COURSE STRUCTURE

&

SYLLABUS
(3rd – 8th SEMESTER)

FOR B.TECH PROGRAMME
IN
APPLIED ELECTRONICS
&
INSTRUMENTATION ENGINEERING

BIJU PATNAIK UNIVERSITY OF TECHNOLOGY ORISSA,
ROURKELA

2007 - 2008
### COURSE STRUCTURE
#### SECOND YEAR B.TECH PROGRAMME
#### APPLIED ELECTRONICS & INSTRUMENTATION ENGINEERING

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| Practical/Sessional Contact Hrs. Credit |  |
| **Practice/Lab** | **Practice/Lab** |
| BENG 9202 Basic Electronics Laboratory or BENG 9201 Basic Electrical Engineering Laboratory | 0-0-3 | 2 |
| BCSE 9201 Computer Lab (OOP) | 0-0-3 | 2 |
| BENG 9203 Mechanical Engineering Lab. or CPES 9201 Network & Devices Laboratory | 0-0-3 | 2 |
| CPES 9202 Analog Electronics Laboratory | 0-0-3 | 2 |
| **Total** | 8 | 29 |

**L-Lecture T-Tutorial P-Practical**
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

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

Text Books
1. Fluid Mechanics, A.K. Mohanty, PHI
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
BENG 1201 ELECTRICAL MACHINES (3-1-0)

Module I (10 Lectures)

D.C Mechanics:
D.C Generator – construction and principle of operation, E.M.F. equation; types of generator; no load and load characteristics; Voltage build-up of shunt Generator; voltage regulation, Application.
D.C Motor – construction and principle of operation; back E.M.F; torque and speed equations; characteristics and performance curves; speed control of series and shunt motors; motor starters; industrial application.
Losses and Efficiency of D.C machines.

Module II (10 Lectures)

Transformer:
Single phase – construction and principle of operation; E.M.F. equation; Phasor diagram; actual and approximate equivalent circuits; open and short circuit tests, voltage regulation; losses and efficiency.
Three Phase – Construction and principle of operation; connection of three single-phase units in wye, delta, open delta configurations; Autotransformer; conventional transformer connected as Autotransformer. Special Transformers – induction heating and high impedance and high frequency transformer.

Module III (10 Lectures)

Synchronous Machines:
Three-phase alternators – construction and principle of operation; E.M.F. equation; distribution and pitch factors; Synchronous reactance; performance of alternators on no-load and load; Phasor diagram; voltage regulation, power calculations of turbine and hydro-generators.; synchronization of a generator.
Three-Phase Synchronous Motor- construction and principle operation; V-curves; Phasor diagram; methods of starting; applications.

Module IV (10 Lectures)

Three-Phase induction Motor- construction of slip ring and squirrel cage type induction motors; Phasor diagram and equivalent circuit; torque-slip characteristics; maximum torque calculations; open and short-circuit tests; losses and efficiency; starting of induction motors; speed control; Induction generator.
Single-Phase Induction Motor- construction and principle of operation; capacitor- start and capacitor-run motors; Universal motor; Stepper motors.

Books:

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. Avadnhulu

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

Water quality parameters and standards.

Module II (16 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 : Procec 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 isolators.

**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.

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

Module I
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
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
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 handing: Exceptions and derived classes, function exception declarations, Unexpected exceptions, Exceptions when handling exceptions, resource capture and release etc.

Module IV
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
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  

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.


**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)


MODU LE - IV  

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

   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 LAB. (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 Characterstics 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 LAB. (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 COMPUTER OOP WITH C++ LAB. (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 LAB. (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 LAB. (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 waveform.

**CPES 9202 ANALOG ELECTRONICS LAB. (0-0-3)**

**List of Experiments**

(At least 10 out of 12 experiments should be done)

1. BJT Bias circuit – Design, construction & test


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 1201 ELECTRICAL MACHINES (3-1-0)

Module I (10 Lectures)
D.C Mechanics :
D.C Generator – construction and principle of operation, E.M.F. equation ; types of generator; no load
and load characteristics; Voltage build-up of shunt
Generator; voltage regulation, Application.
D.C Motor –construction and principle of operation ; back E.M.F; torque and speed equations;
characteristics and performance curves; speed control of series and shunt motors; motor starters;
industrial application.
Losses and Efficiency of D.C machines.

Module II (10 Lectures)
Transformer:
Single phase – construction and principle of operation; E.M.F. equation; Phasor diagram; actual and
approximate equivalent circuits; open and short circuit tests, voltage regulation; losses and efficiency.
Three Phase – Construction and principle of operation; connection of three single –phase units in wye,
delta, open delta configurations; Autotransformer; conventional transformer connected as
Autotransformer. Special Transformers – induction heating and high impedance and high frequency
transformer.

Module III (10 Lectures)
Synchronous Machines :
Three- phase alternators – construction and principle of operation; E.M.F. equation; distribution and
pitch factors; Synchronous reactance; performance of alternators on no-load and load; Phasor
diagram; voltage regulation, power calculations of turbine and hydro-generators.; synchronization of a
generator.
Three-Phase Synchronous Motor- construction and principle operation; V- curves; Phasor diagram;
methos of starting; applications.
Module IV (10 Lectures)

Three-Phase induction Motor- construction of slip ring and squirrel cage type induction motors; Phasor diagram and equivalent circuit; torque-slip characteristics; maximum torque calculations; open and short-circuit tests; losses and efficiency; starting of induction motors; speed control; Induction generator.

Single-Phase Induction Motor- construction and principle of operation; capacitor- start and capacitor-run motors; Universal motor; Stepper motors.

Books :

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

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

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

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:
   Nomenclature and classification, Thermoplastic and thermosetting resins, Some typical useful
   polymers: Polyethylene, PVC, polystyrene, PMMA, Nylon 6:6, Nylon 6, Bakelite, Terylene,
   Silicones. Natural and synthetic rubbers: Neoprene, Butyl and Polyurethane rubber, Vulcanization.
   (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 : Proder 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
   House.

BSCC 2202 MATERIAL SCIENCES (3-0-0)

MODULE - I (10 Lectures)
   Materials.
2. Electron theory of solids : Free electron theory of metals. Electrical conductivity; Thermal
   conductivity, Quantum theory of free electrons. Band theory of solids, Conductivity of metals
3. Conductors, Insulators, Semiconductors, Intrinsic and extrinsic semiconductors, Band theory of semiconductors Hall effect.


**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 isolators.


**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.

**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. Avadnhulu

**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; 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 (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)
Storage Strategies: Indices, B-Trees, Hashing, Transaction processing: Recovery and Concurrency 
Control, Locking and Timestamp based Schedulers, Multiversion and Optimistic Concurrency Control 
Schemes. 
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)
The Study of Organizational Behaviour : Learning objectives, Definition and Meaning, Why Study OB, 
An OB Model, New Challenges for OB Manager. 
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. 
Perception – Meaning and Definition, Perceptual Process, Importance of Perception in OB. Motivation 
– Nature and Importance, Hertzberg’s Two Factor Theory, Maslow’s Need Hierarchy Theory, 
Alderfer’s ERG Theory, Evaluations. 
Case Analysis

Module III  (12 hours)
Organizational Behaviour Process : Communication – Importance, Types, Gateways and Barriers to 
Communication, Communication as a tool for improving Interpersonal Effectiveness. Groups in 
Organizations - Nature, Types, Why do people join groups, Group Cohesiveness and Group Decision-
making Managerial Implications, Effective Team Building. Leadership – Leadership & Management, 
Theories of Leadership – Trait theory, Leader Behaviour theory, Contingency Theory, Leadership and 
Follwership, How to be an effective Leader. Conflict – Nature of Conflict and Conflict Resolution. 
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 invent, OR-AND invent 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 LAB. (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 LAB. (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 COMPUTER (RDBMS) LAB. (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 LAB. (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 waveform.

BENG 9203 MECHANICAL ENGINEERING LAB. (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 Venturi meter.

Group C

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

CPES 9203 DIGITAL ELECTRONICS LAB. (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 multiplies 4-bit unsigned numbers to produce an 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

**Applied Electronics and Instrumentation Engineering**

<table>
<thead>
<tr>
<th>5th Semester</th>
<th>6th Semester</th>
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<tbody>
<tr>
<td><strong>Theory</strong></td>
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<td><strong>Contact Hrs. Credit</strong></td>
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<td>L-T-P</td>
<td><strong>L-T-P</strong></td>
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<tr>
<td>HSSM 4301 Optimisation in Engineering</td>
<td>HSSM 4302 Production &amp; Operation Mgmt.</td>
</tr>
<tr>
<td>CPEE 5307 Electromagnetic Theory</td>
<td>CPEC 5305 Microprocessors &amp; Microcontrollers</td>
</tr>
<tr>
<td>CPEE 5302 Control System Engineering</td>
<td>CPEC 5302 Digital Signal Processing</td>
</tr>
<tr>
<td>CPEE 5306 Power Electronics</td>
<td>CPEN 5303 Electronics Instr. &amp; Measurement</td>
</tr>
<tr>
<td>CPEN 5301 Sensor and Signals</td>
<td>CPEN 5304 Fibre Optic Instrumentation</td>
</tr>
<tr>
<td>CPEN 5302 Principles of Measurement Systems</td>
<td>CPEN 5305 Advanced Electronics Circuits</td>
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<td><strong>Total</strong></td>
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<tr>
<th><strong>Practicals/Sessionals</strong></th>
<th><strong>Contact Hrs. Credit</strong></th>
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<th><strong>Contact Hrs. Credit</strong></th>
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<tbody>
<tr>
<td>CPEE 9305 Power Electronics Laboratory</td>
<td>0-0-3 2</td>
<td>CPEC 9304 Microprocessor &amp; Microcontrollers Lab.</td>
<td>0-0-3 2</td>
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<tr>
<td>CPEN 9301 Sensor &amp; Signal Lab.</td>
<td>0-0-3 2</td>
<td>CPEC 9302 Digital Signal Processing Lab.</td>
<td>0-0-3 2</td>
</tr>
<tr>
<td>CPEN 9302 Measurement Lab.</td>
<td>0-0-3 2</td>
<td>CPEN 9301 Instrumentation Design &amp; Simulation</td>
<td>0-0-3 2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
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<td><strong>Total</strong></td>
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**L-Lecture  T-Tutorial  P-Practical**
5th Semester

HSSM 4301 OPTIMIZATION IN ENGINEERING (3-0-0)

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

CPEE 5307 ELECTROMAGNETIC THEORY (3-1-0)

Module I (5 hours)

Electrostatics (7 hours)
Module II  
(3 hours)  
Joules law. Boundary Conditions for Current densities. The EMF.

Magnetostatics:  
(8 hours)  

Module III  
(5 hours)  
Poynting’s Theorem, Time – Harmonic EM Fields. Application to Transformer.

Plane wave Propagation:  
(6 hours)  

Module IV  
(10 hours)  
Antennas:  

Text Books:  
1. Electromagnetic Field Theory, Fundamental by B. S. Guru & Huseyn  

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

CPEE 5302 CONTROL SYSTEM ENGINEERING (3-0-0)

Module - I  
Introduction:  
(10 hours)
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 tachometer, synchros, amplidyne, stepper motor

Module -II

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

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

Module – III

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

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.

Module – IV

State variable analysis: Introduction, concept of state variables, state vector, input and output vector, general state model representation of linear time invariant, SISO and MIMO systems and their block diagram representations, state model representations of physical systems

Digital Control System: Introduction to digital control system, Shanon’s sampling theorem, signal reconstruction, transfer function of ZOH, the z-transforms of various functions, inverse z transform, properties of z-transform, solution of difference equations, the pulse-transfer function of linear feedback systems.

Introduction to MAT Lab.

Text Books:
2. Modern Control Engineering by K. Ogata, PHI
3. Modern Control Engineering by D. Roy Choudhury, PHI

Reference Books:
Module - I (8 hours)


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, voltage commutation, current commutation, load commutation).
(4 Lectures)

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 pf 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 –IV (10 hours)

DC Choppers:
Basic Principles of class A, B, C, D, E Choppers, voltage commutated 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 briges 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

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

CPEN 5301 SENSORS AND SIGNALS (3-1-0)

Sensors:
Module – I
(15 hours)

Module – II
(12 hours)
Signal Conditioning Elements:

Module – III
(6 hours)
Signal Processing Elements:

Module – IV
(6 hours)
Display Elements:

Module – V
(5 hours)
Intrinsically safe Measurement Systems.
Text Books:

Additional Reading:

CPEN 5302 PRINCIPLES OF MEASUREMENT SYSTEMS (3-0-0)

Module – I

The Accuracy of Measurement Systems in Steady state:
Measurement error of a system of ideal elements. The error probability density function of a system of non ideal elements. Error reduction techniques.

Module – II

Loading effects and two part Networks:

Module – III


Module – IV
Measurement techniques for Process variables, Pressure measurement; Measurement of level and Density; Measurement of flow and Measurement of Temperature.

Text Books:
2. Instrumentation and Process Measurements by W. Bolton, University Press. Selected Portion from Chapter 1, 5, 6, 7 and 8.

**Additional Readings**

2. Industrial Control and Instrumentation by W. Bolton, University Press.
3. Introduction to Instrumentation and Control By A.K. Ghosh, PHI.

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**PRACTICALS**

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

(Any 10 experiments must be done)

1. V-I characteristics of SCR.
2. Different methods of triggering of SCR.
   a) Phase controlled method.
   b) UIT Triggering method.
   c) Cosine controller triggering 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 freewheeling diodes.
5. 3-Phase half and fill 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
10. Three phases IGBT based four quadrant chopper drive for D.C. motor.
11. Three phase IGBT based four quadrant chopper drive for induction motor.
12. Study of 1 phase cycle converter.

**CPEN 9301 SENSORS AND SIGNALS LAB. (0-0-3)**

(Any five from 1-10 and 11, 12, 13, 14 and 15 should be done)

Credit = 2

**Passive Electrical Transducers:**

1. Resistance temperature Characteristics of a thermometer. (3hrs)
2. Strain Gauge transducer. (3hrs)
3. Linear variable differential Transducer. (3hrs)
4. Capacitive Transducer. (3hrs)
Active Electrical Transducers:
5. Temperature – emf characteristics of thermocouple. (3hrs)
6. Piezoelectric Transducer and their characteristics. (3hrs)
7. Hall-effect transducer. (3hrs)
8. Electro-chemical Transducer – measurement of Bioelectric signals. (3hrs)
9. Photodiode – Measurement of VI characters. (3hrs)
10. Digital Displacement Transducers. (3hrs)
11. Low pass, high pass, band pass active filters. (6hrs)
12. IC instrumentation Amplifier. (6hrs)
13. Analogue to Digital Conversion of a sinusoidal signal. (3hrs)
14. Digital to Analogue Conversion. (3hrs)
15. Amplitude modulation - Balanced Modulator. (3hrs)

CPEN 9302 MEASUREMENT LAB. (0-0-3)
(Any six experiments from 1-8, 9,10 &11 expt.12 should also be done)

Oscilloscope measurements:
1. Sine wave, Square wave and Pulse Measurement. (3hrs)
2. Phase and frequency measurement - Time base method and Lissageous figure method. (3 hrs)
3. Pulse Delay measurement - in Digital counters. (3 hrs)
4. Frequency Response Measurement and square wave Testing. (3 hrs)
5. Linearity measurement of an Amplifier. (3 hrs)
6. Dynamics measurement - Displaying VI characteristics of a component. (3 hrs)
7. Amplitude modulation measurement. (3 hrs)
8. Time domain Reflectometry. (3 hrs)

Other Measurements:
10. Wavemeter measurement. (3 hrs)
11. Resolution of bandwidth measurement. (3 hrs)
12. Spectrum Analyzer Measurements (6 hrs)
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 and tools of managing production and operation functions of an organization.

Module I

   (3 hours)


   (4 hours)


   (4 hours)

Module II


   (7 hours)


   (4 hours)
Module III


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


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


CPEC 5305 MICROPROCESSOR & MICROCONTROLLER (3-1-0)

Module – I

(12 hours)


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

Memory Interfacing:– Interfacing EPROM & RAM Memories: 2764 & 6264,

Interrupts :– 8085 Interrupts
Module – II

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

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

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.


(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

REFERENCE:

1. Microprocessor architecture, programming & application with 8085 by R.S. Gaonkar.


3. The Intel Microprocessor – (Architecture, Programming & Interfacing) by Barry B. Brey.

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

Module – I

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 – I
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
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.

CPEN 5303 ELECTRONICS INSTRUMENTATION AND MEASUREMENTS (3-1-0)

Module – I
(5 hours)

Digital Voltmeters and Frequency meters.
(5 hours)

Module – II
(10 hours)
Cathode Ray Oscilloscopes

Module – III
(6 hours)

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

Calibration of Instrument :
(4 hours)

Module – IV
(3 hours)
Spectrum Analyzer: Block diagram, Operation, performance and application- Digital spectrum Analyzer.

Measurements :
(4 hours)
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:

CPEN 5304 FIBER OPTIC INSTRUMENTATION (3-0-0)

Module I
Optical Sources: Light Emitting Diodes (LEDs). LED Structures. Light Source Materials Quantum Efficiency and LED Power, Modulation of an LED.

Optical Detectors:

Module II
Optical Fiber

Power Launching and Coupling
4 hours)

Module III
Fiber-Optic Sensors
Optical Amplifiers:
Semiconductor Optical amplifiers (SOA). Fabry–Perot type Erbium Dioped Fiber amplifiers.
Module IV

Fiber –optic Measurements: (4 hours)

Text Books:
2. Fiber Optics and Opto electronics by R. P. Khare, Oxford University Press Selected Portion from Ch. 2,3,4,5, & 13.

Additional Reading:
4. Fiber optic Communications by Harold Kolimbins, Pearson Education.

CPEN 5305 ADVANCED ELECTRONICS CIRCUITS (3-0-0)

Module – I (10 hours)
Active Filters:
First & Second order low pass / high pass, band pass, band reject, and all pass filters. Universal active filter design. Wien Bridge oscillator, Sawtooth wave generator OP Amps. Voltage Controlled Oscillator.

Module – II (10 hours)
Astable – Multivibrator: Emitter coupled, Collector coupled, Wave forms.

Module – III (12 hours)
Wideband amplifiers and Negative resistance devices:
Frequency response; Transient response of transistor stage, shunt compensation of a transistor stage in cascade, Other methods of compensation. Rise time of cascaded compensated stages, low frequency compensation.

Negative Resistance Switching Circuits:
Tunnel Diode operation and characteristics, Monostable Astable, Bistable circuits using tunnel diode, Voltage controllered Negative Resistance Switching Circuits. UJT operation and characteristics. Application of UJT to generate Sawtooth waveform.

Module – IV (10 hours)
Analysis & Design of: Voltage time base generator. Current time base generator Instrumentation Amplifier, IC 555 Timer, Phase Locked Loop.

Text Book:
1. Pulse, Digital and switching Waveforms - Jacob Millman and Herbert, Taub (TMH Publication).
3. Pulse and Digital Circuits by A. Anand Kumar, PHI

Supplementary Books:

**PRACTICALS**

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**

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

OPTIONAL (Any Two)

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) 8051 MICROCONTROLLER**

1. Initialize data to registers and memory using immediate, register, direct and indirect addressing mode

OPTIONAL (any one)

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)
1. Addition, subtraction, Multiplication, Division of 16 bit nos + 2’s complement of a 16 bit no.

OPTIONAL (Any One) (1 hour)

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

CPEC 9302 DIGITAL SIGNAL PROCESSING LAB. (0-0-3)
(Experiments 1-8 are compulsory. But all expts. should be done)

1. Different types of Signal generation using Matlab. (both continuous and discrete.) (3 hours)
2. Linear Convolution of sequences. (Without using the inbuilt function (conv) available in Matlab.) (3 hrs)
3. Circular Convolution of two Sequences Comparision of result with the result obtained from Linear convolution. (3 hours)
4. i) Finding Auto correlation of a sequence
   ii) Finding cross correlation of 2 sequences.
   iii) Finding power spectral density of a sequence. (3 hours)
5. Finding the convolution of periodic sequence using DFT and IDFT. (3 hours)
6. Implementation of FFT (Fast Fourier Transform) algorithm
   i) Decimation in Tane (DIT)
   ii) Decemation in Frequency (DIF) (6 hours)
7. Design of FIR filter (lowpass, highpass, bandpass). Using windowing technique (harming window, haming, window rectangular window, Kaiser window. (9 hrs)
9. Convolution of long duration sequences using overlap add, overlap save meter. (3 hrs)
10. Working with a DSP processor. (fixed point -TMS320C-5X / Floating point ) series.
   i) Implement convolution (Linear & circular convolution )
   ii) FIR & IIR implementation. (6 hrs)

Lab. Reference:
Digital Signal Processing a hands-on approach by Schucer C, Mohesh Chgave. (TMH)
1. Design and Simulation of comparators and Schmidt Trigger circuits using Op Amps. (6 hrs)
2. Design and Simulation of an Instrumentation amplifier. (6 hrs)
3. Design of an SMPS Power supply. (6 hrs)
4. Design and simulation of a function generator to generate:
   i) Sine wave
   ii) Square wave
   iii) Pulse (9 hrs)
5. Designing a Digital Multimeter. (6 hrs)
6. Design and simulation of frequency counter. (6 hrs)
   OR
   Designing a FFT spectrum analyzer. (6 hrs)
## COURSE STRUCTURE
### FOURTH YEAR B.TECH PROGRAMME
#### APPLIED ELECTRONICS AND INSTRUMENTATION ENGINEERING

<table>
<thead>
<tr>
<th>7th Semester</th>
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<td><strong>Theory</strong></td>
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<td>CPEN 5401 Process Control Instrumentation</td>
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<td>PECS 3401 Soft Computing</td>
<td>Electives (&lt;em&gt;Any Two&lt;/em&gt;)</td>
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<td>CPEC 5308 Communication Engg.</td>
<td>PEEN 5401 ModernRadarTechnique</td>
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<td><strong>Electives (&lt;em&gt;Any one&lt;/em&gt;)</strong></td>
<td>PEEN 5402 IndustrialInstrumentation</td>
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<td>BCSE 3306 Computer Networks</td>
<td>PEEC 5411 AdvancedCommunication Systems</td>
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<td>BCSE 3401 Computer Graphics &amp; Multimedia</td>
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<td>CPEN 9406 Entrepreneurship Project</td>
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**Total** 8 14

**Total** 27 27
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.


Module – II

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.


Module – III


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.

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 :


CPBM 8401 BIOMEDICAL ELECTRONICS AND INSTRUMENTATION (3-1-0)

BIO-ELECTRIC SIGNALS & ELECTRONICS

(1.1) Origin of bio-electric signals, (1.2) Recording Electrodes, (1.3) Skin-contact impedance (1.4) Electrodes for ECG, (1.5) Electrodes for EEG, (1.6) Electrodes for EMG, (1.7) Micro-electrodes.

PHYSIOLOGICAL TRANSDUCERS

2.1 Pressure transducers, (2.2) Transducers for body temperature measurement, (2.3) Pulse sensors, (2.4) Respiration Sensors.

BIOMEDICAL RECORDERS :

(3.1) Electrocardiograph, (3.2) Phonocardiograph, (3.3) Electroencaphalograph (EEG), (3.4) Electromyograph.

PATIENT MONITORING SYSTEM


BLOOD FLOW METERS :

(5.1) Electromagnetic blood flow meter, (5.2) Ultrasonic blood flow meter, (5.3) NMR blood flow meter, (5.4) Laser Doppler flow meter.

BLOOD GAS ANALYZERS :


BLOOD CELL COUNTERS :

(7.1) Method of cell counting, (7.2) Coulter Counters, (7.3) Automatic recognition and differential counting of cells.

PATIENT SAFETY :

(8.1) Electric Shock hazards, (8.2) Leakage currents (8.3) Test Instruments for checking safety parameters of biomedical equipments.

Text Book :


Additional Reading :

PECS 3401 SOFT COMPUTING (3-0-0)

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 — IV

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

CPEC 5308 COMMUNICATION ENGINEERING (3-0-0)

Module - I

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 Base band signal from Time domain to Frequency domain and Vice-versa.

Module - II

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)


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

(10 hours)

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 GHz - 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:

1. Analog and Digital Communication Systems 5th Edition by Martin S. Roden. SPD Publisher Selected portion from Ch. 1, 2, 3, 4 and 5.
3. Communication Systems by R.P. Singh and S. D. Sapre. TMH.
Additional Reading:

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

BCSE 3306 COMPUTER NETWORKS (3-0-0)

Module – I

10 hours

Overview of Data Communications and Networking.


Analog Transmission: Modulation of Digital Data; Telephone modems, modulation of Analog signals.

Multiplexing: FDM 150, WDM 155, TDM 157.

Transmission Media: Guided Media, Unguided media (wireless)

Circuit switching and Telephone Network: Circuit switching, Telephone network.

Module – II

12 hours

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 ICMP R6

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.

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, Bezier 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 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 :


PEBM 8401 BIO-MEDICAL INSTRUMENTATION AND MEASUREMENT (3-0-0)

Module - I
(11 hours)
Biokmetrics, Man-Instrument System, Problems encountered in measuring a living system.

Review of Transducers. Transducers for Biomedical applications


Module - II
(10 hours)

Cardiovascular Measurements:
Module - III

Measurements on Nervous System


Module – IV

Non-invasive Diagnostic Measurements.

Principle of Ultrasonic measurement - Ultrasound, Modes of Transmission, Ultrasonic imaging, Ultrasonic Diagnosis.

Text Books:

Additional Readings:

PRACTICALS

CPEC 9408 COMMUNICATION ENGG. LAB. (0-0-3)

(All eight experiments are compulsory)
1. Generation of AM-Balanced Modulator Demodulation of AM signal.
3. Demodulation of frequency modulated signal.
5. Measurement of Noise figure of an amplifier.
7. Establishing a Fibre optic communication link.
8. Study of a practical satellite Communication system.

OR

Multiple Access facilities in Mobile communication systems.
CPEC 9403 VLSI LAB (0-0-3)
(All are compulsory)

1. Characteristics of NMOS.
2. Characteristics of CMOS
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 ofLatch, 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 using Xilnx or IRSIM or any other open source tools. (GPSPL).
Objective of the Course: The course aims at introducing the basic concepts of marketing to the undergraduate students in engineering. The learning shall help the students in better designing, manufacturing and selling product/service packages keeping competitive market, customers and cost in view.

**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:**
CPEN 5401 PROCESS CONTROL INSTRUMENTATION (3-1-0)

Module – I
Introduction to Process Control – The Block Diagram, the Principle, Control System Evaluation, the Analogue and Digital Processing, ON/ OFF Control, the Programmable Logic Controllers.

(2 Lectures)

Final Control Operations:

(8 Lectures)

Module – II
Discrete-State Process Control:

(10 Lectures)

Module – III
Controller Principles:
Process Characteristics, Process Load, Controller System Parameters, Controller Modes, Discontinuous Controller Modes, Continuous Controller Modes, Composite Control Modes.

(6 Lectures)

Implementation of Controller Modes:
Various Analogue Electronics Controllers using OpAmps, Direct implementation of Proportional, Integral and Derivative Response (PID) Controller.

(4 Lectures)

Module – IV
Digital Control:

(8 Lectures)

Process Control –Loop Characteristics
Settings up a Process Control Loop System and tuning the System for Optimum performance, Control System configurations, Control System Quality, Stability, Bode Plot, Process Loop turning.

(6 Lectures)

Test Book:
1. Process Control Instrumentation Technology, Seventh Edition by Curtis D. John Son, Persona Education. Selected portion form Chapter 1, 7, 8, 9, 10, 11 and 12.

Additional Reading:
2. Industrial Control and Instrumentation by W. Bolton, University Press.
PEEN 5401 MODERN RADAR TECHNIQUES (3-0-0)

Module – I
(10 hours)


Module – II
(12 hours)
Electronics Scanning Radar:


Module – III
(10 hours)

Module – IV
(8 hours)

Text Book:

Additional Reading:
1. Introduction to Radar System by Merril Skolhik.

PEEN 5402 INDUSTRIAL INSTRUMENTATION (3-0-0)

PART – A: INSTRUMENTATION IN PETROCHEMICAL INDUSTRIES.
(1.1) Instrumentation and Control in reactors and distillation column, (1.2) Temperature and pressure control, Optimization (1.3) Elementary idea of batch reactors, (1.4) Measurement and control of column pressure, (1.5) Control of feed, re-boiler, Reflux rates, (1.6) Optimization of distillation columns.

(2.1) Instrumentation and Control in dryers, (2.2) Batch and continuous dryers.
(3.1) Instrumentation and Control in evaporators, (3.2) Types of evaporates, (3.3) Measurement and control of pressure, density, conductivity, differential pressure.
PART – B: POWER PLANT INSTRUMENTATION.

(4.1) Instrumentation for thermal power plants- testing, monitoring and control instrumentation coal handling/ crushing units, boiler, turbines, condensers, generators and auxiliary systems.

(5.1) Nuclear reactor instrumentation, Diffusion, Moderation, Absorption and delay processes, Neutron flux measurement, Control rod calibration, Nuclear fuel inspection and testing including poisoning, Radiation energy measurement, Remote control Instrumentation, Nuclear Instrumentation, Maintenance.

PART – C: MEASUREMENT OF CHEMICAL COMPOSITION


Gas Analysis: Chromatography Moisture Measurement

Text Books:

Part – A:

Part – B:
CEGB: Modern Power Station Practices: V-6 and V-8, Pergaman, Process, 1971
H. V. Morse: Nuclear Power –Cambridge University press.

PART – C

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

Module - I
1. Review of Fundamental Concepts of Data Communication. (2 hours)
2. Data-Link Protocol and Data Communications Networks. (10 hours)

Module - II
Digital T-Carriers and Multiplexing.


Module – III (10 hours)

Schedule - IV
Microwave Radio Communications: (10 hours)

**Text Books:**

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

**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

**PECS 3414 COMPUTER ORGANIZATION (3-0-0)**

**Module-I**
Basic Structure of Computers: Functional units, Operational concepts, Bus structures, software, Performance, Multiprocessors and multicomputers. Machine instruction and programmes: Memory location and addresses, Memory Operations, Instructions and instruction Sequencing, Addressing modes, Assembly Languages, Basic Input/Output operations, subroutine, additional instructions.

**Module-II**
8085 Microprocessor Architecture: Instruction Sets, Addressing modes, Memory interfacing. Assembly Language Programming.
Module III
Arithmetic: Addition and subtraction of signed numbers, Design of Fast Adders, Multiplication of positive numbers, Signed-operand multiplication, Fast multiplication, Integer Division, Floating-point Numbers (IEEE754...) and operations.

Module IV
Basic Processing units: Fundamental concepts, execution of complete Instructions, Multibus organization, Hardwired control, Micro programmed control.

Memory System: Basic Concepts, cache Memory, performance consideration, Virtual memories, Memory Management requirement, secondary storage.

Text Book:

Reference:
1. Computer Organization & Design Hardware/Software interface: David A Patterson, John L. Hennessy ELSEVIER.
5. Structured Computer Organization, A. S Tanenbum, PHI.

BCSE 3305 OPERATING SYSTEMS (3-0-0)

Module-I
Introduction: What is an Operating System.
Operating system structures: System components, protection system, O.S. services, system calls.

Module-II
Deadlocks: System model, Deadlock characterization methods for handling Deadlocks, Deadlock Prevention, Deadlock avoidance, Deadlock detection, recovery from Deadlock.
Memory Management: Background, Logical versus physical address space, swapping, contiguous Allocation, Paging Segmentation.

Virtual Memory: Background, Demand paging, performance of Demand paging, Page Replacement, Page Replacement Algorithms, Allocation of frames, Trashing.

Module-III

Module-IV
Text Book
   Chapter-1, Chapter-3 (3.1,3.2,3.3), Chapter-4, Chapter-5 (5.1,5.2,5.3), Chapter-7 (7.1,7.7), Chapter-8,  
   Chapter-9, Chapter-10, Chapter-11, Chapter-12 (12.1-12.5), Chapter-13 (13.1-13.5)

Reference Book:
2. Operating System and System Programming, SCITECH, P. Blkeiahn Prasad
3. Morden O.S. – PHI, Andrew, S. Tannenbaum

PRACTICALS
CPEN 9405 PROCESS CONTROL LAB. (0-0-3)
(Five of the six experiment must be done)
1. Studies and experimental determination of characteristics of SCR, DIAC, and TRIAC.       
   (6hrs)
2. Experimental studies on closed loop and open loop control systems.                        
   (6 hrs)
   (6 hrs)
4. Analogue Electronics PID controller.                                                   
   a) Proportional Controller                                                              
   b) Integral Controller                                                                  
   c) Derivative Controller                                                                 
   Experimental studies on a 3 positions Analogue controller using comparators, summing amplifier and inverters. 
   (6 hrs)
   (6 hrs)
   (6 hrs)

REFERENCE:
2. Industrial control & Instrumentation by W. Bolton, University Press.

CPEN 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.
   • Working capital assessment, Balance Sheet, Costing, Book keeping.
   • 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