COURSE STRUCTURE

&

SYLLABUS
(3rd – 8th SEMESTER)

FOR B.TECH PROGRAMME
IN
ELECTRICAL ENGINEERING

BIJU PATNAIK UNIVERSITY OF TECHNOLOGY ORISSA,
ROURKELA

2007 - 2008
## COURSE STRUCTURE
SECOND YEAR B.TECH PROGRAMME
ELECTRICAL ENGINEERING

### 3rd Semester

<table>
<thead>
<tr>
<th>Theory</th>
<th>Contact Hrs.</th>
<th>Credit</th>
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<tr>
<td>BSCM 2201 Mathematics - III</td>
<td>L-T-P</td>
<td>3-1-0</td>
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<tr>
<td>CPES 5201 Network Theory</td>
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<tr>
<td>BSCP 2201 Physics - II / BSCP 2202 Physics of Semiconductor Devices</td>
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<tr>
<td>BCSE 3201 Object Oriented Programming</td>
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<tr>
<td>HSSM 4201 Engineering Economics &amp; Costing</td>
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<tr>
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<tr>
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<td>0-0-3</td>
<td>2</td>
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<tr>
<td>or BENG 9201 Basic Electrical Engineering Laboratory</td>
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L-Lecture  T-Tutorial  P-Practical
3rd Semester
BSCM 2201 MATHEMATICS - III (3-1-0)

Module - I (9 Lectures)
Partial differential equations : The vibrating string. The wave equation & its solution.
The Heat equation and its solution

Module - II (10 Lectures)
Two - dimensional wave equation and its solution.
Laplace equation in polar, cylindrical and spherical coordinates. Potential.

Module - III (13 Lectures)
Complex analysis : Complex numbers and functions conformal mappings
Complex integration. Cauchy’s Theorem Cauchy’s integral formulas.

Module - IV (8 Lectures)
Taylor’s and Laurent’s series, Residue theorem, evaluation of real integrals.

The Course covered by : Advance Mathematics by E. Kreyszig, John Wiley & Son’s (P) Ltd. (8th Edition)
Chapter 11 (except 11.6)
Chapter 12, 13, 14, 15

CPES 5201 NETWORK THEORY (3-1-0)

MODULE - I (12 Hours)
Topological description of networks; Reviews of mesh & nodal analysis. Reciprocity & Millman’s theorem, Maximum power transfer theorem.
Q factor, Bandwidth and Selectivity in Series & parallel resonance Circuits.
Coupled Circuits : Dot Convention for representing coupled circuits, coefficient of coupling.
Loop Analysis of coupled circuits, single and double tuned coupled circuits Transient study in RLC networks by Laplace transform method with DC and AC excitation.
Response to step, impulse and ramp inputs S - domain circuits
Two Port networks : Z, Y, h, & ABCD representation of T and TT2 - port networks both in transmission parameters T - TT networks, 2 port network, Cascade and Parallel Connections.
Image and iterative impedances.

MODULE - II (12 Hours)
Network Functions & Responses :
Concept of complex frequency, driving point and transfer functions for one port and two network, poles & zeros of network functions, Restriction on Pole and Zero locations of network function.
Impulse response and complete response. Time domain behaviour form pole-zero plot.
Problems in Optimizing power transfer; Insertion loss.
MODULE - III (10 Hours)

Fourier Series & Fourier Transforms: Fourier Series representation of non sinusoidal waves. Discrete spectra, rms values of non sinusoidal waves, Steady state response of linear circuits to non sinusoidal waves, power in such circuits. Fourier Internal and Fourier transform of signum and step functions. Applications to RL and RC circuits.

Network Synthesis:
Driving point functions, properties of positive real function.

MODULE - IV (8 Hours)


TEXT BOOKS
1. Network Analysis: M.E Van Valkenbrg

REFERENCE BOOKS
1. A Course in Electrical Circuits and Analysis: M. L. Soni, J. C. Gupta
2. Network Synthesis: M. E. Van Valkenberg
3. Electrical Networks: Alexander & Sadiku

BENG 1208 - FLUID MECHANICS AND HYDRAULIC MACHINE (3-1-0)
Module – I (12 hours)
Introduction: Scope of fluid mechanics and its development as a science
Physical property of Fluid
Density, specific gravity, specific weight, specific volume, surface tension and capillarity, viscosity, compressibility and bulk modulus, Fluid classification.

Fluid static
Pressure, Pascal’s Law, Pressure variation for incompressible fluid, atmospheric pressure, absolute pressure, gauge pressure and vacuum pressure, monometer.
Hydrostatic process on submerged surface, force on a horizontal submerged plane surface, force on a vertical submerged plane surface.

Module – II (12 hours)
Buoyancy and flotation, Archimedes’ principle, stability of immersed and floating bodies, determination of metacentric height.
Fluid dynamics: Introduction, Euler’s equation along a streamline, energy equation, Bernoulli’s equation, Analysis of finite control volumes and its application to siphon, venture meter, orifice meter

Module – III (6 hours)
Turbine: Classification, reaction, Impulse, outward flow, inward flow and mixed flow turbines, Francis & Kaplan turbines, Pelton wheel, Physical description and principle of operation, Governing of Turbine.
Module – IV

Centrifugal Pump : Principles of classification, Blade angles, Velocity triangle, efficiency, specific speed, characteristics curve.
Reciprocating Pump : Principles of working, slip, work done, effect of acceleration and frictional resistance, separation

Text Books

1. Fluid Mechanics, A.K. Mohanty, PHI
3. Fluid Mechanics, Modi & Seth

BSCP 2201 PHYSICS - II (3-0-0)

This one semester Physics course is divided into four units. The unit - I deals with some aspects of nuclear physics, unit - II introduces certain features of condensed matter physics, unit - III deals with certain aspects of semiconductors and superconductors and unit - IV introduces Opto-electronic devices and fibre-optic communication system.

Unit - 1

This unit covers the basic principles and applications of different types of accelerators and their important applications.

Detailed constructional features of accelerators are not necessary.

1. Need for nuclear accelerators.
3. RF accelerators : Linear accelerator, cyclotron, electron accelerator, betatron.

Unit - 2

This Unit deals with diffraction in crystals and its role in determining crystal structure.

Study of crystal structure by diffraction methods, Bragg’s condition for crystal diffraction, Lau condition, Miller indices, Reciprocal lattice, Geometrical structure factor, Atomic form factor.

Unit - 3

This unit deals with certain features of semiconductors and superconductors.

2. Superconductivity : Superconductors and their properties, Meisner effect, Type - I and Type - II Superconductors, Thermodynamic properties of superconductors, London equation, Application of superconductors.

Unit - 4

This unit introduces some Opto - electronic devices and fibre - optic communication system.

LED : Principle construction of operation and application, Introduction to fibre optics, basic characteristics of optical fibres, optical fibre communication system.
Books Recommended

1. Nuclear Physics, P. R. Roy & B. P. Nigan
2. Particle Accelerators, M. S. Livingston & J. P. Blewett
3. Concepts of Modern Physics, A. Beiser
4. Introduction to Solid State Physics, C. Kittel
5. Introduction to Lasers, A. Avadhnulu

**BSCP 2202 PHYSICS OF SEMICONDUCTOR DEVICES (3-0-0)**

**Module I (10 Hours)**

An appreciation of Quantum Mechanics in determining electrical properties of semiconductor.

**The Semiconductor in Equilibrium**:
Equilibrium distribution of electrons & holes, the n0 and p0 equation, intrinsic carrier concentration; Dopant atoms and energy levels, ionization energy; the extrinsic semiconductor, the n0 p0 product, position of Fermi-energy level, variation of EF with doping concentration and temperature.

**Carrier Transport Phenomena**:
Carrier drift: mobility, conductivity, velocity saturation:
Carrier Diffusion: Diffusion current density. Total current density. The Einstein relation.

**Module II (10 Hours)**

**Non-equilibrium Excess Carrier in Semiconductor**
Excess carrier generation and recombination, characteristics of excess carriers-continuity equation and time – dependent Diffusion equation. Ambipolar Transport – Derivation of equation and applications.

**The Pn junction and Diode**
Basic structure, built-in potential barrier, Electric field, space charge width; Reverse applied bias-space charge width and Electric field. Junction capacitances.
Pn junction Diode: Ideal – current voltage relationship, Minority Carrier distribution, Ideal Pn junction currents under forward and reverse bias.

**Module III (10 Hours)**

**Pn junction diode (contd.)**:
Temperature effects, Small signal model of Pn junction, Equivalent circuits Recombination Current. Junction Breakdown.

**Metal-Oxide- Semiconductor FET (MOSFET)**
The MOS structure: Energy band diagrams, Depletion Layer thickness, Work function difference, Flat band Voltage, Threshold Voltage, Charge distribution, Capacitance –Voltage characteristics.

The basic MOSFET operation, Current –Voltage relation (Concepts)
Frequency limitation: Small signal Equivalent circuit.
The CMOS Technology.
Module IV (10 Hours)

The Bipolar Transistor


Text Book :
1. Semiconductor Physics and Devices- Basic Principles BY Donald A. Neamen, 3rd Edition, Tata McgrawHill Edition. (Selected portion from chapters 2,4,6,7,8,10 &11.)

For additional reading

BSCC 2201 CHEMISTRY - II (3-0-0)

Module I (12 Lectures)
(To develop awareness about Water Treatment)

Water quality parameters and standards.


Module II (10 Lectures)
(To develop the basic concepts about the transition metal compounds and corrosion)

1. Corrosion:
   Dry and wet corrosion, Galvanic Corrosion, Stress Corroton, Factors affecting corrosion, Corrosion Control : (Proper design and fabrication procedure, Cathodic protection, Passivation).

   (8 Lectures)

2. Polymers:


   (8 Lectures)

Module III (10 Lectures)
(To introduce the students about the basic concepts of fuels)

1. Fuels:

   Classification of fuels, calorific value, Analysis of Coal and Coke, Refining of Crude oil, Fractional distillation, Cracking, Knocking and antiknocking, Octane and Cetane number.

   Gaseous Fuel : Prodcer gas, Water gas, LPG & CNG.

   Cobustion Calculation.
Module IV (10 Lectures)
(To develop awareness amongst the students about the importance of water quality in domestic and industrial world and concepts of various kinds of pollutions)

1. Water Treatment:
   Water quality parameters and standards, treatment of water for industrial and domestic purpose.

2. Environment pollution:
   Green house effect, acid rain, depletion of ozone layer; Water pollution- bio chemical effect of lead, arsenic, mercury and fluorides, sewage-B.O.D. and C.O.D.

Books:
2. Organic Chemistry by Solomons and Fryhle, Wiley Publishing
3. Guide to Organic Reaction Mechanism by Peter Sykes
4. Concise Inorganic Chemistry by J. D. Lee, 4th/5th Ed. ELBS

BSCC 2202 MATERIAL SCIENCES (3-0-0)

MODULE - I (10 Lectures)

MODULE - II (10 Lectures)
5. Dielectric Materials: Microscopic Displacement of atoms and molecules in an external dc electric field, Polarization and dielectric constant, Dielectric susceptibility. Temperature dependence, Dielectric Breakdown. Ferro electric material Piezoelectrics, Pyroelectrics, Dielectric Materials as electrical isulators.

MODULE - III (10 Lectures)


9. Ceramics: Types, Structure, Mechanical properties, applications

MODULE - IV (10 Lectures)


Text Books:

2. Vijaya M. S., Rangarajan G, Materials Science, TMH
3. Rajendra V., Marikani A., Materials Science, TMH
4. Van Vlack L. H., Elements of Material Science and Engineering, Addison Wesley
5. Material Science, Raghavan
6. Processes and Material of manufacture: Lindberg, PHI.

BCSE 3201 OBJECT ORIENTED PROGRAMMING USING C++ (3-0-0)

Module I (10 Hours)
Introduction to object oriented programming, user defined types, polymorphism, and encapsulation. Getting started with C++ -syntax, data-type, variables, strings, functions, exceptions and statements, namespaces and exceptions, operators. Flow control, functions, recursion. Arrays and pointers, structures.

Module II (10 Hours)
Abstraction mechanisms: Classes, private, public, constructors, member functions, static members, references etc. Class hierarchy, derived classes.
Inheritance: simple inheritance, polymorphism, object slicing, base initialization, virtual functions.

Module III (12 Hours)
Prototypes, linkages, operator overloading, ambiguity, friends, member operators, operator function, I/O operators etc.
Memory management: new, delete, object copying, copy constructors, assignment operator, this input/output.
Exception handling: Exceptions and derived classes, function exception declarations, Unexpected exceptions, Exceptions when handling exceptions, resource capture and release etc.

Module IV (8 Hours)

Templates and Standard Template library: template classes, declaration, template functions, namespaces, string, iterators, hashes, iostreams and other type.
Design using C++ design and development, design and programming, role of classes.

Text Books:
1. Bhave & Patekar- Object oriented Programming with C++, Pearson Education
3. Robert Lafore- Object oriented programming in Microsoft C++.
4. Balguru Swamy-C++, TMH publication

HSSM 4201 ENGINEERING ECONOMICS AND COSTING(3-0-0)

Module I (10 Hours)

Time value of money : Simple and compound interest, Time value equivalence, Compound interest factors, Cash flow diagrams, Calculation, Calculation of time –value equivalences.
Present worth comparisons, Comparisons of assets with equal, unequal and infinite lives, comparison of deferred investments, Future worth comparison, pay back period comparison.

Module II (10 Hours)

Use and situations for equivalent annual worth comparison, Comparison of assets of equal and unequal life. Rate of return, Internal rate of return, comparison of IIR with other methods, IRR misconceptions. Analysis of public Projects : Benefit/ Cost analysis, quantification of project, cost and benefits, benefit/ cost applications, Cost –effectiveness analysis.

Module III (10 Hours)

Depreciation, Computing depreciation charges, after tax economic comparison, Break-even analysis; linear and non-linear models. Sensitivity analysis: single and multiple parameter sensitivity.

Module IV (12 Hours)


Text Book
1. Horn green, C.T., Cost Accounting, Prentice Hall of India
Module I (8 Hours)
Learning – Nature of Learning, How Learning occurs, Learning and OB.
Case Analysis

Module II (10 Hours)
Foundations of Individual Behaviour: Personality – Meaning and Definition, Determinants of Personality, Personality Traits, Personality and OB.
Case Analysis

Module III (12 Hours)
An Introduction to Transactional Analysis (TA).
Case Analysis

Module IV (10 Hours)
Case Analysis

TEXTBOOKS:
Keith Davis, Organizational Behaviour, McGraw – Hill.

REFERENCE BOOKS:
Stephen P. Robbins, Organizational Behaviour, Prentice Hall of India.
CPES 5202 ANALOGUE ELECTRONICS CIRCUITS (3-1-0)

MODULE - I (11 Hours)
1. DC biasing of BJTs and FETs : Load lines, Operating Point, Fixed bias and Voltage - divider bias. DC bias with voltage feedback. Bias stabilization. Design of bias.

MODULE - II (14 Hours)

MODULE - III (14 Hours)

MODULE - IV (8 Hours)
9. 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 bandpass.

TEXT BOOK
1. Electronic Devices and Circuit Theory By - Robert L. Boylestad and Lowis Nashelsky. 8th Edition Pearson Publication. Selected portion from Chapter 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 and 17.

SUPPLEMENTARY BOOKS
4. Electronic Devices and Circuits By David A. Bell, 4th Edition, PHI.
PRACTICALS
BENG 9202 BASIC ELECTRONICS LABORATORY (0-0-3)

(At least 8 experiments including 1 - 7 and any one from 8 - 10)
1. Familiarity with electronics components and Devices
   Testing of a semiconductor Diode and a Transistor. IC pins connection (Digital Multimeter should be used should be used in testing components and devices).
2. Study and use of Oscilloscope to view waveforms and measure its amplitude and frequency.
4. Half wave and Full wave rectifiers without and with capacitor filter. Record of waveforms, Measurement of Average and rms values.
5. V - I Characteristics of anpn or pnp transistor. DC Biasing and measurement of dc voltages and currents.
7. Op amp in Inverting, non inverting, Integrating and Differentiating configuration, Record of wave forms.
8. Truth Tables of logic gates.
9. Study and experiment using MUX - DEMUX ICs / Shift Register IC.
10. Study on CMOS logic Inverter.

BENG 9201 BASIC ELECTRICAL ENGINEERING LABORATORY (0-0-3)

List of Experiment (Any 8 of the following)
1. Study and measurement the armature and field resistance of a DC machine.
2. Calibration of ammeter, voltmeter and wattmeter with the help of sub-standard instrument.
3. Verification of circuit theorems. Thevenin's and Superposition theorems (with DC source only).
4. Voltage-current characteristics of incandescent lamps and fusing time-current characteristics of fuse wire.
5. Measurement of current, voltages and power in R-L-C series circuit excited by Single Phase AC supply.
6. Connection and starting of a three phase induction motor using direct online (DOL). or star-delta starter.
7. Connection and measurement of power consumption of a fluorescent lamp.
8. Determination of open circuit characteristics (OCC) of DC machine.
10. Connection and testing of a single phase energy meter (unity power factor load only)
11. Study of fan motor
BCSE 9201 OOP WITH C++ LABORATORY (0-0-3)
(10 classes for 10 different programs)

1. Programs on concept of classes and objects.(1 class)
2. Programs using inheritance.(1 class)
3. Programs using polymorphism.(1 class)
4. Programs on use of operator overloading.(1 class)
5. Programs on use of memory management.(1 class)
6. Programs on exception handling and use of templates.(1 class)
7. Programs on File handling in C++. (1 class)

BENG 9203 MECHANICAL ENGINEERING LABORATORY (0-0-3)

Group A (Mechanics / Material Testing Lab.
1. Determination of equilibrium of coplanar forces.
2. Determination of Moment of Intertia of Flywheel.

Group B
4. Determination of Metacentric Height and application to stability of floating bodies.
5. Verification of Bernoulli’s Theorem and its application to Venturimeter.

Group C
7. Calibration of Bourden Type Pressure gauj and measurement pressure using manometers.
8. Study of Cut-Sections of 2 stroke and 4 stroke Diesel Engine.

CPES 9201 NETWORK DEVICES LABAROTARY (0-0-3)

1. Verification of Network Theorems
3. Determination of parameters of a 2 port network Z, Y, h and ABCD parameters.
5. Study of a transformer as a coupled circuit and determination of its self and mutual inductance.
6. Response of single of double tuned coupled circuits.
7. Spectral analysis of a non-sinusoidal wave form.

CPES 9202 ANALOG ELECTRONICS CIRCUIT LABORATORY (0-0-3)

List of Experiments
(At least 10 out of 12 experiments should be done)
1. BJT Bias circuit – Design, construction & test
4. Design, Build and test of BJT emitter-follower - D.C and A.C performance voltage gain, input impedance and output impedance investigated.
6. Frequency response of a common-emitter amplifier: low frequency, high frequency and mid frequency response.
7. Feedback amplifiers: series and shunt feedback types- input and output impedance and A.C gain with and without feedback.
10. OP-Amp Frequency Response and Compensation.
4th Semester

BSCM 2202 MATHEMATICS - IV (3-1-0)

Module - I
Solution of equations by iteration, Newton’s method, Secant method, Interpolation
Numerical integration and differentiation

Module - II
Gauss Siedel iteration method for solving a system of linear equations, Ruage Kutta Methods, Introductory Linear Programming, Introductory Programming

Module - III
Probability, Random variables, Probability distribution, mean & variance of distribution
Binomial, Poisson, hyper-geometric and normal distributions

Module - IV
Random sampling, estimation of parameters, confidence intervals, Testing of hypothesis, acceptance sampling, correlation and regression

Course covered by : Advance Mathematics by E. Kreyszig (8th Edition)
Chapter 17 (17.1 - 17.3, 17.5), Chapter 18 (18.4), Chapter 19 (19.1), Chapter 20, Chapter 21, Chapter 22

BENG 1208 - FLUID MECHANICS AND HYDRAULIC MACHINE (3-1-0)

Module – I
(12 hours)
Introduction : Scope of fluid mechanics and its development as a science
Physical property of Fluid
Density, specific gravity, specific weight, specific volume, surface tension and capillarity, viscosity, compressibility and bulk modulus, Fluid classification.

Fluid static
Pressure, Pascal’s Law, Pressure variation for incompressible fluid, atmospheric pressure, absolute pressure, gauge pressure and vacuum pressure, monometer.
Hydrostatic process on submerged surface, force on a horizontal submerged plane surface, force on a vertical submerged plane surface.

Module – II
(12 hours)
Buoyancy and flotation, Archimedes’ principle, stability of immersed and floating bodies, determination of metacentric height.
Fluid dynamics : Introduction, Euler’s equation along a streamline, energy equation, Bernoulli’s equation, Analysis of finite control volumes and its application to siphon, venture meter, orifice meter

Module – III
(6 hours)
Turbine : Classification, reaction, Impulse, outward flow, inward flow and mixed flow turbines, Francis & Kaplan turbines, Pelton wheel, Physical description and principle of operation, Governing of Turbine.

Module – IV
(8 hours)
Centrifugal Pump : Principles of classification, Blade angles, Velocity triangle, efficiency, specific speed, characteristics curve.
Reciprocating Pump : Principles of working, slip, work done, effect of acceleration and frictional resistance, separation

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3. Fluid Mechanics, Modi & Seth

CPES 5201 NETWORK THEORY (3-1-0)

MODULE - I (12 Hours)

Topological description of networks; Reviews of mesh & nodal analysis. Reciprocity & Millman’s theorem, Maximum power transfer theorem.

Q factor, Bandwidth and Selectivity in Series & parallel resonance Circuits.

Coupled Circuits : Dot Convention for representing coupled circuits, coefficient of coupling.

Loop Analysis of coupled circuits, single and double tuned coupled circuits Transiet study in RLC networks by Laplace transform method with DC and AC excitation.

Response to step, impulse and ramp inputs S - domain circuits

Two Port networks : Z, Y, h, & ABCD representation of T and TT2 - port networks both in transmission parameters T - TT networks, 2 port network, Cascade and Parallel Connections.

Image and iterative impedances.

MODULE - II (12 Hours)

Network Functions & Responses :

Concept of complex frequency, driving point and transfer functions for one port and two network, poles & zeros of network functions, Restriction on Pole and Zero locations of network function. Impulse response and complete response. Time domain behaviour form pole-zero plot.


Problems in Optimizing power transfer; Insertion loss.

MODULE - III (10 Hours)

Fourier Series & Fourier Transforms : Fourier Series representation of non sinusoidal waves. Discrete spectra, rms values of non sinusoidal waves, Steady state response of linear circuits to non sinusoidal waves, power in such circuits. Fourier Internal and Fourier transform of signum and step functions. Applications to RL and RC circuits.

Network Synthesis :

Driving point functions, properties of positive real function.

MODULE - IV (8 Hours)


TEXT BOOKS

1. Network Analysis : M.E Van Valkenbrg
REFERENCE BOOKS

1. A Course in Electrical Circuits and Analysis : M. L. Soni, J. C. Gupta
2. Network Synthesis : M. E. Van Valkenberg
3. Electrical Networks : Alexander & Sadiku

**BSCC 2201 CHEMISTRY - II (3-0-0)**

**Module I (12 Lectures)**
(To develop awareness about Water Treatment)
Water quality parameters and standards.
Hardness of Water : Types of hardness, Units of hardness, Determination of hardness.
Disadvantages of hardwater, acidity and alkalinity, Water Softening Techniques. Boiler feed water, Water for Domestic purposes (municipal / Drinking Water)

**Module II (10 Lectures)**
(To develop the basic concepts about the transition metal compounds and corrosion)
1. Corrosion:
   Dry and wet corrosion, Galvanic Corrosion, Stress Corrosion, Factors affecting corrosion,
   Corrosion Control : (Proper design and fabrication procedure, Cathodic protection,
   Passivation).
   (8 Lectures)

2. Polymers:
   (8 Lectures)

**Module III (10 Lectures)**
(To introduce the students about the basic concepts of fuels)
1. Fuels:
   Classification of fuels, calorific value, Analysis of Coal and Coke, Refining of Crude oil,
   Fractional distillation, Cracking, Knocking and antiknocking, Octane and Cetane number.
   Gaseous Fuel : Producer gas, Water gas, LPG & CNG.
   Combustion Calculation.

**Module IV (10 Lectures)**
(To develop awareness amongst the students about the importance of water quality in domestic and industrial world and concepts of various kinds of pollutions)
1. Water Treatment:
   Water quality parameters and standards, treatment of water for industrial and domestic purpose.
2. Environment pollution:
   Green house effect, acid rain, depletion of ozone layer; Water pollution- bio chemical effect of lead, arsenic, mercury and fluorides, sewage-B.O.D. and C.O.D.

Books:
2. Organic Chemistry by Solomons and Fryhle, Wiley Publishing
3. Guide to Organic Reaction Mechanism by Peter Sykes
4. Concise Inorganic Chemistry by J. D. Lee, 4th/5th Ed. ELBS

BSCC 2202 MATERIAL SCIENCES (3-0-0)

MODULE - I (10 Lectures)

MODULE - II (10 Lectures)
5. Dielectric Materials : Microscopic Displacement of atoms and molecules in an external dc electric field, Polarization and dielectric constant, Dielectric susceptibility. Temperature dependence, Dielectric Breakdown. Ferro electric material Piezoelectrics, Pyroelectrics, Dielectric Materials as electrical isulators.

MODULE - III (10 Lectures)
   Plastics - Types : Thermosetting and thermoplastics. Transfer moulding, injection moulding, extension moulding, Blow moulding, Welding of plastics; Rubber types, application.
9. Ceramics: Types, Structure, Mechanical properties, applications

**MODULE - IV (10 Lectures)**


**Text Books:**
2. Vijaya M. S., Rangarajan G, Materials Science, TMH
3. Rajendra V., Marikani A., Materials Science, TMH
4. Van Vlack L. H., Elements of Material Science and Engineering, Addison Wesley
5. Material Science, Raghavan
6. Processes and Material of manufacture: Lindberg, PHI.

**BSCP 2201 PHYSICS - II (3-0-0)**

This one semester Physics course is divided into four units. The unit - I deals with some aspects of nuclear physics, unit - II introduces certain features of condensed matter physics, unit - III deals with certain aspects of semiconductors and superconductors and unit - IV introduces Opto-electronic devices and fibre-optic communication system.

**Unit - 1**

This unit covers the basic principles and applications of different types of accelerators and their important applications.

**Detailed constructional features of accelerators are not necessary.**

1. Need for nuclear accelerators.
3. RF accelerators: Linear accelerator, cyclotron, electron accelerator, betatron.

**Unit - 2**

This Unit deals with diffraction in crystals and its role in determining crystal structure.

Study of crystal structure by diffraction methods, Bragg’s condition for crystal diffraction, Lau condition, Miller indices, Reciprocal lattice, Geometrical structure factor, Atomic form factor.

**Unit - 3**

This unit deals with certain features of semiconductors and superconductors.

2. **Superconductivity**: Superconductors and their properties, Meisner effect, Type-I and Type-II Superconductors, Thermodynamic properties of superconductors, London equation, Application of superconductors.

**Unit - 4**

This unit introduces some Opto-electronic devices and fibre-optic communication system.


**LED**: Principle construction of operation and application, Introduction to fibre optics, basic characteristics of optical fibres, optical fibre communication system.

**Books Recommended**

1. Nuclear Physics, P. R. Roy & B. P. Nigan
2. Particle Accelerators, M. S. Livingston & J. P. Blewett
3. Concepts of Modern Physics, A. Beiser
4. Introduction to Solid State Physics, C. Kittel
5. Introduction to Lasers, A. Avadhnulu

**BSCP 2202 PHYSICS OF SEMICONDUCTOR DEVICES (3-0-0)**

**Module I (9 Hours)**

An appreciation of Quantum Mechanics in determining electrical properties of semiconductor.

**The Semiconductor in Equilibrium**:

Equilibrium distribution of electrons & holes, the n0 and p0 equation, intrinsic carrier concentration; Dope atoms and energy levels, ionization energy; the extrinsic semiconductor, the n0 p0 product, position of Fermi-energy level, variation of EF with doping concentration and temperature.

**Carrier Transport Phenomena**:

Carrier drift: mobility, conductivity, velocity saturation:

Carrier Diffusion: Diffusion current density. Total current density. The Einstein relation.

**Module II (9 Hours)**

**Non-equilibrium Excess Carrier in Semiconductor**

Excess carrier generation and recombination, characteristics of excess carriers-continuity equation and time – dependent Diffusion equation. Ambipolar Transport – Derivation of equation and applications.

**The Pn junction and Diode**

Basic structure, built-in potential barrier, Electric field, space charge width; Reverse applied bias-space charge width and Electric field. Junction capacitances.
Pn junction Diode: Ideal – current voltage relationship, Minority Carrier distribution, Ideal Pn junction currents under forward and reverse bias.

Module III (9 Hours)

Pn junction diode (contd.):
Temperature effects, Small signal model of Pn junction, Equivalent circuits Recombination Current. Junction Breakdown.

Metal-Oxide- Semiconductor FET (MOSFET)
The MOS structure: Energy band diagrams, Depletion Layer thickness, Work function difference, Flat band Voltage, Threshold Voltage, Charge distribution, Capacitance – Voltage characteristics.

The basic MOSFET operation, Current – Voltage relation (Concepts)
Frequency limitation : Small signal Equivalent circuit.
The CMOS Technology.

Module IV (8 Hours)

The Bipolar Transistor

Text Book :
1. Semiconductor Physics and Devices- Basic Principles BY Donald A. Neamen, 3rd Edition, Tata McgrawHill Edition. (Selected portion from chapters 2, 4, 6, 7, 8, 10 & 11.)

For additional reading

BCSE 3202 RELATIONAL DATABASE MANAGEMENT SYSTEMS (3-0-0)

Module I (10 Hours)
Database System Architecture - Data Abstraction, Data Independence, Data Definitions and Data Manipulation Languages.
Data models - Entity Relationship(ER), Mapping ER Model to Relational Model, Network . Relational and Object Oriented Data Models, Integrity Constraints and Data Manipulation Operations.

Module II (10 Hours)
Relation Query Languages, Relational Algebra, Tuple and Domain Relational Calculus, SQL and QBE.
Relational Database Design: Domain and Data dependency, Armstrong’s Axioms, Normal Forms, Dependency Preservation, Lossless design, Comparison of Oracle & DB2

Module III (8 Hours)
Query Processing and Optimization: Evaluation of Relational Algebra Expressions, Query Equivalence, Join strategies, Query Optimization Algorithms.
Module IV (12 Hours)


Advanced topics: Object-Oriented and Object Relational databases. Logical Databases, Web Databases, Distributed Databases, Data Warehouse and Data Mining.

Text Books:-
2. C.J.Date - An Introduction to Database Systems, Pearson Education

HSSM 4202 ORGANIZATIONAL BEHAVIOUR (3-0-0)

Module I (8 Hours)

Learning – Nature of Learning, How Learning occurs, Learning and OB.

Case Analysis

Module II (10 Hours)
Foundations of Individual Behaviour: Personality – Meaning and Definition, Determinants of Personality, Personality Traits, Personality and OB.


Case Analysis

Module III (12 Hours)

An Introduction to Transactional Analysis (TA).

Case Analysis

Module IV (10 Hours)

Case Analysis
TEXTBOOKS:
Keith Davis, Organizational Behaviour, McGraw – Hill.

REFERENCE BOOKS:
Stephen P. Robbins, Organizational Behaviour, Prentice Hall of India.

HSSM 4201 ENGINEERING ECONOMICS AND COSTING (3-0-0)

Module I (10 Hours)
Time value of money: Simple and compound interest, Time value equivalence, Compound interest factors, Cash flow diagrams, Calculation, Calculation of time –value equivalences.
Present worth comparisons, Comparisons of assets with equal, unequal and infinite lives, comparison of deferred investments, Future worth comparison, pay back period comparison.

Module II (10 Hours)
Use and situations for equivalent annual worth comparison, Comparison of assets of equal and unequal life. Rate of return, Internal rate of return, comparison of IIR with other methods, IRR misconceptions. Analysis of public Projects: Benefit/ Cost analysis, quantification of project, cost and benefits, benefit/ cost applications, Cost –effectiveness analysis.

Module III (10 Hours)
Depreciation, Computing depreciation charges, after tax economic comparison, Break-even analysis; linear and non-linear models. Sensitivity analysis: single and multiple parameter sensitivity.

Module IV (12 Hours)

Text Book
1. Horn green, C.T., Cost Accounting, Prentice Hall of India

CPES 5203 DIGITAL ELECTRONICS CIRCUITS (3-1-0)

Module I (11 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.
Module II (13 Hours)
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 invention, OR-AND invention implementation, Ex-OR function, Parity generation and checking, Hardware Description Language (HDL).

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

Module III (12 Hours)
Synchronous Sequential Logic

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

Module IV (15 Hours)
Memory and Programmable Logic
Random Access Memory (RAM), Memory Decoding, Error detection and Correction, Read only Memory, Programmable Array Logic, Sequential Programmable Devices.

Register Transfer Levels
Register transfer level notion, Register transfer level in HDL, Algorithm, State Machine, Design Examples. HDL Description of Design, Examples, Binary Multiplier, HDL, Description of Binary Multiplier.

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

Text Book

PRACTICALS
BENG 9201 BASIC ELECTRICAL ENGINEERING LABORATORY (0-0-3)

List of Experiment (Any 8 of the following)
1. Study and measurement the armature and field resistance of a DC machine.
2. Calibration of ammeter, voltmeter and wattmeter with the help of sub-standard instrument.
3. Verification of circuit theorems. Thevenin’s and Superposition theorems (with DC source only).
4. Voltage-current characteristics of incandescent lamps and fusing time-current characteristics of fuse wire.

5. Measurement of current, voltages and power in R-L-C series circuit excited by Single Phase AC supply.

6. Connection and starting of a three phase induction motor using direct online (DOL), or star-delta starter.

7. Connection and measurement of power consumption of a fluorescent lamp.

8. Determination of open circuit characteristics (OCC) of DC machine.


10. Connection and testing of a single phase energy meter (unity power factor load only)

11. Study of fan motor

**BENG 9202 BASIC ELECTRONICS LABORATORY (0-0-3)**

(At least 8 experiments including 1 - 7 and any one from 8 - 10)

1. Familiarity with electronics components and Devices
   Testing of a semiconductor Diode and a Transistor. IC pins connection (Digital Multimeter should be used should be used in testing components and devices).

2. Study and use of Oscilloscope to view waveforms and measure its amplitude and frequency.


4. Half wave and Full wave rectifiers without and with capacitor filter. Record of waveforms, Measurement of Average and rms values.

5. V - I Characteristics of anpn or pnp transistor. DC Biasing and measurement of dc voltages and currents.


7. Op amp in Inverting, non inverting, Integrating and Differentiating configuration, Record of wave forms.

8. Truth Tables of logic gates.

9. Study and experiment using MUX - DEMUX Ics / Shift Register IC.

10. Study on CMOS logic Inverter.

**BCSE 9202 RDBMS LABORATORY (0-0-3)**

(10 Classes for 10 Different Programs)

1. Use of SQL syntax : Insertion, Deletion, Join), Updation using SQL. (1 class)

2. Program segments in embedded SQL using C as host language to find average grade point of a student, etc.. (1 class)

3. Program for Log based data recovery technique. (1 class)

4. Program on data recovery using check point technique. (1 class)
5. Concurrency control problem using lock operations. (1 class)
6. Use of package (ORACLE) for programming approaches (2 classes)
7. Use of package (DB2) for programming approaches (2 classes)
8. Programs on JDBC/ODBC to print employee’s / student’s information of a particular department. (1 class)

CPES 9201 NETWORK DEVICES LABAROTARY (0-0-3)

1. Verification of Network Theorems
3. Determination of parameters of a 2 port network Z, Y, h and ABCD parameters.
5. Study of a transformer as a coupled circuit and determination of its self and mutual inductance.
6. Response of single of double tuned coupled circuits.
7. Spectral analysis of a non-sinusoidal wave form.

BENG 9203 MECHANICAL ENGINEERING LABORATORY (0-0-3)

Group A (Mechanics / Material Testing Lab.
1. Determination of equilibrium of coplanar forces.
2. Determination of Moment of Intertia of Flywheel

Group B
4. Determination of Metacentric Height and application to stability of floating bodies.
5. Verification of Bernoulli’s Theorem and its application to Venturimeter.

Group C
7. Calibration of Bourden Type Pressure gauj and measurement pressure using manometers.
8. Study of Cut-Sections of 2 stroke and 4 stroke Diesel Engine.

CPES 9203 DIGITAL ELECTRONICS CIRCUITS LABORATORY (0-0-3)
(10 experiments out of 13 should be done during the Semester)
1. Digital Logic Gates: Investigate logic behaviour of AND, OR, NAND, NOR, EX-OR, EX-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 construct and test: address and subtractors, code converters, gray code to binary and 7 segment display.
4. Design, implement and test a given design example with (i) NAND Gates only (ii) XOR Gates only and (iii) Decide and NAND Gates.
5. Design with multi-plexers and de-multiplexers.
7. Shift Registers: Investigate the operation of all types of shift registers with parallel load. Design.
9. Memory Unit: Investigate the behaviour of RAM unit and its storage capacity – 16 X 4 RAM: testing, simulating and memory expansion.
10. Clock-pulse generator: design, implements and test.
12. Binary Multiplier: design and construct a circuit that multiplier 4-bit unsigned numbers to produce a 8-bit product.
13. Verilog HDL simulation of experiments: choose any form Sl No 3 to 12 and implement it.
## COURSE STRUCTURE
### THIRD YEAR B.TECH PROGRAMME
#### ELECTRICAL ENGINEERING

<table>
<thead>
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<th>5th Semester</th>
<th>6th Semester</th>
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<tbody>
<tr>
<td><strong>Theory</strong></td>
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<td>CPEE 5301 Electrical Machines - I</td>
<td>3-1-0 4</td>
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<td>CPEE 5302 Control System Engineering</td>
<td>3-1-0 4</td>
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<td>CPEE 5303 Transmission &amp; Distribution</td>
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<tr>
<td>CPEC 5305 Microprocessor &amp; Microcontrollers</td>
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<tr>
<td>CPEN 5306 Instrumentation &amp; Measurement</td>
<td>3-0-0 3</td>
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<td>CPEE 9301 Control &amp; Instrumentation Lab.</td>
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<td>CPEE 9303 Design of Electrical Power Aparatus Lab</td>
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<td>CPEC 9304 Microprocessor &amp; Microcontroller Lab.</td>
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<td>CPEE 9304 Electrical Machine Lab. - II</td>
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**L-Lecture**  **T-Tutorial**  **P-Practical**
Course Objective: The course aims at acquainting the students to mathematical modeling of engineering design, operation and maintenance problems and their optimization algorithms.

Module – I (10 hours)
Formulation of engineering optimization problems: Decision variables, objective function and constraints. Example of typical design, operation and maintenance problems in engineering: Design of a water tank, design of a truss, design of a network (electrical, communication sewerage and water supply networks), product mix problem, transportation and assignment problems, shift scheduling of employees, design of reliable devices, design of reactors, shortest route problem, set covering problem, traveling salesman problems. Only physical problems and their mathematical models to be discussed.

Linear Programming Problem: Formulation, Graphical solution, Simplex method, Duality theory, Dual simplex method, Formulation and solution of engineering problems of planning and scheduling.

Module – II (10 hours)
Sensitivity Analysis, Transportation Problem, Assignment Problem, Network Models: Minimal Spanning Tree Problem, Maximal Flow Problem, Shortest Route Problem, Minimum Cost Flow Problem. Algorithms and applications to be covered.

Module – III (10 hours)

Module – IV (12 hours)
Queueing theory, Game theory, Simulation, Decision theory & Sequencing Problem

References:
4. B.E Gillett, Introduction to operations research, TMH
2. D.C. Generator: No load characteristics; conditions for self excitation - Critical resistance and speed; operation of separately excited, shunt excited, series excited and compound excited generators under load conditions; parallel operation.

MODULE – 2 (8 hours)

3. D.C. Motor: Back EMF; speed equation; speed torque, speed current and torque current characteristics of shunt, series and compound motors; speed control by variation of flux, by variation of armature resistance, by variation of voltage. Use of variable voltage rectifier and chopper for controlling speed (only Block diagram to be given). D.C. Motor starting and starters; losses and efficiency; Swinburn’s test, brake test and Hopkinson’s test

MODULE – 3 (8 hours)

4. Single phase transformers: Construction; EMF equation; ideal transformer; voltage and current ratio, development of equivalent circuit of an actual transformer, phaser diagram, voltage regulation; losses and efficiency; condition of maximum efficiency; All day efficiency; determination of parameters from OC & SC tests; back to back test; per unit representation; parallel operation and load sharing.

5. Single phase auto transformer: Construction; principles of operation; equivalent circuit, rating, comparison with 2 winding transformer (4 hours)

6. Three phase synchronous machine: Construction of cylindrical rotor and salient pole machines; advantages of rotating poles type; Air gap flux density and mmf; poly phase armature winding, induced EMF; winding factors; harmonics in EMF and its elimination

MODULE – 4 (10 hours)

7. Armature resistance and leakage reactance; Armature reaction at various pf. Loads; rotating magnetic field;

8. Cylindrical rotor type synchronous generator: phasor diagram; armature reaction reactance; synchronous reactance and impedance, OC & short circuit tests; determination of synchronous reactance; short circuit ratio, ZPF characteristics; Potier reactance; Calculation of regulation by synchronous impedance method, ZPF method, mmf method; modified mmf method, Power angle equation and power angle characteristics.

Text Books :

1) Electrical Machines by P.K. Mukherjee & S. Chakravorty (Dhanpat Rai)
2) Electrical Machines, S. Ghosh, Pearson

References:

1. Electrical Machine by Nagrath & Kothari
**CPEE 5302 CONTROL SYSTEM ENGINEERING (3-1-0)**

**Module - I**
(10 hours)

**Introduction:**
Basic concepts of control systems, Open loop and closed loop systems, difference between open loop and closed loop systems, classifications

Mathematical model of physical systems, transfer function, block diagram algebra, signal flow graph (SFG), Mason’s gain formula, application of SFG to control systems

**Feed back theory:** Types of feedbacks, effect of degenerative feedback on control system, regenerative feedback.

**Components:** A.C. Servo motor, DC servo motor, AC tacho meter, synchros, amplidyne, stepper motor

**Module – II**
(10 hours)

Time domain analysis: Standard test signals: Step, ramp, parabolic and impulse signals. Time response of 1&1 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 error constants of different types of control systems Generalised error series method

**Concepts of stability:** Necessary conditions of stability, Hurwitz stability criterion, routh stability criterion, application of routh stability criterion to linear feedback systems, relative stability

**Module – III**
(12 hours)

Root locus techniques: Root locus concepts, rules for construction of root loci, determination of roots from root locus, root contours. systems with transportation lag

Frequency domain analysis: Introduction, Bode plots, determination of stability from Bode plots, polar plots, nyquist stability criterion, application of nyquist stability criterion to linear feedback systems

**Module – IV**
(8 hours)

Closed loop frequency response: Constant M circles, constant N circles, use of Nicolas chart

Controllers: Introduction, proportional, derivative and integral control actions, PO, PI and PID controllers and their applications to feedback control systems, Zeigler- Nichols method of tuning PID controllers for known dynamic model of the plant.

**Text Books:**

1. Modern Control Engineering by D. Roy Choudhury, PHI
2. Modern Control Engineering by K. Ogata, PHI
Reference Books :

2. Control System, Theory & Applications by Sama_it Ghosh, Pearson Education

CPEE 5303 TRANSMISSION AND DISTRIBUTION (3-0-0)

MODULE – I
12 hours

General Introduction to power transmission by D.C. and A.C. overhead lines.

Lines Constants
Resistance, inductance and capacitance of single and three phase lines with symmetrical and unsymmetrical spacing transposition, charging current, skin effect and proximity effect

Performance of transmission Lines
Analysis of short, medium and long lines, equivalent circuit, representation of the lines and calculation of transmission parameters, use of static or synchronous condensers for improvement of regulation.

MODULE – II
9 hours

Corona
Power loss due to corona, practical importance of corona, and inductive interference with neighbouring communication lines, use of bundled conductors in e.h.v. transmission lines and its advantages

Overhead line Insulators
Voltage distribution in suspension type insulators, method of equalizing, voltage distribution, economic use of insulators.

Mechanical Design of Overhead Transmission Line
Sag and stress calculation, tension and sag at erection, effect of ice and wind, vibration dampers

MODULE – III
9 hours

Under Ground Cables
Type and construction, grading of cables, capacitance in 3 core cables and dialectic loss

Distribution System
Effect of System voltage on transmission efficiency.. Economic choice of conductor size, Kelvin’s Law, types of distributors and feeders (radial & ring), voltage drop and load calculation for concentrated and distributed loads.

Substation & Earthing
Types of substations, arrangement of busbars and control equipments, solid earthing, resistance earthing and Peterson coil

MODULE – IV
6 hours
CPEC 5305 MICROPROCESSOR & MICRO CONTROLLER (3-1-0)

Module - I
(12 hours)


MEMORY INTERFACING:- Interfacing EPROM & RAM Memories: 2764 & 6264,

Interrupts :- 8085 Interrupts

MODULE – II
(12 hours)

Microprocessor Based System Development Aids:- Programmable Peripheral Interface: 8255, Programmable DMA Controller: 8257, Programmable Interrupt Controller: 8259

Microcontroller (Architecture and Programming):- Introduction to 8051 Microcontrollers (Architecture, Pin description), 8051 Assembly Language Programming (JUMP, LOOP, CALL Instructions), I/O Port Programming, 8051 Addressing Modes, Arithmetic & Logic Instructions

MODULE – III
(12 hours)

Microcontroller Interrupts and Interfacing to 8255:- 8051 Interrupts, Interfacing to 8255

Intel 8086 (16 bit processors):- 8086 Architecture, Addressing Modes, Instruction Format, Pins & Signals, 8086 Basic System Concept, Interfacing with Memories, 8086 Interrupts.

MODULE – IV
(11 hours)

Intel 80386 :- Introduction to 80386 Microprocessor, Architecture, Pins & Signals, Memory System, Registers, 80386 Memory Management, Paging Technique, Protected Mode Operation, brief introduction to 80387 Math Coprocessor.

Pentium Processors (Only features) :- Introduction to Pentium Processors, Memory System, Input/Output System, Brief (only the features of Pentium Processor mentioned above are to be discussed)
TEXT BOOKS

1. 0000 to 8085 – Introduction to Microprocessor for Scientists & Engineers by Ghosh & Sridhar, PHI publication (for Module I to Module – III)
2. Advanced Microprocessor and Peripherals (Architecture, Programming & Interfacing) by A.K. Roy & K.M. Bhurchandi – TMH Publication (For Module-V to Module- VII)
3. The 8051 Microcontroller & Embedded Systems by Mazidi & Mazidi – Pearson / PHI publication (For Module-IV)
4. Microcontrollers [theory and applications] TMH publication by Ajay V. Deshmukh. (Chapter – 2 to Chapter – 6)
5. Microprocessors and programmed logic (2nd Edition), Pearson Education by Kenneth L. Short

CPEN 5306 INSTRUMENTATION & MEASUREMENTS (3-0-0)

• MODULE – I (12 hours)

Measuring Instruments

Classification, Absolute and secondary instruments, indicating instruments, control, balancing and damping, constructional details, characteristics, errors in measurement

Wattmeters

Electrodynamometer type, induction type, single phase and three phase wattmeters, compensation.

Energymeters

AC. Induction type single phase and three phase energy meter, compensation,... creep, error, testing

Frequency Meters

Vibrating reed type, electrical resonance type

MODULE – II (10 Hours)

Instrument Transformers

Potential and current transformers, ratio and phase angle errors, phasor diagram, methods of minimizing errors; testing and applications

Galvanometers

General principle and performance equations of 0' Arsonval Galvanometers, Vibration Galvanometer and Ballistic Galvanometer; undamped, underdamped and overdamped motion of galvanometer. Measurement of charge and flux by Ballistic Galvanometer.

Potentionmeters

D.C. Potentiometer-Crompton potentiometer, construction, standardization, application. AC. Potentiometer-Drysdale polar potentiometer; Gall Tinsley coordinate type potentiometer, standardization, application.

MODULE –III (9 Hours)

DCI AC Bridges

General equations for bridge balance, measurement of self inductance by Mazwell's bridge (with variable inductance & variable capacitance), Hay’s bridge, Owan’s bridge, measurement of capacitance by Schearing bridge, errors, Wagner’s earthing device, Kelvin's double bridge.
Transducer

Strain Gauges, Thermistors, Thermocouples, Linear Variable Differential Transformer (LVDT) Capacitive Transducers, Peizo-Electric transducers, Optical Transducer, Torque meters, inductive torque transducers, electric tachometers, photo-electric tachometers.

MODULE – IV (9 Hours)

Electronics Instruments

CRG: Block diagram, Sweep generation, vertical amplifiers, use of CRG in measurement of frequency, phase, Amplitude and rise time of a pulse.

Digital Multimeter: Block diagram, principle of operation, Accuracy of measurement.

Electronic Voltmeter: Transistor Voltmeter, Block diagram, principle of operation, Accuracy of measurement.

Electronic Votmeter: Transistor Voltmeter, Block diagram, principle of Operation, accuracy of measurement.

Digital Frequency meter: Block diagram, principle of operation, typical features accuracy of measurement

Reference Books:
1) A Course in Elec. & Electronics Measurements & Instrumentation: A K. Sawhney
2) Electronic Instrumentation and Measurement techniques: W.O. Cooper
3) Electronic Measurement & Instrumentation Systems: Larry Jones & A Foster Chin
4) Electrical Measurement and Measuring Instruments - Golding & Waddis

PRACTICALS

CPEE 9301 CONTROL AND INSTRUMENTATION LAB. (0-0-3)

CONTROL: (Any five)
1. Study of a DC Speed control system and determination of transfer function of a permanent magnet dc motor.
2. Study of a two-phase AC servomotor and its transfer function parameters.
3. Find the frequency response of a Lag and Lead compensator.
4. To observe the time response of a second order process with P, P+I, P+I+D control and apply PID control to a DC servomotor.
5. To study the characteristic of a relay and analyze the relay control system (Phase Plane).
6. Study of a DC position control system
7. Study of a linear system simulator

INSTRUMENTATION: ( Any five)
1. Measurements of unknown resistance, inductance, and capacitance using Bridges.
2. To plot the displacement –voltage characteristics of the given LVDT.
4. Use a strain gauge to plot the curve between strain applied to a beam and the output voltage.
5. Study of resistance-voltage characteristics of Thermistors
7. Plot the output characteristics of a torque transducer
CPEC 9304 MICROPROCESSOR & MICROCONTROLLER LAB. (0-0-3)

A) 8085
1. Addition, Subtraction, Multiplication, Division two 8 bit numbers resulting 8/16 bit numbers.

2. Smallest /Largest number among n number in a given data array + Binary to Gray Code / Hexadecimal to decimal conversion. (1 hour)

B) INTERFACING (5 hours)
1. Generate square waves on all lines of 8255 with different frequencies (concept of delay program) 1 lecturer)
2. Study of stepper Motor and its operations (Clockwise, anticlockwise, angular movement, rotate in various speeds)

OPTIONAL (Any Two) (1 hour)
1. Study of Traffic Light controller
2. Study of Elevator Simulator
3. Generation of Square, triangular and saw tooth wave using Digital to Analog Converter
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.

C) 8051MICROCONTROLLER (3 hours )
COMPULSORY (2 hours)
1. Initialize data to registers and memory using immediate, register, direct and indirect addressing mode

OPTIONAL (any one) (1 lecture)
1. Addition, subtraction of 16 bit numbers.
2. Multiplication, Division of 16 bit numbers
3. Transfer a block of data to another memory location using indexing.
4. Operation of 8255 using 8051 microcontroller

D) 8086 (2 hours)
COMPULSORY (1 hour)
1. Addition, subtraction, Multiplication, Division of 16 bit nos + 2’s complement of a 16 bit no.

1. Finding a particular data element in a given data array.
3. Largest /Smallest number of a given data array.
4. To separate the Odd and Even numbers from a given data array.
5. Sorting an array of numbers in ascending/descending order

Total – 13 hours

NOTE Total 10 (Ten) experiments have to be completed.
Two from GP-A, four from Gp-B, two from Gp-C, two from Gp-D

CPEE 9302 ELECTRICAL MACHINES LAB - I (0-0-3)

1. O.C and S.C test on single phase transformer
2. Parallel operation of two single phase transformer
4. Transformer connection: Y to Y, Y to , Scott connection, 3 phase to 6 phase, ZIGZAG connection YD1, YD11
5. No load and load characteristics of DC shunt generator
6. Speed control of D.C motor by armature voltage and field excitation control
7. Open circuit and short circuit tests of an alternators
8. Synchronizing of an alternator to infinite bus
9. No load and blocked rotor test of an induction motors
10. Load characteristics of a 3 phase induction motor
6th Semester

HSSM 4302 PRODUCTION AND OPERATIONS MANAGEMENT (3-0-0)

Objective: This course aims at acquainting all engineering graduates irrespective of their specializations the basic issues related to operations management.

Module I

   (3 hours)

   (4 hours)

   (4 hours)

Module II

4. Location and Layout Planning: Factor Influencing Plant and Warehouse Locations, Impact of Location on cost and revenues. Facility Location Procedure and Models: Qualitative Models, Break-even Analysis, Single Facility, Location Model, Multi-facility Location Model, Mini-max Location, Total and Partial Covering Model.

   Line Balancing: Basic concepts, General Procedure, Rank Positional Weight Method.
   (7 hours)

5. Forecasting: Principles and Method, Moving Average, Double Moving Average, Exponential Smoothing, Double Exponential Smoothing, Winter’s Method for Seasonal Demand, Forecasting Error Analysis.

Module III

   (4 hours)

8. **Inventory Control**: Relevant Costs, Basic EOQ Model, Model with Quantity discount, Economic Batch Quantity, Periodic and Continuous Review Systems for Stochastic Systems, Safety Stock, Reorder Point and Order Quantity Calculations, ABC Analysis. (4 hours)

**Module - IV**

9. **Project Management**: Project Management through PERT / CPM. Network Construction, CPM, Network Calculation, Crashing of Project Network, Project Scheduling with Limited Resources. Line of Balance. (5 hours)

10. **Modern Trends in Manufacturing**: Just in Time (JIT) System; Shop Floor Control By Kanbans, Total Quality Management, Total Productive Maintenance, ISO 9000, Quality Circle, Kaizen, Poke Yoke, Supply Chain Management (6 hours)

**Reference**:


**Module – I**

**Operation of salient pole synchronous alternator**:

Two reaction theory, phasor diagram, direct and quadrature axis reactances, voltage regulation, power angle equation and characteristics; slip test.

Synchronization of alternators; synchronizing power and torque; parallel operation; load sharing, operation of alternators connected to infinite bus bar.

3 phase synchronous motor connected to infinite bus bar; principles of torque production; torque and power expressions in cylindrical rotor and salient pole rotors, approximate relation with armature resistance neglected; power-angle characteristics for both type of motors; v-curves; starting of synchronous motor. Hunting and its remedy; use as a synchronous condenser and other uses. (12 hours)

**Module – II**

**3 phase transformer**: Construction of core type and shell type transformers, Three single phase transformers connected as a bank of 3 phase transformer;

Transformer connection - YY, _Y, _Y, M, _ig zag,Y zig zag. Phase displacement of primary and secondary voltages for different connections, vector groups.Two single phase transformers connected as open delta. Rating of such transformers;Phase conversion : 3 phase to 6 phase; 3 phase to 12 phase; T connection of 2 single phase transformers to have 3 phase to 3 phase; 3 phase to 2 phase and vice versa. Parallel operation of 3 phase transformers, 3 winding transformer and its equivalent circuit, Time harmonics in single phase and 3 phase transformers; causes and remedy; floating neutral; switching in transients. (9 ours)

**Module – III**

**Poly phase induction motor** construction - cage & wound rotor type; principle of operation, speed and slip; equivalent circuit and phasor diagram; power and torque expressions, slip torque characteristics and effect of rotor resistance on it; no load and blocked rotor test; determination of parameters, circle diagram and determination of performances curves

Starting of both types of motors; Speed control by change of voltage, rotor resistance, no. of poles and frequency. Speed control by slip power recovery method and voltage injection method, casc_ding

Cogging & Crawling - Causes & remedy Principle of induction generator (10 hours)
Module – II (09 hours)

Single phase induction motor. Double revolving theory, torque-slip characteristics, starting methods: Split phase starting - Use of resistance or capacitance, shaded pole starting, starting as an repulsion motor.

A.C. Series motor - Construction and operation; plain and compensated series motor; problems in commutation and their remedy; phasor diagram; universal motor. Repulsion motor - Construction and principles of operation, repulsion induction motor.

Special machines, their construction and principles of operation:
Reluctance motor, hysteresis motor; stepper motor, AC servomotor, linear motor Single and three phase induction regulator

Text Books:
1. Electrical Machines, S. Ghosh, Pearson Publication
2. Electrical Machines by P.K. Mukheee & S. Chakravorty (Dhanpat Rai)
3. Theory and Performance of AC Machines - (M.G. Say)

References:
1. Electrical Machines, Charles Hubert, Pearson
2. The Performance & Design of A.C. Commutator motors by E.G. Taylor

CPEC 5302 DIGITAL SIGNAL PROCESSING (3-0-0)

Module – I (10 hours)

Discrete Time Signals and System
Discrete Time Signals (Elementary examples, classification: periodic and a periodic Signals energy and Power signals, Even and Odd Signals).

Discrete Time System:
Block diagram representation of discrete time systems, classification of discrete time systems – static and dynamic, time variant and time – invariant, linear and non-linear, casual and anti-casual, stable and unstable.

Analysis and response (convolution sum) of discrete time linear LTI system, Recursive and Non-recursive discrete time system. Constant coefficient differences equations and their solutions, impulse response of LTI system, structures of LTI systems Recursive and Non-recursive realization of FIR system. Correlation of discrete time Signal.

Selected portions from Chapter 2 (2.1, 2.2, 2.3, 2.4, 2.5, 2.6.1) of Textbook – I
Chapter 1 of Textbook- 2.

Module – II (10 hours)

The Z transform
The Z-transform and one-sided Z-transform, properties of Z-transform, inverse of the Z-transform, Solution of difference equations.

Selected portions from Chapters 3 (3.1, 3.2, 3.5) of Textbook – I
Selected portion of chapter 4 of Textbook - 2

The Discrete Fourier Transform
The DFT and IDFT, relationship, DFT with Z-transform, the DFT as a linear transformation Relationship of DFT with Z-transform, properties of DFT: periodicity, linearity, summery and time reversal of a sequence.
Circular convolution, circular correlation, circular correction by convolution, method linear convolution by overlap save methods and by overlap add method, Circular convolution and correlation by DFT method, Overlap add and save filtering by DFT method.

Selected portion from Chapter – 5 (5.1.2,5.1.3,5.1.4,5.2,5.2.1,5.2.2, 5.2.3, 5.3.2) of textbook – 1.
Selected portion of chapter 6 of textbook - 2.

Module- III (10 hours)

Fast Fourier Transform:
Operation counts by direct copulation of DFT, Radix – 2 FFT algorithm- Decimation –in-time (DIT) and Decimation – in frequency (DIF) algorithm, Efficient computation DFT of Two real sequences, Efficient Computation of DFT of a 2 N-pt real sequences.

Selected portions from chapter 6 (6.1.1,6.1.3, 6.2.1, 6.2.2) of Text book –1
Selected portions from chapter 7 and 8 of Text book – 2.

Design and Digital Filters:

Selected portions from chapter 8 (8.1.1, 8.2.1, 8.2.2., 8.3.2,8.3.3.) of Text book – I

Module – IV (10 hours)

Estimation of spectra from finite duration signals, Non-parametric method of power spectrum estimations.

The Bartleff method and the Blackman and Tukey method.

Selected portion from chapter 12 of Text book - 1: 12.1,12.1.1,12.1.2,12.1.3,12.2.1, 12.2.3.
Selected portion from chapter 12 of Text book – 2


Structure IIR Systems - Direct form I & II realizations

Selected portions from chapter 7 (7.2, 7.2.1, 7.2.2, 7.3, 7.3.1 ) of Text book –I
Selected portions from chapter 9 of Text book – 2.

Text Books
2. Digital Signal Processing by S. Salivahanan, TMH

Reference Book:
Introduction of Digital Signal Processing – J. R. Johnson, PHI.

CPEE 5305 ADVANCED CONTROL SYSTEM ENGINEERING (3-0-0)

Module – I (10 hours)

Mathematical modeling of dynamic systems in state space, state space representation of Mechanical and Electrical systems, State equations and transfer functions, Characteristics equation, Eigenvalues
and Eigenvector of state matrix, Solution of time-invariant state equation, determination of State Transition Matrix, use of Cayley–Hamilton Theorem, Minimal, Polynomial, Sylvester’s interpolations, controllability, observability

**Module – II**

Introduction to design of control systems in state space, design of phase lead and phase lag controllers in time and frequency domain, pole placement design, State observers.

**Module - III**

Sampling and Signal reconstruction: definition and Evaluation of Z-Transform, properties of Z-Transform, Inverse Z-Transform, Mapping between S-plane and Z-plane, system descriptions by difference equations and solutions.


**Module – IV**

Nonlinear systems: Common physical nonlinearities, the phase plane methods, Basic concepts, Singular points, stability on nonlinear systems, Construction of phase trajectories, Construction by analytical and graphical methods, System analysis by phase plane method, the describing function methods: Basic concepts, derivation of describing functions for common nonlinearities, stability analysis by Describing function approach, Jump resonance, Lyapunov stability criterion, Popov’s stability criterion.

**Text Books**

1. Modern Control Engineering, K. Ogata, PHI
2. Automatic Control System, B.C. Kuo, PHI

**CPEE 5306 POWER ELECTRONICS (3-0-0)**

**Module – I**


**Triggering Circuits:**
Types of triggering schemes: DC, AC & pulsed triggering, UJT triggering scheme, R-C triggering scheme, cosine – law triggering scheme.

Commutation.
Principle of natural commutation and forced commutation, circuits for forced commutation (Resonant commutation, self commutation, auxiliary commutation, complementary commutation, external pulse commutation.

**Module-II**

Control Rectifiers (AC to DC Converter)
Single Phase- Circuit Configuration and Principle of operation of operation of half wave, full wave controlled rectifiers (full converters and semi converters) wave form of voltage and current at the output and across the thyristor for R-L & R-L-E load, effect of source inductance, importance of free wheeling diode for inductive loads. Input power factor for R & R-L load, Ripple factor. Average output voltage and currents.

Three Phase Controlled Rectifiers:
Half wave and full wave full controlled bridge rectifiers. Three phase semi-converters, average output voltage and current for R & R-L load.

Module – III (10 hours)

Inverters (DC to AC Converters):


Bridge Inverters: Principle of operation:

Three Phase: Concept of three phase bridge inverters, principle of operation (180° conduction mode & 120° conduction mode), wave form of output voltage and current for R & RL load.

Module – II (10 hours)

DC Choppers:
Basic Principles of class A, B, C, D, E Choppers, voltage commuted chopper, current commutated chopper and load commutated chopper.

Jones Chopper & Morgan Chopper.

Cyclo Converter (Single Phase):

Basic Principle of Single phase Mid Point Cyclo Converters and bridges types cyclo converters.

Application:
Over voltage protection, zero voltage switch, integral cycle triggering (or Burst Firing), Uninterruptible power supply (UPS), Arc welding, HVDC transmission.

Text Book:
1. Power Electronics, Singh & Khanchandani TMH
2. Power Electronics, P. S. Bhimbra, M.H. Rashid, Pearson

Reference Book:
1. Power Electronics – P. C. Sen TMH.

CPPE 5307 ELECTROMAGNETIC THEORY (3-0-0)

Module – I (12 hours)


Electrostatics:

Module – II (11 hours)


Magnetostatics:

Module – III (11 hours)


Plane wave Propagation:

Module – IV (10 hours)

Antennas:

Text Books

Additional Reading:
1. Elements of Electromagnetic by Mathew N. O. Sadiku, Publisher Oxford University Press.

**PRACTICALS**

**CPEE 9303 DESIGN OF ELECTRICAL POWER APPARATUS LAB. (0-0-3)**

1. Computer aided design of a Single-Phase Transformer using MATLAB
2. Optimized design of a 3-phase synchronous generator using MATLAB and hence find out its reactances, voltage regulation and efficiency on load.
3. Induction motor design using MATLAB

**Text Books**

Electrical Machines, Analysis and Design applying MATLAB by J.J.Cathey, Tata Mc-GrawHill

**CPEE 9304 ELECTRICAL MACHINE LAB - II (0-0-3)**

1. To determine the voltage regulation of an alternator by zero power factor method
2. To determine the V curve and inverted V curve of a synchronous motor
3. Speed control of a 3 phase induction motor by rheostatic, cascading and pole changing methods
   (a) Positive sequence
   (b) Negative sequence
   (c) Zero sequence
4. Determination of power angle characteristics of an Alternator
5. 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
   (c) Repulsion start induction motor
   (d) Universal Motor
   (e) Shaped pole motor
6. Study of parallel operation of two alternator
7. Measurement of direct and quadrature axis reactances of a salient pole synchronous machine
8. Measurement of sub-transient and transient reactances of a salient pole alternator

**CPEE 9305 POWER ELECTRONICS LAB. (0-0-3)**

(Any 10 experiments)

1. V-I Characteristic of SCR
2. Different methods of triggering of SCR
   (a) Phase controlled method
3. Study of triac and full wave voltage control method of it.
4. 1 phase half wave and full wave full controlled converter with R, R-L and D.C motor load with / without freewheel diode
5. 3-phase half and full wave full controlled converter with R, R-L and D.C motor load with/ without freewheeling diodes
6. Study of characteristics curves of a 3 phase diode bridge.
7. Study of DC chopper with PWM controller
8. Study of SCR communication
   (a) Forced communication
   (b) Load communication
9. Study of single phase series inverter
10. Three phases IGBT based four quadrant chopper drive for D.C motor
11. Three phases IGBT based four quadrant chopper drive for induction motor
12. Study of 1 phase cyclo converter
# COURSE STRUCTURE
## FOURTH YEAR B.TECH PROGRAMME
### ELECTRICAL ENGINEERING

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**7th Semester**

**HSSM 4403 ENVIRONMENTAL ENGINEERING (3-0-0)**

**Objective**: This course introduces the students to the environmental consequences of Industries, development actions etc. and the methods of minimizing their impact through technology and legal systems.

**Module – I**


**Chemistry and Microbiology in Environmental Engineering**: Physical and chemical properties of water, Atmospheric chemistry, Soil chemistry, Microbiology, Chemical and biochemical reactions, Material balances and Reactor configurations.

**Concept in Hydrology**: Hydrological cycle, Water balance, Energy budget, Precipitation, Infiltration, evaporation and evapotranspiration, Rainfall-runoff relationships, Urban hydrology, Ground water, Ground water chemistry, Water contamination and pollution prevention.

**Module – II** *(9 hours)*

**Water Pollution**: water quality standards and parameters, Assessment of water quality, Aquatic pollution, Freshwater pollution, Estuarine water quality, Marine pollution, Organic content parameters, DO and BOD demand in streams, Transformation process in water bodies, Oxygen transfer by water bodies, Turbulent mixing, Water quality in lakes and preservers, Ground water quality.

**Air Pollution**: Air pollution and pollutants, criteria pollutants, Acid deposition, Global climate change—green house gases, non-criteria pollutants, emission standard form industrial sources, air pollution metereology, Atmospheric dispersion.

**Noise Pollution**: Physical Properties of sound, Noise criteria, Noise Standards, Noise measurement, Noise control.

**Module – III** *(15 hours)*


**Solid Waste Management**

**Source classification and composition of MSW**: properties and separation, storage and transportation, MSW Management, Waste minimization of MSW, Reuse and recycling, Biological treatment, Thermal treatment, Landfill, Integrated waste management.

Industrial Air Emission Control:
Characterization of air stream, Equipment selection, Equipment design, Special Methods: Flue gas desulphurization, NOx removal, Fugitive emissions.

Module – IV (8 hours)

Environment impact Assessment, Origin and procedure of EIA, Project Screening for EIA, Scope studies, Preparation and review of EIS.

Reference:
3. Environmental Science, Curringham & Saigo, TMH,
4. Principles of Environmental Science, Curringham
5. Introduction to Environmental Science, Y. Anjaneyalu, B. S. Publication.

CPEE 5401 POWER SYSTEM OPERATION AND CONTROL (3-1-0)

Module – I (10 hrs)
Fundamental of power System: concepts or real and reactive powers, Complex power per unit representation of power system. Transmission capacity, series and shunt compensation, Load characteristics, Real power balance and its effect on system frequency, Load frequency mechanism, reactive power balance and its effect on system voltage, on load tap changing transformer and regulating of transformer, Introduction to FACT devices.

Module – II (6 hrs)

Module – III (10 hrs)
Load frequency Control: Dynamic incremental state variable, PF versus QV control MW frequency of an individual generator, modeling of speed governing system, Turbine, Division of power system into control areas, P-F control of single control area and two are control, Economic dispatch controller.

Module – IV (14 hrs)

1. Power System Analysis, Hadi Saadat, TMH
3. An introduction to electric Energy System Theory, O.I. Elgerd, TMH
4. Elements of Power System Analysis, W.D. Stevenson, TMH

**CP EE 5402 POWER SYSTEM PROTECTION (3-1-0)**

**Module –I**

Faults on power system and their classification, evolution of a power system, protection system attributes, system transducer, principles of power system protection, over current protection : over current relay, IDMT and DTOC relays, Directional over current relays, Feeder protection.

**Module – II**

Different Protection : Simple differential protection, Zone of protection, percentage differential relay, Earth Leakage protection

Transformer Protection : Over current protection, Differential protection of single and three phase transformers, Star-delta and Delta star connections, Harmonic restraint for magnetizing inrush. Interturn and incipient faults in transformers, Busbar protection.

**Module –III**

Distance relaying : Introduction, impedance, Reactance, and MHO relays, Three stepped distance protection, Carrier added protection of transmission lines.

Generators protection : Stator and rotor faults, Abnormal operating conditions, Generator, differential protection, earth fault relays.

**Module – IV**

Static comparators as relays, Amplitude and phase comparators, Synthesis of distance relaying using static comparators, electronic circuits for Static relays.

Microprocessor based numerical protection, Digital filtering, Numerical overcurrent, differential, and distance protection, effect of CT and PT saturation’s on Numerical relays.

**Books**

1. Fundamental of Power System Protection, Y.G. Paithankar, S.R. Bhide (PHI)
2. Power System Protection and Switchgear, Badriram, D.N. Viswakarma, TMH

**PECS 3401 SOFT COMPUTING (3-1-0)**

**Module – I**

Basic tools of soft Computing – Fuzzy logic, Neural Networks and Evolutionary Computing, Approximations of Multivariate functions, Non – linear Error surface and optimization.

**Module – II**


**Module – III**


**Module – II**

Evolutionary Computing : Genetic algorithms : Basic concepts, encoding , fitness function, reproduction. Differences of GA and traditional optimization methods. Basic genetic programming concepts Applications.
Text Books.

1. V. Keeman, “Learning and Soft computing”, Pearson Education, India.

CPEC 5308 COMMUNICATION ENGINEERING (3-0-0)

Module – I (12 hours)


Baseband Signals
Analogue Signal, Digital Signal. Converting an analogue signal to Digital Signal: Sampling, Nyquist Criteria. Information and Sampled value. Quantization and Binary Coding of sampled values. Transformation of Baseband signal from Time domain to Frequency domain and Vice-versa. F. T. of few simple baseband signals.


Module – II (12 hours)

Modulation Techniques:

Digital Modulation Techniques
Phase Shift Keying (PSK), Frequency Shift Keying (FSK) – their Basic Principle, Waveform, Generation and Detection. Ideal low pass, Bandpass and Band rejection filters – their impulse response (no mathematical derivation).

Module – III (11 hours)


Performance of Communication Systems in the Presence of noise: SNR of AM, FM. PSK-PCM- Simple derivation and or Interpretation of Standard SNR expressions in each case.

Noise bandwidth, Available Power, Noise temperature Two port noise Bandwidth, Input Noise Temperature, Noise Figure, Equivalent noise temperature of a cascade. An example of a receiving system.

Antennas and Propagation of Radio Waves:
Dipole Antenna and Parabolic Reflector Antenna- their Principle of Operation, Radiation Pattern and Gain Propagation of Radio wave over ground and through ionosphere. Line of Sight Propagation of Microwave Signal.

**Module – IV**

Modern Communication Systems:
Brief description of fiber optic communication System : Block Diagram, Range of operating Wavelength, Optical Fiber, Optical Sources - LEO & LASER, Optical detectors; Concept of GH2 - km Bandwidth. Advantages of fiber optic system,
Brief description of Satellite Communication Systems : Block diagram. Frequency bands of operation, uplink and down link frequencies, Transponder, earth stations, Types of Antenn mounted on satellites. Services available through satellite.

Mobile Communication
Cellular Communication System : Block Schamic description, Cellular frequency bands, digital Technology, Cellular Concept, Capacities, Roaming facilities. Received Signal, Fading concept of diversity reception. Multiple access facilities.

**Text Books :**

3. Communication Systems by R.P. Singh and S. D. Sapre. TMH.

**Additional Reading :**

Communication Electronics - Principles and Applications, 3rd Edition by Louis E. Freuzel. (For topics 6, 7, and 8)

**PEEE 5401 ADVANCED ELECTRIC MACHINES (3-0-0)**

**Module-1**

Synchronous Machines: Mathematical descriptions of 3-phase synchronous machines, flux linkage and armature voltage equations, inductance's of salient-pole synchronous machines, Park's transformation, power and torque calculations from d-and q-axes representation, Phasor diagram, Balanced and unbalanced short-circuits of the synchronous generators, steady, transient, and subtransient reactances, and time constants, short-circuit currents, Negative sequence reactance, measurement of transient parameters from short-circuit tests. Synchronous Machines dynamics and Phasor representation.

**Module-2**

Induction Machines: Mathematical description of three-phase induction machines in arbitrary, and synchronously rotating reference frames, power and torque calculation in terms of d-and q-variables, Induction-machine electrical transients, decay of short-circuit currents, transient equivalent circuit, Induction machine dynamics.

**Module-3**

Switched Reluctance motors: flux linkage and inductance formulations, and their dynamic equations, torque calculations, torque ripple minimization, Permanent magnet and Hysteresis motors and their mathematical descriptions and dynamic performance, Inductor alternators, linear synchronous and induction motors.
Module-4

Direct-current machine dynamics, dynamic analysis of separately excited and shunt generators and motors, effects of saturation, dynamic analysis with time-domain techniques, Metadynes and amplidyynes as generalized machines, theory and performance of stepper motors and brushless dc motors.

Books:

1. Electrical Machines by Mulukutla S. Sharma (West Publishing company)
2. Electrical Machines and Power Systems by S.A. Nasar

PEEE 5402 POWER STATION ENGINEERING (3-0-0)

Module – I

Introduction to different sources of energy and general discussion on their application to generation. Hydel power.

Hydrology:- Catchment area of a reservoir and estimation of amount of water collected due to annual rainfall, flow curve and flow duration curve of a river and estimation of amount stored in a reservoir formed by a dam across the river, elementary idea about Earthen and Concrete dam.

Turbines:- Operational principle of Kaplan & Francis turbine and pelton wheel, specific speed, workdone and efficiency.

Hydroplant:- head gate, perstock, surge tank, scroll case, draft tube and tailrace, classification of plants, turbines for different heads, plant capacity as a base load and peakload station, plant auxiliaries.

Module – II

Thermal Power.

Overall plant components in Block dams indicating the air, circuit, coal and ash circuit, water and steam circuit, cooling water circuit; various types of steam turbines, ash and coal handling system, elementary idea about a water tube boiler, super heater, reheaters, economiser air preheater, dust collection, draft fans and chimney; condensers, feed water heaters, evaporators and makeup water, bleeding of steam; cooling water system; Governors, plant layout and station auxiliaries.

Module – III

Nuclear power

Introduction to fission & fusion, reactor construction, controlled chain reaction, operational control of reactors, Brief study of various types of reactors (Boiling water, pressurised water, sodium graphite, breeder) layout of nuclear power plant

Electrical System.

Different types of alternators, methods of cooling

Excitation system:- Shaft mounted D. C. generator, elements of static and brushless excitation, field flashing,

AV.R. :- magnetic amplifier and thyristor converter types.

Main transformer, unit transformer and station reserve transformer. Commissioning tests of alternators and transformers.
Module – IV
(07 hours)
Choice of size and number of generating units:- Review of the terms maximum demand, load factor, diversity factor, plant capacity and use factor, load & load duration curve and their effect on the generating capacity. Reserve units (hot, cold and spinning reserve) Effect of powerfactor on the generating capacity and economy. Different types of power tariffs.
Brief idea about national grid and its operational problems.

Ref. Books:
1. Elements of electrical power system design by M.V Despande (A. H. Wheler)
2. Power station engg. & economy by SKrotizki & Vopat (Tata M. H)

CPEC 5403 VLSI DESIGN (3-0-0)

Module – I
(10 hours)
Introduction, Historical perspective, VLSI Design methodologies, VLSI Design Flow, Design Hierarchy, Design Styles, CAD Technology. Fabrication of MOSFETS, Fabrication processes, NMOS Fabrication, CMOS n-well process, Layout Design rules, Stick Diagrams, Full Custom Mark Layout Design, MOS Transistor, Review of structure and operation of MOSFET (n-MOS enhancement type), CMOS, MOSFET v-I characteristics, MOSFET scaling and small geometry effects, MOSFET capacitances, Modeling of MOS Transistors- Basic concept the SPICE level-1 models, the level –2 and level –3 model equations.

Module – II
(10 hours)
MOS Inverters : Basic NMOS inverters, characteristics, inverters with resistive load and with n-type MOSFET load, CMOS inverter and characteristics.
MOS inverters : Switching characteristics and interconnect effects: Delay time definitions and calculation, inverter design with delay constraints, estimation of parasitics switching power dissipation of CMOS inverters.

Module –III
(10 hours)
Combinational MOS logic circuits, CMOS logic circuits, state style, complex logic circuits, pass transistor logic, sequential logic circuit – introduction, SR latch, clocked latch & flip-flop circuits, CMOS D latch and edge triggered flip-flop.
Dynamics logic circuits : Dynamic logic, basic principles, high performance dynamics CMOS circuits, Dynamic Ram, SRAM, flash memory.

Module – IV
(12 hours)
Systems Design method, design strategies, concept of FPGA, standard cell based design, design capture tools, hardware definition languages such as VHDL and packages. Xilinx (introduction), introduction to IRSIM and GOSPL (open source packages), design verification and testing, simulation at various levels including timing verification, faults models. Design strategies for testing chip level and system level test techniques.

Text Books:
1. CMOS Digital integrated Circuits – Analysis & Design – Sung Mo-Kang & Yussuf Leblebici, TMH.
2. VHDL Programming by example –Perry TMH.

Reference Books:

**BCSE 3310 COMPUTER SYSTEM ARCHITECTURE (3-0-0)**

**Module – I**

(06 hours)

Introduction: Brief history of computers, organization and architecture, basic organization of computers, system bus & interconnection, PCI, computer functions, l-cycle. Interrupt and class of interrupts, Von-Neumann Machine: structure of IAS, computer components, fetch and execute cycles, example of program execution, instruction cycle state diagram, instruction pipelining.

**Module – II**

(14 hours)

CPU Organization: Fundamental concepts, fetching and storing a word in memory, register transfer, performing an arithmetic and logic operation, execution of a complete instruction, general register organization: control word, examples of micro-operations, stack organization, RPN, evaluation of arithmetic expression using RPN, instruction format: three address, two address, one address and zero address instructions, addressing modes: types of addressing modes, numerical examples, data transfer and manipulation: transfer, data manipulation, arithmetic, logical & bit manipulation instruction, program control: conditional branch instruction, subroutine, program interrupt, types of interrupt, RISC & CISC characteristics, control unit operation: hardware and micro-programmed control.

**Module – III**

(08 hours)


**Module – IV**

(12 hours)

Memory Organization: Memory hierarchy, characteristic of memory system, semiconductor main memory types, organization, memory cell operation, cache memory: cache principle, elements of cache design, cache size, mapping function, replacement algorithm, LRU, FIFO, LFU, write policy, number of caches: single versus two level caches, Pentium cache organization, associative memory: hardware organization, match logic, read operation, write operation auxiliary memory: magnetic disks, magnetic tapes, virtual memory: paging, address mapping using pages, segmentation, demand paging, memory management hardware.

**Books:**


**CPEN 5303 ELECTRONICS INSTRUMENTATION AND MEASUREMENTS (3-0-0)**

**Module – I**

(10 hours)


Module – II (10 hours)

Cathode Ray Oscilloscopes

Module – III (10 hours)

Signal Generators
Low Frequency Signal Generators, Function Generators, Pulse Generators , RF Signal Generators, Sweep frequency Generators, Frequency Synthesizer

Calibration of Instruments

Module – IV (3 hours)

Spectrum Analyzer: Block diagram , Operation, performance and application- Digital spectrum Analyzer.

PRACTICALS

CPEC 9403 VLSI LAB. (0-0-3)

1. Characteristics of NMOS .
2. Characteristics of CMOS
3. Stick diagram , introduction to λ rules .
4. Implementation of inverter, NAND and NOR gate
5. Design of Half Adder
6. Design of Full Adder
7. Design of a multiplexer
8. Design of decoder circuits
9. Design of Latch, S-R flip-flop, D flip – flop
10. Design of Memory circuits.

N. B.

a) Lab. ‘1’ through ‘4’ can be done using Tanner Spice/magic tools
b) Lab ‘5’ through ‘10’ should be done suing Xilinx or IRSIM or any other open source tools. (GPSPL).

CPEE 9402 POWER SYSTEM LAB. (0-0-3)

1. Determination of operating characteristics of biased different relay with different % of biasing
2. Determination of A,B, C, D parameters of an artificial transmission line
3. Determination of the operating characteristics of an induction type over current relay different % of plug setting and time multipliers
4. Determination of transient and sub-transient reactance of a three phase alternators
5. Parallel operation of two alternators and effect of its load sharing
Objective of the Course: The course aims at introducing the basic concepts of marketing to the undergraduate students.

Module – I (9 hours)

Marketing Management: Concept, Process, Functions and relevance in the current context.


Competition Analysis: Factors contributing to competition, Competition analysis tools, Competitive arena mapping, Segmentation matrix.


Module II (10 hours)

Market Research and Information Systems: Research Process, The Internet and World Wide Web based Information collection and processing, Database, Data Warehouses and Data Mining, Global Market Research, Competitive Intelligence.

Consumer Behaviour: Importance of buyer and his/her role in purchasing. Influence of buyer behaviour, Buyer behaviour study tools. Organizational buying behaviour.


Market Demand Forecasting: Key Terms, Forecasting Tools: Short term tools: Moving average and Exponential smoothing methods, Long-term forecasting Tools: Time series analysis, Econometrics methods, Qualitative tools: Buying Intention Survey, Sales Force Opinion and Delphi Techniques.

Module – III (11 hours)


Module – IV (10 hours)

Channels of Distributions: Designing Distribution Channels, Wholesaling and Physical Distribution, Retailing. Supply Chain Management (Basic only). Personal selling, Direct Marketing, Managing Sales Force.


References:

CPEE 5403 ELECTRICAL DRIVES (3-1-0)

Module – I
(10 hrs)
Requirements, AC and DC drives, modern trends in drives technology, Characteristics of DC, Induction and Synchronous motor drives, Braking and starting, Classification, Dynamic and stability consideration of electric drives.

Module – II
(14 hrs)
Converter for feeding electric motors, Phase controlled and line commutated converters, DC Choppers, inverters, Cycloconverter and AC voltage controller for Drive systems, Controller for drive systems, Control of DC, Induction, and Synchronous motor drives.

Module – III
(10 hrs)
Control Techniques for electric drives, Block diagram representation, transfer functions transient response, frequency response and stability, compensating techniques.

Module – IV
(8 hrs)
Rating and heating of electric drives, power loss, Heating and Cooling of motors, Classes and duty and selection of motors, Drives for specific application like steel, paper, machine tools, cement and sugar mills, Microprocessor for control of electric drives, microprocessor hardware and software for drive system.

Text Books :
1. Electric drives, V. Subrahmanyam, TMH
2. Power Electronics and Drives, M.H. Rashid, PHI
3. Modern Power Electronics and AC Drives, B.K. Bose, (Pearson)

CPEC 5404 MOBILE COMMUNICATION (3-0-0)

Module – I
(12 hours)
A brief introduction to Mobile Telephony, Technologies and Choices.

Module – II
(14 hours)
Small Scale Fading and Multipath, Dopper Shift. Types of Small Scale Fading and their effect on received signal.

Modulation Techniques:
FM for Analogue, FM Detection Techniques – PLL and Quadrature Detection. Digital Modulation: $\pi / 4$ QPSK and MSK, GMSK.
Module – III

Spread Spectrum Techniques – DS-SS and FH-SS.
Performances of FM, π/4 QPSK & MSK in Fading and Interference.

Multiple Access Techniques:
Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Spread Spectrum Multiple Access – Frequency Hopped Multiple Access (FHMA), Code Division Multiple Access (CDMA). Frequency and Channel specification for CDMA Digital Cellular Standard (IS-95).

Module – II

Wireless Networking:

Global System for Mobile (GSM): features, architecture, channel types, Frame Structure in GSM. Signal processing in GSM.

Text Books:
5. Wideband Wireless Digital Communication by Andreas F. Molisch Editor Pearson Education.

PECS 3413 INTERNET AND WEB TECHNOLOGY (3-0-0)

The Internet and WWW
Understanding the WWW and the Internet, Web Architecture, Major issues in web solution development, Web servers (details of Apache Web Server), Web Browsers (Microsoft Internet Explorer and Netscape Navigated)

HTML
Planning of Web page, Model and structure for a Website, designing Web pages, Basic HTML using images links, HTTP methods and forms, Tables, Multimedia content (Audio and Video) Frames

CGI Basics
Introduction to CGI, CGI building blocks, CGI Scripting in C, CGI Security

JAVA Script
Programming Fundamentals, built in object, Form object and elemnt, Adavnce Java Script objects, Working with data, Flow Control Structures, Operator, Custom function and Object, Data entry and Validation, Tables and Forms, Security Issues

VB Scripts
VB Script functionality, Active X controls, Active Server Pages, Error Handling, VB Script Controls, Web Based application
**Textbooks**

There are large numbers of good books available in each topic. Instructor are advised to use their library resources.

**Reference Books**

1. Internet Read-Map, Benett Falk, BPB Publication
2. HTML complete reference, Powell, TMH
3. Rese Colderun, Teach yourself CGI Programming in 7 days, Tech Media 1998
5. Professional ASP 3.0, Alles Homer & David Susmen, SPD Publication

**PEEC 5411 ADVANCED COMMUNICATION SYSTEMS (3-0-0)**

**Module – I**

Review of Fundamental Concepts of Data Communication.

Data-Link Protocol and Data Communications Networks.


**Module II**

Digital T-Carriers and Multiplexing.


**Module – III**


**Module – IV**

Microwave Radio Communications:


Text Books:

Additional Reading:
1. Wideband Wireless Digital Communication by Andreas F. Molisch-Editor, Pearson Education.

**PEEC 5402 ADAPTIVE SIGNAL PROCESSING (3-0-0)**

**ADAPTIVE SYSTEMS & APPLICATION:**

**ADAPTIVE ALGORITHMS:**

**ADAPTIVE FILTER STRUCTURES:**

**HIGHER ORDER SPECTRA**
Properties, Application to Blind De-convolution, Channel Equalization and Image Processing.

**Text Book:**

**Measurements**

**Text Books:**
1. Electronic Instrumentation and Measurements, 2nd Edition, by David A. Bell, Prentice Hall of India. Chapter 4,6,9,10,11,12, and 14.

**Additional Reading:**

**BCSE 3306 COMPUTER NETWORKS (3-0-0)**

**Module – I**

**Module – II**
Data Link Layer
Error Detection and correction: Type of Errors, Detection, Error Correction

Data Link Control and Protocols:
Flow and error Control, Stop-and-wait ARQ, Go-Back, N ARQ, Selective Repeat ARQ, HDLC.
Point-to-Point Access: PPP
Point-to-Point Protocol, PPP Stack,
Multiple Access:
Random Access, Controlled Access, Channelization.
Local area Network: Ethernet.
Traditional Ethernet, Fast Ethernet, Gigabit Ethernet.
Wireless LANs: IEEE 802.11, Bluetooth virtual circuits: Frame Relay and ATM.

Module – III 10 hours
Network Layer: Host to Host Delivery: Internetworking, addressing and Routing
Network Layer Protocols: ARP, IPVA, ICMP, IPV6 ad ICMPv6
Transport Layer: Process to Process Delivery: UDP; TCP congestion control and Quality of service.

Module –IV 8 hours
Application Layer:
Client Server Model, Socket Interface Domain Name System (DNS):
Electronic Mail (SMTP) and file transfer (FTP) HTTP and WWW.

Security:
Cryptography, Message security, User Authentication.

Text Book:

Reference Book:
2. Computer Networks, A. S. Tannenbaum PHI.

PECS 3408 IMAGE PROCESSING (3-0-0)

Module- I (8 hours)

Module – II (8 hours)

Module- III (8 hours)
Image Restoration

Module – IV (16 hours)
Image Compression
Fundamentals, Image Compression Models, Elements of Information Theory, Error-Free Compression, Image Compression Standards.
Image Segmentation
Detection of Discontinuity, Edge linking and Boundary Detection, Thresholding, Region-Oriented Segmentation, The use of Motion in Segmentation.

Text Books
Reference Book :
2. Fundamentals of Digital Image Processing, Anil Ku Jain, PHI
3. Fundamental of Electronic Image Processing, Arther R. Weeks Jr. PHI

BCSE 3401 COMPUTER GRAPHICS AND MULTIMEDIA (3-0-0)

Module –I (10 Hours)

A survey of Computer Graphics Applications e.g.: CAD, Presentation Graphics, Art, Entertainment, Education and Training, Visualization, GUI.


Output Primitives: - Points and Lines, Bresenham’s line Algorithm, Midpoint Circle algorithm, Filled Area Primitives

Attributes of output primitives: Line, Curve, Area fill and character generation, Bundled attributes, antialiasing. Two Dimensional Geometric Transformation.

Module –II (10 Hours)

Two Dimensional Viewing: the viewing Pipeline Viewing coordinate Reference frame, Window-to-viewport coordinate Transformation. Line Clipping (Cohen-Sutherland Algorithm) and polygon Clipping (Stherland-Hodgeman algorithm) Three dimensional Object Representation: Polygon Surface, quadratic Surface, Spline Representation, Beziers and Curves and Surfaces B-Spline Curves and surfaces.

Module –III (10 Hours)

Three Dimensional Geometric and Modeling Transformations: Translation, Rotation, Scaling, Reflections, shear, composite Transformation, Modeling and Coordinate Transformation

Three Dimensional Viewing: Viewing Pipeline, Viewing coordinates, Projections (Parallel and Prospective) Clipping

Visible Surface Detection Method: Backface Detection, Depth Buffer, A Buffer, Scan line and Depth sorting

Illumination Models: Basic Models, Displaying Light Intensities, Halftone Pattern and Dithering Techniques.

Surface Rendering Methods: Polygon Rendering Methods, Gouraud and Phone Shading

Module –IV (10 Hours)


Text Books
2. Multimedia Computing Communications And Applications : Ralf Steinmetz And Klara Nahrstedt – Pearson Education.

Reference:
PEEC 5412 TELEMATICS (3-0-0)

TELEPHONIC SYSTEMS
Elements of Telephone System. Manual telephone exchange. Automatics telephone exchange. Traffic and service grade, Crossbar exchange, Electronics exchange, transmission of computer data over telephone lines. Digital transmission of speech over telephone lines. Concept of quantization, coding and multiplexing, electronics space division switching , time division switching

RADIO COMMUNICATION SYSTEMS
Transmitters, Receivers Various types of AM and FM transmitters, Radio telegraph transmitters, Various types of AM and FM communication receivers, electronically tunes receivers.

SATELLITE COMMUNICATION SYSTEMS
Orbits, Kepler’s laws of planetary motion, Station Keeping, Satellite altitude, Transmission path and path loss, Noise consideration, Satellite system, Saturation Flux density, Effective Isotropic Radiated Power, Multiple access methods , uplink and down link power budget calculations.

INTRODUCTION TO COMPUTER COMMUNICATION SYSTEMS
Introduction, Types of networks, Design F Ieatures, Examples, Packet radio and satellites , Network protocols, introduction to open system interconnection ( OSI) model, different layers and functions of each layer.

INTEGRATED SERVICES DIGITAL NETWORKS (ISDN)
Motivation of ISDN, new services, network protocol architecture, transmission channels, user-network interface, signaling, numbering and addressing, service characterization, inter-working, ISDN standards, broadband ISDN, voice and data integration.

CELLULAR AND MOBILE COMMUNICATION
Introduction to mobile radio communications, concept of cell propagation effects, process of fading, multi-path fading, delay spread and Doppler spread, Rayleigh fading channel, diversity techniques, introduction to GSM standard.

TEXT BOOKS
1. Electronics Communication by – D. Roody and J. Coolen, PHI, India
3. Telecommunication Switching Systems and Networks , T. Vishwanathan, PHI

PRACTICALS
CPEE 9406 ENTREPRENEURSHIP PROJECT (0-0-3)
1. The project will be for 2 credits and 3 periods per week is to be devoted for the project.
2. The teacher has to give elementary idea about entrepreneurship through classroom teaching before a project report is prepared by the student.
3. The teacher will first cover the following topics through lecturer and exercises on motivation and games.
   - Entrepreneurship concept, EDP in India, Indian middle class value.
   - Entrepreneurial qualities, motivation perception, risk taking etc.
   - Market survey, Business opportunity guidance
   - Role of DIC, SFC, Bank etc.
   - Decision making, Leadership, Communication skill
   - Preliminary Project Report, preparation for a specific product and submission of the report.
4. Evaluation
   (a) The teacher has to conduct tests/ motivational exercises to assess entrepreneurial capability of the student (20%)
   (b) The teacher has to test the knowledge of the student on the above topic through a written test. (20%)
   (c) The teacher has to evaluate the report submitted by the student (i.e. Project report within 50 pages) (60%).
Reference Books

1. Entrepreneurship of Small Industries, M. V. Deshpande, Deep and Deep Publication