compound Motor, Comparison between Different types of DC Motors and thEEr Application.

4. DC MOTOR STARTING and PERFORMANCE CHARACTERISTICS:

Necessity of a Starter, Starting of DC Shunt, Series and Compound Motors, Precautions During Starting of DC Series Motor, Speed Control of DC Shunt and Series Motors, Classification of Losses,

Efficiency Evaluation from Direct and Indirect Methods (i) Brake Test (Direct method), (ii) Swinburne's Test (Indirect method), (iii) Regenerative/Hopkinson's Test (Indirect method).

MODULE- III [17 hours]

5. SINGLE PHASE TRANSFORMER:
Constructional Features, EMF Equation, Turns Ratio, Phasor Diagrams at No-Load and Load Conditions, Equivalent Circuit, Determination of Parameters From Tests (Open Circuit Test and Short Circuit Test, Back to Back test), Voltage Regulation, onload/offload tap changer, Losses and Efficiency, Auto Transformers and their application.
6. THREE PHASE INDUCTION MACHINES:
Constructional Features of Squirrel Cage Rotor type and Slip Ring/Wound Rotor type of Induction Motors, Principle of Operation, Concept of Slip, Slip Speed, Equivalent Circuit and Phasor Diagram, No-Load and Blocked Rotor tests, Determination of Parameters, Slip~Torque Characteristics Losses and Efficiency. Starting of Squirrel Cage Rotor type and Slip Ring/Wound Rotor type of Induction Motors, Speed Control of Induction Motors, Cogging, Crawling and Electrical Braking of Induction Motors Induction.

Text Book:

1. Electrical Machines – D P Kothari and I J Nagrath – Tata McGraw Hill.

Reference Book(s):

2. Electrical Machinery – P S Bimbhra – Khanna Publishers.
3. Electrical Machines – P.K.Mukherjee&S.Chakravorti–Dhanpat Rai

PCEC 2203 DIGITAL ELECTRONICS CIRCUITS
(3-1-0) CREDITS: 4
(Common with ECE)

MODULE I (16 hours)

Number System and Codes:-
Binary Number base Conversations, Octal and Hexadecimal numbers, Complements, Signed Binary Numbers, Binary Codes- BCD Codes, Gray Code, ASCII Character Code, Codes for serial data transmission and storage. Boolean Algebra and Logic Gates
Axiomatic definition of Boolean algebra. Basic theorems and properties of Boolean algebra, Boolean functions; Canonical and Standard forms; minterms and maxterms standard forms; minterms and maxterms, standard forms Digital Logic Gates, multiple inputs.

Gate Level Minimization:-
The Map Method, K Maps, input five variables, Product of Sums Simplification, Don't care conditions. Nand and NOR implementation. AND –OR invent, OR-AND invent implementation, Ex-OR function, Parity generation and checking, Hardware Description Language (HDL).

MODULE II (17 hours)

Combinational Logic:-
Combinational Circuits, Analysis and Design Procedure; Binary Adder-Sub tractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multipliers, HDL for Combinational Circuits.

Synchronous Sequential Logic:-
Sequential Circuit, Latches, Flip-flop, Analysis of Clocked sequential Circuits, HDL for Sequential Circuits, State Reduction and Assignment. Design Procedure.

MODULE III (17 hours)

Registers and Counters:-
Shift Register, Ripple Counters, Synchronous Counters Asynchronous Counter, Ring Counters, Modulo-N Counters, HDL for Registers and Counters.

Memory and Programmable Logic:-
Random Access Memory (RAM), Memory Decoding, Error detection and Correction, Read only Memory, Programmable Array Logic, Sequential Programmable Devices.

Digital Integrated Logic Circuits:-
RTL, DTL, TTL, ECL, MOS and CMOS logic circuits. Switch –lever-Modeling with HDL.

Text Book

1. Digital Design, 3rd Edition by M. Morries Mano, Pearson Edu. India

Reference Books:

1. Digital Principles and Applications, 6th Edition, Donald P. Leach, Albert Paul Malvino and Goutam Saha, Tata McGraw Hill Publishing Company Ltd., New Delhi.
2. Digital Fundamentals, 5th Edition, T.L. Floyd and R.P. Jain, Pearson Education, New Delhi.
3. Digital Electronics, Principles and Integrated Circuit, Anil K. Jain, Wiley India Edition
4. Digital Design – Principle & Practice, 3rd Edition by John F. Wokerly, Pub. Pearson Education.

MANAGEMENT CORE -II (3-1-0) CREDITS: 4

Common to all Branches. Syllabus as prescribed by School of Management.
Refer Annexure -I for list of subjects and syllabus

PLEE 2206 ELECTRICAL MACHINES-I LAB (0-0-3) CREDITS: 2

(Common with EE)

1. Determination of critical resistance & critical speed from no load test of a DC Shunt generator.
2. Plotting of external and internal characteristics of a DC shunt generator.
3. Determination of efficiency of DC machine by direct loading.
4. Determination of efficiency of DC machine by Swinburne's Test.
5. Determination of Efficiency and Voltage Regulation by Open Circuit and Short Circuit test on single phase transformer.
6. Speed control of DC Motor by Ward-Leonard Method.
7. Study of current, voltage & frequency of a 1-ph transformer & to calculate voltage and current of the transformer using CRO.
8. Polarity test and Parallel operation of two single phase transformers.
9. Back to back test of a single phase transformer.
10. Load characteristics of DC (i) self (ii) separately excited DC generator.
11. Calculation of earth resistivity of industrial earthing.
12. Separation of core losses of a DC machine.

PLEC 2206 DIGITAL ELECTRONICS CIRCUIT LABORATORY

(0-0-3) CREDITS: 2
(Common with ECE)

[Minimum 12 experiments have to be done with 5 minimum using software**]**

1. Digital Logic Gates: Investigate logic behavior of AND, OR, NAND, NOR, EX-OR, EX-
   a. NOR, Invert and Buffer gates, use of Universal NAND Gate.

2. Gate-level minimization: Two level and multi level implementation of Boolean functions.
3. Combinational Circuits: design, assemble and test: adders and subtractors, code converters,
    a. gray code to binary and 7 segment display.
4. Design, implement and test a given design example with (i) NAND Gates only (ii) NOR
    a. Gates only and (iii) using minimum number of Gates.
5. Design with multiplexers and de-multiplexers.
6. Flip-Flop: assemble, test and investigate operation of SR, D & J-K flip-flops.
7. Shift Registers: Design and investigate the operation of all types of shift registers with
    a. parallel load.
8. Counters: Design, assemble and test various ripple and synchronous counters - decimal
    a. counter, Binary counter with parallel load.
9. Clock-pulse generator: design, implement and test.
10. Binary Multiplier: design and implement a circuit that multiplies 4-bit unsigned numbers
    a. to produce a 8-bit product.

Using VHDL:-

11. Verilog/VHDL simulation and implementation of Experiments listed at Sl. No. 3 to 11.

Using Pspice:-

12. Design and simulation of Digital Adder circuit.
13. Design and simulation of Multiplexer, Demultiplexer, Encoder and Decoder.
14. Design and simulation of Digital Multiplier and Comparator.
15. Design and simulation of different types of Flip-Flop(S-R, J-K,D & T).
16. Design and simulation of different types of Counter circuits (Synchronous Counter, Asynchronous Counter and Up-down Counter).

BLHU 2210 LIFE SKILLS DEVELOPMENT LABORATORY (0-0-3) CREDITS:0

Common to all Branches. Will be conducted from 1st to 6th Semesters for all branches. No credits added but the students are required to get qualified as prescribed by the T & P cell for being able to and considered for placement. The exercises to be carried out shall be decided as per the industry's requirements from time to time.

CENTURION UNIVERSITY OF TECHNOLOGY &MANAGEMENT:ODISHA
B.TECH PROGRAMME IN ENGINEERING & TECHNOLOGY –New Regulations
(2012-13 Admitted Batch onwards)
ELECTRICAL & ELECTRONICS ENGINEERING:: B.TECH III YEAR

5th Semester				*6th Semester*			
Theory				*Theory*			
Code	*Subject*	*L-T-P*	*Credits*	*Code*	*Subject*	*L-T-P*	*Credits*
PCEE 3110	*Electrical Machines-2 (Common with EE)*	*3-1-0*	*4*	*PCEE 3201*	*Power Electronics (Common with EE)*	*3-1-0*	*4*
PCEE 3111	*Power System Generation*	*3-1-0*	*4*	*PCEE 3202*	*Control Systems Engineering (Common with ECE & EE)*	*3-1-0*	*4*
PCEC 3109	*Microprocessors (Common with ECE & EE)*	*3-1-0*	*4*	*PCEE 3203*	*Power Systems Transmission & Distribution (Common with EE)*	*3-1-0*	*4*
	Free Elective - I	*3-1-0*	*4*		*Free Elective - II*	*3-1-0*	*4*
	Management core - III	*3-1-0*	*4*		*Management core - IV*	*3-1-0*	*4*
Total Theory		*15-5-0*	*20*	*Total Theory*		*15-5-0*	*20*
	Practical/Sessional				*Practical/Sessional*		
PLEE 3106	*Electrical Machines-2 Lab (Common with EE)*	*0-0-3*	*2*	*PLEE 3206*	*Power Electronics Lab (Common with EE)*	*0-0-3*	*2*
PLEC 3106	*Microprocessors Lab (Common with ECE & EE)*	*0-0-3*	*2*	*PLEE 3107*	*Control Systems Lab (Common with EE)*	*0-0-3*	*2*
PLEE 3108	*PSIM&MATLAB Simulation Lab (Common with EE)*	*0-0-3*	*2*	*PLEE 3208*	*Automation Lab (PLC)(Common with EE)*	*0-0-3*	*2*
BLHU3109	*Life Skills Development**	*0-0-2*	*1*	*PLEE 3209*	*Project-1*	*0-0-3***	*2*
				BLHU3210	*Life Skills Development**	*0-0-2*	*1*
Total Practical/Sessional		*0-0-11*	*6*	*Total Practical/Sessional*		*0-0-11*	*8*
TOTAL SEMESTER CREDITS			*26*	*TOTAL SEMESTER CREDITS*			*28*
TOTAL CUMULATIVE CREDITS			*136*	*TOTAL CUMULATIVE CREDITS*			*164*
Total Contact Hours.			*31*	*Total Contact Hours.*			*31*
** Not to be counted for CGPA computations*							
*** Not to be counted for contact hour computations*							

5TH SEMESTER

PCEE 3110 ELECTRICAL MACHINES-II (3-1-0) CREDITS: 4

(Common with EE)

MODULE-I (17Hrs)

Three Phase Synchronous Generators
Synchronous Generator Construction (both Cylindrical Rotor and Salient Pole type), The Speed of Rotation of a Synchronous Generator, Induced voltage in A.C. Machines, The Effect of Coil Pitch on A.C. Machines, Distributed Windings in A.C. Machines, The Equivalent Circuit of a Synchronous Generator (Armature Reaction Reactance, Synchronous Reactance and Impedance).

Cylindrical Rotor type Three Phase Synchronous Generators
The Phasor Diagram of a Synchronous Generator, Power and Torque in Synchronous Generators (Power Angle Equation and Power Angle Characteristic), Two reaction theory, Phasor diagram, Power-angle characteristic of synchronous generators, Measuring Synchronous Generator Model Parameters (Open Circuit and Short Circuit Tests and Determination of Synchronous Impedance and Reactance), Voltage Regulation by Synchronous Impedance Method, Zero Power Factor = ZPF Method ,Zero Power Factor characteristic, Potier Reactance.

Salient Pole type Three Phase Synchronous Generators
Two Reaction Concept, Development of the Equivalent Circuit of a Salient Pole type Three Phase Synchronous Generator (Direct axis and Quadrature axis Reactances, Phasor Diagram for various load power factors,), Torque and Power Equations of Salient Pole Synchronous Generator (Power Angle Equation and Power Angle Characteristic with stator resistance neglected). Synchronous condenser, Hunting

MODULE-II (15 Hrs)

Parallel operation of Three Phase A.C. Synchronous Generators
The Conditions Required for Paralleling, The General Procedure for Paralleling Generators, Operation of Generators in Parallel with Infinite bus bar, Effect of excitation, effect of unequal voltage and steam power supply. Load Sharing between two generators.

Three Phase Synchronous Motors
Basic Principles of Motor operation, Construction, Starting Synchronous Motors, Equivalent circuit & phasor diagram. Effect of excitation on varying load, power developed in a synchronous motor, induction motor and Synchronous Motors, Synchronous Motor Ratings, Applications of synchronous motors.

MODULE-III (18 Hrs)

Single Phase and Special Purpose Motors

Introduction to Single Phase Induction Motors, Starting of Single Phase Induction Motors, Speed Control of Single Phase Induction Motors, The Circuit Model of a Single Phase Induction Motor, Other types of Motors: Reluctance Motors.

Three phase transformers : Constructional features-winding, bushings, bushing CT's, cooling arrangements, Three-Phase Transformer connections, Two Single-Phase Transformers connected in Open Delta (V-Connection) and their rating, T-Connection (Scott Connection) of Two Single-Phase transformers to convert Three-Phase balanced supply to Two-Phase balanced supply.

Transformer Three phase Connections: Various Phase Displacements (0^o, 180^o,$+30^o$ and -30^o),
Connection Diagrams and Phasor Diagrams of various Vector Groups (Yy0, Dd0, Dz0, Yy6, Dd6, Dz6, Yd1, Dy1, Yz1, d11, Dy11, Yz11), Parallel operation of three phase transformer. Earthing of electrical machines.

Text Book:

1. Electrical Machines – D P Kothari and I J Nagrath – Tata McGraw Hill.

Reference Book(s):

2. Electrical Machinery – P S Bimbhra – Khanna Publishers.

3. Electrical Machines - P. K. Mukherjee, S. Chakravarti, Dhanpat Rai & Sons

PCEE 3111 POWER SYSTEMS GENERTION (3-1-0) CREDITS: 4

MODULE-I (17 hours)

Introduction to the Different Sources of Energy: Resources and Development of Power in India. Indian Energy Scenario. Economics of Power Generation & Variable Load on Power Station: Load curve, load duration and integrated load duration curves, demand, diversity, capacity, utilization plant capacity and plant use factors- Numerical Problems. Load curves and Selection of generating units, Importance of Selecting the units, Types of load on Power Station, Inter-connected Grid system.
Tariff Methods:
Costs of Generation and their division into Fixed, Semi-fixed and Running Costs. Desirable Characteristics of a Tariff Method.-Tariff Methods: Flat Rate, Block-Rate, two-part, three–part, & power factor tariff methods and Numerical Problems.

MODULE-II (17 hours)

Hydro-Electric Power Plant:
Selection of site for hydro-electric power plant. Hydrology: Hydrological cycle, precipitation, run-off and its measurement, hydrograph, flow duration and mass curves, Estimation of amount stored by a dam across the river, Storage and Pondage.
Turbines: Operational principle of Kaplan and Francis Turbine and Pelton wheel, Speed and Pressure Regulation, Work done, efficiency
Essential Elements of a Hydro-electric Power Plant: Catchment's area, Reservoir, Dam, Head Gate, Spillways, Pen stock, Surge Tanks, Scroll case, Draft tubes and Tail Race, Power House, Classification of Hydroelectric Power Plants. Governors, Plant auxiliaries
Nuclear Power Stations:
Nuclear Fusion & Fission and Chain reaction, Nuclear fuels, Principle of operation of nuclear reactor, Reactor Components: Moderators, Control rods, Reflectors and Coolants. Radiation hazards, Shielding and Safety precautions. Types of Nuclear reactors and brief description of PWR, BWR and FBR.

MODULE-III (16 hours)

Thermal Power Plant:
Selection of site for thermal power plant. Constructional Details: Overall Block Diagram indicating the air circuit, coal and ash circuit, water and steam circuit, various types of steam turbines, ash and coal handling system, High Pressure and High capacity water tube boilers, Economizer, Superheaters, De-Superheater, Re-heater, Air Pre-heater.
Draft System: Natural, Induced Forced and Balance Draft, PA fan, FD fan, ID fan, Chimney. Condensers, Feed water heaters, Evaporators, Make-up water, bleeding of steam, cooling water system. Electrostatic Precipitator: Basic working Principle and constructional details Governors, Plant auxiliaries

Text Books:-

1. P. K. Nag, "Power Plant Engineering", 3rd Edition, Tata McGraw Hill Publication.
2. Bernhardt G. A. Skrotzki, William A. Vopat, 'Power Station Engineering and Economy', 2nd Edition, Tata McGraw Hill Publication
3. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti, Dhanpat Rai & Co. Pvt. Ltd., 1999.
4. Principles of Power Systems by V.K Mehta and Rohit Mehta S.CHAND& COMPANY LTD., New Delhi 2004.

Reference Books:

1. Electrical power systems - by C.L.Wadhwa, New Age International (P) Limited, Publishers,1998
2. R. K. Rajput, 'A Text Book of Power Plant Engineering', 3rd Edition, Laxmi Publishing.

PCEC 3109 MICROPROCESSORS (3-1-0) CREDITS: 4
(Common with ECE & EE)

Module-I: (16 Hours)

Organization of Microprocessor

Introduction to the general concept of microprocessor organization, I/O sub-systems, programming the system, ALU, instruction execution, instruction word format, addressing modes, address/data/control bus, tristate bus, interfacing I/O devices, and data transfer schemes, architectural advancements of microprocessor, evolution of microprocessors.

Microprocessor Architecture: Microcomputer and 8085 Microprocessor Architecture, Pins & Signals, Register Organization, Timing & Control Module, 8085 Instruction Timing & Execution.

Assembly Language Programming of 8085: Instruction set of 8085, Memory & I/O Addressing, Assembly language programming, Stack & Subroutines.

Interfacing EPROM & RAM Memories: 2764 & 6264, 8085 Interrupts

Module-II: (16 Hours)

Intel 8086- Hardware Architecture:

Introduction, Bus interface unit(BIU), Execution unit(EU), pin description, register organization, instruction pointer, data register, pointer and index registers, status register, stack, external memory addressing, bus cycle (minimum mode):memory or I/O read/write for minimum mode, clock generator Intel- 8284A, bidirectional bus trans-receiver 8286/8287, bus controller 8288, bus cycle memory read/write for minimum mode, 8086 system configuration (minimum mode as well as maximum mode), memory interfacing, interrupt processing; software interrupts, single step interrupt, non-maskable interrupt, maskable interrupt, interrupt priority, DMA, Halt State, Wait for Test state, comparison between 8086 an 8088.

Module-III: (16 Hours)

Instruction set and programming:

Programmer's model of Intel 8086, operand type, addressing modes 8086 assembler directives, instruction set, programming examples on data transfer group, arithmetic-logical groups, control transfer groups (loop and loop handling instruction), conditional and unconditional group, procedures and stack operations, string instructions. branch program structure like IF-THEN-ELSE REPEAT-UNTIL and WHILE-DO,

I/O Interfacing;

8-bit input- output port 8255 PPI, memory mapped i/o ports,8254 programmable Interval Timer, 8257 Programmable Direct Memory Access Controller, 8251 USART, 8279 Programmable Keyboard/Display Controller.

Text Books:

1. Ghosh& Sridhar, 0000 to 8085– Introductions to Microprocessor for Scientists & Engineers, PHI
2. Microprocessors and Interfacing; by Douglas V Hall; McGraw Hill.

Reference Book:

1. Microprocessors and Micro controllers Architecture, programming and system Design 8085, 8086, 8051, 8096: by Krishna Kant; PHI.
2. The 8086 Microprocessor: Programming & Interfacing the PC- Kenneth J. Ayala, Delmar Cengage Learning, Indian Ed.
3. Fundamentals of Microprocessors and Microcontrollers by B.Ram. DhanpatRai Publications.
4. The 8088 and 8086 Microprocessors Programming, Interfacing, Softw, Hardware and Application; by Walter A. Triebel & Avtar Singh ; Pearson India.

FREE ELECTIVE - I (3-1-0) CREDITS:4

Refer Annexure – II for list of Free Electives and the syllabus

MANAGEMENT CORE - III (3-1-0) CREDITS:4

Common to all Branches. Syllabus as prescribed by School of Management. Refer Annexure -I for list of subjects and syllabus

PLEE 3106 ELECTRICAL MACHINES –II LABORATORY (0-0-3)CREDITS: 2

(Common with EE)

1. Determination of the voltage regulation of an alternator by zero power factor (zpf) method
2. Speed Control of a 3 phase induction motor by rheostatic, cascading and pole changing methods.
3. Determination of Efficiency, Plotting of Torque-Slip Characteristics of Three Phase Induction motor by Brake Test.
4. Determination of parameters of synchronous machine
(a) Negative sequence reactance
(b) Zero sequence reactance
5. Determination of voltage regulation of alternator by direct loading method.
6. Determination of parameter of a single phase induction motor and study of
(a)Capacitor start induction motor
(b) Capacitor start and capacitor run induction motor
7. Determination of parameter of a single phase induction motor and study of
(a) Universal motor
(b) Shaded pole motor
8. Study of parallel operation of two alternators
9. Measurement of direct and quadrature axis reactance of a salient pole synchronous machine
10. Determination of voltage regulation of alternator by synchronous impendence method.
11. Determination of Efficiency, Plotting of Torque-Slip Characteristics of Three Phase Induction motor by Brake Test.
12.Load Test of a 3-phase slip ring induction motor.

PLEC 3106 MICROPROCESSOR LAB (0-0-3) CREDITS : 2
(Common with ECE & EE)

(TOTAL 10 (Ten) experiments to be completed. **Two** from **Group A**, **Two** from **Group B**, **Two** from **Group C**, **Two** from **Group D. and another two experiments to be conducted as projects in design, development and application of microprocessor system.,**

A) 8085:
1. Addition, Subtraction, Multiplication, Division two 8 bit numbers.
2. Smallest / Largest number among n number in a given data array + Binary to Grey Code, Hexadecimal to Decimal conversion.

B) OPTONAL (Any one)
1. Finding a particular data element in a given data array.
2. Marking of specific bit of a number using look-up table.
3. Largest / Smallest number of a given data array.
4. To separate the event and odd numbers from a given data array.

8086 (Compulsory)

1. Addition, Subtraction, Multiplication, Division of 16 bit numbers + 2's compliment of a 16 bit no.
2. Sorting an array of numbers in ascending / descending order.

C) INTERFACING (Compulsory)

1. Generate square waves on lines of 8255 with different frequencies (concept of delay program).
2. Study of stepper motor and its operations (clockwise, anticlockwise, angular movement, rotate in various speeds).

OPTONAL (Any two)

1. Study of Traffic Light Controller.
2. Study of Elevator Simulator.
3. Generation of square, triangular and saw tooth wave using DAC.
4. Study of 8253 and its operation (Mode 0, Mode 2, Mode 3).
5. Study of Mode 0, Mode 1, BSR Mode operation of 8255.
6. Study of 8279 (keyboard & display interface).
7. Study of 8259 Programmable interrupt controller.

OPTONAL (Any ONE)

1. Addition, Subtraction of 16 bit numbers.
2. Multiplication, Division of 16 bit numbers.
3. Transfer a block data to another memory location using indexing.
4. Operation of 8255 using 8051 microcontroller.

PLEE 3108 PSIM & MATLAB SIMULATION LAB

(0-0-3) CREDITS: 2

(Common with EE)

1. Simulation of DC Circuits.
2. Simulation of AC Circuits.
3. DC & AC Transient response of RL Series network.
4. DC & AC Transient response of R-C Series network.
5. DC & AC Transient response of R-L-C Series network.
6. Mesh Analysis
7. Nodal Analysis
8. Obtain frequency response of a given system by using various methods:
   (a)General method of finding the frequency domain specifications.
   (b) Polar plot
   (c) Bode plot
   Also obtain the Gain margin and Phase margin.
9. Determine stability of a given
10. Dynamical system using following methods.
    a) Root locus
    b) Bode plot
    c) Nyquist plot
11. Transform a given dynamical system from I/O model to state variable model and vice versa.
12. Simulation of Op Amp based Integrator and Differentiator circuits.

BLHU 3109 LIFE SKILLS DEVELOPMENT LABORATORY (0-0-3) CREDITS:0

Common to all Branches. Will be conducted from 1st to 6th Semesters for all branches. No credits added but the students are required to get qualified as prescribed by the T & P cell for being able to and considered for placement. The exercises to be carried out shall be decided as per the industry's requirements from time to time.

6TH SEMESTER

PCEE 3201 POWER ELECTRONICS (3-1-0) CREDITS: 4
(Common with EE)

MODULE – I (16 Hrs)

Power Semiconductor Devices
Power Diodes: Characteristics
Thyristors: SCR, Static V-I characteristics of SCR, two transistor analogy of SCR, dynamic characteristics of SCR, Gate characteristics of SCR, Thyristor ratings, DIAC, TRIAC, GTO.Triggering Circuits: R- Triggering, R-C Triggering, UJT triggering, Design of UJT triggering circuit, Cosine law triggering, triggering circuit using pulse train.
Thyristor commutation circuits : Class-A, Class-B, Class-C, Class-D, Calss-E, Class-F commutation circuits. Series and parallel operation of thyristors, protection of thyristors: di/dt protection, dv/dt protection, design of snubber circuit, overvoltage protection, over current protection.

MODULE – II (17 Hrs)

Control rectifiers (AC to Dc converter):
Single phase converters : Principle of phase control, half wave controller rectifier with R, RL and R-L-E load, fully controlled bridge converter with R, R-L, R-L-E load. Effect of freewheeling diode, performance measures of two pulse converters. Half controlled (semi) converter. Effect of single phase full converter with source inductance. Dual converter.
Single phase PWM rectifier.
Three phase converter: 3-phase half wave controlled rectifier with R, and R-L load, 3-phase fully controlled bridge converter with R-L load (6-pulse converter), 3-phase semi converter. Effect of 3-Phase full converter with source inductance.

MODULE – III (17 Hrs)

DC to DC converter: Classification:
First quadrant, second quadrant, first and second quadrant, third and fourth quadrant, four quadrant converter. Switching mode regulators: Buck regulators, Boost regulators, Buck- Boost regulators, Cuk regulators, Isolated Types: Fly Back Converters, Forward converters,
Push Pull Converters, Half bridge & Full bridge Converter. DC to AC converter Series inverter, parallel inverter, single phase bridge inverter, 3-phase bridge inverter (120^0 And 180^0 conduction mode), concept of PWM inverter. Zero Current Switching resonant inverters, Zero Voltage Switching resonant inverter

Text Books:

1.Power Electronics: Circuits,Devices and Applications by M H Rashid, 3rd Edition, Pearson
2.Power Electronics P.S.Bhimbra,Khanna Publications

Reference Books:

1. Power Electronics: Principles and Applications by J. Vithayathil, TMH Edition
2. Power Converter Circuits by W Shepherd and L Zhang, CRC, Taylor and Francis, Special Indian Edition.
3. Power Electronics: Converters , Applications, and Design by Mohan, Undeland and Robbins, Wiley Student Edition.

PCEE 3202 CONTROL SYSTEM ENGINEERING (3-1-0) CREDITS: 4
(Common with ECE & EE)

MODULE-I: (17 Hrs)

Introduction to Control Systems : Basic Concepts of Control Systems, Open loop and closed loop systems, Elements of Servo Mechanism and types of servo mechanism, Mathematical Models of

Physical Systems: Differential Equations of Physical Systems: Mechanical Translational Systems,Rotational systems, Electrical Systems, Analogy between Mechanical and electrical quantises, Derivation of Transfer functions, Block Diagram Algebra, Signal flow Graphs, Mason's Gain Formula. Feedback characteristics of Control Systems: Effect of negative feedback on sensitivity, bandwidth, Disturbance, linearizing effect of feedback, Regenerative feedback. Control Components: D.C. Servomotors, A.C. Servomotors. A.C.Tachometer, Synchros, Stepper Motors

MODULE-II: (17 Hrs)

Time response Analysis: Standard Test Signals : Time response of first order systems to unit step and unit ramp inputs. Time Response of Second order systems to unit step input, Time Response specifications, Steady State Errors and Static Error Constants of different types of systems. Stability and Algebraic Criteria, concept of stability, Necessary conditions of stability, Hurwitz stability criterion, Routh stability criterion, Application of the Routh stability criterion to linear feedback system, Relative stability by shifting the origin in s-plane. Root locus Technique: Root locus concepts, Rules of Construction of Root locus, Determination of Roots from Root locus for a specified open loop gain, Root contours, Systems with transportation lag. Effect of adding open loop poles and zeros on Root locus.

MODULE-III: (16 Hrs)

Frequency Response Analysis: Frequency domain specifications, correlation between Time and Frequency Response with respect to second order system, Polar plots, Bode plot. Determination of Gain Margin and Phase Margin from Bode plot.
Stability in frequency domain: Principle of argument, Nyquist stability criterion, Application of Nyquist stability criterion for linear feedback system.
Controllers: Concept of Proportional, Derivative and Integral Control actions, P, PD, PI, PID controllers.

Text Book:

1. Control Systems Engg. by I.J. Nagrath and M.Gopal, 5th Edition, New Age International Publishers (2010).

Reference Books :

1. Design of Feedback Control Systems by R.T. Stefani, B. Shahian, C.J. Savator, G.H. Hostetter, Fourth Edition (2009), Oxford University Press.
2. Control Systems (Principles and Design) by M.Gopal 3rd edition (2008), TMH.
3. Analysis of Linear Control Systems by R.L. Narasimham, I.K. International Publications
4. Control Systems Engineering by S.P. Eugene Xavier and J. Josheph Cyril Babu, 1st Edition (2004), S. Chand Co. Ltd.
5. Problems and solutions in Control System Engineering by S.N. Sivanandam and S.N. Deepa, Jaico Publishing House.

PCEE 3203 POWER SYSTEMS TRANSMISSION & DISTRIBUTION
(3-1-0) CREDITS: 4
(Common with EE)

MODULE-1 (17 hours)

Transmission Line Parameters
Types of conductors - calculation of resistance for solid conductors - Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configuration with and without transposition, Numerical Problems.
Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines.
Performance of Short and Medium Length Transmission Lines

Classification of Transmission Lines - Short, medium and long line and thEEr model representations - Nominal-T, Nominal-Pie and A, B, C, D Constants for symmetrical & Asymmetrical Networks, Numerical Problems.
Mathematical Solutions to estimate regulation and efficiency of all types of lines.

MODULE-2 (17 hours)

Performance of Long Transmission Lines
Long Transmission Line-Rigorous Solution, evaluation of A,B,C,D Constants, Interpretation of the Long Line Equations, Incident, Reflected and Refracted Waves -Surge Impedance and SIL of Long Lines,
Wave Length and Velocity of Propagation of Waves - Representation of Long Lines - Equivalent-T and Equivalent Pie network models.
Various Factors Governing the Performance of Transmission line
Skin and Proximity effects - Description and effect on Resistance of Solid Conductors - Ferranti effect - Charging Current - Effect on Regulation of the Transmission Line, Shunt Compensation.
Overhead Line Insulators
Types of Insulators, String efficiency and Methods for improvement, Numerical Problems – voltage distribution, calculation of string efficiency, Capacitance grading and Static Shielding

MODULE-3 (16 hours)

Mechanical Design of Overhead Transmission Lines :
General Considerations, Line Supports, Types of Steel Towers, Cross Arms, Span, Conductor Configuration, Spacings and Clearances, Sag and Tension Calculations, with equal and unequal weights of towers, Effect of Wind and Ice on weight of Conductor, Numerical Problems
Corona - Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference
Underground Cables :
Types of Cables, Construction, Types of Insulating materials, Calculations of Insulation resistance and stress in insulation, Numerical Problems. Capacitance of Single and 3-Core belted cables, Numerical Problems. Grading of Cables - Capacitance grading, Numerical Problems, Description of Inter-sheath grading.
Distribution :
Comparison of various Distribution Systems, AC three-phase four-wire Distribution System, Types of Primary Distribution Systems, Types of Secondary Distribution Systems, Voltage Drop in DC &AC Distributors, Kelvin's Law & Limitations,General Design Considerations, Load Estimation, Design of Primary & Secondary Distribution, Sub-Stations, Economical Design of Distributors, Design of Secondary Network, Lamp Flicker, Application of Capacitors to Distribution Systems.

Text Books:

1. Power System Analysis- By John J. Grainger & W. D. Stevenson, Jr, Tata Mcgraw-Hill, 2003 Edition, Reprint, 2010.
2. Power System Analysis & Design- By B. R. Gupta, S. Chand Publications, 3rd Edition, Reprint, 2003.

Reference Books:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarthy, Dhanpat Rai & Co Pvt. Ltd.
2. Electrical power systems - by C.L.Wadhwa, New Age International (P) Limited, Publishers,1998
3. R. K. Rajput, 'A Text Book of Power Plant Engineering', 3rd Edition, Laxmi Publishing

FREE ELECTIVE - II (3-1-0) CREDITS:4

Refer Annexure – II for list of Free Electives and the syllabus

MANAGEMENT CORE - IV (3-1-0) CREDITS:4

Common to all Branches. Syllabus as prescribed by School of Management. Refer Annexure -I for list of subjects and syllabus

PLEE 3206 POWER ELECTRONICS LABORATORY (0-0-3) CREDITS: 2
(Common with EE)

List of Experiments:

1. Study of V_I characteristics of silicon controlled rectifier.
2. Study of different methods of triggering of SCR
   (a) RC-Triggering method
   (b) UJT-Triggering method.
3. Study of single phase fully controlled converter using R & L load.
4. Study of single phase semi converter using R - L- E load.
5. Study of 3-phase full wave semi converter with R, R-L and D.C motor load with/ without freewheeling diodes.
6. Study of class-A, class-B, class-C, class-D, class-D, class-E commutation circuits.
7. Study of parallel inverter.
8. Study of series inverter.
9. Study of Jones chopper.
10. Study of Fly back converter using PWM technique.
11. Study of Step-up & step-down chopper with PWM technique.
12. Study of forward converter using PWM technique.
13. Study of AC voltage regulator using PWM technique.
14. Study of IGBT based 3-ph voltage source inverter.

PLEE 3107 CONTROL SYSTEMS LABORATORY (0-0-3) CREDITS: 2

(Common with EE)

List of Experiment:

1. Study of a dc motor driven position control system.
2. Obtain the frequency response of a lag and lead compensator
3. To study and validate the controllers for a temperature control system
4. Study of Relay control system.
5. Study of process control simulator
6. Obtain the speed-torque characteristics of DC servo motor.
7. Determination of incremental Transfer function of an AC Servomotor.
8. Determination of incremental Transfer function of a DC Servomotor.
9. Stability analysis of linier systems.
10. Design of P, PI, PID Controller.
11. Study of Synchros.
12. Study of stepper motor control system.

PLEE 3208 AUTOMATION LAB (PLC) (0-0-3) CREDITS: 2
(Common with EE)

List of Experiments:

1. Study hardware and software used in PLC
2. Implementation of Logic gates
3. Develop a ladder program for DOL starter
4. Develop an application using On-Delay timer.
5. Develop an application using OFF Delay Timer
6. Develop an application using UP/DOWN counter
7. Implementation of PLC Arithmetic instructions
8. Study of PID controller instruction for a pilot plant

9. Position control using dc motors
10. Starting of three phase induction motor using star-delta starter.

PLEE 3209 PROJECT -1 (0-0-0) CREDITS: 2

BLHU 3210 LIFE SKILLS DEVELOPMENT LABORATORY (0-0-3) CREDITS:0

Common to all Branches. Will be conducted from 1st to 6th Semesters for all branches. No credits added but the students are required to get qualified as prescribed by the T & P cell for being able to and considered for placement. The exercises to be carried out shall be decided as per the industry's requirements from time to time.

ANNEXURE - I MANAGEMENT CORE (3-1-0) CREDITS:4

List of Management Core subjects

(Students are required to choose one subject out of the four in 3rd, 4th, 5th and 6th semesters.)

Sl. No.	*Semester*	*Course Code*	*Course Title*
1	*3rd /4th / 5th / 6th*	*MGGM1104*	*Essential Economics for Management*
2		*MGFM1101*	*Accounting for Managers*
3		*MGGM1206*	*Organizational Behavior*
4		*MGOM1201*	*Production & Operations Management*

SYLLABUS OF MANAGEMENT CORE SUBJECTS

MGGM1104 ESSENTIAL ECONOMICS FOR MANAGEMENT (3-1-0)

Course Objective:

In today's dynamic economic environment, effective managerial decision making requires timely and efficient use of information. The basic purpose of this course is to provide students with a basic understanding of the economic principles, methodologies and analytical tools that can be used in business decision making problems. It provides an understanding of the economic environment and its impact on strategy formulation. The course also focuses on the impact of economic policies on managerial decision-making by providing an understanding of fiscal policy, and national and global economic issues affecting business.

The language of science (and all analytical thinking) is mathematics. Since economics is a social science, use of some mathematical tools, basically the constrained and un-constrained optimization techniques will help in measuring and solving the basic economic problems and thus improves decision-making. It becomes difficult and totally un-practicable to solve business (economic) problems logically and systematically without use of mathematics. The basic objective is to solve problems mathematically and interpret the results economically.

Module-1: Introduction & Micro Economics .

Introduction to economics- Scarcity, Choice and Efficiency, Circular Flow of Economic Activity, Fundamental issues of what, how and for whom to produce to make the best use of economics, Economic Role of Government.

Basic Concepts: Marginalism and Incrementalism, Functional Relationships: Total, Average and

Marginal. General and partial equilibrium, Opportunity cost

Demand for a commodity: Law of demand, Demand schedule and demand curve, Individual and market demand, Change in demand

Consumer behavior: Analysing law of demand through Marshalian utility analysis and

Indifference curve technique. Consumer Surplus

Elasticity of Demand

Price Elasticity of demand : Estimation, Types, Elasticity and revenue, Factors affecting price elasticity of demand

Income elasticity , Cross elasticity, Uses of different concepts elasticity in business decisions.

Analysis of Supply: Law of Supply, Supply schedule and supply curve, Change in supply, Price elasticity of supply,

Equilibrium of demand and supply: Equilibrium with demand and supply curves, Effect of a shift of demand and supply curves, Rationing of prices, Impact of tax on prices and quantity, Prices fixed by law (Minimum floors and Maximum ceilings)

Demand Estimation: Approaches to demand estimation, Demand Estimation by Regression Analysis.

Demand Forecasting: Sources of Data (Expert opinion, Surveys, Market experiments), Timeseries Analysis (trend projection and Exponential smoothening), Barometric Forecasting, Forecasting with input and output model.

Production Function: Production function with one variable input, Production function with two variable inputs, optimal combination of inputs, Returns to scale

Cost Theory: Types of costs, Production and cost, Short-run cost functions, Long-run cost functions, Economies of scale and scope, Learning curve, Cost-Volume-profit Analysis

Perfect Competition: Characteristics, Equilibrium price determination under both short run and long run, Evaluation of perfect competition

Monopoly: Characteristics, Profit maximizing price determination under both short run and long run, Allocative efficiency and income redistribution, Relevance of perfect competition and monopoly

Monopolistic Competition: Characteristics, Profit maximizing price determination under both short run and long run, Evaluation of Monopolistic competition

Oligopoly: Characteristics, Price Rigidity(Kinked demand curve model), Interdependence (The

Cournot model) and Cartels and Collusion, Price Leadership, Cost-plus Pricing, Multiple Product

Pricing, Price Skimming, Penetration Pricing, Transfer Pricing and Price Discrimination

Module-2: Macro Economics .

National Income Accounting: Concept, Eight variants of national product aggregates, Measurement (Income, Value Added and Expenditure), Real and Nominal GNP, Difficulties in measuring the national income, Uses of National income statistics

Environmental Income Accounting, Green GDP, Sustainable Development, National income and social welfare

Consumption and Investment functions: Concept, Determinants, Multiplier and Accelerator

Demand for Money: Classical and Keynesian theories on demand for money

Supply of Money: Components of money supply, The process of Deposit Creation, Balance Sheet of the Central Bank.

Aggregate Demand: The Goods Market and the IS Curve, The Money Market and the LM Curve, Form IS-LM model to the Aggregate Demand.

Aggregate Supply

Explaining macro-economic equilibrium through Aggregate Demand and Aggregate Supply,

Monetary Policy: Objectives, Instruments, Monetary Policy in The AD- AS Framework,

Crowding-Out Controversy, Monetary policy in an open economy

Fiscal Policy: Objectives, Instruments, Impact of Structural Deficits, Government Debt and Economic Growth.

Interaction between monetary and Fiscal Policy

Features of The Business Cycle, Definition Of Inflation, Price Indices, Prices in the AD-AS

Framework, The Economic Impacts of Inflation, The Phillips Curve, Anti-Inflationary Policy

Unemployment: Types, Okun's Law, Impact of Unemployment, Economic Interpretation Of Unemployment

International Trade: Economic Basis For International Trade, Gains from International Trade Balance of Payment (BoP): Meaning, BoP Account, Disequilibrium in BoP, Measures to correct disequilibrium in BoP

Foreign Exchange: The Determination of Foreign Exchange Rates, Floating Exchange Rate and Fixed Exchange Rates, Mundell-Fleming Model,

Books & Reference:

1. Managerial Economics in a Global Economy, by D. Salvatore, Sixth Edition, OUP, 2008
2. Managerial Economics, Truett&Truett, Wiley Publication.
3. Managerial Economics, by Petersen Craig H. Cris Lewis and S.K. Jain, Pearson, 2007
4. Modern Micro Economics, , Koutsoyiannis, (1975) , A, Macmillan Press
5. Managerial Economics, Mehta, P. L (1999), Sultan Chand & Sons
6. Principles of Microeconomics, Mankiw, N. G (2006), Cengage Learning
7. Macroeconomics, Mankiw, N. G, (2009), Worth Publishers
8. Macroeconomics, Theory and Policy, Dwivedy, D.N (2007), Tata McGraw Hill
9. Macroeconomics, D'Souza, E (2008), Pearson Education
10. Macroeconomic Analysis, Shapiro, E (2003), Galgotia Publications
11. Environmental Economics in Theory and Practice – Hankey N, Shogren J F, and White B – 1999 – Macmillan Indian Limited
12. Indian Economy, Mishra &Puri (2011), Himalaya Publishing House

MGFM1101 ACCOUNTING FOR MANAGERS (3-1-0)

Course Objective:

This course 'Accounting for Managers' has been designed to enable the students to acquire the skills necessary to prepare, use, interpret and analyze financial information.

Module 1 (12)

Accounting Environment of business, Corporate Entities: Salient Features, GAAP: Concepts, Conventions, Assumptions, Accounting Equation: Tool to understand business decisions, Financing

Decisions/Investment Decisions/Operating Decisions, Accounting Equation Financial Statements,

Balance Sheet/Income Statement/Cash Flow Statement, Financing Decisions and Financial Statement,

Module 2 (12)

Equity Instruments: Equity and Preference Capital, Debt Instruments: Debentures/ Bonds/ Loans,

Dividend and Interest payment, Investment Decision and Financial Statements, Fixed Assets:/Inventory Valuation/Investment , Operating Decisions and Financial Statements, Revenue

Recognition, Expenses, Profit: Gross Profit/PBDITA/PBIT/PBT/PAT, Interrelationship between Financial statements

Module 3 (12)

Financial Statement Analysis: common size statements, ratio analysis, Du pont analysis, Inter-firm and intra-firm comparison, reading CFS

Module 4 (12)

Cost Concepts and decision making, Overheads, CVP analysis. Preparation of Cost Sheets using excels, Budgeting and Budgetary Control, Variance analysis, Activity based costing (ABC), cost & pricing A group project work will be given to students to analyse an industry and track market price movement.

Books & Reference:

1. Financial Accounting -- A managerial Perspective, R. Narayanswamy, PHI

2. Cost Accounting- A managerial Emphasis by Horn green, Dater and Foster.

3. Khan & Jain – Management Accounting, TMH.

4. Horngren ,Datar, Foster- Cost Accounting, Pearson.

5. Financial Accounting, Jain/Narang/Agrawal, Kalyani.

6. Basic Financial Accounting for Management, Shah, Oxford.

MGGM1206 ORGANIZATIONAL BEHAVIOUR (3-1-0)

Introduction to the Course :

Organizational Behavior (OB) is a field of study that investigates the impact that individuals, groups, and structure have on behavior within an organization. Then it applies that knowledge to make organizations work more effectively.

Course Objective :

This course will expose students to gain knowledge on the diversified behavioral science theories and its applications in organizations.

Pedagogy

Class room lectures will be substantiated by Case Analysis, assignment and viva-voce,

Demo Exercises, Movie Analysis, Games, role playing Comprehensive Course Outline :

Module – 1 (12)

Concept and models of OB, OB Systems- The Synergy

Module - 2(Individual System)(12)

Perception, Learning and Behaviour Modification, motivation, attitude and Values, personality, emotion and stress.

Module – 3(Social System) (12)

Communication, Group Dynamics, Conflict , Leadership

Module - 4(Organizational systems) (12)

Organizational power and politics, Organizational culture and climate, Organizational Change and development, International Dimensions of OB, Managing Diversity.

Recommended Text :

• Robins &Sanghii, Organisational Behaviour, Pearson

• Aswathappa, Organization Behavior,Himalaya**Reference Books** :

• Luthans ,F. Organisational Behaviour - TMH

• UdaiPareek , Understanding Organisational Behaviour, Oxford

• Prasad,L.M. Organization Behavior,S.Chand.

• Greenberg and Baron, Behavior in organization, Prentice hall.

MGOM1201 PRODUCTION AND OPERATIONS MANAGEMENT (3-1-0)

Course Objective:

The course is designed to acquaint the students with decision making in planning, scheduling and control of production and operation functions in both manufacturing and services. Course Content:

Module:1 (12)

Operations Management- An Introduction Primary topics in Operations Management, Operations Function, and Transformation process and Competitiveness.

Operations Strategy

Strategic Decisions in Operations, Strategy Deployment, and Vertical Integration, Service Operation, Service strategy, Manufacturing Strategy and Mass customization;

Product Development and Service Design

New Product design, Product life cycle, Process design, Process life cycle, Form design, Functional design, Production design, Concurrent design, Technological design and Service design process.

Module:2 (14)

Facilities Location & Layout Planning

Location - Principles and Factors; Location Analysis techniques- Factor Rating, Centre of Gravity Technique, Brown & Gibson Model. Layout – Concept & Basic Principles, Process Layout (Block Diagramming,

Relationship Diagram, Computerized Layout Solutions, Service Layout); Product Layout – Process Layout; Fixed Position Layout. Hybrid Layouts – Cellular, FMS (Flexible Manufacturing System)

Project Management and Scheduling

Project planning, , project control, project scheduling Models Project Network, Critical path Method

(CPM), Programme Evaluation Review Technique(PERT) , Project crashing and Time cost Trade-Off; Objective of Scheduling, Sequencing, Gantt charts, Advanced Planning and Scheduling System. Strategies for Managing Demand, Strategies for Managing Supply Production planning control, Aggregate planning costs and strategies. Gantt chart, Sequencing model. "n" jobs 1 machine, "n" jobs 2 machines, "n" jobs “m” machine

Module:3 (12)

Inventory Management

Concept of inventory with independent demand: Inventory cost structure Deterministic inventory model - EOQ models, instantaneous receipt, Inventory model with discounts, delivery over a period of time, Periodic review and continuous review inventory model; Selective Inventory Control - ABC and VED.

Quality Management

Concept of quality; Quality of design, Conformance & performance; Cost of poor process performance and quality. Statistical Quality Control - Process Control (X, R & P chart), Product control-acceptance sampling and OC curve. Concept of TQM.

Module:4 (10)

Just in Time and Lean Production

Basic element in JIT, Pull system, Push system, Kanban production control system , Benefits of JIT, Jit implementation in Learning Organization, JIT in Services. topics.

Books

1. Chase, Jacobs, Aquilano, Agarwal, - "Operations Management", TMH
2. Aswathappa& Sridhar Bhat, - "Production and Operations Management", HPH **Reference**:
1. Krajewski,Ritzman,Kansal, - "Operations Management", Pearson
2. Everette. Adam Jr., Ronald J. Ebert, - "Production and Operations Management", PHI
3. Roberta S. Russell & Bernard W. Taylor III, - "Operations Management", Pearson/ PHI
4. Gaither, Frazier- Operations Management