Course Structure & Syllabus
For B.Tech. (4 Years Course)
(W.E.F 2020-21)

Department of Electronics and Instrumentation
FET, MJP Rohilkhand University
Bareilly (UP)

SCHEME OF COURSES FOR B.TECH
Electronics and Instrumentation

B.Tech First Year, Semester I

S. No	Subject Code	Subject	Teaching Schedule			Credits
			L	T	P	
1.	PH-101T	Engineering Physics-I (All Branches)	3	1	0	4
2.	CY-101T	Engineering Chemistry (EE, EI & EC)	3	1	0	4
3.	MA-101T	Engineering Mathematics-I (All Branches)	3	1	0	4
4.	HU-101T	Communicative English (EE, EI & EC)	2	1	0	3
5.	CS-101T	Computer Fundamentals & Programming (EE, EI & EC)	3	1	0	4
6.	ME-107T	Engineering Graphics (CSIT, CH & ME)	1	2	0	2
7.	EE-101T	Basic Electrical Engineering (EE, EI, & EC)	3	1	0	4
8.	EI-101T	Basic Electronics Engineering (ME, CSIT,& CH)	3	1	0	4
9.	CY-103T	Environmental Studies (CSIT, CH & ME)	3	0	0	2
10.	HU-103T	Fundamentals of Economics (ME, CSIT & CH)	3	0	0	2
11.	ME-101T	Manufacturing Techniques (CS, CH, ME)	2	0	0	2
12.	ME-105T	Basic Mechanical Engineering (EC, EI, EE)	3	1	0	4
		Total				**22/25**
Laboratory Courses						
13.	PH-101P	Engineering Physics Lab (CSIT, CH & ME)	0	0	3	2
14.	CY-101P	Engineering Chemistry Lab (EE, EI & EC)	0	0	3	2
15.	CS-101P	Computer Programming Lab (EE, EI & EC)	0	0	3	2
16.	EE-101P	Basic Electrical Engg. Lab (EE, EI & EC)	0	0	3	2
17.	EI-101P	Basic Electronics Engg. Lab (ME, CSIT & CH)	0	0	3	2
18.	ME-101P	Workshop Practice Lab (ME, CSIT & CH)	0	0	3	2
		Total				**6/6**
		G.Total				**28/31**

B.Tech. I year II Semester

	Subject Code	Subjects	Teaching Schedule			Credits
			L	T	P	
1.	PH-102T	Engineering Physics-II (All Branches)	3	1	0	**4**
2.	CY-101T	Engineering Chemistry (ME, CSIT & CH)	3	1	0	**4**
3.	MA-102T	Engineering Mathematics-II (All Branches)	3	1	0	**4**
4.	HU-101T	Communicative English (CSIT, CH, ME)	2	1	0	**3**
5.	CS-101T	Computer Fundamentals & Programming (CSIT, CH, ME)	3	1	0	**4**
6.	ME-107T	Engineering Graphics (EE, EI & EC)	1	2	0	**2**
7.	EE-101T	Basic Electrical Engineering (ME, CSIT & CH)	3	1	0	**4**
8.	EI-102T	Basic Electronics Engineering (EE, EI & EC)	3	1	0	**4**
9.	CY-103T	Environmental Studies (EE, EI & EC)	3	0	0	**2**
10.	HU-103T	Fundamentals of Economics (EE, EI & EC)	3	0	0	**2**
11.	ME-101T	Manufacturing Techniques (EC, EI, EE)	2	0	0	**2**
12.	ME-105T	Basic Mechanical Engineering (CSIT, CH, ME)	3	1	0	**4**
		Total				**25/22**
Laboratory Courses						
11.	PH-101P	Engineering Physics Lab (EE, EI & EC)	0	0	3	**2**
12.	CY-101P	Engineering Chemistry Lab (ME, CSIT & CH)	0	0	3	**2**
13.	CS-101P	Computer Programming Lab (ME, CSIT & CH)	0	0	3	**2**
14.	EE-101P	Basic Electrical Engg. Lab (ME, CSIT & CH)	0	0	3	**2**
15.	EI-102P	Basic Electronics Engg. Lab (EE, EI & EC)	0	0	3	**2**
16.	ME-101P	Workshop Practice Lab (EE, EI & EC)	0	0	3	**2**
		Total				**6/6**
		G.Total				**31/28**

III Semester

S. No	Subjects Code	Subjects	Teaching Schedule			Credits
			L	T	P	
1.	EI-201T	Analog Electronics (EI, EE, CSIT)	3	1	0	4
2.	EI-203T	Electronic Measurement & Instrumentation (EC, EI)	3	1	0	4
3.	CS-203T	Data Structure	3	1	0	4
4.	EC-203T	Electromagnetic Theory (EC, EI)	3	1	0	4
5.	EE-201T	Network Analysis & Synthesis	3	1	0	4
6.	MA-201T	Engineering Mathematics-III	3	1	0	4
7.	HU-203T	Human Value and Professional Ethics-I	2	0	0	2
8.	EI-201P	Analog Electronics Lab (EI)	0	0	3	2
9.	EI-203P	Electronic Measurement & Instrumentation Lab (EI)	0	0	3	2
10.	CS-201P	Computer Programming Lab-II	0	0	3	2
			Total Credits			**32**

IV Semester

S. No	Subjects Code	Subjects	Teaching Schedule			Credits
			L	T	P	
1.	EI-202T	Linear Integrated Circuits (EC,EI, EE)	3	1	0	4
2.	EC-202T	Signals & Systems (EC,EI)	3	1	0	4
3.	EI-204T	Digital Electronic Circuits (EI)	3	1	0	4
4.	CS-204T	Computer Organization	3	1	0	4
5.	EE-202T	Element of Electrical Machines (EC, EI, ME)	3	1	0	4
6.	HU-204T	Human Value and Professional Ethics-II	2	0	0	2
7.	EI-204P	Digital Electronic Circuits Lab (EI)	0	0	3	2
8.	EI-202P	Linear Integrated Circuit Lab (EC, EI, EE)	0	0	3	2
9.	EE-202P	Electrical Machine Lab	0	0	3	2
			Total Credits			**28**

V Semester

S. No	Subject Code	Subjects	Teaching Schedule			Credits
			L	T	P	
1.	EC-301T	Analog Communication Systems (EC, EI)	3	1	0	4
2.	EI-301T	Microprocessors & Their Applications (EC,EI, EE, CSIT)	3	1	0	4
3.	EI-303T	Sensors and Transducers (EI)	3	1	0	4
4.	EI-309T	Industrial Instrumentation (EI)	3	1	0	4
5.	EE-301T	Control Systems (EC, EI, EE)	3	1	0	4
6.	EE-303T	Power Electronics (EC,EI, EE)	3	1	0	4
7.	EC-301P	Analog Communication Lab (EC, EI)	0	0	3	2
8.	EI-301P	Microprocessor Lab (EC, EI, EE, CSIT)	0	0	3	2
9.	EI-303P	Sensors and Transducers Lab (EI, CH)	0	0	3	2
10.	EI-307P (CH)	Instrumentation and Analysis Lab. (For CH branch only)	0	0	3	2
11.	EE-301P	Control System Lab (EC, EI, EE)	0	0	3	2
			Total Credits			**32**

VI Semester

S. No	Subjects Code	Subjects	Teaching			Credits
			L	T	P	
1.	EC-302T	Digital Signal Processing (EC, EI)	3	1	0	4
2.	EI-302T	Embedded Systems (EC, EI)	3	1	0	4
3.	EC-304T	Digital Communication System (EC,EI)	3	1	0	4
4.	EI-304T	Optical Fibre Instrumentation (EI)	3	1	0	4
5.	EI-306T	Modern Control System (EI)	3	1	0	4
6.	EI-308T	Power Plant Instrumentation (EI)	3	1	0	4
7.	EI-302P	Embedded Systems Lab (EC, EI)	0	0	3	2
8.	EC-304P	Digital Communication Lab (EC, EI)	0	0	3	2
9.	EI-304P	Optical Fibre Instrumentation Lab (EI)	0	0	3	2
		Total Credits				**30**

VII Semester

S. No	Subject Code	Subjects	Teaching Schedule			Credits
			L	T	P	
1	EI-413T	Process Control Instrumentation (EI)	3	1	0	4
2.	EI-405T	Metrology and Calibration (EI)	3	1	0	4
3.	-----	Open Elective	3	1	0	4
4.	-----	Pool Elective	3	1	0	4
5.	EI-407	Industrial Training (EI)	0	0	3	2
7.	EI-409	Seminar (EI)	0	0	3	2
6.	EI-403P	Product Design Lab (EI)	0	0	3	4
7.	EI-405P	Project-I (EI)	0	0	3	4
8.	EI-413P	Process Control Instrumentation Lab.	0	0	3	2
Total Credits						**30**

List of Pool Elective:

1.	EI-437T	Antenna Engineering
2.	EI-457T	PCB Design & Technology
3.	EI-439T	Virtual Instrumentation
4.	EI-433T	Soft Computing Techniques,
5.	EI-431T	Integrated Circuit Technology and Design
6.	EI-451T	IoT
7.	EC-433T	Digital System Design
8.	EC-452T	PC Interfacing
9.	EE-411T	Non Conventional Energy Sources
10	CS-451T	Wireless Network and Mobile Computing
11	ME-473T	Work Study
12	CE-461T	Environmental Management

List of Open Elective:

1.	MA-491T	Operation Research
2.	CY-401T	Polymeric Materials and their Applications
3.	PH-419T	Futuristic Materials
4.	HU-449T	Principles of Management
5.	HU-409T	Quantitative Methods in Economics

Note: The Pool Elective and Open Elective Subjects offered by various Departments of FET may be added/modified/replace as future requirement.

VIII Semester

S. No	Subjects Code	Subjects	Teaching Schedule			Credits
			L	T	P	
1.	EI-408T	Biomedical Instrumentation (EI)	3	1	0	4
2.	-----	Open Elective	3	1	0	4
3.	-----	Pool Elective	3	1	0	4
4.	EI-406P	Project-II (EI)	0	0	12	12
5.	EI-404P	Advanced Instrumentation Lab (EI)	0	0	3	2
6.	EI-408P	Biomedical Instrumentation Lab. (EI)	0	0	3	2
Total Credits						**28**

List of Pool Elective:

1	EI-438T	Analytical Instrumentation
2	EI-448T	Solid State Electronic Devices
3	EI-458T	Digital System Design Using VHDL
4	EI-460T	Instrument Design & Reliability
5	EC-458T	Digital Image Processing
6	EC-460T	Monolithic Microwave Integrated Circuit
7	EC-416T	Mobile Communication
8	CS-440T	Data & Computer Network

List of Open Elective:

1. HU-402T Engineering Economics
2. PH- 429T Material Imperfection and Applications
3. HU-407T Foreign Trade

Note: The Pool Elective and Open Elective Subjects offered by various Departments of FET may be added/modified/replace as future requirement.

SEMESTER-1

PH-101T Engineering Physics-I (All Branches) Credits-4 LTP: 310

Interference: Coherent sources, Theory of interference, displacement of fringes, Fresnel‟s biprism experiment, Interference in thin film, wedge shaped film, Newton‟s rings.

Diffraction: Basic idea of Fresnel & fraunhofer diffraction, single, double and n slit diffraction, diffraction grating, Rayleigh‟s criterion of resolution, resolving power of telescope, microscope and grating.

Polarization: Phenomenon of double refraction, Malus law, Nicol prism, quarter wave and half wave plates, production and analysis of plane, circularly and elliptically polarized light, optical activity, specific rotation, Lorentz half shade and biquartz proarimeters.

Wave Mechanics: Elementary idea of quantization, black body radiation, Frank-Hertz experiment, Photoelectric effect. Wave particle duality, De Broglie concept of matter waves, Heisenberg‟s uncertainty principle, Schrodinger‟s wave equation, physical significance of wave function, applications of Schrodinger‟s wave equation: (i) Particle in one dimensional box. (ii) Potential Step (iii) Potential barrier-quantum mechanical tunneling (Basic idea).

Solid State Physics: Structure of crystalline solid: Lattice translational vectors, unit cell, Bravais lattice, Miller indices and simple crystal structures.

Free electron model: Free electron gas in one and three dimensions, Fermi energy, Density of states, Heat capacity of the electron gas, failure of free electron model.

Band theory: Kronig Penny model, motion of electrons in one dimension according to the band theory, effective mass of an electron, concept of hole, distinction between metals, insulators and intrinsic semi-conductors.

Books:

1) Geometrical & Physical Optics: B.K.Mathur
2) Introduction of Solid State Physics: C. Kittel
3) Solid State Physics: A.J. Dekkar
4) Quantum Mechanics: Singh and Bagdel
5) Optics: Ajai Ghatak
6) Quantum Mechanics: B.K. Agarwal & Hari Prakash
7) Optics: A.H. Flower
8) Geometrical & Physical: Zenkin‟s & White
9) Quantum Mechanics: Eisberg

Subject: Engineering Chemistry Code: CY-101T Credits: 4 LTP: 310

Schrődinger equation: origin of quantization; applications of particle in a box problem; hydrogen atom; properties of atomic orbitals; many electron atoms; molecular orbital theory; bonding and intermolecular forces.

Thermodynamics: Fundamental definition and concepts of thermodynamics; Work, heat and energy; First law: *Cp* and *Cv*; Second law: entropy; Helmholtz and Gibbs Energy; chemical potential; Third law; phase equilibria; chemical equilibrium.

Chemical kinetics: Rate laws; elementary reaction and chain reaction.

Periodic table and periodic properties: basis of periodic table, trends in size, electron affinity, ionization potential and electro negativity, Use of Ellingham diagram and thermodynamics in the extraction of elements; Transition metal chemistry: inorganic complexes, isomerism, nomenclature; bonding in transition metal complexes; valence bond and crystal field theory, magnetism, bonding aspects, structural distortion; Bioinorganic chemistry: storage and transport proteins; Catalysis: hydrogenation, hydroformylation and olefin metathesis.

Organic Chemistry: Hűckel treatment of ethylene, butadiene and benzene, concept of aromaticity, configuration, molecular chirality and isomerism, conformation of alkanes and cycloalkanes, reactivity of carbonyl groups (additions, addition-eliminations, reactions due to acidic proton, reactivity of acid halide, ester and amide), functional group inter-conversions involving oxidation and reduction. Introduction to bio-organic chemistry: carbohydrates, amino acids proteins and nucleic acids. Polymer chemistry definition, classification of polymers, orientation of polymers, types of polymerization, Mechanism of addition and condensation polymerization, thermo plastic and thermo setting revius: Important thermosetting and thermoplastic polymers: eg. Bakelite, polyester, cellulose derivatives, PVC, Poly ethylene, Teflon, Polystyrene, Nylon Natural and synthetic rubbers.

Suggested Books:

1. P.W. Atkins, **Physical Chemistry** (7th Edition), Oxford University Press, 2006.
2. I. A. Levine, **Physical Chemistry**, McGrawHill, 2009
3. D.A. McQuarrie and J.D. Simon, **Physical Chemistry -a Molecular Approach**, Viva Books Pvt. Ltd., 1998.
4. R.T. Morrison and R.N. Boyd, **Organic Chemistry**, Prentice Hall of India Pvt. Ltd., 5th Ed, 1990
5. G. Solomons and C. Fryhle, **Organic Chemistry**, John Wiley & Sons (Asia) Pte Ltd.
6. J.D. Lee, **Concise Inorganic Chemistry**, (5th Edition), ELBS, 1996.
7. D. F. Shriver and P. W. Atkins, **Inorganic Chemistry,** Oxford University Press, 2006
8. F.W.Bill mayer, Polymer Science, Tata McGraw Hill.

Subject: Engineering Mathematics-I **Code: MA-101T,** **Credits: 4**

Branches :All, **Sem: I/II Semester** **LTP: 3 1 0**

UNIT: 1 Differential Calculus:

Limit, continuity and differentiability of functions of single variable. Successive, Differentiations, Leibnitz Theorem, Expansion of functions by Maclaurin‟s and Taylor‟s theorems.

Functions of several variables: Partial derivatives, Euler‟s theorem, change of variables, total differential coefficients, maxima and minima, Lagrange‟s method of multiplier.

UNIT: 2 Integral Calculus:

`Fundamental and mean value theorems of integral calculus.

Reduction formulae, Walli‟s formula, Beta and Gamma functions, Double and Triple integrals, change of orders of integrations. Area enclosed by plane curves, surfaces and volumes of revolutions.

UNIT: 3 Vectors and Matrices:

Differentiations and integrations of vectors. Gradient, Divergence and Curl. Vector identities, Green‟s, Gauss‟s and stoke‟s theorems with applications.

Types and algebra of matrices, rank, solution of simultaneous linear equations, Eigen values and Eigen vectors, diagonalisation of matrices, Cayley-Hamilton Theorem.

References:

1. E. Kreyszig: Advance Engineering mathematics, John Wiley & Sons, 2005.
2. B.V. Ramana: Higher Engineering Mathematics, Tata McGraw Hill Co. Ltd., 2008
3. R.K. Jain & S.R.K. Iyenger: Advance Engineering Mathematics, Narosa Publishing House, 2002.
4. J.C. Sharma: Vector Algebra, Students & Friends Co. Ltd. Agra.
5. J.K.Goel & K.P.Gupta: Matrix algebra, Students & Friends Co. Ltd. Agra.
6. H.K.Dan: Advanced Engineering Mathematics.

Subject: Communicative English Code: HU-101T Credits: 3 LTP: 2 1 0

This course has a double purpose. It introduces literature and its forms and also helps students learn the English language. The linguistic aspect will be dealt with by concentrating on the dictionary skills and introducing principles of pronunciation, vocabulary development, and syntax. The main topics include:

(a) **Pronunciation:** Basic sounds of English (vowels and consonants) and word-stress

(b) **Vocabulary:** word-formation (prefixes and suffixes), synonyms and antonyms

(c) **Syntax:** parts of speech, active and passive voice, direct and indirect speech, tenses, basic sentence patterns, etc. The literary aspect will be dealt with through suitable texts such as poems, short stories and plays (chosen be the instructors). The main topics for discussion will be:

(a) What is literature?

(b) The nature of literary language (mainly "figurative "language)

(c) The literary forms or genres

(d) Literature and socio-cultural context

Pre-Requisities of Scientific Writing: Salient features: BOCUST formula. Grammatical pre-requisites: Usage, Sentence fragments, questions tag. Modifiers, connectives Split infinitives, Dangling participle Gereunds, ellipsis coherence & unity: Method.

CS-101T Computer Fundamental and Programming Credits 4(3-1-0) Section

A: Computer Fundamentals

1. **Introduction:** Basic definition, Classification of Computers, Block diagram of computer and brief idea of its part (I/O, Memory, control unit) with their working and example.
2. **Number System:** Introduction, Data representation-Decimal, Binary, octal, Hexadecimal and their inter convertibility.
3. **Planning the computer program:** Purpose of program planning, algorithms, flow charts, Pseudo code.
4. **Computer Software:** Introduction to software, hardware, Firmware with example, Type of software, Translators and their types (compiler, interpreter, assembler etc.).
5. **Basic operating system concepts:** OS, Types of OS (MS-DOS,WINDOWS) Role of OS with its characteristics in brief (Multi-programming, Multitasking, Multiprocessing, Multi-threading, Time-sharing, online-processing, Real-time processing).

Section B: Programming in C

6. **Introduction :**Introduction to C Programming Language, structure of C programs, compilation and execution of C programs, debugging techniques, data types and sizes, declaration of variables, modifiers, identifiers and keywords, symbolic constants, storage classes (automatic, external, register and static) and their use –when and where , macros, the Cpre-processor.
7. **Operators:** unary operators, Arithmetic and logical operators, bitwise operators, assignment operators ,relational operators, shift operators, comma operators, conditional operators , size of operators ,type conversion , type casting .
8. **Control statements:** IF-ELSE statement, nested if-else, Switch statement, break, exit (), return (), continue, go-to statement.
9. **Iterative statements:** While-loop, do-while loop, for loop, nested loops , difference between iteration and recursion,
10. **Functions:** Built in and User defined, function declaration, definition and function calls, parameter passing, actual and formal argument, call by value and call by reference, recursive functions , command line argument, multifile program.
11. **Arrays:** Linear Arrays(declaration, accessing elements of an array, initialization) multidimensional Arrays, array of strings, passing array to functions.
12. **Structureandunions:**Definition,Declaration,Accessingofelementanduseofstructure,union,enumerated data types and difference between structure and union, arrays of structures, passing structure in to function and passing its element in to function, .
13. **Pointers:** Introduction, Accessing the address of a variable , Declaring &initializing pointers, Accessing a variable though in pointer, pointers &Arrays, Pointers& character strings, pointers & functions.

References:

1. –Computer Fundamentals ‖by V.Rajaraman
2. –Computer Fundamentals ‖by. B. Ram
3. –Programming in C ‖by E. Balagurusamy, TMH.
4. –Let us C‖, by Yashwant kanetkar, Narosa publications.
5. –Schaums outline series‖, by Gottfried, TMH
6. Programming in C by Dennis and Ritche 7.—Magic with C‖ A B Publication

Subject: Basic Electrical Engineering Code: EE-101T Credits: 4 L T P: 3 1 0

UNIT 1: Basic Concept: Definitions & units, Introduction to Basic Laws, Circuit Elements, KVL, KCL, Ideal & Real Sources, Dependent & Independent Sources, Conversion of Voltage Source into Current Source & vice Versa, Controlled and Uncontrolled Sources, Loop and Nodal Method of analysis, Star to Delta Transformation & vice-versa.

UNIT 2: Magnetic Circuit: MMF, Flux, Reluctance, Magnetic Effect of Electrical Current, Hysteresis & Eddy Current Losses.

UNIT 3: Network Theorems: Superposition, Thevenin, Norton, Maximum Power Transfer & Reciprocity Theorems.

UNIT 4: Steady-State Response: Steady-State Response of Circuit to Sinusoidal functions, Phasor Representation of Sinusoids, Concept of Complex Impedance, Series & Parallel AC Circuits, Series & Parallel resonance

UNIT 5: Balanced Three-Phase Circuit: Generation of Three Phase Voltage, Star/Delta Connected Supply, Balanced Load Circuits, Line and Phase Voltage & current Relations. Concept of Three Phase Power.

UNIT 6: Transient: Response of RC, RL & RLC Circuit to DC Excitation only (simple problem).

UNIT 7: Instruments: Introduction to MI, MC Instruments, Extension of range, Dynamometer Type Wattmeter, Simple problems based on these instruments.

Books:

1) Basic Circuit Therory by L.P. Huelsman, PHI.
2) Hughes Electrical Technology by M. Smith, Addison-Wesley Pub
3) Electrical Technology by B.L. Theraja.
4) Electrical Engineering Fundamentals by V. Deltoro, PHI

Subject: Basic Electronics Engg. **Code: EI-101T/102T** **Credits: 4**

Branches: All branches **Sem: I/II Semester** **L T P: 3 1 0**

Course Outcomes; At the end of the course, student will be able to

CO1: Understand the concept of semiconductor physics

CO2: Characterize junctions diode

CO3: Apply the concept of diode in rectifying circuits, filters circuits and DC power supplies

CO4: Understand the application of diode in wave shaping, in voltage multiyear

CO5: Understand fundamental principles of bipolar junction transistors

Unit 1:- Introduction of Semiconductor Physics: Band Theory of solids, Insulator, Semiconductor & Metals, Mobility and Conductivity, Electrons and holes in an intrinsic semiconductor, Carrier concentration in an intrinsic semiconductor, n-type material, p-type material, Donor and Acceptor impurities, Charge densities in a semiconductor, Hall-effect, Diffusion, the continuity equation, Fermi level in a semiconductor having impurities.

Unit 2:- Junction Diode Characteristics: p-n junctions, Forward bias, Reverse bias junction, V-I characteristics, Effect of temperature on a p-n junction diode, Maximum temperature operation, Reverse breakdown voltage, Capacitive effects in a p-n junction diode, Space charge capacitance, Diffusion capacitance, Diode Resistance, Static and Dynamic Resistance, Comparison of practical with ideal diode, load line analysis of a diode circuit.

Unit 3:- Rectifying Circuits and DC Power supplies: p-n junctions as an rectifier, form factor, average voltage and current, haft wave & full wave rectifier, voltage regulation, Ripple factor, Bridge rectifier, Comparison of rectifier circuits, Filter circuits for power supplies, inductor filter, capacitor filter, Effect of capacitor series resistance, Peak inverse voltage of a half wave rectifier, LC filter, Comparison of filter circuits.

Unit 4:- Diode Applications: Clippers, Series and parallel, Clampers, Zener diodes, Zener diode specification, Voltage regulator circuits, Design of a voltage regulator circuits, Effect of supply voltage variations, Zener diode breakdown mechanism, Voltage multiplier circuits, voltage doublers, voltage Tripler, Quadrupoler.

Unit 5:- Bipolar Junction Transistor: The junction transistor, Transistor current components, transistor as an amplifier, Common base configuration. Early effect, the input and output characteristics, Common emitter configuration I/O characteristics, Active, Saturation, Cut-off regions for configurations, common collector configuration, common base current gain, common emitter current gain.

REFERENCES

1. Integrated Electronics: Analog and Digital Circuits and System by Millman, Halkias and Parikh, TMH, Second Edition.
2. Electronic Devices and Circuits, An introduction by Allen Mottershead, TMH.
3. Electronic Devices and Circuits theory by Robert L. Boylestad, Louis Nashelsky.

Basic Mechanical Engineering **ME-105T** **Credit: 04**

L T P (3 1 0)

A. Thermodynamics:

Unit: 1 Fundamental Concepts and definitions: Definition of thermodynamics, system, surrounding and universe, phase, concept of continuum, macroscopic & microscopic point of view. Density, specific volume, pressure, temperature. Thermodynamic equilibrium, property, state, path, process, cyclic process, Energy and its form, work and heat, Enthalpy.

Unit: 2 Zeroth Law: Concepts of temperature, zeroth law.

First Law: First law of thermodynamics. Concept of processes, flow processes and control volume, flow work, steady flow energy equation, Mechanical work in a steady flow of process.

Second Law: Essence of second law, Thermal reservoir, Heat engines. COP of heat pump and refrigerator, Statements of second law. Carnot cycle, Clausius inequality, Concept of Entropy.

Unit: 3 Properties of steam and thermodynamics cycles: Properties of steam, use of property diagram, Steam-Tables, processes involving steam in closed and open systems. Rankine cycle. Introduction to I.C. Engines-two & four stoke S.I. and C.I. engines. Otto cycle, Diesel cycle.

B. Mechanics

Unit: 4 Force system and Analysis:

Basic Concept: Laws of motion. Transfer of force to parallel position. Resultant of planer force system. Free Body Diagrams, Equilibrium and its equation, Centre of gravity, Moment of Inertia.

Friction: Introduction, Laws of coulomb friction, Equilibrium of bodies involving dry friction-Belt Friction.

Unit: 5 Stress and Strain Analysis:

Simple stress and strain: Introduction, Normal shear stresses, stress-strain diagrams for ductile and brittle materials, elastic constants, one dimensional loading of members of varying cross sections, strain Energy.

Unit: 6 Newton's Second Law: D'' alemberts Principle-problems (for horizontal & inclined surface). Analysis of lift, motion problem. Motion of several connection bodies, Motion of two bodies connected by as tiring, when one body is lying on horizontal surface and other is hanging free, when one body is lying on inclined plane and other is hanging free case (i) Smooth inclined surface case (ii) Rough inclined surface of co-efficient of friction „μ'' (only problems).

Work Power & Energy: work-Units of work-Problems (horizontal & inclined surface). Power Derivation of the expression for power required to drive a body, problems energy, Types of energy problems. Laws of conservation of energy. Newton''s law of conservation of momentum. Plastic impact & Elastic impact. Driving a pile into ground-problems. Motion of connected bodies, work done by spring.

Books:

1) Thermodynamics by P.K. Nag.
2) Thermodynamic by P.L. Ballaney.
3) Engineering Mechanics & Strength of Materials by R.K.Bansal (Chapter 6, 7 & 9) Lakshmi Publications, New Delhi.
4) Holman, J.P.: Thermodynamics, MC Graw Hill book Co. NY.
5) Yadav R.: Thermodynamics and Heat Engines. Vol I & II (SI Edition) Central Publishing House Allahabad.
6) Yadav R.: Steam & Gas Turbines.
7) Engineering Mechanics by S.S. Bhavikatti & K.G. Rajashekarappa (Chapter 9 & 10) New Age Publications, New Delhi
8) F.L. Singer: Strength of Materials.
9) Timoshenko: Strength of Materials.

Subject: Basic Electronics Engg. Lab **Code: EI-101P/102P**
Branches: CSIT, ME, CH (Semester-I); **EC, EI, EE (Semester-II)**

Course outcome; At the end course student s are able to understand
Cos1; understand about Electrical component such as resistance, capacitors and Inductor
Cos2; understand about Bread Board, multimeter, cathode ray oscilloscope and function generator
Cos3; understand about various types of semiconductor devices like diode, BJT transistors
Cos4; understand about half wave and full wave rectifier

List of Experiments

1. To study the Resistance and estimate its value on the basis of color code and Digital Multimeter.
2. To study the Capacitors.
3. To study the Inductors.
4. Study of Bread Board.
5. Study of Multimeter and Tong Tester
6. To study the various types of diodes: Semiconductor diodes, Zener diode & Light emitting diode.
7. To study the Bipolar Junction Transistors.
8. To study the Cathode Ray Oscilloscope (CRO).
9. To study the Function Generator and demonstrate the waveform on CRO.
10. To study the Half-wave rectifier and demonstrate I/P and O/P waveforms.
11. To study the Full-wave rectifier and demonstrate I/P and O/P waveforms.

Note:-

(1) In addition, Department may include more experiments based on the future requirement.

(2) The details of other lab experiments can be taken from concerned departments.

SEMESTER-2

Subject: Engineering Physics-II **Code: PH-102T** **Credits: 4**
Branches: All Branches **Semester: II** **L T P: 3 1 0**

Dielectric Properties of Materials: Polarization of dielectrics, dielectric constant, electric susceptibility, non-uniform polarization, electric displacement vector, Lorentz local field, Polarizability, Clausius-Mosotti relation, frequency dependence of dielectric constant.

Magnetic Properties of Materials: Magnetization, three magnetic vectors (B.M & H), susceptibility and permeability, Dia, Para, and ferromagnetism, Magnetic domains, hysteresis, Ferro electricity & Piezoelectricity.

Maxwell's Equations: Displacement Current, Maxwell"s equation in vacuum & medium (Integral and Differential forms), Poynting theorem, Poynting vector.

Electromagnetic Waves: Wave equation, plane waves, Propagation of electromagnetic waves through non-conducting medium, reflection and transmission.

Superconductivity: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Type I and Type II superconductors, BCS theory (Qualitative), high temperature superconductors. Characteristics of superconductors in superconducting state, applications of superconductors.

Nuclear Physics: Basic properties and constituents of nucleus, mass defect, packing fraction and binding energy, semi empirical mass formula, elementary idea of nuclear forces and their characteristic properties, Nuclear fission, important components and working of nuclear fission reactor, Basic Concept of nuclear fusion reactors.

Books:

1) Electricity and Magnetism: Berkley Physics Course-II.
2) Electromagnetic waves & Radiating systems: Jordan and Keith.
3) Solid State Physics: C. Kittel
4) Nuclear Physics: I. Kaplan
5) Modern Physics: A. Beiser
6) Electrodynamics: D.J. Griffith.

Subject: Engineering Mathematics-II **Code: MA-102T** **Credits: 4**

Branches: All Branches **Semester: II** **LTP: 310**

UNIT: 1 **Numerical Techniques:** Numerical solution of algebraic and transcendental equations by Bisection method, Secant method, Regula-Falsi and Newton-Raphson methods. Numerical integration by Gauss quadrature formula, Trapezoidal rule, Simpson‟s rule and Weddle‟s rule. Numerical solution of ordinary differential equations by Euler‟s method, Milne‟s method and Runge-Kutta method.

UNIT: 2 **Probability and Statistics:** Definitions of probability and simple theorems, conditional probability, Baye‟s Theorem, random variables, discrete and continuous distributions, Binomial, Poisson and normal distributions, correlation and linear regression.

UNIT: 3 **Complex Analysis:** Analytic functions, C-R equations in Cartesian and polar forms, Harmonic functions, Milne-Thomson method, complex integration, Cauchy‟s theorem, Cauchy‟s integral formula. Lioville‟s and Morera‟s Theorems, Taylor‟s and Laurent‟s theorems. Residues: Cauchy‟s residue theorem, evaluation of real integrals of the type $\int_0^{2\pi} f(\cos\theta, \sin\theta)\, d\theta$ and $\int_{-\infty}^{\infty} f(x)\, dx$.

References:

1. E.Balagurusamy: Numerical Methods, Tata McGraw Hill, 2008.
2. Devi Prasad: An introduction to Numerical analysis, Narosa Publishing House, 2006.
3. J.B.Conway: Functions of one complex variable, springer verlag, International Students Edition Narosa Publishing House, 1980.
4. A.M.Goon, M.K.Gupta & B.Das Gupta: Basic Statistics, The world Pren Pvt. Ltd., Calculta, 1991.
5. L.V.Alhfors: Complex analysis, Tata McGraw Hill, 1979.

ME-107T **ENGINEERING GRAPHICS** **(I year: I Sem)**

Credits: 02

L	T	P	Total
1	2	0	02

Unit: 1 Importance of Engineering Drawing, Engineering Drawing Instruments and uses, Layout of Drawing sheet, Lettering and Dimensioning, Types of Lines. Scales: What is scale, Representative factor, Types of Scale: Plain, Diagonal and Vernier scales, Metric Measurements and conventions, Plain Scale, diagonal scale& vernier scale(forward & backward both).

Unit: 2 Conic Section, Definition, and different methods of construction of ellipse, hyperbola and parabola by Eccentricity method Construction of parabola and ellipse by concentric circles method, Oblong method, Parallelogram method.

Unit: 3 Projections, Principle, types and conventions, Theory of Projections and orthographic projections:- Introduction, Types of projections, Orthographic projections, Planes of Projection, Four quadrants, Types of orthographic projections, (a) Projections of point and straight lines, (b) Projections of lines inclined to both the planes, Projection of planes, (a) Projection of solids (b) Projection of solids inclined to both H.P. & V.P. (of prisms pyramids etc).

Unit: 4 Isometric Projections: Theory of isometric projection- Isometric lengths, Isometric scales:- Methods to draw Isometric view or projection, various positions of Isometric axes. Isometric projection with isometric lines, non-isometric lines and with curved & circular surfaces.

Recommended Text Book

1. A Text book of Engineering Drawing (Geometrical Drawing) by R.K. Dhawan
2. Engineering Drawing & Graphics, by K.Venugopal Rao
3. Engineering Drawing by P.S. Gil
4. Engineering Drawing by N. D. Bhatt

Subject: Basic Electronics Engg. **Code: EI-101T/102T** **Credits: 4**

Branches: All branches **Sem: I/II Semester** **L T P: 3 1 0**

Course Outcomes; At the end of the course, student will be able to

CO1: Understand the concept of semiconductor physics

CO2: Characterize junctions diode

CO3: Apply the concept of diode in rectifying circuits, filters circuits and DC power supplies

CO4: Understand the application of diode in wave shaping, in voltage multiyear

CO5: Understand fundamental principles of bipolar junction transistors

Unit 1:- Introduction of Semiconductor Physics: Band Theory of solids, Insulator, Semiconductor & Metals, Mobility and Conductivity, Electrons and holes in an intrinsic semiconductor, Carrier concentration in an intrinsic semiconductor, n-type material, p-type material, Donor and Acceptor impurities, Charge densities in a semiconductor, Hall-effect, Diffusion, the continuity equation, Fermi level in a semiconductor having impurities.

Unit 2:- Junction Diode Characteristics: p-n junctions, Forward bias, Reverse bias junction, V-I characteristics, Effect of temperature on a p-n junction diode, Maximum temperature operation, Reverse breakdown voltage, Capacitive effects in a p-n junction diode, Space charge capacitance, Diffusion capacitance, Diode Resistance, Static and Dynamic Resistance, Comparison of practical with ideal diode, load line analysis of a diode circuit.

Unit 3:- Rectifying Circuits and DC Power supplies: p-n junctions as an rectifier, form factor, average voltage and current, haft wave & full wave rectifier, voltage regulation, Ripple factor, Bridge rectifier, Comparison of rectifier circuits, Filter circuits for power supplies, inductor filter, capacitor filter, Effect of capacitor series resistance, Peak inverse voltage of a half wave rectifier, LC filter, Comparison of filter circuits.

Unit 4:- Diode Applications: Clippers, Series and parallel, Clampers, Zener diodes, Zener diode specification, Voltage regulator circuits, Design of a voltage regulator circuits, Effect of supply voltage variations, Zener diode breakdown mechanism, Voltage multiplier circuits, voltage doublers, voltage Tripler, Quadrupoler.

Unit 5:- Bipolar Junction Transistor: The junction transistor, Transistor current components, transistor as an amplifier, Common base configuration. Early effect, the input and output characteristics, Common emitter configuration I/O characteristics, Active, Saturation, Cut-off regions for configurations, common collector configuration, common base current gain, common emitter current gain.

REFERENCES

1. Integrated Electronics: Analog and Digital Circuits and System by Millman, Halkias and Parikh, TMH, Second Edition.
2. Electronic Devices and Circuits, An introduction by Allen Mottershead, TMH.
3. Electronic Devices and Circuits theory by Robert L. Boylestad, Louis Nashelsky.

Environmental Studies

CY-103T **Credits: 2** **L T P (3 0 0)**

Multidisciplinary nature of environmental studies, Ecosystems, Biodiversity and its conservation, Indicators of environmental pollution, Environment and human health. Consumption of natural resources and environmental degradation of forests, water, coal, minerals, energy, and land. Sustainable development, Environmental policy and legislation, Environmental impact assessment. Pollution of lakes, rivers, ground water, coasts, and oceans, Science and technology for drinking water and wastewater treatment and issues in management of systems. Solid and hazardous waste management: causes, effects and control measures. Air and noise pollution, science and engineering of pollution control, Global Issues including climate change, global warming, acid rain, ozone layer depletion, nuclear hazards, Disaster management, industrial accidents, floods, earthquakes, cyclones and landslides, Grees house effect etc.

Suggested Books

1. W.P. Cunningham and M.A. Cunningham, **Principles of Environmental Science,** Tata McGraw-Hill Publishing Company, New Delhi, 2002.

2. J.A. Nathanson, **Basic Environmental Technology**, Prentice Hall of India, New Delhi, 2002.

3. S.J. Arceivala, and S.R. Asolekar, **Wastewater Treatment for Pollution Control and Reuse** (3rd Edition), Tata McGraw Publishing Co. Ltd., New Delhi, 2006.

4. S.R. Asolekar, and R. Gopichandran, **Preventive Environmental Management: An Indian Perspective**, Foundation Books Pvt. Ltd., New Delhi, 2005. Some selected book-chapters, monographs and journal papers

Fundamentals of Economics

HU-103T **Credits: 2** **LTP (300)**

Microeconomics: What is Economics? Basic economic problems and nature of economics; demand and supply; consumer choice; individual and market demand; production and cost of production; profit maximization and perfect competition; market structure-monopoly, monopsony, monopolistic competition, and oligopoly; externalities and public goods; factor markets-land, labour and capital market.

Macroeconomics: National income accounting-income, expenditure and components of GDP; consumption and saving; investment spending and demand for money; financial systems-central bank, money, credit, financial markets and asset prices; income and spending; money, interest and income; fiscal and monetary policies; economic growth and accumulation; aggregate supply-wages, prices and unemployment; inflation.

Suggested Books:

1. R.S. Pindyck and D.L. Rubinfeld. **Microeconomics** (7th Edition), Pearson Prentice Hall, New Jersey, 2009.
2. R. Dornbusch, S. Fischer, and R. Startz. **Macroeconomics** (9th Edition), McGraw-Hill Inc. New York, 2004.

MANUFACTURING TECHNIQUES **Code: ME-101T** **Credit: 02**
Branch: All **Sem: I** **LTP: 2 0 0**

Unit: 1 Carpentry:-

Wood, timber-exogenous & endogenous, Cross section of an exogenous tree, Seasoning of wood, Seasoning methods, defects (Both natural and that occurs during conversion), Brief description of carpentry tools, various carpentry process. Carpentry joints.

Unit: 2 Pattern & Pattern making:-

Pattern, types of pattern (Single piece, split, Match plate, Sweep, Loose piece, Gated patterns), Pattern making allowances, Design considerations in pattern making, pattern making materials, Core prints.

Unit: 3 Foundry:-

Moulding materials, types of foundry sands; characteristics of foundry sands; Binders & additives; moulding procedures: Floor moulding, Bench moulding, Pit moulding, Machine moulding, Green sand moulding, Dry sand moulding, CO2, Core making processes.

Unit: 4 Foundry' tools & equipments:-

Tools used in foundry (hand tools); moulding machine- (Jolt machine, Squeezing machine, Sand Slinger, Push off machine), Furnaces (Pit furnace, cupola furnace).

Unit: 5 Welding:-

Welding: Pressure and non-pressure, arc welding (AC and DC arc welding, Introduction to Carbon arc welding, metal arc welding, TIG & MIG welding); Electric resistance welding (Spot, seam, projection, But, thermit welding), welding tools and equipments, Gas welding (oxyacetylene).

Unit: 6 Bench work & fitting:-

Tools (holding tools, striking tools, cutting tools), various operations performed in fitting shop (detailed).

Unit: 7 Machine tools: Definition, types.

Lathe specifications; Lathe operations in brief (facing, plain turning, step turning, taper turning, threading, drilling and boring). Milling machine (introduction & brief description of operations only).

Unit: 8 Jigs & Fixture: Introduction, Location points, Basic Design of Jigs & Fixture, Types of Jigs & Fixture.

Text Book:

A text Book on workshop technology by B. S. Raghuvanshi

Reference Book:

Workshop technology by Hazara & Chaudhry,

Production technology by R.K.Jain

Sub: Engineering Physics Lab	**Code:PH-101P**	**Credits: 2**
Branches: All branches	**Sem: I/II Semester**	**L T P: 3 1 0**

List of Experiments

1. To determine the variation of T with l for a compound pendulum (Bar pendulum) and then to determine
(a) The value of **acceleration due to gravity (g)** in the laboratory.**(b) Position of centre of gravity** of the bar and the **(c) The radius of gyration (k)** of the bar about an axis passing through C.G. and perpendicular to its length.

2. To determine the (a) **coefficient of damping (K)** (b**) relaxation time τ**, and (c) **the quality factor Q** of a damped simple harmonic motion using a simple pendulum.

3. To determine the **frequency of A.C. mains** by means of Melde's experiment.

4. To determine the **Young's Modulus of the material** of a given beam supported on two knife-edges and loaded at the middle point, using spherometer arrangement.

5. To determine the **surface tension** of a liquid by a capillary rise method.

6. To determine the **wavelength of sodium light** by Newton's rings.

7. To determine the **wavelength of prominent lines of mercury** by plane diffraction grating.

8. To determine the **specific rotation of cane sugar solution** with the help of a polarimeter.

9. To determine the **dispersive power of the material** of the prism for violet and yellow colours of mercury light with the help of a spectrometer.

10. To study the **V-I characteristics** of **P-N Junction** Diode.

11. To study the **V-I characteristics** of **Zener Diode** and find zener breakdown voltage.

12. To verify the **Stefan's law**.

13. To find the **Planck's constant** by using LEDs of different colours.

14. To find the **energy band gap** of a given material by Four Probe Method.

15. (i) To find the value of **Rydberg constant**.
(ii) To measure the **wavelength of visible spectral lines in Balmer series** of atomic hydrogen.

SEMESTER-3

Subject: Analog Electronics **Code: EI-201T** **Credits: 4**
Branches: EI, CSIT, EE **Sem: III semester** **L T P: 3 1 0**

Course Outcomes: At end of the course, students will be able to:

CO1: Analyze simple electronic circuits based on diode and transistor with special focus on designing amplifiers with discrete components

CO2: Design simple linear power supply according to required specifications; analysed biased circuit for BJTs and amplifiers(CE,CB,CC for BJT and FET)

CO3: Perform analysis of AC of amplifiers based on weak signal model (small signal).

CO4: Demonstrate about the feedback effect in amplifier (BJT and FET)

Syllabus

Unit 1:- Transistor as an amplifier: Transistor Biasing and thermal stabilization: The operating point, Biasing Circuits, fixed bias, bias stability, self-bias or emitter bias, fixing of Q-point using graphically & analytical methods, stabilization against variation in I_{CO}, V_{BE}, β: Bias compensation Diode for I_{CO}, V_{BE}.

Unit 2:- The Transistor at low frequencies: Two port devices and the hybrid model. The h-parameter, determination of h-parameter from input and output characteristics. Analysis of a transistor amplifier circuit using h-parameters; the emitter follower (its modelling), miller‟s theorem and its dual, cascading transistor amplifier (up to 2 stages), simplified hybrid model, high input resistance transistor circuit e.g. Darlington, Emitter follower.

Unit 3:- Field effect transistors: General description on FET, JFET operations and its characteristics, MOSFET-N-channel MOSFET, P-channel MOSFET, Drain and Gate Characteristics of MOSFET; the FET small signal model, CS and CD amplifiers at high and low frequencies.

Unit 4:- Feedback amplifiers: Classification of amplifiers, feed back concepts, transfer gain with feedback, general characteristics of negative feedback amplifier, input and output resistances for voltage series, current series, current shunt, voltage shunt feedback, analysis of feedback amplifier (voltage series, current series, current shunt, voltage shunt feedback).

Unit 5:- Power amplifier: Class A large signal amplifier, second harmonic distortion, higher order harmonic generation, the transfer audio power amplifier, efficiency, class B, class C, class AB and push-pull amplifier.

REFERENCES

1. Integrated Electronics Analog and Digital circuits and systems, J. Millman, Halkias and Prikh, TMD.
2. Electronics Devices and Circuit Theory; Robert Boylestad & Nashlasky (PHI).
3. Electronics Devices and Circuit: Allen mottershed (TMH).

Subject: Electronic Measurement & Instrumentation **Code: EI-203T,** **Credits: 4**
Branches: EC, EI **Sem: III Sem.** **L T P: 3 1 0**

Course Outcomes: Upon a successful completion of this course, the student will be able:

CO1: To define the performance characteristics and explain the concepts of electrical and electronic instruments used for measuring electrical quantity.

CO2: To understand different types of measuring instruments, their construction, operation and characteristics.

CO3: To apply the different measurement techniques for the measurement of current, voltage, resistance, inductance, capacitance etc.

Unit -1: Measurement & Measurement Systems: Methods of Measurement, Direct and Indirect types of measurement systems; Mechanical, Electrical and Electronic Instruments; Classification of Instruments- Null and Deflection type; Modes of Operation- Analog and Digital. **Characteristics of Instruments:** Static and Dynamic Characteristics, Noise, Linearity, Hysteresis, Threshold, Dead Time & Dead Zone, Input & Output Impedance, Loading Effects due to Shunt Connected Instruments, Loading Effects due to Series Connected Instruments.

Unit-2: Errors in Measurement: Types of static errors-gross errors, systematic errors & random errors; Sources of errors. **Dynamic Response of Instruments & Measuring Systems:** Dynamic response, First order system, Second order system.

Unit-3: Ammeter: DC Ammeter, Multirange Ammeter, Aryton Shunt or Universal Shunt, Requirement of a Shunt, Extending of Ammeter Ranges. **Voltmeter:** DC Voltmeter, Mutirange Voltmeter, Extending Voltmeter Ranges; Digital Voltmeter (DVM)-Ramp type DVM, Dual slope Integrating type DVM, Successive Approximation DVM**. Multimeter:** Introduction, Display (No. of Digit), Range, Resolution, Accuracy; Use of Multimeter as Micro-ammeter, DC Ammeter, DC Voltmeter, AC Voltmeter and Ohmmeter. **Measurement of Power & Wattmeter:** AC & DC Current and Voltage Probes, Power in DC & AC Circuit, Electrodynamometer Wattmeter, Measurement of Power in 3 Phase circuit, 3 Phase Wattmeter, Measurement refractive power.

Unit-4: Bridges: DC Bridge-Wheatstone Bridge, Kelvin Bridge, Measurement of Low & High Resistance; AC Bridge-General equation of bridge balance, General form of AC Bridge, Maxwell's Bridge, Hay's Bridge, Anderson's Bridge, Wein's Bridge, Schering Bridge. **Potentiometers:** DC Basic Circuit, Laboratory type, Standardization of Potentiometers; AC: Drysdale polar potentiometers, Gall-Tinsley AC Potentiometer (Working & Construction both).

Unit-5 :Cathode Ray Oscilloscope (CRO): Block diagram of oscilloscope, Observation of waveform on CRO, Measurement of Phase & Frequency of CRO (Lissajous Patterns). **Waveform Analyzer:** Frequency selective wave analyzer, Heterodyne wave analyzer, Applications of wave analyzers. **Q-Meter:** Principle of working, Circuit of a Q-meter, Applications of Q- Meter.

Reference Books:

1. Electrical & Electronics Measurements and Instrumentation, A K Sawhney, Dhanpat Rai & sons Publication
2. Electronic Instrumentation, H. S. Kalsi, TMH Publication
3. Modern Electronic Instrumentation and Measurement Techniques, Cooper D & A D Helfrick, PHI.
4. Electronic Instrumentation and Measurements, David A Bell, PHI / Pearson Education

CS-203N **Data Structure** **Credits4(3-1-0)**

UNIT 1: Basic Concepts & Notation: Data structure concepts and its types, Linear and Non-Linear data structures. Basics of Complexity and their types;

Array as an ADT: one dimensional array, two dimensional array and multidimensional array.

UNIT 2: Stacks: Definition and examples, primitive operations, Array representation of stacks, Example: Infix, Postfix, and Prefix: Basic definitions and Examples, Evaluating a postfix expression, Converting an expression from infix to postfix, Recursion - tower of Hanoi.

UNIT 3: Queues and Linked Lists: The Queue and its sequential Representation, Priority Queue; Linked Lists: Inserting and removing nodes from the list, Linked list as a data Structure, Other List structures: Circular Lists, Doubly Linked Lists.

UNIT 4: Trees: Binary Trees, Operation on Binary Trees, Traversal: In order, Preorder, Post order; Application Binary Tree. Expression Tree; Binary Tree Representation: Array representation, Link List representation; Example: Huffman Algorithm.
Binary search tree: inserting into Binary Search Tree (BST), Deleting from a BST, Balanced (AVL) Tree, Search Tree and B-Tree.

UNIT5: **Search Methods:** Basic search Techniques: Sequential Searching, Indexed Sequential Search, B++tree.

Sorting: Selection sort, bubble sort, insertion sort, quick sort and Merge sort, Heap sort and their time complexity.
Hashing: Hash function: Division Method, Mid-square Method, Folding Method, hash table, collision resolution: linear probing, chaining.

UNIT 6: Graphs and Their Applications: Introduction, Representation of graphs- Adjacency matrix and adjacency list, Wars hall‘s algorithm, Dijkstra‘s algorithm, Graph traversal: Depth first search, Breadth First search.

Text Books

1. Data Structures using C/C++: Tennenbaum, PHI
2. Introduction to Data tructures: Schaum Series. By Lipetu, Mac Graw Hill
3. Data Structures by Augenstein & Tenenbaum.

Subject: Electromagnetic Theory **Code: EC-203T** **Credits: 4**

Branches: EC, EI **SEM: III Semester** **L P T: 3 1 0**

Unit 1:- Elements of Vector Calculus: Co-ordinate system, differential volume, surface 7 line elements, gradient, divergence, curl and del-operator.

Unit 2:- Review of static electric field: Coulomb's Law, Electric field-intensity, electric flux and flux density, Gauss's Law, conservation properties of electrostatic field, electric potential, Energy and work in electric field, Current, current density and conductor capacitance & dielectric materials, polarization relative permittivity, multiple dielectric capacitors, energy stored in a capacitor.

Unit 3:- Review of magnetic field: Faraday's law, Lenz's law, bio-savart law, Ampere's law, Magnetic flux density, Vector magnetic potential, stokes theorem, magnetic force, Displacement current, self, internal and mutual inductance.

Unit 4:- Maxwell's Laplace's and Poisson's Equation and Boundary condition: Introduction and its applications.

Unit 5:- Electromagnetic waves: Introduction and solutions for partially-conducting perfect dielectric and good conductor mediums, skin depth, interface conditions ate normal incidence, oblique incidence and Snell's laws, perpendicular and parallel polarization, standing wave, power and the pointing vectors.

Unit 6:- Transmission Lines: Wave equation for ideal transmission line, characteristics impedence, propagation & reflection, VSWR, impedance, transformation, smith chart, parallel and co-axial transmission lines, Impedance Matching, single and double stub matching, impedance matching single and double slub matching, impedance measurement, Motion of charged particles in an Electric & Magnetic Field.

REFERENCES

1. Electromagnetic; john D. Kraus TMH
2. Schaum's outline series on Electromagnetic; Joseph A. Edinister , Tata McGraw hill inc.
3. Engineering Electromagnetics; Haytt, Kemmerly.
4. Electromagnetic wave and radiating system; John, Balmin
5. Engineering Electromagnetic; William Haytt

Subject: Network Analysis & Synthesis Code: EE-201T Credits: 4

Branches: EC, EI, EE SEM: III Semester L T P: 3 1 0

Unit 1:- Graph Theory and Network Equation: Introduction, Graph of a Network, Tree, Co-tree; Incidence Matrix, Cut set and Tie-set matrices, Network Equilibrium Equations, Analysis of Network, Duality and Dual Network.

Unit 2:- Fourier Series: Trigonometric and Exponential forms of Non-Sinusoidal functions, Evaluation of Fourier coefficients, Waveform Symmetry, Effective value of a Non-Sinusoidal Wave, Fourier Transform.

Unit 3:- Laplace Transform: Laplace Transform and its applications, Laplace Transformation, basic theorems, Gating function, Laplace Transform of periodic functions, initial value and final value theorems, Solution of network problems.

Unit 4:- Two Port Networks: Open Circuit, Short Circuit parameters, Hybrid and inverse hybrid parameters and interrelation between them, interconnection of two port networks, input output and image impedances.

Unit 5:- Network Function: Network function, Poles and Zeros, necessary conditions for driving points and transfer functions, application of network analysis, Driving network functions, Time domain behaviour from pole zero plot.

Unit 6:- Passive network synthesis: Hurwitz polynomial, positive real functions, LC, RL, R two terminal syntheses.

Unit 7:- Attenuators: Lattice, T-type, π-type, Bridge-T, L-type, Ladder type, balanced type, insertion loss.

Unit 8:- Filters: Filter fundamentals, Constant-k low pairs, Constant-k high pass and constant-k band pass. Band elimination filters m-derived T-section, termination with m-derived half sections, m-derived band pass.

BOOKS

1. Network Analysis by D. Roy Chaudhary, New stage publication.

2. Network Analysis by Van Valkenberg, PHI.

Subject: Engineering Mathematics-III **Code: MA-201T** **Credits: 4**

Branches: All Branches **SEM: III Semester** **L T P: 3 1 0**

UNIT:1 Ordinary Differential Equations:

First order equations (linear and non-linear). Linear equations of second and higher orders with constant and variable coefficients. Solution of second order equations by removing first derivative, changing of dependent and independent variables and method of variation of parameters.

UNIT:2 Special Functions & Partial Diff. Eqns:

Power Series solutions of second order equations by frobenious method. Legendre polynomials and Bessel‟s functions of first kind and their properties. Method of separation of variable for heat, wave and Laplace equations: Their solutions and related applications.

UNIT:3 Integral Transforms:

Laplace transform, existence theorem, Laplace transform of derivatives and integrals, Laplace transform of special functions. Inverse Laplace transform, convolution theorem. Applications of Laplace transform and its inverse to solve ordinary and partial differential equations.

Introduction to Fourier transforms. Fourier series, half range sine and cosine series, related applications.

References:

1. J.N.Sharma: Differential Equations, Krishna Prakashan Media (P) Ltd., Meerut.
2. B.V.Raman: higher Engineering Mathematics, Tata McGraw Hill Co., Ltd., 2008.
3. R.K.Jain& S.R.K. Iyenger: Advance Engineering Mathematics, Narosa Publishing House, 2002.
4. A.R.Vashistha: Integral Transforms KrishanPrakashan Media (P) Ltd., Meerut.
5. G.F.Simmons: Differential Equations, Tata McGraw Hill Co. Ltd., 1981.

Subject: **Human Values and Professional Ethics – I** *Code:* **HU-203T** *Credits: 2*

Branches: All Branches *SEM: III Semester* *L T P: 2 0 0*

1.Sensitization of student towards issues in all dimensions of life There are a whole range of issues which one faces in life towards which the young students are generally unfamiliar and therefore insensitive. Almost all the concerns - environmental, societal, familial or personal, are result of human action. Sensitization towards them therefore is an important step.

2.Inculcation of Self Reflection.

Human action is governed by various internal factors primarily the beliefs one holds, and therefore looking-in' becomes essential, to see what beliefs one is holding, whether they are really true or not, if they are not true, then what could be the process to get the "right" belief and then further validate it. Most of the young people are somehow trained to look only ―outside‖. The motivation and the skill to look inside are missing. Inculcation of self reflection in students will result in them becoming more responsible, honest and trustworthy. Lack of such qualities in individuals is major concern of organizations, institutions and society in general.

3.Understanding (Clarity) of Human Relationships and Family.

It will try to show that relationships and material prosperity are the basic desire for a human being. Two global problems which we face today are war (including terrorism) and imbalance in nature (global warming). If we look at reasons for war, the fundamental cause is: Human Being is in opposition to other Human Being. Therefore one is willing (or gets compelled) to exploit others. This is due to lack of understanding of relationships.

4.Exposure to Issues in Society and nature (larger manmade systems and Nature)

To show that fundamental reasons for imbalance in nature are pollution and resource depletion. Both these aspects are result of consumerist model of development.

To show how harmony can be ensured at following levels individual, human-human relationships, larger society, Various social systems like education system, economic system, political system and others, and rest of the nature.

5.Development of Commitment and Courage to Act.

If the understanding is right, then the actions become right. Commitment and courage to act are considered consequences of right understanding in an individual. In the course, an attempt will be made to build right understanding in the individual, and then further plan of actions will also be discussed in order to implement the understanding in various life situations in the right manner.

Subject: Analog Electronics Lab **Code: EI-201P** **Credits: 2**
Branches: EI, CSIT **Semester: III** **LTP: 003**

Course Outcomes: At end of the course, students will be able to:

CO1: Analyze the circuit design process and simulate the common base, common emitter and common collector amplifier circuits
CO2: Analyze and select analog devices using circuit specifications based on circuit requirements
CO3: To study input output characteristic of transistors, filter and rectifier circuits.
CO4: Study effect of biasing and plot the characteristic

List of Experiments

(1) To measure, plot and study the V-I characteristics of semiconductor diode:

(a) Forward bias (b) Reverse bias

(2) To draw the input and output waveforms for the following Rectifier Circuits:

(a) Half-Wave Rectifier Circuit.

(b) Full-Wave Rectifier Circuit.

(c) Filter Circuits.

(3) To study the output characteristics of a NPN Transistor.

(4) To study the output characteristics of a PNP Transistor.

(5) To study the characteristics of N-channel FET.

Note:-
(1) In addition, Department may include more experiments based on the future requirement.

Subject: Electronic Measurement & Instrumentation Lab **Code: EI-203P,** **Credits: 2**

Branches: EI **Sem: III Sem.** **L T P: 0 0 3**

Course Outcomes: Upon a successful completion of this course, the student will be able:

CO1: To analyze different measurement devices and its working principles.

CO2: To apply the concepts for the measurement of different parameters such as current, voltage, resistance, inductance, capacitance etc.

CO3: To apply the concept of calibration of a measuring instrument.

List of Experiments:

1. Instrument workshop- Observe the construction of PMMC, Dynamometer, Electrothermal and Rectifier type of instruments, Oscilloscope and Digital multimeter.
2. Calibrate moving iron type ammeter/voltmeter by potentiometer.
3. Measurement of resistance using Kelvin's double bridge.
4. Measurement of power in three phase circuits.
5. Measurement of frequency by Wien's Bridge.
6. Measurement of Inductance by Anderson's Bridge.
7. Measurement of capacitance by Schering Bridge.
8. Measurement of R,L,C & Q using LCR Q meter.

SEMESTER-4

Subject: Linear Integrated Circuits **Subject Code: EI-202T** **Course credit: 04**
Sem.: IV **Branch: EI, EC, EE** **L T P: 3 0 1 0**

Course Outcomes: At end of the course, students will be able to:

CO-1: Understand the concepts of various amplifiers, active filters, PLL and Oscillators.
CO-2: Analyze the various electrical parameters of Op-Amp using negative feedback, active filters circuits and oscillators.
CO-3: Design and implementation of op-amp based circuits and active filters.
CO-4: Perform experiments to obtain output of circuits based on 741IC op-amp and presents the results.

Course Pre-requisites: Students should have the basic fundamentals and applicationsof Basics Electronics Engineering, Analog Electronics and Network Analysis.

UNIT -1 : Differential Amplifier-Introduction, Differential amplifier circuit configurations, D.C and A.C analysis of dual input balanced output differential amplifier, Constant current bias circuit, Transistor current mirror and active loads, Level translator stages of op-amp.

UNIT- 2 : Operational Amplifier and its Characteristics Introduction, Block diagram representation of typical op-amp; Electrical parameters like-Input offset voltage, Input offset current, Input bias current, CMRR, Slew rate etc.; The ideal Op-Amp, Equivalent circuit of an Op-Amp, Voltage transfer curve, Open-loop Op-Amp Configurations.

UNIT - 3 : Negative Feedback and Frequency Response of Op-Amp-Block diagram representation of Feedback configurations, Voltage series and Voltage shunt feedback amplifier, Concentrating on Voltage gain, Input and Output resistances, Bandwidth and feedback expressions, voltage follower circuits. Frequency response, Compensating networks, High frequency op-amp equivalent circuit, Open-loop voltage gain as a function of frequency.

UNIT - 4 : Applications of Op-Amp- Summing amplifier, Scaling and averaging amplifier, Instrumentation amplifier, Integrator, Differentiator, Differential amplifier realization using one and two op-amp.

Active Filters, Advantages of active filters over passive filters, First order low pass Butterworth filter design, Second order low pass Butterworth filter, First and second order high pass Butterworth filters, Band pass and band reject filters, All pass filters.

UNIT -5 : Oscillators and Signal Generators- Oscillator Principles, Oscillator Types, Phase Shift Oscillator, Wien Bridge Oscillator, Voltage controlled Oscillator.Basic comparator, Zero crossing detector, Schmitt Trigger, Square wave generator, Triangular wave generator, Introduction to 555 Timer, Monostable and Astable operation of 555 Timer, Phase locked loop.

Text Books:

1. Op-amps and Linear Integrated Circuits by Ramakant A. Gayakwad, PHI, India.

2. Operational amplifiers and linear Integrated circuits by Coughlin and Driscoll-PHI, India.

3. Linear Integrated Circuits by D. Roy Chaudhary, Shail Jain, New Age International (P) Ltd, India.

Subject: Signals and Systems **Code: EC-202 T** **Credits: 4**

Branches: EC, EI **SEM: IV Semester** **L P T: 3 1 0**

Unit 1:- Signals: Introduction, classification of signals, signal energy, signal power, transformations of independent variable, unit step function, unit impulse function, Sampling function, exponential function, even and odd functions.

Systems: Introduction, classification of systems, continuous time LTI systems, convolution integral: Graphical & analytical methods of convolution, Signal comparison: Orthogonality, correlation.

Unit 2:- Continuous time signal analysis:

Fourier Series: Introduction, Fourier series representation of continuous time periodic signals, convergence of Fourier series, properties of continuous time Fourier series.

Fourier Transform: Introduction, representation of continuous time aperiodic signals, properties of Fourier transform, ideal and practical filters, Energy and Power spectral density of signal.

Unit 3:- The Laplace transforms: Introduction, region of convergence, the inverse Laplace transform, properties of Laplace transform, unilateral Laplace transform.

Unit 4:- Sampling: Introduction, sampling theorem, Nyquist rate & Nyquist interval, Recovery from sampled signal, Aliasing, Aperture effect, ideal sampling, natural sampling and flat top sampling.

Unit 5:- Random variables: Introduction, Discrete random variables: conditional probabilities, cumulative distribution function (CDF), Continuous random variables: Probability density function (PDF), Gaussian PDF, Rayleigh density function.

REFERENCES BOOKS

1. Signals and Systems by Alan V. Oppenheim, Alan S. Willsky.
2. Linear Systems and Signals by B.P. lathi
3. Modern Digital and Analog Communication Systems by B.P Lathi
4. Signals and Systems by Simon Haykins
5. Digital communication systems by Taub& Schilling

Subject: Digital Electronic Circuits	**Code: EI-204T**	**Credits: 4**
Branches: EI	**SEM: IV Semester**	**L T P: 3 1 0**

Course outcomes: At the end of the course, the student will have the ability to:

CO1: understand the Boolean algebra and minimization of functions.

CO2: understand the different logic families and their working principle.

CO3: designing the combinational logic circuit with different digital gates.

CO4: designing the Sequential logic circuit with different digital gates.

CO5: designing the different register and counter.

Unit 1:- Basic Concept of Boolean Algebra: Different rules for arithmetic operation, minimization of switching functions with theorem and K-Map up to five variables, reduction techniques, prime and essential implicants, concepts of don‟t care condition, min. and max. Terms SOP, POS variables, entered mapping VEM, plotting & reading theory, QM methods.

Unit 2:- Digital Logic Families: TTL, RTL, DTL, ECL, Totem pole and open collector concept, comparison of logic families.

Unit 3:- Combinational Logic Circuits: Design of combinational logic circuit using different chips/gates. Code converter: BCD-gray, Excess-3, encoders, decoders, multiplexers, de- multiplexers, 7-segment decoder/driver, ROM, PLA, full and half adder/subtractor, parallel adder/subtractor, look ahead carry generator, parity bit checker/generator, Implementation of boolean function with mux and decoder.

Unit 4:- Sequential Logic Circuits: Concept of memory storage, Latches, Flip Flops, JK, SR, T, D, Master slave, characteristic table truth table, concept of flip-flop, conversion techniques, race around condition, Triggering of flip flop, classification of sequential machines, oscillators, analysis of synchronous sequential circuits, design steps for sequential circuits, state diagram, state reduction minimization of the next state decoder, o/p decoder designing.

Unit 5:- Design of Single mode and Multimode Counter: Registers, Shift register, Shift register sequences, Ripple & Ring Counter using shift register and memories type of register universal and directional.

REFERENCES

1. Digital Logic and Computer Design by M. Morris Mano (PHI)
2. Digital Principles and Applications by Malvino & Leach, McGraw-Hill Book Co.
3. Fundamental of Digital Electronics by T.C. Bartee, TMH

Code: CS-204N **Computer Organization** **Credits: 4(3-1-0)**
Branches: EE, EC, EI ,CSIT

1. **Introduction: -** Review of digital logic gates, Design of adder and subtractor using gates &K-MAP.

2. **Arithmetic for Computer:-** Introduction to number system, negative numbers, Arithmetic Algorithms (addition, subtraction, Booth Multiplication), IEEE standard for Floating point numbers

3. **Processor Design:-** Von-Neumann Structure, Processor Organization: General register organization, Stack organization, Addressing modes, instruction types, RISC and CISC.

4. **Control Design: -** Control memory address sequencing, micro instruction interpretation, CPU control unit, Hardwired & Micro Programmed Control Unit, basic concepts of micro programmed control, micro program sequencer for a control memory, micro instruction formats.

5. **Memory Organization:-** Characteristics of memory systems, Memory Hierarchy, Virtual Memory, Dynamic Address Translation Scheme addressing scheme for main memory, TLB, characteristics and principles of cache memory, elements of cache design, Cache memory organization, Block replacement policies and mapping techniques.

6. **System Organization: -** Synchronous & asynchronous communication, standard communication interfaces, Bus arbitration (Serial and Parallel procedure), Modes of transfer, Programmed I/O (IO addressing, IO instruction), DMA (Cycle Stealing Concept, DMA Controller and DMA Transfer), interrupt driven I/O: Interrupt processing, interrupt hardware, types of interrupts and exceptions. **REFERENCES**

1. Computer Architecture and Organization, By John P. Hayes, TMH.
2. Computer organization and design, by John L. Hennessy & David A. Petterson, organ Kaufman.
3. Computer System Architecture, by M. Morris Mano, PHI
4. Computer Organization, Stallings(PHI)
5. Structured Computer Organization, Tannenbaum (PHI)

Subject: Element of Electrical Machines **Code: EE-202T** **Credits: 4**

Branches: EC, EI, and ME **SEM: IV Semester** **L T P: 3 1 0**

UNIT-I:

TRANSFORMER:

Principle & construction of single phase transformer, EMF equation, phasor diagram, equivalent circuit diagram, SC test, OC test, efficiency.

UNIT-II:

DC MACHINES:

Principle & construction of DC generator, types of windings, types of DC generator, OCC, load characteristics, principle & construction of DC motor, back EMF, torque equation, load characteristics.

UNIT-III:

INDUCTION MOTORS:

Principle and construction of 3-phase induction motor, concept of slip, phasor diagram. Equivalent circuit diagram, T-S characteristics.

UNIT-IV:

SYNCHRONOUS MACHINES:

Principle and construction of synchronous machines, EMF equation, OCC & SCC, synchronous impedence, principle of synchronous motor, V-curve, synchronous condenser.

Text Books:

Electrical Technology by B.L.Theraja

P.S.Bimbhra, “Electrical Machinery”, Khanna Publisher

Subject: Human Values and Professional Ethics – II Code: HU-204T Credits: 2

Branches: All Branches SEM: IV Semester *L T P*: 2 0 0

Unit 1: Understanding Education:

Dialogues on education, to reflect over meaning and significance of education. History and philosophy of education, Search for truth and understanding of cosmos and society. - Pre industrialization and post industrialization. Modern education, a process of alienation from self and society. - Critique of education from the Western and Indian perspectives

Unit 2: Indian Perspectives of Education:

Notions of Vidya, Shiksha, Talim and Education. Upanishads and Raj-Yoga for understanding and educating the Self. - Spirit of enquiry of the Upanishads and the path of Ashtanga Yoga. Role of education in transforming social consciousness. Alternatives in education in 19th-20th century India.

Unit 3: Harmony in nature:

Four orders of nature- material order, plant order, animal order and human order. Salient features of each. Human being as cause of imbalance in nature. (Film "Home" can be used.). Human being as cause of imbalance in nature. Depletion of resources- water, food, mineral resources. Pollution, Role of technology, Mutual enrichment not just recycling. Prosperity arising out of material goods and understanding of self. Seperation of needs of the self and needs of the body. Right utilization of resources. Understanding the purpose they try to fulfil.

Unit 4: Recapitulation on society:

Five major dimensions of human society. Fulfilment of the individual as major goal. Justice in society. Equality in human relationships as naturally acceptable. Establishment of society with abhaya (absence of fear).

Unit 5: Ethics:

Ethical Human Conduct, Value, Character and Netikataa. Professional ethics, conduct as an engineer or scientist. Holistic human being through holistic education in just order.

Subject: Linear Integrated Circuit Lab	**Code: EI-202P**	**Credits: 2**
ranches: EC, EI and EE	**SEM: IV**	**L T P:0 0 3**

Course outcomes: At the end of the Lab, student will be able to:

CO1: Work in a team to demonstrate various application of IC 741 OP-AMP.

CO2: Investigate the response of a given op-amp (IC 741) based circuits for standard input signals.

CO3: Present the observations made by their team in record while avoiding plagiarism

List of Experiments

1. To perform the op-amp based Inverting amplifier.
2. To perform the op-amp based Non-Inverting Amplifier.
3. To perform the op-amp based Voltage follower amplifier.
4. To perform the op-amp based Adder.
5. To perform the op-amp based Subtractor.
6. To perform the op-amp based Integrator circuit.
7. To perform the op-amp based Differentiator circuit
8. To perform the op-amp based Comparator circuit.

Subject: Digital Electronic Circuit Lab	**Code: EI-204P**	**Credits: 2**
Branches: EI	**SEM: IV Semester**	**L T P: 0 0 3**

Course outcomes: At the end of the Lab, the student will have the ability to:

CO1: Design the Boolean algebra and minimization of functions.

CO2: Design the different logic families and their working principle.

CO3: Design the combinational logic circuit with Binary and BCD Adder/ Subtractor, multiplexers/Demultiplexers.

CO4: Designing the Sequential logic circuit with different digital gates.

List of Experiments

1. To verify the truth table of logic gates.
2. Realization of Boolean functions using various logic gate ICs.
3. To study application of IC 7483 binary addition/subtraction and BCD addition/subtraction.
4. To study the functions of multiplexers, Demultiplexers and decoder.
5. To study the various types of flip-flops using NAND gates.

Note:-

(1) In addition, Department may include more experiments based on the future requirement.

(2) **The details of other lab experiments can be taken from concerned departments.**

SEMESTER -5

Subject: Analog Communication System **Code: EC-301T** **Credits: 4**

Branches: EC, EI **SEM: V Semester** **L P T: 3 1 0**

Unit 1:- Introduction to Analog communication

Review of Signals and Systems: Baseband Signals, Band pass Signals, LPF,HPF, BPF. Fourier series representation of periodic signals. Frequency spectrum of sinusoidal signals. Need for modulation, Block diagram of Analog Communication system, Frequency Division Multiplexing. Definitions of Amplitude Modulation, Frequency Modulation and Phase Modulation.

Unit 2:-Amplitude Modulation

DSBFC: Time domain and frequency domain description single tone modulation, power relations in AM waves, Generation of AM waves: square law Modulator, Switching modulator. Detection of AM Waves: Square law detector, Envelope detector. Double side band suppressed carrier modulation: Time domain and Frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves. Single side band Suppressed carrier modulation: Introduction to Hilbert Transform, Frequency domain description, Frequency discrimination method for generation of AM SSB Modulated Wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves. Introduction to VSB. Comparison of AM Techniques, Applications of different AM Systems.

Unit 3:- Angle Modulation

Basic concepts, Phase Modulation, Frequency Modulation, and Relation between them. Spectrum Analysis of Sinusoidal FM Wave (Single Tone): Narrow band FM, Wide band FM, Transmission bandwidth of FM Wave, Comparison of FM & AM. Generation of FM Waves: Direct Method: Varactor Diode, Reactance Modulator. Indirect Method: Armstrong Method, Commercial FM transmitter block diagram and explanation of each block. Detection of FM Waves: Balanced Frequency discriminator, Phase locked loop, Foster Seeley Discriminator, Ratio detector.

Unit 4:- Receivers and Noise

Radio Receiver: Characteristics of receiver, Types of Receiver: Tuned radio frequency receiver, Super-heterodyne receiver. Noise: Sources of Noise, Models of Noise: AWGN, Impulse Noise. Noise in AM Receivers: using coherent detection, using Envelope detection. Noise in FM receivers. Pre-emphasis and De-emphasis.

Unit 5:- Pulse Modulation

Sampling Process, Pulse Amplitude modulation, Pulse Width Modulation and Pulse Position Modulation. Pulse Code Modulation, Differential Pulse code Modulation. Delta Modulation and Adaptive Delta Modulation. Time Division Multiplexing.

Text Book:

1. **George Kennedy** and **Bernard Davis, "Electronic Communication Systems",** TMH Edu Pvt. Ltd.
2. **Simon Haykin, "Communication Systems"**John Wiley& Sons Inc**.**
3. **Herbert Taub**and **Donald L. Schilling, "Principles of Communication Systems",**Tata McGraw Hill Publication.

Subject: Microprocessor & Their Applications **Code: EI-301T** **Credits: 4**
Branches: EC, EI, EE and CSIT **SEM: V Semester** **L T P: 3 1 0**

Course outcomes: At the end of the course, the student will have the ability to:

CO1: Describe the general architecture of 8085 microprocessor system and its memory organization.
CO2: Explore and categorize the instruction sets; and assembly language programming of 8085 by the use of different instructions.
CO3: Differentiate between various types of Interrupts and processes.
CO4: Understand and realize the Interfacing of various I/O devices with 8085 microprocessor and their use in industrial and non-industrial applications.
CO5: Understand the advance microprocessor and different communication standards.

Unit 1:- General features and Architecture of 8085 Microprocessor: Microprocessor architecture and its operation, Memory, Memory Organisation, Memory Mapped I/O mapped I/O Scheme, 8085 Microprocessor pin configuration, Internal architecture and its operation, Control signals, Flag register, Timing control unit, Decoding, Execution of an instructions and memory interfacing. Timing instruction cycle, Opcode Fetch, memory and input output read/write cycle of an instruction set.

Unit 2:- Programming Techniques of 8085 Microprocessor: How to write and execute a simple program timing and execution of the instructions, Addressing modes, programming techniques, programming technique for looping, counting and indexing, counter programs and timing delay program and timing calculations, stack operation and subroutine programs.

Unit 3:- Interrupts of 8085 Microprocessor: Hardware and software interrupts, interrupts call locations, RIM, SIM, RST 7.5, 6.5 and 5.5.

Unit 4:- Programmable interfaces of 8085 microprocessor and its Applications: Programmable peripheral interface 8255, programmable interval timer 8253/8254, DMA controller 8257, and interrupt controller 8259, Delay subroutine, seven segment display, water level indicator, microprocessor based traffic control.

Unit 5:- Introduction to 8086, other advance microprocessors and various IEEE communication standards: Internal Architecture organisation, Maximum mode and minimum mode, instruction set, initialization instructions, constructing the machine codes for 8086 instruction. Assembler directives, addressing modes, procedure and macros, re- entrant and recursive procedures, 8087 Coprocessor: Features and internal organization, Features and architecture of 80186, 80286, 80386 & 80486, RS-232, RS-442, IEEE-488.

REFERENCE BOOKS:

1. Microprocessor Architecture programming and application with 8085/8080 by Ramesh S. Gaonkar.
2. Fundamentals of Microprocessor & Microcontroller by B. Ram.
3. Microprocessor and interfacing Programming and Hardware by Douglas V. Hall.
4. The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386 80486, Pentium and Pentium pro-processor, Architecture, Programming and interfacing by Berry b. Bery.

Subject: Sensors and Transducer	**Code: EI-303T**	**Credits: 4**
Branches: EI	**Semester: V**	**L T P: 3 1 0**

Course outcomes: At the end of the course, the student will have the ability to:

CO1: understand the different types of transducers and its Characteristics.

CO2: understand the working principle of Miscellaneous Transducers.

CO3: understand the requirement and concept of Signal Conditioning and Data Acquisition Systems.

CO4: understand the different types of Data Transmission & Telemetry system with data Display and Recorders

Unit 1:- Introduction of Transducer: Definition, Transducers, Sensors and Actuators, transducer as a function of instrumentation system, Classification of transducers-active and passive, primary and secondary, Inverse Transducers, electrical transducers and their advantages, typical example of transducer element.

Characteristics and selection of transducers:-Input characteristics-type of input and operating range, transfer characteristics-transfer function, Output characteristics-type of electrical output, output impedance and useful range, selection criteria of transducers, typical specification of a transducer system.

Unit 2:- Resistive, Inductive and Capacitive Transducers: Resistive Transducers- Linear and nonlinear potentiometers, materials used, advantages and disadvantages of resistive transducers; Strain gauge principle and types-bonded, unbounded, semiconductor strain gauge. Inductance Transducer- Introduction, principle of working, change of self induction, change of mutual induction and production of eddy currents. LVDT-construction, principle, advantages, disadvantages and uses. Capacitive Transducer- Introduction, principle of working, change in area of plates, change in distance between two plates and variation of two plates. Nonlinearity in capacitive transducers and differential arrangements, frequency response, advantages, disadvantages and uses.

Unit 3:- Miscellaneous Transducers: Digital Transducer- Introduction, types of digital encoding transducers, classification of encoders-Tachometer, incremental and absolute. Piezoelectric transducer- Principle, operation, equivalent circuit, loading effect, frequency response and uses. Hall Effect Transducer- Construction, Principle and uses. Optoelectronic Transducer- Photovoltaic cell and its application, photoconductive cell and semiconducting photodiode.

Unit 4:- Signal Conditioning and Data Acquisition Systems: Types of signal conditioning- DC and AC, Analog and Digital data acquisition system, single and multi-channel data acquisition systems. Components of data acquisition systems use of data acquisition systems.

Unit 5:- Data Transmission & Telemetry, Display and Recorders: Introduction of telemetry, general telemetry system, Landline Telemetry-voltage telemetry system, current telemetry system, position telemetry system and feedback telemetry system; RF (Radio frequency) Telemetry System-general modulation methods (AM, FM) comparison between AM & FM, Pulse modulation, Pulse amplitude modulation and pulse code modulation telemetry systems, Transmission channel and media-wire line and radio link. Analog displays & recorders, digital recorders, digital displays, digital printers, barcode.

Reference Books

1. Electrical & Electronic Measurement & Instrumentation by A.K. Swahney
2. Telemetry Principle, D Patranabis; TMH Ed-1, 1999

Subject: Industrial Instrumentation **Subject Code: EI-309T** **Credits: 04**
Session: 2019-20 **Semesters: VII (For EI Engg)** **L TP: 3 1 0**

Course Outcomes: At end of the course, students will be able to:

CO1: acquire familiarity about various industrial instrumentation types, their parameters and different types of measurement techniques.

CO2: understand the principles of industrial parameter standards and its calibration methodology.

CO3: acquire extensive knowledge about pressure and temperature measurement, thermocouples and pyrometry techniques.

Unit-1 Pressure Measurement- Introduction, Absolute pressure, Gauge pressure, Moderate pressure measurement - manometers, Elastic transducers-elastic elements, Bourdon pressure gauge, LVDT type pressure transducer, Capacitive type pressure transducer; High pressure measurement, Low pressure (vacuum) measurement: Mc-leod gage, Knudsen gage, Thermal conductivity gages, Resistance thermometer, Pirani gage, Thermistor gage; Ionization gage.

Unit-2 Force, Torque and Shaft Power Measurement- Introduction, Principle of measurement of Force, Basic methods of force measurement –Balance, Hydraulic load cell, Pneumatic load cell, Elastic force devices, Characteristics of elastic force transducer-Bonded strain gauge, Linear variable differential transformer (LVDT) transducer, Piezoelectric transducer; Torque measurement on rotating shafts, Shaft power measurement (dynamometers).

Unit-3 Temperature Measurement- Introduction, Temperature scales, Non-electrical methods (Thermal expansion methods)-Bimetallic thermometers, Liquid-in-glass thermometers; Electrical methods-Electrical resistance thermometers: Metallic resistance thermometer or Resistance temperature detectors (RTDs), Semiconductor resistance sensors (Thermistors), Thermo-electric Sensors (Thermocouple): Law of Intermediate Temperatures, Law of Intermediate Metals, Thermocouple Materials; Radiation Methods (Pyrometry)– Radiation fundamentals, Total Radiation Pyrometer, Selective Radiation Pyrometer.

Unit-4 Flow Measurement- Introduction, Variable head meters (obstruction flow meters)-Venturi meter, Orifice meter, Nozzle meter; Variable area meters-Rotameter, Pitot static tube, Target flow meter, Turbine flow meter, Vortex shedding flow meter; Special methods- Ultrasonic flow meter, Electromagnetic flow meter, Hot wire and hot film anemometer, Laser Doppler Anemometer.

Unit-5 Level Measurement- Introduction, Methods of Liquid Level Measurement, Direct Methods-Float type level indicator, Displacer level detectors; Indirect Methods-Hydrostatic pressure type, liquid purge system; Electrical Methods-Capacitance level indicator, Radiation level detector, Optical level detectors, Ultrasonic level detectors.

Text Books:

1. Instrumentation, Measurement and Analysis, B.C. Nakra& K.K. Chaudhry, TataMcGraw Hill Education Private Limited, Second Edition, New Delhi.
2. Measurement Systems Application and Design, Ernest O Doeblin&Dhanesh N Manik, Tata McGraw Hill Education Private Limited, Fifth Edition, New Delhi.
3. Industrial Instrumentation and Control, S.K. Singh, Tata McGraw Hill EducationPrivate Limited, Third Edition, New Delhi.

Subject: Control Systems ***Code: EE-301T*** ***Credits: 4***

Branches: EI, EC and EE ***SEM: V Semester*** ***L T P: 3 1 0***

Unit 1:- Introduction:- Basic components of a control system, open loop & closed loop systems.

Unit 2:- Feedback Control System:- Principle of feedback, Transfer function, block Diagram and its Reduction Techniques, Signal flow graph, Effect of feedback on parameters variations and disturbance signal.

Unit 3:- Mathematical Modelling of physical System:- Modelling of translation and rotation mechanical systems, electrical systems, transfer function of these systems.

Unit 4:- Time Response Analysis:- Time response of first & second order systems, steady-state errors, and error constant, Time domain specifications of second order systems. Basic concepts of P, PD, PI, PID controllers.

Unit 5:- Stability:- Basic concepts, BIBO stability, asymptotic stability, Routh-Hurwitz Criterion.

Unit 6:- Root Locus Techniques: - Basic properties & construction of root loci.

Unit 7:- Frequency domain specification:- Frequency domain specification, Bode plots, Polar plots, Nyquist stability criterion, Gain & Phase Margins, M & N-circles, Nichols chart.

Unit 8:- Compensator Design:- Basic concepts of lag, lead & lag-lead compensators.

BOOKS

1. Control System Engineering by Nagrath & Gopal (New Age)
2. Modern Control Engineering by K. Ogata (PHI)
3. Automatic Control System by B.C. Kuo, PHI

Subject: Power Electronics ***Code: EE-303T*** ***Credits: 4***

Branches: EI, EC and EE ***SEM: V Semester*** ***L T P: 3 1 0***

Unit 1:- Introduction:- Solid State Power Devices, Construction & Characteristics of Power Diode, Fast recovery Diode, Transistor, MOSFET, IGBT, GTO, TRIAC and DIAC, Dynamic characteristics of SCR, Gate Characteristics, Ratings, Mountings, Protection, Series & Parallel Connections, Snubber Circuit.

Unit 2:- Firing Circuit & Commutation Techniques:- R.R-C, UJT & Static Firing Circuits, Commutation Techniques-Line Commutation, Resonance Communication, External Pulse Commutation; Current & Voltage Commutation-Auxiliary & Complementary.

Unit 3:- AC Regulator:- Single Phase AC Regulator, Synchronous Tap Changer, Multistage Regulators, 3-Phase AC Regulator and speed control of AC Motors using ac regulator.

Unit 4:- AC to DC Converters:- Single Pulse, Mid-point & Bridge type two-pulse converters, Semi converter, 3-phase mid-point & Bridge converters, Single-phase & 3-phase Dual-converters-circulating & Non-Circulating Current Schemes, PWM Techniques, Speed Control of D.C. Motor using Converters.

Unit 5:- DC Choppers:- Step-down & Step-up Choppers, Single, Double 7 Four-Quadrant Choppers, Control Strategies, Voltage & Current Commutated Choppers, Multiphase Chopper, Speed Control of DC Motor using Chopper.

Unit 6:- Inverters:- Mid-point & Bridge type 1-inverter, 3-inverter-120^0& 180^0 conduction schemes, Modified McMurray inverter, McMurray Bedford inverter, Morgan inverter, Current Source inverter, CSI vs. PWM techniques, speed control of AC motors using inverters.

Unit 7:- Cyclo-converters:- 1-&3-Cyclo-converters, mid-point & bridge type cycle-converters, advantage of cyclo-converters.

BOOKS

1. Power Electronics Circuits, Devices & Application by M. Rashid, PHI
2. Power Electronics & Introduction to Drives by A.K. Gupta & L.P. Singh, Dhanpat Rai.
3. Power Electronics by P.S. Sen, TMH

Subject: Analog Communication Lab ***Code: EC-301P*** ***Credits: 2***

Branches: EC, EI ***SEM: V Semester*** ***L T P: 003***

1. To study DSB/ SSB amplitude modulation & determine its modulation factor & power in side bands.
2. To study amplitude demodulation by linear diode detector
3. To study frequency modulation and determine its modulation factor
4. To study sampling and reconstruction of Pulse Amplitude modulation system.
5. To study Pulse Width Modulation and Pulse Position Modulation.
6. To construct a triangular wave with the help of Fundamental Frequency and its Harmonic component.
7. To construct a Square wave with the help of Fundamental Frequency and its Harmonic component.
8. Study of Pulse code modulation (PCM) and its demodulation using Bread Board.
9. Study of Amplitude shift keying modulator and demodulator.
10. Study of Frequency shift keying modulator and demodulator.
11. Study of Phase shift keying modulator and demodulator.

Note:-In addition, Institutes may include more experiments based on the expertise

Subject: Microprocessor Lab	**Code: EI-301P**	**Credits: 2**
Branches: EC, EI, EE, and CSIT	**SEM: V Semester**	**L T P: 0 0 3**

Course outcomes: At the end of this lab, the student will have the ability to:

CO1: understand the general architecture of 8085 microprocessor system and its memory organization.
CO2: explore and practice of various instructions and assembly language programming model of 8085.
CO3: practice of arithmetical and logical operations with assembly language program.
CO4: practice of interfacing of I/P and O/P peripherals with the help of assembly language program.
CO5: practice and implementation of various applications by using 8085 programming models.

1. Study of SDK -85 microprocessor trainer kit.
2. Study of the instructions set of the 8085 microprocessor.
3. Perform the basic logical/ arithmetic and data transfer operation.
4. WAP to add two 8-bits hexadecimal numbers and store the carry at given location.
5. WAP to add two 16-bits hexadecimal numbers and store the carry at given location.
6. WAP to add two BCD numbers of 8-bits.
7. WAP to perform subtraction of two 8-bits hexadecimal numbers.
8. WAP to perform multiplication of two hexadecimal numbers by addition method.
9. WAP to perform multiplication of two hexadecimal numbers by partial product method.
10. WAP to perform division of two hexadecimal numbers by subtraction method.
11. WAP to find a maximum number from a block of Data of 8-bites long.
12. WAP to find a minimum number from a block of Data of 8-bites long.
13. WAP to find number of ones “1” and number of zeros “0” in an 8-bit data.
14. WAP to sort block of Data of 8-bytes long in ascending order.
15. WAP to sort block of Data of 8-bytes long in descending order.
16. WAP to find factorial of number.
17. WAP to move / shift a block of Data of 8-bytes long to five location upward.
18. WAP to move /shift a block of Data of 8-bytes long to five location downward.
19. WAP to interface 8-bit ADC with microprocessor through 8255.
20. WAP to interface 8-bit DAC with microprocessor through 8255.
21. WAP to interface traffic light control model with microprocessor through 8255.

Note:-In addition, Institutes may include two more experiments based on the expertise

Subject: Sensors and Transducer Lab	**Code: EI-303P**	**Credits: 2**
Branches: EI	**Semester: V**	**L T P: 0 0 3**

Course outcomes: At the end of the Lab, the student will have the ability to:

CO1: Understand the measurement of speed using magnetic Pick-up Photo-reflective transducer.

CO2: Understand the measurement of angular displacement using different transducer

CO3: Understand the Strain Gauge.

CO4: Understand the measurement of electrical component R, L and C using LCR meter

LIST OF EXPERIMENTS

1. Study of LVDT.
2. Measurement of Speed using magnetic Pick-up Transducer and verify the result by Tachometer.
3. Measurement of Speed using Photo-reflective Transducer and verify the result by Tachometer.
4. Measurement of Angular Displacement using capacitive and resistive Transducer.
5. Study of Strain Gauge.
6. Measurement of Known and Unknown Inductance, Capacitance and Resistance using LCR meter.

Note:-In addition, Institutes may include more experiments based on the expertise

Subject: Instrumentation and Analysis Lab	**Code: EI-307P**	**Credits: 2**
Branches: CH	**Semester: V**	**L T P: 0 0 3**

Course outcomes: At the end of the Lab, the student will have the ability to:

CO1: Understand the measurement of Temperature.
CO2: Understand the measurement of Pressure.
CO3: Understand the measurement of Flow.
CO4: Understand the measurement of pH, TDS and Conductivity of liquid .

LIST OF EXPERIMENTS

1. Study of Temperature Transducers
2. Study of Pressure Transducer
3. Study of Flow meter
4. Study of pH meter
5. Study of Conductivity meter
6. Study of TDS meter.

Note:-In addition, Institutes may include more experiments based on the expertise

Subject: Control System Lab	***Code: EE-301P***	***Credits: 2***
Branches: EI, EE & EC	***SEM: VI Semester***	***L T P: 003***

1. DC SPEED CONTROL SYSTEM
(a) To study D.C. speed control system on open loop and close loop.
(b) To study of Transient performance, another time signal is added at the input of control Circuit.
(c) To study how eddy current breaking is being disturbance rejected by close and open loop.
2. DC MOTOR POSITION CONTROL
(a) To study of potentiometer displacement constant on D.C. motor position control.
(b) To study of D. C. position control through continuous command.
(c) To study of D.C. position control through step command.
(d) To study of D.C. position control through Dynamic response.
3. AC MOTOR POSITION CONTROL
(a) To study of A.C. motor position control through continuous command.
(b) To study of error detector on A.C. motor position control through step command.
(c) To study of A.C. position control through dynamic response.
4. MAGNETIC AMPLIFIER
(a) To study Input / Output characteristic of a magnetic amplifier in mode (i) Saturable Reactor, (ii) Self Saturable Reactor.
5. SYNCHRO TRANSMITTER / RECEIVER
(a) To study of Synchro Transmitter in term of Position v/s Phase and voltage magnitude with respect to Rotor Voltage Magnitude/Phase.
(b) To study of remote position indication system using Synchro-transmitter/receiver.
6. PID CONTROLLER
(a) To observe open loop performance of building block and calibration of PID Controls.
(b) To study P, PI and PID controller with type 0 system with delay.
(c) To study P, PI and PID controller with type 1 system.
7. LEAD LAG COMPENSATOR
(a) To study the open loop response on compensator. (b) Close loop transient response.
8. LINEAR SYSTEM SIMULATOR (a) Open loop response
(i) Error detector with gain, (ii) Time constant, (iii) Integrator
(b) Close loop system
(I) First order system (II) Second order system (III) Third order system
9. Introduction to MATLAB (Control System Toolbox), Implement at least any two experiment in MATLAB. a. Different Toolboxes in MATLAB, Introduction to Control Systems Toolbox.
b. Determine transpose, inverse values of given matrix.
c. Plot the pole-zero configuration in s-plane for the given transfer function.
d. Determine the transfer function for given closed loop system in block diagram representation. e. Plot unit step response of given transfer function and find peak overshoot, peak time.
f. Plot unit step response and to find rise time and delay time.
g. Plot locus of given transfer function, locate closed loop poles for different values of k.
h. Plot root locus of given transfer function and to find out S, Wd, Wn at given root & to discuss stability.
i. Plot bode plot of given transfer function.
j. Plot bode plot of given transfer function and find gain and phase margins
k. Plot Nyquist plot for given transfer function and to compare their relative stability
l. Plot the Nyquist plot for given transfer function and to discuss closed loop stability, gain and phase margin.

Note:-In addition, Institutes may include more experiments based on the expertise

SEMESTER -6

Subject: Digital signal processing **Code: EC-302T** **Credits: 4**

Branches: EI, EC **SEM: VI Semester** **L P T: 3 1 0**

Unit-1 Discrete Time Signals & Systems: Basic discrete time signals, Basic operations on discrete time signals, Classifications of discrete time signals, Discrete time systems and its properties, Analysis of discrete time LTI systems, Techniques for the Analysis of LTI Systems.

Unit-2 The Z- Transform: The Z-transform, Region of convergence and its properties, Properties of Z-transform, Inversion of Z-transform, One sided Z-transform.

Unit-3 Discrete Fourier Transform and it's efficient computations: Discrete Fourier Transform, Its advantages & applications, properties of Discrete Fourier Transform, linear filtering methods based on DFT, Fast Fourier Transform, Its advantages & applications, FFT algorithms(Radix-2 & Radix-4 FFT algorithim), Application of FFT algorithms.

Unit-4 Implementation of Discrete Time system (Filters):

Structure Realization of Discrete time FIR Filters : Direct Form, cascade Form Structure, Linear Phase and Lattice structure Realization.

Structure Realization of Discrete time IIR Filters: Direct Form-I, II, cascade Form Structure, Parallel Form Structure, Transposed Direct Form Realization(Signal Flow Graph) Lattice & Lattice Ladder structure Realization.

Unit-5 Design of Discrete Time system (Filters):

Design of FIR Filter: Design of Symmetric & Asymmetric FIR Filters, Design of FIR Differentiators, Design Linear Phase FIR filters using (Fourier Series Method, Rectangular Window Method, Frequency Sampling Method).

Design of IIR Filter: Design of Low pass & High pass Digital Butterworth Filter, Low pass & High pass Digital Chebyshev Filter using Impulse Invariance Transform Method, Bilinear Transform Method.

REFERENCE BOOKS

1. Digital signal processing (principles, algorithms and applications) by John G. Proakis & Dimitris G. Manolakis, PHI
2. Digital signal processing by Alan V. Oppenheim and Ronal W. Schafer.
3. Introduction to Digital System Processing by Roman Kook., McGraw hill international editions.

Subject: Embedded Systems **Code: EI-302T** **Credits: 4**
Branches: EC, EI **SEM: VI** **L P T: 3 1 0**

COURSE OUTCOMES: Upon completion of the subject students will be able to:

CO1: Describe internal architecture and operation of microcontroller 8051 and understand the role of embedded system
CO2: Develop assembly language programs using instruction set of 8051
CO3: Understand the interfacing of different peripheral devices with Microcontrollers.
CO4: Understand the design and application of advanced microcontroller and their role in embedded systems.
CO5: Explain IoT systems and the technology behind them.

Unit 1:-Introduction to Microcontrollers and Embedded Systems: Basic architecture of 8051, overview of the 8051 family, Pin description, input-output port and their functions, Memory organization. An introduction to embedded system, classification of embedded systems,

Unit 2:- Instruction Sets and Programming of 8051 Microcontrollers: Instruction set, Address modes, Assemblers and Compilers, 8051 assembly language programming, 8051 timer programming, Basic registers of the Timer and programming in different modes, 8051 Counters programming, basic registers of the counters and programming in different modes, serial port programming.

Unit 3:- Real world interfacing of 8051 with: LCD, push button and Relay, keyboard, ADC and DAC, Stepper motor.

Unit 4:- Introduction to Advanced Microcontrollers: Introduction and Architecture of PIC, ARM, AVR and AT 89C2051 Microcontroller.

Unit 5:- Introduction to IoT: Architectural Overview of IoT, Design principles and needed capabilities, IoT Applications, IoT Technology Fundamentals- Devices and gateways, Role of Cloud in IoT

.Recommended Books

1. The 8051 Microcontroller and Embedded System-M.A. Mazidi, Pearson Education.
2. Microcontrollers-A.J. Ayala, Penram International Publishing (1) Pvt. Ltd.
3. 8051 Microcontroller-I. Scott Mackenzie.
4. Microcomputer systems, The 8086/8088 family-Liu & Gibson, prentice Hall of India.
5. The 8086/8088 Family-Design, programming and interfacing-John Uffenbeck-Prentice Hall of India.
6. Microprocessor Architecture, programming and applications with 8085-R.K. Gaonkar, New Age International Publishers.

Subject: Digital Communication System **Code: EC-304 T** **Credits: 4**

Branches: EC, EI **SEM: VI Semester** **L T P: 3 1 0**

Unit 1:- Motivation for Digital Communication, digital transmission of Analog signals, line coding, bandwidth of digital data, Bit rate, likelihood, prior and posterior probabilities. MAP rule, Maximum likelihood rule.

Unit 2:- Digital Modulation Techniques, BPSK, BFSK, ASK, DPSK, QPSK, Transmitter & Receiver Probability of error of Different Modulation Techniques, M-array modulation Schemes and constellation diagrams.

Unit 3:- Data Transmission, Different Signals, Integrator Response, Optimum filter and matched filter, transfer functions calculation, Probability of error calculation for matched filter, correlation reception of signals, Noise calculation in PCM & DM Systems.

Unit 4:- Information Theory, Absolute & conditional Joint entropy schemes rate of information mutual information, Noise free channel, channel with independent input & output channel capacity, Binary symmetric channel, BEC channel, reception of signals, Shannon Hartley Theorem, capacity of Gaussian channel, BW S/N trade off,

Unit 5:- Coding techniques, coding efficiency, Binary, Shannon Fanon, Huffinan coding error control code, Block codes, Linear block code, hamming distance, error correcting code, cyclic code, convolution codes.

Text Book:

1. **Herbert Taub**and **Donald L. Schilling, "Principles of Communication Systems",**Tata McGraw Hill Publication.
2. **B.P.Lathi,"Modern Digital and Analog Communication Systems",** Oxford UniversityPress.
3. **John G. Proakis, “Digital Communications”,** McGraw-Hill Education.

Subject: Optical Fiber Instrumentation **Code: EI-304T** **Credits: 4**

Branches: EI **SEM: VI Semester** **L T P: 3 1 0**

Course outcomes: At the end of the course, the student will have the ability to:

CO1: understand the basics of optical fiber and their types.

CO2: understand the transmission characteristics of optical fiber.

CO3: understand the different types of optical sources and detectors.

CO4: understand the optical fiber components and optical fibers sensors.

CO5: understand the applications of optical fiber in different fields.

Unit 1: Optical Fiber Waveguides: Historical development in optical fiber, Advantages of optical Fiber, Classification of Optical fiber, Ray theory transmission-Acceptance angle, numerical aperture, skew rays, Electromagnetic theory for optical propagation-Electromagnetic waves, Modes in planar waveguide and cylindrical fiber, Phase and group velocity, Evanescent field and G-H shift.

Unit 2: Transmission Characteristics of Optical Fiber: Attenuation, Materials absorption losses, Linear & non-linear scattering losses, Fiber bend loss, Mid-infrared and far-infrared transmission, Dispersion, modified fibers, polarization and non-linear phenomenon.

Unit 3: Optoelectronic Devices: LED - Introduction, power and efficiency, structures-Planar, Dome, Surface emitter and edge emitters, LED Characteristics and modulation; **Semiconductor Laser-** Basic concepts, Optical emission from semiconductors, semiconductor injection laser, laser structure, injection laser characteristics, injection laser to fiber coupling, mid-infrared lasers. **Detector-** Introduction, optical detection principles, absorption, quantum efficiency, responsivity, long wavelength cut-off, p-n, p-i-n photodiodes, and avalanche photodiode.

Unit 4:- Optical Fiber System and Sensors: Introduction, Beam splitters, directional couples, switches and modulators. Fiber birefringence, the state of polarization, Electro-optic, photo-elastic and magneto-optics effect. Introduction to Optical Fiber, Classification of Optical fiber sensors, Temperature sensor, Pressure sensor; Sound pressure sensor, Liquid level sensor, Flow sensor, Magnetic sensor, Displacement sensor, Pollution sensor, Medical application, Fiber interferometers, Optical fiber gyroscope.

Unit 5:- Passive Applications of Optical Fibers in Instrumentation: Introduction, Fiber bundle, GRIN-rod lenses, non-semiconductor laser, optical fiber in Medicine, industry, military, commercial, instrumentation industry and other application.

REFERENCES BOOKS

1. Optical Fiber Communication System by Johan M. Senior, PHI
2. Handbook of Fiber optics by Chai Yeh, Academic Press

Subject: Modern Control System **Code: EI-316T** **Credits: 4**
Branches: EI **Semester: VI** **L T P: 3 1 0**

Course outcomes: At the end of the course, the student will have the ability to:

CO1: understand the mathematical model of Sample & hold circuit.
CO2: analyse the solution of difference equations using z-transform and its properties and s-z plane mapping by using various techniques of discretization.
CO3: create state models using physical variables, mathematical variables and to solve the state equation
CO4: identify appropriate techniques to analyse the system for its controllability and observability.
CO5: apply Lyapunov theorem of stability to linear and nonlinear systems.

Unit-1 Sampling and Reconstruction: Introduction sampled data control systems. Sample and hold operation, a mathematical model operation, sample and zero order hold, Ideal sampler, Frequency Domain consideration in sampling and reconstruction, sampling theorem, advantage of digital control system.

Unit-2 Transform analysis of sampled-data systems: Linear difference equation, Z- transform, Definition, Properties, Inverse Z-transform, Pulse transfer function, Methods of discretization: Impulse invariance, Step invariance (ZOH equivalence), Finite difference approximation of derivatives, Rectangular rules of for integration, Bilinear transformation, Jury stability criterion, Routh's stability criterion on t-plane. Block diagram analysis of sampled-data systems, Block diagram realization to transfer function: Recursive realization, Direct Realization, Cascade Realization, Parallel Realization.

Unit-3 State variable analysis of continuous and discrete systems: State variable representation, Transformation of state variables, conversion of state variable models to transfer function, Conversion of transfer functions to canonical state variable models, I & II companion forms, Jordan canonical form, Eigen values, Eigen vectors, Solutions of state equations, State transition matrix, Concepts of controllability and observability.

Unit-4 Non Linear control: Non Linear Systems, Basic Concepts, Stability definition, Stability theorems, Lyapunov functions for nonlinear systems and linear systems, Lyapunov stability theorem for discrete time systems.

Unit-5 Microprocessor based control system case study: 1. Microprocessor based position control /Speed control algorithm. 2. Temperature control system.

References:

1. Digital control engineering by M.Gopal New age International Publishers.

2. Digital control & State variable methods conventinhal and neuro-fuzzy control system by M. Gopal TMH.

Subject: Power Plant Instrumentation	**Code: EI-308T**	**Credits 4**
Branches: EI	**Sem: VI**	**L T P: 310**

Course outcomes; at the end curse , student will be able to
CO1; Understand power plant and signal transmission
CO2; Understand about humidity and measurement
CO3; Understand about pH and conductivity measurement
CO4 ; Exhaust gas analyses
CO5; Nuclear measurement

Unit 1: Introduction to Power Plant and Signal Transmission: Introduction to power plant, Types of Power Plant: brief introduction of Thermal, Hydro, Nuclear etc., Importance of Measurement and Instrumentation in Power Plant, Classification of various instruments used in the power plant. Remote Signal Transmission in Power plant: Voltage and Current Transmission; The Earth Ground Concept, Typical Power Supply Grounding Error, Shock Hazard Protection Using Earth Ground, Grounding Consideration, Basic grounding Practices; Shielding and its Practical Guidelines with Examples, Protection from Electrostatic Discharge; Concept of Live Zero and 4-20mA signal transmission.

Unit 2: Humidity and Moisture Measurement: Relative, Absolute Humidity, Specific Humidity and Dew Point, Dry & Wet Psychrometers, Psychrometric Chart, The Sling Psychrometer, Types of Hygrometers: Capacitive, Resistive type, Aluminium Oxide Hygrometer, Crystal Hygrometer; Measurement of Dew Point, Moisture and Measurement of Moisture for Granular and web type samples.

Unit 3: pH & Conductivity Measurement: Introduction to pH, Principle of pH Measurement, Electrodes for pH Measurement, pH meters: Null Detector Type, Chopper Amplifier Type, Vibration Condensor Amplifier Type; Block Diagram of Digital pH Meter. Conductivity Measurement: Definitions, Conductivity Cells- Two pole and Four Pole Cell; Sources of Error in Conductivity Measurement: Polarisation, Field Effect, Cable Resistance and Capacitance, Temperature Variation; Toroidal Conductivity Measurement set-up.

Unit 4: Exhaust Gas Analyses: Principles of Gas Analysers, Types of Gas Analysers, Paramagnetic Oxygen Analysers, Magnetic Wind Instruments, Infrared Gas Analyser, Thermal Conductivity Analysers based on Gas Density, Methods based on Ionisation of Gases, Measurement of Smoke and Dust: Photocell Type Smoke Meters, Reflected Light Dust Meter.

Unit 5: Nuclear Measurement: Fuel Leak Detection by: Gamma Activity of the Fission Product & Gaseous Fission Product Activity; Measurement of Neutron Flux: Ionisation Chamber Method, Pulse Counters; Dosimeters: Survey Dosimeter and Fountain Pen Dosimeters.

Reference Books:

1. Handbook of Analytical Instruments (2e), RS Khandpur, Tata McGraw Hill Education Private Limited, New Delhi.
2. Power Plant Engineering by SC Arora & Dom Dundwar
3. Electrical and Electronic Measurement and Instrumentation, AK Sahany, DhanpatRai and Sons.
4. Instrumentation and Control, D. Patranbis, Prentice Hall of India New Delhi.
5. Introduction to Measurements and Instrumentation, Arun K. Gosh, Prentice Hall of India New Delhi.
6. Electronic Instruments and Instrumentation Technology, MMS Anand, Prentice Hall of India New Delhi.

Subject: Embedded Systems Lab **Code: EI-302P** **Credits: 2**

Branches: EC, EI **SEM: VI Semester** **L T P: 0 0 3**

COURSE OUTCOMES: During this lab course, students can learn to:

CO1: Apply the fundamentals of assembly level programming of microcontroller.

CO2: Perform and demonstrate arithmetic operations using assembly language programming using Keil assembler.

CO3: Execute and Demonstrate logical operations using assembly language programming using Keil assembler.

CO4: Perform and demonstrate string instructions using assembly language programming

CO5: Demonstrate sorting operations and using assembly language programming

CO6: Understand the importance of different peripheral devices & their interfacing to 8051

LIST OF EXPERIMENTS

1. Familiarization with 8051 microcontroller board and Its Interfacing cards.
2. Write a program to add two 8 bit number using 8051 microcontroller.
3. Write a program to subtract two 8 bit number using 8051 microcontroller.
4. Write a program to multiplies two 8 bit number using 8051 microcontroller.
5. Write a program to divide two 8 bit number using 8051 microcontroller.
6. Write a program for up counter 0-9 and display it on seven segment display using 8051 microcontroller.
7. Write a program for down counter from 9-0 using 8051 microcontroller and display it on seven segment display.
8. Interface LCD display with 8051 board and display any character.
9. Interface LCD display with 8051 board and write program to display string HELLO WORD.
10. Interface seven segment board with 8051 board and display any alphanumeric character.
11. Write a program to move stepper motor in clock wise direction using 8051 microcontroller.
12. Write a program to move stepper motor in anti clock wise direction using 8051 Microcontroller.
13. Write a program to read analog voltage using parallel ADC USING 8051 microcontroller.

Note:-In addition, Institutes may include more experiments based on the expertise

Subject: Digital Communication Lab ***Code: EC-304P*** ***Credits: 2***

Branches: EC, EI ***SEM: VI Semester*** ***L T P:0 0 3***

1. To construct a triangular wave with the help of Fundamental Frequency and its Harmonic component.
2. To construct a Square wave with the help of Fundamental Frequency and its Harmonic component.
3. Study of Pulse code modulation (PCM) and its demodulation using Bread Board.
4. Study of delta modulation and demodulation and observe effect of slope overload.
5. Study of pulse data coding techniques for NRZ formats.
6. Study of Data decoding techniques for NRZ formats.
7. Study of Manchester coding and Decoding.
8. Study of Amplitude shift keying modulator and demodulator.
9. Study of Frequency shift keying modulator and demodulator.
10. Study of Phase shift keying modulator and demodulator
11 Study of single bit error detection and correction using Hamming code.

12 Measuring the input impedance and Attenuation of a given Transmission Line

Note:-In addition, Institutes may include more experiments based on the expertise

Subject: Optical Fiber Instrumentation Lab Code: EI-304P Credits: 2

Branches: EI SEM: VI Semester L T P: 003

Course outcomes: At the end of the course, the student will have the ability to:

CO1: understand the various types of optical fibers-glass, plastic, transmission cable.

CO2: understand the basics of optical fiber by simulation software.

CO3: understand transmission characteristics of optical fiber by simulation software

CO4: understand to measure several parameters of Optical fibers like numerical aperture.

CO5: understand to set up communication link using optical fiber.

1. To learn the optical Fiber Characteristics & Simulation Software:-
   a) V-value and no. of guided modes b) Gaussian beam
   c) Guided and refracted rays in MMSI fiber d) Pulse dispersion
   e) Variation of cut-off wavelength with relative index difference
   f) Material dispersion studies g) Different modes
   h) Spot size
   i) Pulse broadening due to wavelength dispersion j) Splice's losses
   k) Bending losses
   l) Losses curves for optical fiber
   m) Design consideration for SM fiber
   n) Design aspects of Fiber optic communication system
2. To study the light emitting diode and photo detector used for optical fiber systems.
3. Study of losses in optical fiber.
4. Measurement of numerical aperture of optical fiber

Note:-In addition, Institutes may include more experiments based on the expertise

SEMESTER -7

Subject: Process Control Instrumentation **Code: EI-413T** **Credits 4**
Branches: EI **SEM: VII** **L T P: 310**

Course Outcomes ; At the end of course ,student will be able to
CO1: Understand the concept of process dynamics
CO2: Understand the concept of control action &about controller
CO3: Understand about final control elements and control valves
CO4: Understand multiloop control system and about PLC
CO5: Understand about PLC

Unit-1 Process Dynamics
Process variables, Load variables, Dynamics of simple pressure, flow level and temperature process, interacting and non-interacting systems, continuous and batch process, self- regulation, Servo and Regulator operation.

Unit-2 Control Actions and Controllers
Basic control actions – characteristics of two position, three position, Proportional, Single speed floating, Integral and Derivative control modes – PI, PD, PID control modes, Pneumatic, Hydraulic and Electronic Controllers to realize various control actions.

Tuning of controllers
Tuning: process curve reaction method, Zeigler-Nicols (Z-N), Cohen-coon tuning, lambda tuning, Luyben tyrus online tuning method,

Unit-3 Final Control Elements
I/P Converter, P/I converter - pneumatic, electric and hydraulic actuators – valve positioned, Control valves – characteristic of control valves – valve body – Globe, Butterfly, diaphragm, Ball valves – Control valve sizing – Cavitations, flashing - problems.

Unit-4 Multiloop Control System: Feedback- Feed forward control
Feed forward control, Ratio control, Cascade control, Split range, Auctioneering control Multivariable, interaction and decoupling, Multivariable control of loops, Case Study (Distillation column, and Boiler)

Unit-5 PLC (Programming Logic Controllers)
PLC Logic controls for Industrial Automation: Building blocks of a PLC, Input Module, Output Module, I/O Rack Enclosures, Timers/Counters, Memory Map, Data Table Memory Area- Output table, Storage area, Ladder Diagrams, Types of PLC, Case study etc.

Text Books:
1. Chemical Process Control: An introduction to Theory and Practice – by Stephanopoulos, Prentice Hall, New Delhi, 1999.
2. Process Control – Harriott P., TMH, 1991
3. Digital Control And State Variable Methods- by M Gopal TMH

References:
1. Process Control, Third Edition – Liptak B.G., Chilton Book Company, Pennsylvania, 1995
2. Process control – by Pollard A., Heinemann Educational Books, London, 1971.
3. Automatic Process Control – by Eckman D.P. , Wiley Eastern Ltd., New Delhi, 1993.
4. Process Control – by Patranabis.
5. Process System Analysis and Control – Coughanowr, McGraw Hill, Singapore
6. Process Control – by Seborg.
7. Process Control – by Curt. Johnson.

Subject: Metrology and Calibration **Code: EI-405T** **Credits: 4**
Branches: EI **SEM: VII Semester** **L T P: 310**

Course outcomes: At the end of the course, the student will have the ability to:
CO1: understand the history and basics of measurement.
CO2: understand the term calibration and its associated terms.
CO3: understand the calibration procedure of different instruments.
CO4: understand the concept of NABL and ISO certification.
CO5: understand the estimation of measurement uncertainty using statistical methods.

Unit-1 The Metrology: History of measurement, Definition of measurement, Categories of metrology, Treaty of the meter, SI Units-Base units and derived units. Measurement areas, Fundamental of measurements- Measurements and measurand, Measuring and test equipment (M&TE), Measurement standards. Metrology Organizations-Treaty organization, General conference on weights and measures (CGPM), International Committee for Weight and Measures (CIPM).National Metrology Hierarchy in India. Metrology: an essential component of Calibration.

Unit-2 The Calibration and ISO Standards: Introduction to Calibration, general terms related to calibration-Accuracy, True value, Nominal value, Error, Uncertainty, Various types of accuracy statements, uncertainty in counts in digital meters, precision, indication of precision-conformity & no. of significant figure, Repeatability, reproducibility Calibration standards, Traceability, Traceability chart. Standard labs. conditions, Example of calibration chain, Calibration interval, calibration certificate. Introduction to ISO-9000 standards, Need of calibration in ISO standards. Requirement of the standard-Management requirement& document control. Test and calibration Laboratory Accreditation, NABL, fields of accreditations.

Unit-3 The Calibration Procedures: The General Calibration Procedure, Calibration of temperature sensors-Thermocouple, RTD and thermistor, Calibration of Pressure Gauges, Calibration of Dimensional Gauges-vernier calliper's and screw gauges, Calibration of Flow meter-analog flow-meter and calibration of Electrical parameters-voltage, current and resistance.

Unit-4 Basic Statistical Concepts: Review of some statistical concept- central tendency of data (Mean, Median, Mode), Best estimate of true value of data, Measures of dispersion, Standard deviation, Introduction and Properties of Gaussian Distribution, Area under the normal distribution curve, Mean value and standard deviation of continuous distribution of Gaussian type, Standardised normal distribution, Confidence level, Central limit theorem, Significance test.

Unit-5 Estimation of Uncertainty in Measurements: Background of Evolution of uncertainty of measurement- International perspectives on measurement uncertainty, Recommendation INC-1(1980).The Guide to the expression of uncertainty in measurement. Evaluation of Uncertainty- Type A component & type-B component. Uncertainty obtained from an assumed distribution-normal distribution, rectangular distribution & Triangular distribution. NABL guidelines for measurement of uncertainty.Examples of uncertainty calculations.

Reference Books:

1. Calibration Principles, Subburaj Ramaswamy, Vijay Nicole Imprints Pvt. Limited, Chennai, 2009.
2. Metrology and Calibration for Industrial Quality Control, Sanjeev Tyagi, Employment News, 13-19 July 2002.
3. Instrumentation, Measurement and Analysis by BC Nakra and KK Chowdhary, 4/e, Tata Mc-Graw Hill Publishing Company Limited, 2017.
4. Calibration: Philosophy in Practices, 2/e, Fluke corporation USA, 1994.
5. A course in Electrical and Electronic Measurements and Instrumentation, AK Sawhney, Dhanpat Rai and Co.

Subject: Industrial Training	**Code: EI-407**	**Credits: 2**
Branches: EI	**Semester: VII**	**L T P: 0 0 3**

Course Object

Engineering graduate program in India involve summer training as a fundamental piece of their education programs with a target to improve the information of the students. Students apply their experimental and theoretical knowledge in the field of industry

Course Outcomes: At end of the course, students will have

CO1: Ability to acquire and apply fundamental principles of science and engineering.

CO2 Ability to conduct research in the chosen field of engineering

CO3: Ability to identify, formulate and model problems and find engineering solution

CO4: Ability to conduct research in chosen field of engineering.

CO5: Ability to be a multi-skilled engineer with good technical knowledge , management, leadership, and entrepreneurship skills.

During the course of study from 3rd to 7th semester each student is expected to undertake a minimum of four industrial visits or undertake a minimum of two weeks of industry/field training. The students are expected to submit a report, which shall be evaluated by an internal assessment committee at the end of seventh semester for 100 marks or as per institute ordinances.

Subject: Seminar	**Code: EI-409**	**Credits: 2**
Branches: EI	**Semester: VII**	**L T P: 0 0 3**

Course Outcomes: At end of the course, students will be able to:

CO1: Development of presentation Skill

CO2: Enhancement of discussion Skills

CO3: Ability of listening Skill

CO4: Creation of argumentative Skills and Critical thinking

CO5: Questioning & Answering

CO6 : Asking and exploring Interdisciplinary Inquiry

Each one of the students will be assigned a Seminar Topic in the current and frontier areas. The student has to conduct a detailed study/survey on the assigned topic and prepare a report. The student will make an oral presentation followed by a brief question and answer session. The Seminar (presentation and report) will be evaluated by an internal assessment committee for a total of 100 marks or as per institute ordinances.

Subject: Product Design Lab	**Code: EI-403P**	**Credits: 2**
Branches: EI	**SEM: VII**	**L T P: 003**

Course outcomes: At the end of the Lab, the student will have the ability to:

CO1: understand the electrical and electronics component.

CO2: understand the fabrication of PCB.

CO3: design and fabrication of the electronics product.

CO4: understand the troubleshooting of hardware circuit.

Objective: To create interest in Hardware Technology by implementing a hardware circuit with help of printed circuit board lab along with following experiments.

1. Fabrication of hardware circuit in PCB Lab:
    (a) Artwork & printing of a hardware circuit PCB.
    (b) Etching & drilling of PCB.
2. Testing of fabricated PCB of Proposed hardware circuit.

Note:-In addition, Institutes may include more experiments based on the expertise

Subject: Project-I **Code: EI-405P** **Credits: 2**

Branches: EI **Sem: VII Semester** **L T P: 0 0 3**

Course outcomes: At the end of the course, the student will have the ability to:

CO1: understand the design of project in a group.

CO2: understand the presentation to the project idea and its implementation

CO3: learn to do literature survey for their project.

CO4: Execution of his/her project and troubleshooting.

CO5: to make a report of his/her project in a presentable form.

The objective of the Project-I is to enable the students to work in groups of not more than three members in each group on a project involving analytical, experimental , design or combination of these in the area of Electronics and Instrumentation Engineering. Each project shall have a guide or co- guide. The student is required to do literature survey, formulate the problem and form a methodology of arriving at the solution of the problem. The evaluation is based on continuous internal assessment by an internal assessment committee and external evaluation by external expert for 100 marks or as per system adopt by the concern institute/university at the end of semester approved by the Hon‟ble Vice-Chancellor / University.

Subject: Process Control Instrumentation Lab.	***Code: EI-413P***	***Credits 2***
Branches: EI	***SEM: VII***	***L T P: 002***

List of Experiments

1. Study of PID controller Trainer
2. Study of PLC trainer

List of Pool Elective (Seventh Sem):

1.	EI-437T	Antenna Engineering
2.	EI-457T	PCB Design & Technology
3.	EI-439T	Virtual Instrumentation
4.	EI-433T	Soft Computing Techniques,
5.	EI-431T	Integrated Circuit Technology and Design
6.	EI-451T	IoT
7.	EC-433T	Digital System Design
8.	EC-452T	PC Interfacing
9.	EE-411T	Non Conventional Energy Sources
10.	CS-451T	Wireless Network and Mobile Computing
11.	ME-473T	Work Study
12.	CE-461T	Environmental Management

List of Open Elective (Seventh Sem):

1.	MA-491T	Operation Research
2.	CY-401T	Polymeric Materials and their
3.	PH-419T	Futuristic Materials
4.	HU-449T	Principles of Management
5.	HU-409T	Quantitative Methods in Economics

Syllabus of Pool Elective Subjects

Subject: Antenna Engineering	**Code: EI-437T**	**Credits: 4**
Branch: EI (Pool electi ve)	**Sem: VII**	**L T P:310**

Course Outcomes: At the end of the course, the student will have the ability to:

CO1: understand the fundamentals and definitions of Electromagnetic.

CO2: understand the various types of Antenna.

CO3: understand the antennas measurement.

CO4: understand the different types of wave propagation.

Unit-1: Introduction

Antenna fundamental and definition, Maxwell equation, Electromagnetic spectrum, Radio frequency band.

Unit-2: Theory of Radio wave radiation and reception

Current across closed surface, Boundary condition in electromagnetic field, Electromagnetic wave equation in dielectrics and conductors, Radiation from elementary source, Radiation of dipole of finite length, The influence of the earth and metal bodies on antenna radiation.

Unit-3: Fundamental of Antenna

Basic antenna parameter, patterns, beam area, radiation intensity, beam efficiency, directivity, antenna aperature, effective height**,** field from oscillating dipole, antennas field zones, polarization.

Unit-3: Types of Antenna devices

Thin linear Antenna, cylindrical antenna, Biconical antenna, Loop antenna, Helical antenna, slot and micro strip antenna, Horn antenna, Reflector antenna, Lens antenna, Wide band antenna, Terahertz antenna, frequency independent antenna, smart antenna, plasma antenna ,embedded antenna

Unit-4: Antenna measurement

Introduction, Basic concept, Typical sources of errors in antenna measurements, Measurements of different antenna parameters (Input and mutual impedance, Radiation pattern, Gain, Phase front, Polarization).

Unit-5: Radio Wave Propagation

Propagation characteristics of electromagnetic wave, Ground or surface wave propagation, sky wave propagation, space wave propagation, Tropospheric scatter propagation

Text books:

1. Antenna Theory (Analysis and Design): Constantine A. Balanis (WILEY)
2. Antenna: Fusco (Pearson Education)
3. Antenna: J.D. Kraus (TMH)
4. Antenna: D-Pozar (PHI)

Subject: PCB Design & Technology **Code: EI-457T** **Credits: 04**

Semester: VII (Pool Elective) **L T P: 3 1 0**

Course Outcomes: At the end of the course, the student will have the ability to:

CO1: Understand the types of board and layout general rules, parameters and designing approaches.
CO2: Understand the PCB's Design Rules for analog, Digital and High Frequency.
CO3: Understand the the Computer Aided Design of PCB's.
CO4: Understand the Fabrication Technology of Printed Circuit Board
CO5: Understand the Solders & soldering techniques.

Unit- 1: Introduction of Printed Circuit Boards

Types of PCB: Single side and double side, General considerations Layout scale, Grid system, Board types, Standards.

Layout approaches: Materials & Aids: simple approach with sketching of components, Layout sketching with Puppets, Procedures, etc.

Layout General Rules and parameters: Resistance in general, Resistance & temp, Capacitance: capacitance between conductors on opposite sides of the PCB, Inductance of PCB conductors.

Unit- 2: Design of Printed Circuit Board

Design Rules for analog circuits PCB: Placing of heat producing and heat sensitive components: Signal conductors high freq. amplifiers/oscillators, multistage amplifiers especially with high power output stage, High gain DC amplifiers (Thermal effects).

Design Rules for Digital Circuit PCB's: Main problem: Reflection, cross talk, ground and supply line noise, Electromagnetic interference from pulse type E.M. Field.

Design Rules for PCB's in High Frequency and Fast Pulse type Applications: Matching of conductors, effect of mismatch in the different cases: Effect of Mismatch in the Fast-Pulse case, in High freq. case.

Unit-3 Computer Aided Design of PCB's: Input data, component Placement, conductor Routing, Checking, Scope, etc.

Unit-4: Fabrication Technology of Printed Circuit Board

Film Master Production: Introduction, Emulsion Parameter, Film Emulsion, Increasing and Decreasing Line Width.

Photo printing: Basic properties for double-sides PCB's (Print-and-each process, Pannel plating process, Pattern plating process, Tenting process) Photoresist, in General (desirable feature of Photoresist), Wet-film Resist, Dry film resist,

Screen printing: Scope of screen-printing, Screen fibers, Patterns transfer onto the screen, (Direct method, Indirect method)

Plating: Introduction, Immersion plating, Tin immersion plating, Electro less plating, Electro plating.

Etching: Introduction, Under etching, Overhang, Etchant system, (Ferric chloride, Cupric chloride and chromic Acid)

Fabrication process of P.C.B.'s: Single side, double side PTH and multilayer PCB's Soldering

Unit-5: Solders & soldering techniques: Iron soldering, Mass soldering, Flux removal After soldering, PCB cleaning after soldering.

Reference:

PCB design and technology by Walter C Boschart Tata McGraw-Hill publishing company Ltd., New Delhi.

Subject: Virtual Instrumentation **Code: EI-439T** **Credits: 04**
Branch: EI (Pool Elective) **Semester: VII** **L T P: 3 1 0**

Course Objectives: The objective of this course is;
1. To provide knowledge on design of process control by using virtual instrumentation techniques
2. To provide knowledge in process analysis by virtual instrumentation tools.
3. To give basic knowledge in describing function analysis.
4. Get adequate knowledge virtual instrumentation tool sets

Prerequisites : Student should have the sound knowledge of Electronic Instrumentation and measurements

Course Outcomes (COs) : After the successful completion of this course the Students will be able;

CO1: to get familiar about virtual instrumentation and adequate knowledge of VI tool sets using LABVIEW software.
CO2: gets the exposure of LABVIEW programs using different methodology.
CO3: To describe data acquisition model.
CO4: To get introduced about the communication and interfacing protocol for VI models.
CO5: To understand various interaction model and use of VI for industrial and non-industrial applications.

Unit-1: Introduction to Virtual Instrumentation (VI), software based instruments. Introduction to LABVIEW, Components of LABVIEW, Graphical programming versus structural programming, data flow, VIs and sub-VIs, loops and charts, arrays, clusters and graphs.

Unit 2: LABVIEW programs based on case and sequence structures, formula nodes, use of MALTAB script, local and global variables string and file I/O.

Unit–3: Data Acquisition Methods: Analog and Digital DIO, Counters, Timers, Basic ADC designs, interfacing methods of DAQ hardware, software structure, use of simple and intermediate Vis. Use of Data Sockets for Networked communication and controls**.**

Unit–4: Hardware Review and Instrumentation Buses: Bus architecture: History, Bus functions, various buses ISA, EISA, VME, VXI, PCI, IEEE488, USB. **PC Interfacing**: Expansion bus, RS232, RS485, Parallel centronix port with LCD, Seven segments, ADC and DAC.

Unit–5: Active Interaction Devices: Gloves, Data Glove, Power glove, Dexterous hard master, wands, data suit. **Application of Intelligent Instrumentation in Various Fields:** Aviation, Automotive, Defense, Medical & Virtual Landscapes

Text Books:
1. Lisa, K. Wells & Jeffery Travis / Lab VIEW For every one Prentice Hall, 19972.
2. S. Gupta / P.C Interfacing for data Acquisition & Process Control, 2nd Edition / Instrument Society of America, 1994.

Reference Books:
3. Gray Johnson / Lab VIEW Graphical Programming 2nd Edition / Tata McGraw Hill, 1997.
4. Bitter, Mohiuddin, Nawrocki / Advanced Cal VIEW Programming Techniques.
5. NI manual for LABVIEW

Subject: Soft Computing Techniques	**Code: EI-433T**	**Credits: 04**
Branch: EI(Pool Elective)	**Semester: VII**	**L T P: 3 1 0**

Course Outcomes: Upon a successful completion of this course:

CO1: Students will be able to apply biological inspired concepts/ techniques to solve engineering problems

CO2: Students will be able to design methods to optimize solution of complex problems

CO3: Students will be able to analyze statistical data using fuzzy logic concepts.

CO4: Students will be able to evaluate mathematical problems with vague or less information

Artificial Neural Networks

Unit-1 Introduction of Neural Network: Biological Neural Network-structure of human brain, Characteristics of ANN, Artificial neurons, Types of ANN-single layer and multilayer, Hopkinsons, counter propagation, back propagation, feed forward etc., Recurrent Neural Network, active functions, supervised, unsupervised learning algorithms, case study (application).

Fuzzy Logic

Unit-2 Introduction: Uncertainty and Information, Fuzzy sets & Membership functions, chance versus Fuzziness. Features of membership function, various forms of fuzzification, defuzzification to crisp sets, λ-cuts for fuzzy relations, defuzzification to scalars (methods of defuzzification), case study (application).

Classical Sets and Fuzzy Sets: Operations on classical sets, Properties of classical sets, Mapping of classical sets to functions, Operations and properties of Fuzzy sets, Non- interactive fuzzy sets.

Classical relations and fuzzy relations: Cartesian Product, Crisp Relations: cardinality, operations, properties, Fuzzy Relations: cardinality, operations, properties, Fuzzy Cartesian Product & comparison, tolerance and equivalence relations, value assignment: cosine amplitude, max-min method, other forms of composition operation.

Unit-3 Optimization Techniques: Genetic algorithm, Basic fundamental of optimization algorithm, Different steps for Genetic Algorithm, optimization, Mutation, crossover, PSO (Particle Sworn Optimisation), Case study on PSO, GA.

Unit -4 Introduction of MATLAB

Unit -5 Introduction of PYTHON

Books Recommended:

1. Neural Networks, Fuzzy Logic and Genetic Algorithms-Synthesis and Applications, Rajajsekharan & Vijayalakshmi Pai, Prentice Hall of India Private Limited, New Delhi, 2003.
2. Fuzzy Logic with Engineering Applications: Ross T.J, John Wiley, 1996.

Subject: Integrated Circuit Technology and Design **Code: EI-431T** **Credits: 4**

Branches: EI(Pool Elective) **Semester: VII** **L T P: 3 1 0**

Course Pre-requisites: Students should have the basic fundamentals and applications of Digital Electronics, Basics Electronics Engineering, and Integrated Circuits.

Course Outcomes: At end of the course, students will be able to:

CO-1: Describe the fabrication process for various integrated circuits.

CO-2: Analyze the basic electrical properties of MOS circuits and their characteristics.

CO-3: Explore the CMOS layout levels, design layers for process sequence, and resulting device structures.

CO-4: Illustrate circuit diagrams, stick diagrams and mask layouts for nMOS, CMOS based circuits, and design rules for layouts.

CO-5: Discuss the various types of inverters nMOS, CMOS, also design and implementation of digital logic designs of various circuits (combinational logic, multiplexer).

CO-6: Analyze and design subsystem using structured approach for MOS technologies and implementation of computational memory elements (D flip-flop).

Unit-1 Miniaturization & its impact on characterization of Electronic Systems: Introduction, Miniaturization, General Classification of Integrated Circuits (ICs), Advantages of ICs over Discrete Components, Issues related to levels of Integration.

Unit-2 Overview of Monolithic IC Processes: Refining and Growth of Silicon Crystals; Silicon Wafer Preparation; Diffusion: Fick's Laws of diffusion, Diffusion profiles; Ion-Implantation-Ion Implantation system, Properties and Advantages of Ion Implantation; Thermal Oxidation - Utility of Thermal Oxidation, Growth and Properties of Oxide Layers on silicon, Oxide Charges; Photolithography-Photolithographic process steps, Photo-resists; Etching-Wet and Dry Etching; Epitaxy-Epitaxial Growth of Silicon; Chemical Vapour Deposition; Metallization-Aluminum for Metallization, Metallization Processes and its applications, Metallization Patterning.

Unit-3 Basic electrical properties of MOS circuits: I_{ds}-V_{ds} relationship, The Non-saturated region and Saturated region; MOS Transistor threshold voltage (V_t), MOS transistor Trans-conductance and output conductance, MOS transistor figure of merit; NMOS inverter, Pull-up to Pull-down ratio; CMOS inverter and its characteristics.

Unit-4 MOS Circuit Design Process and Scaling: MOS layers, Stick diagrams, NMOS design style, CMOS design style, lambda based design rules, contact cuts, CMOS lambda based design rules, Mask layout of NMOS and CMOS based logic gates, Substrate Bias Effect, MOSFET Scaling.

Unit-5 Subsystem Design: Switch logic; Pass Transistors and Transmission gates; NMOS, CMOS inverters; Two–input NMOS, CMOS Nand Gates; Two-input NMOS, CMOS Nor Gates; Examples of Structured Design (Combinational Logic)-A Parity Generator, Multiplexers (data selectors), A Four-line Gray Code to Binary Code Converter; Some Clocked Sequential Circuits-Two phase clock generator using D flip flops .

Text Books:

1. Integrated Circuits by K.R. Botkar, Khanna Publishers
2. Basic VLSI Design by Douglas A. Pucknell & Kamran Eshraghian, Prentice-Hall of India.

References:

3. VLSI Technology by S. M. Sze, Tata McGraw –Hill Private Limited, New Delhi.
4. Principles of CMOS VLSI Design A systems Perspective by Neil H.E. Weste, Kamran Eshraghian, Publication-Addition Wesley.
5. CMOS Digital Integrated Circuits Analysis and Design by Sung-Mo Kang, Yusuf Leblebici, Tata Mc-Graw-Hill Private Limited, New Delhi.

Subject: Internet of Things (IoT) **Code: EI- EI-451T** **Credits: 4**
Branches: Pool Elective **SEM: VII** **L T P: 3:1:0**

Course Outcomes: After completion of this course student will get knowledge on following

CO1:Able to understand building blocks of Internet of Things and characteristics

CO2:Able to understand the application areas of IOT ·

CO3:Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks·

CO4:Able to develop design thinking skills.

Unit 1- Introduction to IoT: Architectural Overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service(XaaS), Role of Cloud in IoT, Security aspects in IoT.

Unit 2- Elements of IoT: Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfacesSoftware Components- Programming API's (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP.

Unit 3- IoT Application Development: Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices.

Unit 4- IoT Case Studies: IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation

Recommended Books

1. Vijay Madisetti, Arshdeep Bahga, Ïnternet of Things, "A Hands on Approach", University Press
2. Dr. SRN Reddy, Rachit Thukral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs
3. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press
4. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi
5. Adrian McEwen, "Designing the Internet of Things", Wiley
6. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill
7. CunoPfister, "Getting Started with the Internet of Things", O Reilly Media

Subject: Digital System Design **Code: EC-433T** **Credits: 4**

Branch: Pool Elective **Sem: VII** **L T P: 3:1:0**

UNIT-1: Digital Design Fundamentals & Design of Combinational Circuits: Hardware Aspects Related to ASSERTED and NOT-ASSERTED conditions, The Karnaugh Map, Five and Six Variable Maps, Prime and Essential Implicants, Variable-Entered Mapping, VEM Plotting Theory, VEM Reading theory, Tabulation Method.

UNIT-2: Sequential Machine Fundamentals The Need for Sequential Circuits, Basic Architectural Distinctions between Combinational and Sequential Circuits, Concept of Memory, The Binary Cell, Fundamental Differences between Sequential Machines, The Flip-Flop, Flip-Flop Conversion from one type to another.

UNIT-3: Traditional Approaches to Sequential Analysis and Design Introduction, Analysis of Synchronous Sequential Circuits, Approaches to the Design of Synchronous Sequential Finite State Machines, Design Steps for Traditional Synchronous Sequential Circuits, State Reduction, Counters, Shift Register, Shift Register Sequences.

UNIT-4: Asynchronous Finite State Machines Why Asynchronous Circuits, Scope, Asynchronous Analysis, The Design of Asynchronous Machines. **UNIT-5: Introduction to VHDL** Introduction to Hardware Descriptive Languages, Types of Modeling and Fundamental to VHDL Programming

Text books:

1. An Engineering Approach to Digital Design: William I. Fletcher (PHI)
2. Digital Design: Morris Mano (PHI

Subject: P.C. Interfacing ***Code: EC-452T*** ***Credits: 4***
Sem.: VII (Pool Elective) ***L T P: 3 1 0***

UNIT-1:-Introduction to computer Personal computer. Motherboard, Microprocessor, Memory, basic I/O interface, operating system.

UNIT-2:-Communication with external devices, timing circuits, parallel I/O ports, serial I/O ports, plug in slots, PCI bus.

UNIT-3:-Computer interfacing for data acquisition and control, Family of PCs, operator interface, computer languages.

UNIT-4:-Signals, interfacing input signals, analog signal conditioning, input signal buffering and amplification, digital signal conditioning, electromechanical relay.

UNIT-5:-Output system with continuous actuators, cabling, digital to analog converter, analog to digital converters.

UNIT-6:-Plug-in-cards, Input/Output devices, software from transducer to control room, SCXI.

UNIT-7:- Low cost multi-functional DA and C card, IEEE-4888 GPIB, standard add-on-cards, back plane bus, VME bus, VXI bus microcontrollers

Reference:

1. The intel microprocessors, architecture, Programming and interfacing by Barry B. Brey.
2. Microprocessors and interfacing programming and Hardware by Douglas V.Hall.

EE-411T (Pool Elective) NON CONVENTIONAL ENERGY SOURCES, Credits 4 (L T P: 31-0)

UNIT 1: Introduction: Energy Sources, Renewable Energy Sources, and Prospect of Renewable Energy Sources.

UNIT 2: Solar Energy:
Solar Radiation, Solar Radiation Measurement and Conversion of Solar Radiation into Heat, Collection and Solar Energy Storage, Application of Solar Energy.

UNIT 3: Wind Energy:
Principle of Wind Energy Conversion System (WEC), Wind Machines, Generating Systems, Energy Storage.

UNIT 4: BioMass Energy:
BioMass conversion Technology, Photosynthesis, Biogas plants.

UNIT 5: Geothermal Energy: Estimate of Thermal Energy, Sources, Geothermal Plants.

UNIT 6: Ocean Energy:
Ocean Thermal Conversion Electric Conversion (OTEC), Methods of Conversion, Heat Exchanger, Energy From Tides, Tidal Plants, Prospects

UNIT 7: Chemical energy Sources:
Fuel cells, Classifications, hydrogen Production hydrogen energy, utilization of hydrogen gas, hydrogen as a fuel for motorcars.

UNIT 8: Magneto hydrodynamic (MHD):
Principle MHD system, advantages.

UNIT 9: Thermoionic generator:
Principle Basic Thermoionic generator

Books:

1) Non-conventional energy sources by G.D. Rai, Khanna Publisher

CS-451N (Pool Elective) Wireless Network and Mobile Computing Credits4(3-1-0)

UNIT-1 Overview of wireless communication: History, Different Generations, General characteristics of mobile devices, Electromagnetic spectrum, Radio propagation mechanisms, characteristics of wireless medium, wireless topology, cellular system (cell concepts, cell hierarchy, cell fundamentals) Issues in mobile computing: Introduction, functions, 3-Tier architecture, applications and services. GSM: Mobile services, System architecture, Radio interface, Protocols, Localization and calling Handover, Security.

UNIT-2WLAN: Technical issue (uses, design goal, types, components and services offered by a typical IEEE 802.11 network), IEEE 802.11 standard (physical layer, MAC layer mechanism & functionalities, CSMA/CA mechanism). HIPERLAN: HIPERLAN standard, HyperLAN/1 (physical layer, DLC & RLC layer, MAC sub-layer), HyperLAN/2 (Physical layer, MAC sub-layer, power conservation issues) BLUETOOTH: Specifications, transport protocol group, middleware protocol group, profile.

UNIT 3: Medium access control (wireless): Motivation for a specialized MAC (hidden and exposed terminals, near and far terminals), SDMA, FDMA, TDMA and CDMA.

UNIT 4: Mobile Network layer: Mobile IP: Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations, and dynamic host configuration protocols (DHCP). Mobile Transport layer: Traditional TCP, Indirect TCP, Snooping TCP,, Mobile TCP, Fast retransmission/ fast recovery, transmission/time-out freezing, selective retransmission, transaction oriented TCP. Wireless Application Protocol WAP: Introduction, protocol architecture and treatment of protocols of alllayers.

UNIT-5 Introduction & issues in Ad Hoc wireless networks: introduction (cellular vs ad hoc wireless networks and applications), Medium Access Scheme, Routing, Multicasting, transport layer protocols, Pricing Scheme, QoS provisioning, Self organization, security, addressing and service discovery, energy management, Scalability, deployment considerations, Issues in designing a routing protocol for ad hoc wireless Networks (Mobility, Bandwidth constraint, Error prone shared broadcast radio channel, Hidden & exposed Terminal Problems, Resource Constraints, characteristics of idle routing protocol), Classification of routing protocols: Table-driven routing protocols (DSDV,WRP), On-demand routing protocols (DSR, AODV,LAR).

Text Books:

1. Murthy and Manoj, Ad Hoc Wireless Networks, Pearson Education publication.
2. Jochen Schiller,―Mobile Communications‖, Addison-Wesley.
3. StojmenovicandCacute,–HandbookofWirelessNetworksandMobileComputing‖,Wiley, 2002, ISBN0471419028.

REFERENCES :

1. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden , Schwiebert, Loren, –FundamentalsofMobileandPervasiveComputing‖,ISBN:0071412379,McGraw-Hill Professional,.
3. Hansmann,Merk,Nicklous,Stober,–PrinciplesofMobileComputing‖,Springer,
4. MartynMallick,–MobileandWirelessDesignEssentials‖,WileyDreamTech,
5. Mobile computing, A. K. talukder and R RYavagal

Subject: WORK STUDY ***Code: ME-473T*** ***Credits: 4***
SEM: VII (Pool Elective) ***L T P: 310***

This subject deals with concept of Industrial Engineering with special emphasis to time and motion study and its relationship with productivity. The main aim of this subject is to make the student understand work study techniques as a tool for improving productivity. This course mainly focuses on Productivity & its relationship with work study; Scope value & approach of work study;
Method study techniques and its recording techniques; work measurement propose and procedure; Rating & its use in finding standard time.

UNIT 1: (10) Productivity: Factors affecting productivity, causes of low productivity, remedies to increase productivity in brief. Work study and productivity. Work study techniques and their comparison

UNIT 2: (10) Work study- definition, purpose & scope, value of work study, human aspectsin work study, basic approach.

UNIT 3: (20) Method study- definition, purpose and scope, basic approach or procedure, recording techniques, outline process charts, flow process charts, their construction and analysis flow diagrams, string diagram photographic aid, models.

UNIT:4 (10) Critical examination techniques, primary and secondary questions, development, installation and maintenance of improved methods.

UNIT:5 (10) Motion Economy Principle- Micro motion study, therbligs, and motion analysis simo charts, motion study.

UNIT:6 (10) Work Measurement definition, purpose & scope, basic procedure, work measurement techniques, introduction to stop watch time study, work sampling & predetermined motion time standards.

UNIT:7 (10) Rating its techniques & scope, application of rating normal time, standard time calculation using rating.

Text Book: Work study by ILO.

Subject: Environmental Management, **Code: CE-461T,** **Credits: 4**

Semester: VII (Pool elective) **L T P: 3 1 0**

Unit-I: Organizational structure of environmental management at central & state levels, acts & rules related to environmental management – water, air, hazardous waste, biomedical waste , noise pollution and general aspects of environment protection,.

Unit-II: Environmental audit:- water audit & energy audit, case studies
Unit-III: Cleaner technologies and their roles in environmental management

Unit-IV: Total quality management, salient features of ISO 9000, ISO 14000 and ISO 18000 certifications.

Unit-V: Environmental impact assessment, role NGO‟s, life cycle assessment

Unit-VI: Pollution tragedies:- Case studies, environmental politics, environmental economics, eco-labeling.

Unit-VII: National environmental policies:– Air and water policies, phasing out CFC‟s , phasing out of lead from petrol, implementation of CNG, biodegradable plastics, land use planning- land for a forestation, agriculture and urbanization, promotion of mass transit system. Recycling of waste, resources recovery from waste; ground water contamination and prevention, rain water harvesting.

Unit-VIII: Global warming and greenhouse effect, acid rain, depletion of ozone layer, eutrophication genetic erosion, lead pollution, pesticide pollution, increasing sea level, environmental ethics, artificial rain environmental scenario in India, rio Summit, Kyoto Protocol, Kopenhagen summit, BASIC, BRICS, CSR, Green economy, carbon credits, carbon footprint.

Text and Reference Books:

1. Lohani B.N. Environmental Quality Management, 1984 South Asian Publish, New Delhi.
2. Chanlett E.T. Environment Protection, 1979, McGraw Hill- Kogakusha Ltd.
3. ISO 9000 ISO 14 000 and ISO 18000- Volumes
4. Ethics on Engineering by Mastum M.W. and Schenzinger & 3rd Edition MC Graw-LittNewYork1997.
5. Engineering Ethics- Concept and Cases by Harrs C.L., etal word sworth Publishing, Belmot CA1995
6. Engineering Ethics – M. Govindarajan, S. Natarajan, V.S. Senthil kumar, EEE, Prentice Hall of India, New Delhi.

Syllabus of Open Elective Subjects

Subject: Operations Research **Code: MA-491T** **Credits: 4**
Branches: Open Elective **Semester: VII** **L T P:310**

UNIT 1: Introduction: Definitions of O.R. and it's scope, modeling in O.R. General methods for solving O.R. models. The Monte-Carlo technique, main characteristics of O.R., main phases of O.R. Linear programming problems. Graphical method for solving L.P.P., Two phase Method, Big-M Method, problems of tie.

UNIT 2: Assignment Model: Mathematical formulation of assignment model, Reduction theorem, problems of maximization & minimization. Hungarian process, travelling salesman problems.

UNIT 3: Transportation Model : Mathematical formulation of transportation problem. Definition of FS, BFS, Optimum solution. Algorithms of N-W rule, Least-cost & VAM and their problems.

UNIT 4: Sequencing: Introduction, principle assumptions processing of jobs through two, three & m-machine's.

UNIT 5: Game Theory: Characteristics of Games. Basic definitions, minimax criterion and optimal strategy. Equivalence of rectangular Games, Dominance process, Arithmetic method for solving zero-sum-two persons Games. Graphical and simplex methods for solving the games.

UNIT 6: Replacement: Failure mechanism of items, replacement of items that deteoriate, Replacement of item that fail completely.

UNIT 7: Inventory : Elementary Inventory Models, Inventory models with price breaks.

Reference Books:

1. G. Hadley: Linear programming, Narosa Publishing house, 1995.
2. Mokhtar, S. Bazara, John, J. Jarn‟s and Hanif, D. Sherali: Linear Programming and network flows, John Wiley & Sons, New York 1990.
3. H.A.Taha: Operations Research-An Introduction, Macmillan Publishing Co. Inc. New York.
4. Kantiswarup, P.K. Gupta and Man Mohan: Operations Research, Sultan Chand & Sons, New York.

Subject: Polymeric Materials and Their Applications **Code: CY-401T**
Semester: Open Elective **Credit-4** **L T P: 3 1 0**

1. **Basic Polymer Chemistry:** Definition, Classification, Types of polymerization.
2. **Resins and Plastics:** Thermoplastic and thermosetting resins, constituents of plastics, fabrication of plastic materials, Important resins, Cellulose derivatives, Polyethylene, Teflon, Polystyrene, Polyvinylacetate, PVC, Nylons, Phenolic resins Phenol-Formaldehyde, Urea and Malamine-Urea and melamine-Formaldehyde resins, Epoxy resins, Polyester, Silicones, Lon exchange resins.
3. **Rubbers/Elastomers:** Natural rubber, compounding of rubber, Properties, uses, reclaimed rubber, Synthetic rubber, Buna-S, Nitrile rubbers, Fibre reinforced plastics (FRP).
4. **Biopolymers:** Importance and applications of few important biopolymers eg. Proteins, carbohydrates etc.

PH -419 T	**Futuristic Materials**	**Credits: 4**
Branches: Open Elective	**Semester: VII**	**L T P:310**

Semiconductors:

Introduction of semiconductors, intrinsic and extrinsic, II-VI and IIIV semiconductors and its alloys, Advantages and necessity of the tailoring of semiconductor, Semiconductors and it alloys used of LED and other devices, Utility of semiconducting alloys like GaAIAs, GaAIN, GaAIP etc.

Superconductors:

Fundamental Phenomenon associated with superconductors. Type I& II superconductors, Meissner Ochenfeld effects, Josephon effects, fundamental of BCS theory. Novel High Temperature Superconductors. Hole superconductors, TIBaCaCuO single and bilayer. Electron superconductors NdCuO etc. Doping effects in superconductors, Organic superconductors, fullerenesl. Application of the superconductors in science, medical and commercial sectors.

Material for Magnetic media:

Material useful for magnetic recording head, magnetic disk, magnetic tape media, Magneto optic recording materials. Holography, data storage materials.

Holography:

Fundamentals of holography, Difference between conventional photography and holography. Techniques to make a hologram. Advantages of holography over other techniques.

Introduction of following with applications:

Fibre optics, Lasers, Ceramics, Dielectric Characterization of Materials.

Books: 1) Superconductivity Today: T.V. Ramakrishna & C.N.R. Rao Wiley astern Pvt. Ltd, New Delhi, 1992

2) Solid State Physics: Ashcrost/Mervin

Code: HU-449 T ***Subject: Principle of Management*** ***Credits: 4***
Semester: VII (Open Elective) ***L T P:310***

UNIT-1: Management as a discipline: Definition, nature, scope, functions, managerial Skills, Management. Thought-Historical Prospective, Social Responsibility, of Business.

UNIT-2: Planning: Concept and purpose, planning process, Management, By Objectives(MBO), Decision making.

UNIT-3: Organization: Concept and purpose of organisation, types of organisation, bases of Departmentation, concept of Authority and Responsibility, Span of Management, Line and Staff Authority, Functional Authority, Delegation of Authority, Centralization and Decentralization of Authority, Coordination Staffing.

UNIT-4: Directing: Leadership Concept, Ingredients, Traits, Styles, Roles Communication Concept. Types, Process Barriers, Making Communication effective, Importance.

UNIT-5: Controlling: Concept, Provides, Requirements, for adequate control, controlling and earning, Budgeting control Importance, Management Audit, Management in future.

Subject: Quantitative Methods in Economics ***Code: HU-409T***
Semester: VII (Open Elective) ***Credit-4*** ***L T P: 3 1 0***

UNIT:1 **Statistics:** Definition, Importance, Scope and Limitations of statistics, primary and secondary data. Classification of Meaning: objectives and types of classification. Frequency Distribution: Discrete, Grouped and continuous frequency distributions. Fundamentals of frequency distribution.

UNIT:2 **Measures of Central Tendencies:** arithmetic mean, Median, Mode, Geometric Mean and Harmonic Mean, Demerits and Uses of all methods.

UNIT:3 **Measures of Dispersion:** Mean deviation Method about Mean, Median and Mode, Merits and Demerits of Mean Deviation. Coefficient of M.D. Standard Deviation (S.D.) Method with simple short-cut and step deviation methods.Merits and Demerits of S.D. Coefficient of S.D.

UNIT:4 **Correlation:** Introduction, Types of Correlation, Karl Pearson‟s Coefficient of Correlation. Interpretation of „r‟. Probable Error, Uses of Probable Error.

UNIT:5 **Linear Regression Analysis:** Introduction, Two method of Linear Regression Analysis:- (1) Line of Regression of Y on X and (2) Line of Regression and X on Y. Why two lines of regression Coefficient of Regression. Relation between the coefficient of correlation and Regression.

UNIT:6 Index Number: Definition, Uses and Types of Index Numbers, Methods of Construction Index Numbers-(1) Simple Aggregate Method (2) Weighted Aggregate Method (3) Fisher‟s Ideal Index Numbers (4) const of living Index Numbers (5) Chain Base Index Numbers. Base Shifting.Limitations of Index Numbers.

SEMESTER -8

Subject: Biomedical Instrumentation	**Code: EI-408T**	**Credits: 4**
Branches: EI	**SEM: VIII Semester**	**L T P: 310**

Course Outcomes: At end of the course, students will be able to:

CO1: Understand fundamentals of Biomedical Engineering.
CO2: Understand basic nervous, respiratory system and Origen of biopotentials.
CO3: Understand the fundamentals of bioelectric signal and electrodes, blood gas analyzers and flow meter.
CO4: Understand the fundamentals of heart parameters, artificial pacemaker and defibrillator
CO5: Acquires basic knowledge in life therapeutic devices.

Unit 1:- Problems encountered in measuring a living system: Physiological Transducer: Pressure transducer, Transducers for body temperature measurement, pulsar sensors, respiration sensors, Blood pressure measurement of human body.

Unit 2:- Electrocardiograph (E.C.G): Block diagram of E.C.G., E.C.G. leads, Effects of Artifacts on E.C.G., Recording of E.C.G. signal, Microprocessor based E.C.G. machines, Multichannel E.C.G., Electrodes for E.C.G., Electromygraph (E.M.G,): Block Diagram of E.M.G., Electrode for E.M.G., Electroencephalograph (E.E.G.): Block diagram of E.E.G., Electrode for E.E.G., Vector Cardiograph (VCG), Apex Cardiograph, Ballisto- Cardiograph, Phonocardiograph (PCG).

Unit 3:- Blood flow measurement; Electromagnetic blood flow meter, Ultrasonic blood flow meter, NMR blood flow meter, Laser Doppler blood flow meter, Blood gas Analyzers: Blood pH measurement, electrodes for blood pH measurement, measurement for blood PCO2, blood PO2 measurement.

Unit 4:- Measurement of Heart rate: Average heart rate measurement, instantaneous heart rate meter. Pacemakers: Classification of pacemakers, Classification codes of pacemakers, Leads and Electrodes, Defibrillators: D.C. defibrillator circuit, Defibrillator electrodes.

Unit 5:- Modern imaging systems: X-ray m/c, CT scanner, Biological effect of X-ray, MRI systems, Basic NMR concept, Ultrasound imagining system, Biological effect of Ultrasound systems.

REFERENCES BOOKS

1. Biomedical Instrumentation, By R.S. Khandpur, Tata M-Graw Hill Publishing Company Limited, New Delhi.
2. Biomedical Instrumentation & Measurement by Leslie Cromwell, Fread J. Weibell, Prentice-Hall of India Pvt. Ltd.

Subject: Project-II **Code: EI-406P*** **Credits: 12**

Branches: EI **Sem: VIII Semester** **L T P: 0 0 3**

Course outcomes: At the end of the course, the student will have the ability to:

CO1: understand the final design of project in a team spirit.

CO2: implement the literature survey in her/his project.

CO3: learn technical interaction with her/his project supervisor.

CO4: finalize and validation of her/his project.

CO5: to present her/his work to any national/international conference or Journal.

Project-II will be an extension of the project-I started in the seventh semester. The project –II involves intensive literature study and/industrial visit if required, learning of software for designing, learning of programming languages/implementation of hardware circuits, a project involving analytical, experimental, design or combination of these in the area of Electronics and Instrumentation Engineering. On completion of the work, a project report should be prepared and submitted to the project co-ordinator in the department. The evaluation is based on continuous internal assessment by an internal assessment committee and external evaluation by external expert for 100 marks or as per system adopt by the concern institute/ university at the end of semester approved by the Hon‟ble Vice-chancellor/ university.

***new code w.e.f. academic session 2016-17.**

Subject: Advanced Instrumentation Lab **Code: EI-404P** **Credits: 2**

Branches: EI **SEM: VIII** **L T P: 003**

Course outcomes: At the end of the course, the student will have the ability to:

CO1: understand the working of several transducers like optical sensors, temperature sensors etc.

CO2: understand the basics of analytical instruments like pH and Conductivity meter.

CO3: understand principle and working of Hygrometer.

CO4: understand the maintenance and operation precaution of advanced instruments.

List of Experiments

1. Study of Optical Transducers using Trainer Kit. a. Photoconductive Cell
   b. Photovoltaic Cell
   c. Photodiode
   d. Phototransistor
2. Study of temperature transducers using trainer Kit
   a. RTD
   b. Thermocouple
   c. IC temperature Sensor d. Thermister
3. Study of Digital pH meter
4. Study of Digital conductivity meter
5. Study of wet and dry Hygrometer
6. Study of Flow-meter

Note:-In addition, Institutes may include more experiments based on the expertise

Subject: Biomedical Instrumentation Lab	**Code: EI-408P**	**Credits: 2**
Branches: EI	**SEM: VII Semester**	**L T P: 003**

Course outcome; At the end course student s are able to:

CO1: understand about ECG

CO2: Understand about EMG

CO3: Understand about EEG

CO4: Understand about blood pressure

CO5: understand about PCG

List of Experiments

1. Study of Electrocardiograph (ECG)
2. Study of Electroencephalogram (EEG)
3. Study of Electromyogram (EMG)
4. Study of blood pressure
5. Study of pulse sensor
6. Study of Phonocardiograph (PCG)

Note:-In addition, Institutes may include more experiments based on the expertise

List of Pool Elective:

1. EI-438T Analytical Instrumentation
2. EI-448T Solid State Electronic Devices
3. EI-458T Digital System Design Using VHDL
4. EI-460T Instrument Design & Reliability
5. EC-458T Digital Image Processing
6. EC-460T Monolithic Microwave Integrated Circuit
7. EC-416T Mobile Communication
8. CS-440T Data & Computer Network

List of Open Elective:

1. HU-402T Engineering Economics
2. PH- 429T Material Imperfection and Applications
3. HU-407T Foreign Trade

Syllabus of Pool Elective Subjects

Subject: Analytical Instrumentation **Code: EI-438T** **Credits: 04**

Branch: EI (Pool Elective) **Sem: VIII** **L T P: 3 1 0**

Course outcomes: At the end of the course, the student will have the ability to:

CO1: understand the analytical instruments and their types.
CO2: understand the UV and VIS spectrometers for various analyses.
CO3: understand the principle of Infrared Spectroscopy and its applications.
CO4: understand the Mass spectroscopy and its utility in analysis.
CO5: understand the principles and working of instruments used in X-rays and nuclear radiation measurement.

Unit-1: Introduction of Analytical Instruments:

Elements of an analytical instruments, Sensors and Transducer- classification, performance, characteristics and smart sensors; Signal conditioning in analytical instruments, PC based analytical instruments.

Unit-2: Ultraviolet and Visible Spectroscopy:

Introduction, Electromagnetic Radiation and Spectrum, Interaction of Radiation with matter, Laws relating to absorption of radiation: Lambert's Law, Beer‟s Law, Beer–Lambert Law; Absorption Instruments, Radiation Sources: Black body & Discharge lamp, Optical Filters-Absorption & Interference, Monochromator: Prism, Diffraction Gratings, Holographic Gratings, Materials of Optical Components. Photosensitive Detectors: Photovoltaic, High Vacuum Photo–Emission Cells, Photomultiplier Tubes, Silicon Diode Detectors, Photo Diode Arrays, Sample Holders. UV–Visible Spectrophotometers; Calorimeters/ Photometers, Single Beam Filter Photometer, Spectrophotometer: Single Beam Null type, Direct reading Spectro calorimeters/spectrophotometers (Spectronic 20), Double Beam Radio-recording spectrophotometer (Optical Diagram & Block Diagram); Microprocessor based Spectrophotometer (Block Diagram)

Unit-3: Infrared (IR) Spectroscopy:

Introduction, Near–Middle–Far IR range of Spectrum; Basic Components of IR Spectrophotometers: Radiation Source; Monochromaters; Mirrors, Entrance & Exit Slits, Detectors: Quantum Type & Thermal, Types of IR Spectrophotometers: Optical Null method, Radio Recording Method; Fourier Transform IR Spectroscopy (FTIR):Principle and Block diagram.

Unit-4: Mass Spectroscopy:

Mass Spectrometers (MS): Basic of Mass Spectrometer (MS): Principle of operation, Type of Mass Spectrometers: Magnetic Deflection, Time-of-Flight, Radio Frequency, Quadruple Mass Spectrometer.

Unit-5: X-ray Spectroscopy and Nuclear Radiation Measurement:

X-Ray Spectrometers: Introduction, X-ray Spectrum, Instrumentation for X-ray Spectroscopy: X-ray generating equipment, Collimator, Monochromat or and Detectors; X- ray Diffracto meter, X-ray Absorption Meter; X-ray Fluorescence Spectrometry: X-ray Fluorescence Spectrometer. Fundamental of Radio-chemical method, Radiation detectors: Photographic Emulsion, Ionization Chamber, The Geiger Muller Counter, Proportional Counter, Scintillation, Counter and Gamma Detector.

Reference Book:

1. Handbook of Analytical Instruments (2e), RS Khandpur, Tata Mc-Graw Hill Education Private Limited, New Delhi.

Subject: Solid State Electronic Devices **Code: EI-448T** **Credits: 4**
Branch: EI (Pool elective) **Semester: VIII** **L T P: 3 10**

Course Pre-requisites: Students should have the basic fundamentals and applications of Basics Electronics Engineering, Analog Electronics and Integrated Circuits.

Course Outcomes: At end of the course, students will be able to:

CO-1: Understand the knowledge of direct and indirect semiconductors, carrier concentrations, Fermi level and effect of temperature on carrier concentrations.
CO-2: Describe the various types of phenomenon of Excess carriers in Semiconductors.
CO-3: Discuss the energy band diagram, build-in-potential for abrupt, one side abrupt, and linearly graded pn-junction.
CO-4: Analyze the concept of MOS capacitor, Electrostatic potential and non-ideal oxide C-V behavior of MOSFET.
CO-5: Illustrate the various types of MOSFET channel effects.

Unit-1 Carriers Concentrations in Semiconductors: Direct and Indirect Semiconductors; Carrier Concentrations-The Fermi Level, Electron and Hole Concentration at Equilibrium, Temperature Dependence of Carrier Concentrations, Compensation and Space Charge Neutrality; Drift of Carriers in Electric and Magnetic Fields-Conductivity and Mobility, Drift and Resistance, Effects of Temperature and Doping on Mobility.

Unit-2 Excess Carriers in Semiconductors: Carrier Lifetime and Photo conductivity- Direct Recombination of Electron and Holes, Indirect Recombination; Trapping, Steady State Carrier Generation; Quasi Fermi Levels, Photoconductive devices; Diffusion of Carriers- Diffusion Processes, Diffusion and Drift of Carriers, Built-in the Fields, Diffusion and Recombination; The Continuity Equation, Steady State Carrier Injection; Diffusion Length.

Unit-3 p-n Junction: Thermal Equilibrium Condition-Band diagram, Equilibrium Fermi Levels (Built-in-Potential), Space Charge; Depletion Region-Abrupt Junction, One Side Abrupt Junction, Linearly Graded Junction; Current-Voltage Characteristics- Ideal Characteristics.

Unit-4 MOSFETs: The MOS Capacitor, Electrostatic Potential and Charge Distribution in Silicon, Non-Ideal Oxide Capacitance-Voltage (C-V) Behaviour.

Unit-5 MOSFET Channel Effects: Long Channel MOSFET- Gradual-Channel Approximation, Substrate Bias Effect, Short channel MOS Device-Short Channel Effect, Drain Induced Barrier Lowering (DIBL), Gate-Induced Drain Leakage (GIDL).

Text Books:

1. Solid State Electronic Devices by B.G. Streetman and S.K. Banerjee, Sixth Edition,Prentice-HallofIndia Pvt. Ltd., New Delhi.
2. Electronic Devices and Integrated Circuits by Ajay Kumar Singh, Second Edition, PHI Learning Pvt. Ltd, New Delhi.

Reference Books:

3. Semiconductor Devices: Physics and Technology by S. M. Sze, Wiley Student Edition
4. Semiconductor Physics and Devices: Basic Principles by Donald A. Neamen, Third Edition, Tata Mc-GrawHill Publishing Company Limited, New Delhi.

Subject: Instrument Design & Reliability, **Code: EI-460T** **Credit: 4**

Semester: VIII (Pool Elective) **L T P: 3 1 0**

Course outcomes: At the end of the course, the student will have the ability to:

CO1: understand the several important aspects of instruments operation like shielding and grounding.

CO2: understand the various elements of instrument design and manufacturing.

CO3: understands the guidelines for operation of instruments in hazardous environment.

CO4: understand the concept of reliability in instrumentation.

1. Grounding and Shielding: Grounding- The concept of earth ground, Typical power supply grounding error , some example of current return path symbols, Shock hazard protection using earth ground, Grounding considerations, basic grounding practices with examples. Shielding- Practical guidelines, examples Protection from electrostatic discharge.

2. Element of Design & Manufacturing: Introduction, product life cycle, Circuit design, Circuit layout, Assembly and inspection, testing and calibration, power distribution, wiring and cabling, enclosures, integrating Testing.

3. Instrumentation in Hazardous Areas:
Introduction, Hazardous area classification-protective concept, Enclosure classification designations- IP code, NEMA types, equipment design and construction, Intrinsically safe design- Safe energy level, Intrinsic safe circuit design, installing Intrinsic safe systems, Transformer isolation barrier (TIB), Relevant Indian standards.

4. Reliability of Instruments:
Introduction, Definition of component, modules and system, Components-Physics of failure, mathematics analysis, Mode of failure, failure rates. Modules- Failure rates, partial failure, design; Systems- Redundancy, Repair and availability-concept of MTTR, MTBF and maintainability Practical Implementations- Design and operation, environment, Diversity, Technical documentation.

Reference books:

1. Electronic Instruments and Instrumentation technology by MMS Anand, Prentice hall of India, New Delhi.
2. Reliability- An article by BE Noltingk

Subject: Digital Image Processing **Code: EC-458T** **Credits: 4**
Branch: EC **Sem: VIII (Pool Elective)**

UNIT I : DIGITAL IMAGE FUNDAMENTALS

Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – color models.

UNIT II : IMAGE ENHANCEMENT

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering – Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.

UNIT III : IMAGE RESTORATION AND SEGMENTATION

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering Segmentation: Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation- Morphological processing- erosion and dilation.

UNIT IV : WAVELETS AND IMAGE COMPRESSION

Wavelets – Subband coding – Multiresolution expansions – Compression: Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards.

UNIT V : IMAGE REPRESENTATION AND RECOGNITION

Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments – Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors –Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching.

REFERENCE Books

1.Rafael C. Gonzales, Richard E. Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2010.
2.Anil Jain K. “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011.
3.Willliam K Pratt, “Digital Image Processing”, John Willey, 2002.
4.Malay K. Pakhira, “Digital Image Processing and Pattern Recognition”, First Edition, PHI Learning Pvt. Ltd., 2011.

Subject: Mobile Communication **Code: EC-416T** **Credits: 4**

Branch: EC (Pool Elective) **Sem: VIII**

Unit-1: Introduction to wireless communication

Evolution of mobile radio communication, examples of wireless comm. Systems, paging systems, cordless telephone systems, comparison of various wireless comm. systems, modern wireless communication systems : second, third and fourth generation wireless networks, WLL, WLAN, Bluetooth, PAN.

Unit-2: Introduction to cellular mobile systems

Spectrum allocation, basic cellular systems ,performance criteria, operation of cellular systems, analog cellular systems, digital cellular systems, frequency reuse, channel assignment , handoff strategies , capacity of cellular systems

Unit-3: Multiple Access Techniques

Introduction to multiple access techniques: FDMA, TDMA, CDMA, Performance of CDMA systems, Comparison of various multiple access techniques, RAKE receiver.

Unit-4: Digital modulation techniques for wireless communication

Performance analysis of BPSK, DPSK, QPSK, M-ary FSK, MSK, QAM, OFDM for Wireless transmission.

Unit-5: Fading

Propagation path loss, free-space propagation model, outdoor and indoor propagation models, multipath fading frequency dispersive, time dispersive and frequency dispersive channels, delay spread and coherence band with

Unit-6: Diversity and basic Combining methods

Diversity and types of Diversity: time Diversity, antenna Diversity, frequency Diversity, Combining methods: selection combiner, maximal ratio combiner, equal gain combiner.

Text books:

1. Wireless Communication: Theodore S Rappaport
2. IS-95 CDMA: Vijay K Garg
3. Communication Systems: Simon Haykins

Subject: Data & Computer Network	**Code: CS-440T**	**Credits: 4**
Branches: Pool Elective	**SEM: VIII Semester**	**L T P: 3 1 0**

Unit 1:- Introduction: Basic Concepts, transmission mode, categories of network. The OSI model, functions of the layers, interface services, Connections and connectionless oriented services, Services primitives.

Unit 2:- The physical layer: Transmission media, switching, Circuit switching & Packer switching, Message switching.

Unit 3:- Date link layer: Data Link Control- Line Discipline, Flow Control, Error Control.

Data Link Protocol - A Synchronous Protocol & Synchronous Protocols.

Unit 4:- Medium Sub Access sub layers: The channel allocation problem, Topologies: asymmetric and symmetric, Multiple Access protocol, IEEE Standard 802 for LAN & MANS. (IEEE 802.3 (Ethernet)), IEEE 802.4 (Token ring), IEEE 802.5 (Token Bus), IEEE 802.6 (DQDB).

Unit 5:- Network layer: Network layer: design issue, Routing, Algorithms (types and characteristics), Shortest path routing, Flooding, Distance vector routing, Link State routing. Congestion control algorithms; General principles of congestion control, congestion prevention policies, traffic shaping.

Unit 6:- Introduction to Routers: Bridges, ATM, ISDN, SNMP, HTTP, FTF, TELNET, POP3, SLIP, Network Simulator (NS-2).

REFERENCES BOOKS

1. Data Communication and network by Stalling, PHI.
2. Computer networks by A.S. Tannebaum, PHI.
3. Data Network by Bertisekar D, Gallegar R. PHI.
4. Data communication and networking by Behrouz A Forouzan, TMH

Syllabus of Open Elective Subjects

Subject: Engineering Economics (Open Elective) **Code: HU-402T**
Credit-4 **Sem: VIII** **L T P (3 1 0)**

UNIT I: Concepts of Engineering Economics.

- Nature, scope and importance of engineering economics.
- National Income – meaning and concept. Definition of national income, Gross National Product (GNP) and Net National Product (NNP).

UNIT II: Theory of Employment.

- Classical theory of employment – Say‟s Law.
- Keynesian theory of employment – Effective demand, Aggregate demand, Aggregate supply, Underemployment equilibrium.

UNIT III: Consumption Function.

- Keynes‟ law of consumption
- Marginal Propensity to Consume (MPC) Marginal Propensity to Save (MPS)
-

UNIT IV: Monetary Economics.

- Functions of money
- Gresham‟s Law of Money
- Quantity Theory of Money (QTM) – Fisher‟s Version of QTM.
- Cash Balance Approach – Cambridge Equations. Comparison of Fisher equation and Cambridge equation ; Superiority of Cambridge over Fisher.

  Inflation – Definition of inflation, Demand pull inflation, Cost push inflation, Measures to control inflation.

  Deflation – Definition of deflation, Impact of deflation on different sections of society, Measures to control deflation.

UNIT V: Economic Development.

- Definition of Economic Development , obstacles to economic development.
- Definition of Economic Growth , determinants of economic growth, difference between economic development and economic growth.
- Human Development Index (HDI). Gender Inequality Index (GII).
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Reading list

Edward Shapiro, Macroeconomics, Galgotia Publication Ltd. , New Delhi.
R Dornbusch, S Fisher and R Startz, Macroeconomics, McGraw Hill, New York. D M Mithani, Macroeconomics, Himalaya Publishing House, New Delhi.

Subject: Material Imperfection and Their Application **Code: PH-429T**

Semester: VIII (Open Elective) **Credit-4** **L T P: 3 1 0**

Structure of Crystalline Solids: Fundamental concepts, unit cell, crystallographic directions and planes, Crystal systems, Metallic crystal structures.

Imperfections in Solids: Introduction, Point defects: Vacancies and self-interstitials colour centres, in purities is solids, Linear defects dislocations, Interfacial defects, Bulk or volume defects.

Diffusion in Solid: Diffusion, diffusion Mechanisms: vacancy diffusion, interstitial diffusion, steady state diffusion: Fick‟s first law, non-steady state diffusion: Fick‟s second law, Factors that influence diffusion, Applications.

Amorphous Materials: Definition, types, structure, methods of preparation of amorphous materials, Applications: optical fibers, amorphous semi-conductor, optical memories, solar cells.

Plastic deformation & Strengthening Mechanisms: Plastic deformation, the tensile stress-strain curve, modes of plastic deformation-slip and twinning, the shear strength of perfect and real crystals, the stress to move a dislocation, mechanisms of strengthening in metals by grain size reduction, solid solution strengthening, strain hardening.

Lasers: Principle, population inversion, Einstein‟s and B coefficients, types: Ruby laser, he-Ne laser, semi conductor lasers.

Books:
- Non Crystalline materials: by Davis & Mott
- Amorphous Solids: by S.R. Elliot
- Solid State Physics: by M.A. Wahab

Subject: Foreign Trade **Code: HU-407T**
Semester: VIII (Open Elective) **Credit-4** **L T P (3 1 0)**

UNIT: 1 **Nature of foreign Trade:** Meaning, Nature, Scope and Distinct Features of International Transactions.

UNIT: 2 **Theories of International Trade:** The Classical Theory:-Absolute Advantage Model of Adam Smith, comparative Advantage Model of David Ricardo, the Neo-classical Analysis:-International trade Equilibrium under Constant cost, Increasing Cost and Decreasing cost conditions.

UNIT: 3 **Tariffs and Quota:** types and Effect of tariffs and Quotas, Quota vs. Tariff.

UNIT: 4 **International Monetary fund (I.M.F.):** Nature, Objectives and functions of I.M.F. International Monetary System, since the demise of Bretton Woods System.

UNIT: 5 **International Financial Institutions:** World Bank (IBRD, International Financial Corporation (I.F.C.), International Development Association (I.D.A.).

UNIT: 6 **India's Trade Policy:** Trends of Exports and Imports of India since independence, Composition of India"s Foreign Trade.