Course Structure

and

Detailed Syllabi

for

B.Tech.

in

Electronics and Instrumentation

Recommended by Board of Studies (BOS)

महात्मा ज्योतिबा फुले
रुहेलखण्ड विश्वविद्यालय, बरेली

Department of Electronics and Instrumentation Engineering
Faculty of Engineering and Technology
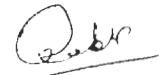# M.J.P. Rohilkhand University, Bareilly

October 2012

Department of Electronics and Instrumentation Engineering
Faculty of Engineering and Technology
MJP Rohilkhand University, Bareilly- 243 006

The Board of Studies (BOS) committee duly approved by Hon'ble Vice-chancellor, for B.Tech. (Electronics and Instrumentation) course of the department recommends the attached syllabus in its meeting dated 20th October 2012. The syllabus will be effective from the academic session 2012-13 onwards.

The following members attended the meeting:

(A) External Expert

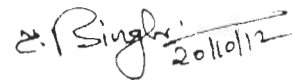1. Dr. R.B. Gupta, Deputy General Manager, Indosolar Ltd., Noida

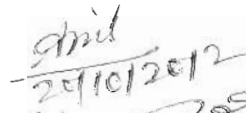*(B) Internal Members*

1. Mr. Sanjeev Tyagi, Reader, Head & Convener BOS

2. Mr. Yatender Kumar, Reader

3. Mr. Yograj S. Duksh, Reader

4. Mrs. Reena Pant, Lecturer (Sr. Scale)

5. Mr. Anil Kumar Singh, Lecturer (Sr. Scale)

6. Mr. Rakesh Kumar Maurya, Lecturer (Sr. Scale)

Course Structure and Syllabi for B.Tech (4 Years Course) in Electronics and Instrumentation Effective from Academic Session 2012-13

Course Structure and Syllabi for B.Tech (4 Years Course) in Electronics and Instrumentation Effective from Academic Session 2012-13

SCHEME OF COURSES FOR B.TECH
Electronics and Instrumentation Engineering
First Year
B.Tech I year, I Semester

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 (EE, EI & EC)	2	0	0	2
12.	ME-105T	Basic Mechanical Engineering (CSIT, CH & ME)	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

S.No	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 (ME, CSIT & CH)	2	0	0	2
12.	ME-105T	Basic Mechanical Engineering (EE, EI & EC)	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 (EC, EI, EE, CSIT)	3	1	0	4
2.	EI-203T	Electronic Measurement & Instrumentation (EC, EI)	3	1	0	4
3.	EC-201T	Electronics Engineering Materials (EC, EI)	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.	EI-201P*	Electronic Devices Lab (EI, CSIT)	0	0	3	2
8.	EC-203P	Electronic Circuit Lab (EC, EI, CSIT)	0	0	3	2
9.	CS-201P	Computer Programming Lab-II	0	0	3	2
			Total Credits			**30**

* w.e.f. academic session 2013-14 in place of EC-201P.

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.	EI-206T	Soft Computing Techniques (EI)	3	1	0	4
5.	CS-204T	Computer Organization	3	1	0	4
6.	EE-202T	Element of Electrical Machines (EC, EI, ME)	3	1	0	4
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			**30**

V Semester

S. No.	Subjects 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	Transducer (EI)	3	1	0	4
4.	EI-305T	Integrated Circuit Technology & Design (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.	EE-303P	Power Electronics Lab (EE, EI)	0	0	3	2
10.	EI-303P	Transducer Lab (EI)	0	0	3	2
		Credits			**Total**	**32**

VI Semester

S. No.	Subjects Code	Subjects	Teaching Schedule			Credits
			L	T	P	
1.	EC-302T	Digital Signal Processing (EC, EI)	3	1	0	4
2.	EI-302T	Microcontrollers & 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	Power Plant Instrumentation (EI)	3	1	0	4
6.	CS-302T	Data Network & Computer Network	3	1	0	4
7.	EI-302P	Microcontrollers Lab (EC, EI)	0	0	3	2
8.	EC-304P	Digital Communication Lab (EC, EI)	0	0	3	2
9.	EE-301P	Control System Lab (EC, EI, EE)	0	0	3	2
10.	EI-304P	Optical Fibre Instrumentation Lab (EI)	0	0	3	2
		Total Credits				**32**

VII Semester

S. No.	Subject Code	Subjects	Teaching Schedule			Credits
			L	T	P	
1.	EI-401T	Biomedical Instrumentation (EI)	3	1	0	4
2.	EI-403T	Industrial Instrumentation (EI)	3	1	0	4
3.	EI-405T	Metrology, Calibration & Data Analysis (EI)	3	1	0	4
4.	-----	Open Elective	3	1	0	4
5.	-----	Pool Elective	3	1	0	4
6.	EI-407	Industrial Training (EI)	0	0	3	2
7.	EI-409	Seminar (EI)	0	0	3	2
8.	EC-401P	Digital Signal Processing Lab	0	0	3	2
9.	EI-403P	Product Design & PCB Lab (EI)	0	0	3	3
10.	EI-405P	Project-I (EI)	0	0	3	2
		Total Credits				**31**

List of Pool Elective:
1. EI-437T   Analytical Instrumentation
2. EI-439T   Virtual Instrumentation
3. EC-433T   Digital System Design
4. EC-452T   PC Interfacing
5. EE-411T   Non Conventional Energy Sources
6. CS-451T   Wireless Network and Mobile Computing
7. ME-473T   Work Study
8. 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

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

S.No.	Subjects Code	Subjects	Teaching Schedule			Credits
			L	T	P	
1	EI-402T	Process Control Instrumentation (EI)	3	1	0	4
2	EI-454T	Digital & Non Linear Control (EI)	3	1	0	4
3	-----	Open Elective	3	1	0	4
4	-----	Pool Elective	3	1	0	4
5	EI-402P	Project-II (EI)	0	0	12	12
6	EI-404P	Advanced Instrumentation Lab (EI)	0	0	3	2
Total Credits						**30**

List of Pool Elective:
1. EI-456T   PCB Design & Technology
2. EI-458T   Digital System Design Using VHDL
3. EI-460T   Instrument Design & Reliability
4. EC-458T   Digital Image Processing
5. EC-460T   Monolithic Microwave Integrated Circuit
6. EC-416T   Mobile Communication

List of Open Elective:
1. HU-402T   Engineering Economics
2. PH- 429T   Material Imperfection and Applications
3. HU-409T   Quantitative Methods in Economics
4. 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.

B.Tech. First Year (First Semester)

PH-101T   Engineering Physics-I (All Branches)   Credits-4   LPT: 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   LPT: 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.

Note: A setting of eight questions will be there covering all the units proportionally out of which any five are to be attempted.

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 Fundamentals & Programming Credits: 4   L T P (3-1-0)

UNIT 1: Introduction to Computers: Basic definition, Generation, Classification of computers, Introduction to Computer architecture. **Number Systems:** Introduction, Classification-Decimal, Binary, Octal, Hexa Decimal, and their convertibility, Data representation, ASCII, BCD, Gray Code. **Input/Output:** Input System, Input device- Keyboard, Mouse, Joystic, Lighten, MCR MICR,Touch Screen, Graphic Tablet, Voice Input System, Output System, Output Devices-VDU, Printers, Plotters.

UNIT 2: Planning The Computer Program: Purpose of program planning, Algorithms, Flowcharts, Decision Tablets, Pseudo code. **Memory:** Introduction, Characteristic, Main Memory, secondary memory, Back- Up Memory, Cache Memory, Primary Memory, Semiconductor Memory, Memory Management Unit.

UNIT 3: Basic Operating System Concept: MS-DOS, WINDOWS, Introduction to basic commands Of DOS, Evolution of Operating Systems, Batch Processing, Spooling, Multiprogramming, Multiprocessing, Time Sharing, On Line Processing, Real-Time Processing, Introduction to Internet, Basic Terms related with internet.
Computer Software:
Introduction to Software, Relationship between Hardware and Software, Types of Software, Acquiring software, Firmware.

UNIT 4: Programming in C: History, Introduction to C Programming, Language, Structure of C Programs, Compilitation and Execution of C Programs, Debugging Techniques, Data Type and sizes, Declaration of Variables, Modifiers, Identifiers and Keywords, Symbolic constants, Storage Classes(Global, Automatic, External, Register, And Static), Enumerations, Command line Parameters, Macros, The C Preprocessors.

UNIT 5: Operators: Unary Operators, Arithmetic and Logical Operators, Bit wise Operators, Assignment Operators, Expressions, Conditional Expressions, Precedence and order of evaluation. **Control Statements:** if-else, switch, break, continue, the comma operator, Goto statement. **Loops:** for, while, do-while. **Functions:** Built-in and user-defined, Function declaration, Definition and Function call, parameter passing, call by value, Call by reference, Recursive Functions, Multifile programs. **Arrays:** Linear Arrays, Multidimensional Arrays, Passing array to functions, Arrays of strings.

UNIT 6: Structure And Union: Definition and differences, Self-referential Structure. **Pointers:** Introduction, Accessing the address of a variable, Declaring & Initializing pointers, Accessing a variable though in pointer, Pointers and Arrays, Pointers and character strings, Pointers and functions.

References:
    1) Computers Fundamental by Rajaraman.
    2) Computers Fundamental by B.Ram.
    3) Computer Fundamental by P.K. Sinha.
    4) 'Programming in C' by E. Balagruswamy, TMH.
    5) 'Let Us C' by Yashwant Kanetkar, Narosa.
    6) Exploring 'C' by Yashwant Kanetkar

ME-101T   **MANUFACTURING TECHNIQUES**

Credit: 02   L   T   P   Total
                                                                 2   0   0   02

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

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 P T: 3 1 0*

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,

Subject: Basic Electronics Engg. Lab   Code: EI-101P/102P   Credits: 2   LTP: 003

Branches: CSIT, ME, CH (Semester-I); EC, EI, EE (Semester-II)

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.**

B.Tech. Second Semester

Subject: Engineering Mathematics-II   *Code: MA-102T*   *Credits: 4*   *LTP: 310*

Branches: All Branches   Semester: II

Note: A setting of eight questions will be there covering all the units proportionally out of which any five are to be attempted.

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 $\int_0^{2\pi} f(\cos\theta, \sin\theta)$ do and $\int_{-\infty}^{\infty}$ fen, 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.

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

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.

Environmental Studies

CY-103T   Credits: 2   L P T (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**   **LPT (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.   2. R. Dornbusch, S. Fischer, and R. Startz. **Macroeconomics** (9th Edition), McGraw-Hill Inc. New York, 2004.

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.

B.Tech Third Semester

Subject: Analog Electronics   *Code: EI-201T*   *Credits: 4*

Branches: EC, EI, CSIT, EE   *Sem: III semester*   *L P T: 3 1 0*

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 characteristic, 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).

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
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, Wein Bridge, Schering Bridge.
Potentiometers: DC Basic Circuit, Laboratory type, Standardization of Potentiometers; AC: Drysdale polar potentiometers, Gall-Tinsley AC Potentiometer (Working & Construction both).

Unit-4
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.

Unit-5
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-6
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. Electronic Measurement & Instrumentation By A.K. Sawhney, Publication- Dhanpat Rai & Sons.
2. Electronic Instrumentation By H.S. Kalsi, Publication- Tata McGraw Hill.

Subject: Electronics Engineering Materials   *Code: EC-201T*   *Credits: 4*

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

Unit 1:- Atoms & aggregates of atoms: Introduction, nomenclature pertaining to electronic states, the electron configuration of atoms, nature of the chemical bond & classification of solids.

Unit 2:- Dielectric properties of insulators in static fields: Polarization & dielectric constant, the atomic interpretation of the dielectric constant of non-atomic gases, qualitative analysis of the dielectric of non-atoms gases, qualitative & quantitative dielectric constant of poly atomic molecules, the internal fields in solids & liquids, the electric constant of solids, some properties of ferroelectric materials, spontaneous polarization piezoelectricity.

Unit 3:- Behaviour of dielectrics in alternating field: Frequency dependence of the electronic permeability, ionic polarization as a function of frequency, dielectric relaxation, dielectric losses.

Unit 4:- Magnetic properties of materials: Classification of magnetic materials, diamagnetism the origin of permanent magnetic dipoles in matters, paramagnetic spin systems, some properties of ferromagnetic materials, anti-ferromagnetic materials, ferri-magnetic materials.

Unit 5:- The conductivity of metals: Relaxation time, collision time & mean free path, electron scattering & resistivity of metals, the heat developed in a current carrying conductor, the thermal conductivity of metals, superconductivity.

Unit 6:- The mechanism of conduction in semiconductor: Classifying materials as semiconductors, the chemical bond in Si &Ge and its consequences, the density of carriers in intrinsic semiconductors, the energy gap, conductivity, hall effect & carrier density.

<u>**REFERENCES**</u>

1. Electrical Engineering Materials, A.J. Dekker

Subject: Electromagnetic Theory *Code: EC-203 T* *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, TataMcGraw hill inc.
3. Engineering Electromagnetics; Haytt, Kemmerly.
4. Electromagnetic wave and radiating system; John, Balmin
5. Engineering Electromagnetics; William Haytt

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

Branches: EC, EI, EE   *SEM: III Semester*   *L P T: 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 P T: 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.

EI-201P Electronic Devices Lab

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

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.

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

B.Tech Fourth Semester

Subject: Linear Integrated Circuits 　　　　　　*Code: EI-202T* 　　　　*Credits: 4*

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

Unit 1:- Differential Amplifiers: Introduction, Differential amplifier circuit configuration, D.C. and A.C. analysis of dual-input balanced output, single input-balanced output, dual input unbalanced output, single input-on balanced output, differential amplifier configuration, FET differential Amplifier, an introduction, differential amplifier with swamping resistors, cascaded differential amplifier stages, cascade or CE-CB configuration.

Unit 2:- Operational Amplifiers: Introduction, Block diagram representation of typical Op-Amplifier, level transistor stage of op-amp, transistor current mirrors and active loads, output stage of op-amp, transfer characteristic of output stage, constant current bias, Thermal stability.

Unit 3:- Interpretation of data sheets and characteristics of an op-amp: Interpreting a typical set of data sheets, electrical parameters like, input offset voltage, input offset current, input bias current, CMMR, Slew rate etc. The ideal op-amp, equivalent circuit of an op-amp, ideal voltage transfer curve, open loop op-amplifier configuration.

Unit 4:- An Op-Amp. With negative feedback: Block diagram representation o feedback configuration, voltage series and voltage shunt feedback amplifier, concentrating on voltage gain, input & output resistances, bandwidth with feedback expressions, voltage follower circuits.

Unit 5:- Frequency response of an op-Amp.: Frequency response, compensating networks, high frequency op-amp., equivalent circuit, open loop voltage gain as a function of frequency.

Unit 6:- Applications of Op-Amp. & Linear I.C.'s: (i) Summing amplifier, scaling and averaging amplifier, instrumentation amplifier, integrator, differentiator, differential amplifier realization using one and two op-amp.

(ii) Active filters; Advantages of active filters over passive filters, First order low pass Butterworth filter design, Second order L.P. Butterworth filter, first and second order H.P. Butterworth filters. Higher order filtered an introduction; band pass and band reject filters. All pass filter design, introduction to oscillators.

Unit 7:- 555 Timer, 566 (VCO), P.L.L., - I.C.'s

REFERENCES

1. Op-amps & linear integrated ckts by: - R.A. Gayakwad-PHI (India).
2. Operational amplifiers and linear integrated Ckts by Coughlin, Driscoll-PHI (India).
3. Linear integrated ckts by D. Roy Chaudhary, Shail Jain/New age international (P) Ltd, India.

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

Branches: EC, EI, and ME   *SEM: IV Semester*   *L P T: 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: Signals and Systems   *Code: EC-202T*   *Credits: 4*

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

Unit 1:- Fourier analysis of signals, Amplitude, Phase and Power spectrum, Orthogonality of functions, Types of signals, Fourier transform of some useful functions, Singularity functions & its properties, Dirac Delta function & its properties, Sampling function, Laplace transform of some useful functions.

Unit 2:- Convolution of signals, Graphical & analytical methods of convolution, sampling theorem, Nyquist rate &Nyquist interval, Aliasing, Aperture effect, Recovery from sampled signal, natural sampling, flat top sampling. Time convolution theorem,Frequency convolution theorem.

Unit 3:- Power & Energy signals, Energy & Power spectral densities of signals, Cross correlation, Auto correlation.

Unit 4:- Systems & Filters: Linear system, Time invariant & LTI system, Impulse response, Causal systems, Filter characteristics of linear systems, Low pass filter High pass filters, Band pass filters, Band pass, Band stop filters.

Unit 5:- Random variables and probability theory, PDF, CDF and their properties, Normal and Gaussian distribution.

REFERENCES BOOKS

1. Modern Digital &Analog System by B.P. Lathi
2. Communication systems by Singh & Spare
3. Communication systems by Simon Haykins
4. Digital communication systems by Taub & Schilling
5. Probability theory and Queuing methods

Unit 1:- Basic Concept of Boolean Algebra: Different rules for arithmetic operation, minimisation 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

1. Introduction: - Review of digital logic gates, Design of adder and subtractor using gates & K-MAP, functioning of multiplexer, de-multiplexer, flip-flop.

2. Arithmetic for Computer: - Introduction to number system, negative numbers, addition & subtraction, logical operation, constructing and A.L.U., multiplications & division, floating point arithmetic.

3. Processor Design:- Processor organisation, Processor Level, information representation, instruction format, Addressing modes (Implied Mode, Immediate mode, register indirect mode, auto increment or Auto decrement mode, direct addressing mode, indirect addressing mode, relative addressing mode, index addressing mode), instruction types.

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

5. Memory Organization:- Classification memories, Memory Hierarchy, Optimization of memory hierarchy, Virtual Memory, Dynamic Address Translation Scheme addressing scheme for main memory, segmented memory system, paged segment memory, memory management policies, High speed memories, characteristics of cache memory, Cache memory organisation, Block replacement policies, interleaved memories, associated memories.

6. System Organization: - Bus arbitration, Programmed I/O (IO addressing, IO instruction), DMA (Types & procedures), interrupts (procedure, interrupt selection, vectored interrupts), Concurrency Control, System management.

REFERENCES:

1. Computer Architecture and Organization, By John P. Hayes, Me Graw Hill.
2. Computer organization and design, by John L. Hennessy & David A. Petterson, Morgan Kaufman.
3. Computer System Architecture, by M. Morris Mano, PHI

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., Non Linear activation functions, Training of ANN and different training algorithms.

Fuzzy Logic

Unit-2 Introduction: Uncertainty and Information, Fuzzy sets & Membership functions, chance versus Fuzziness.

Unit-3 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.

Unit-4 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-5 Properties of Membership Function, Fuzzification and Defuzzification: Features of membership function, various forms of fuzzification, defuzzification to crisp sets, λ- cuts for fuzzy relations, defuzzification to scalars (methods of defuzzification).

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: Linear Integrated Circuit Lab   *Code: EI-202P*   *Credits: 2*

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

List of Experiments

1. To study the op-amp based non inverting amplifier.
2. To study the op-amp based inverting amplifier.
3. To study the op-amp based Integrator circuit.
4. To study the op-amp based Differentiator circuit.
5. To study the following parameters of operational amplifier.
   a) Output Offset Voltage
   b) Input Offset Current
   c) Input Bias Currents
   d) Slew Rate
6. To study the op-amp based Square Wave Generator.

7. To study the op-amp based comparator circuit

Subject: Digital Electronic Circuit Lab   *Code: EI-204P*   *Credits: 2*

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

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.**

B.Tech Fifth Semester

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

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

Unit 1:- Modulation Process: Definition of amplitude modulation, frequency modulation & phase modulation, DSB-AM, DSB-SC-AM, using linear modulation and non linear modulation.

Unit 2:- Linear Modulation: Collector modulator or plate modulator and base modulator.

Unit 3:- Non linear modulation: Balanced moduling& ring modulator

Unit 4:- Generation of frequency modulation: Indirect method of FM i.e. Armstrong method of frequency modulation direct method of FM: reactance modulator.

Unit 5:- Demodulation/detection process: Demodulation of AM waves, diode detection 1, average detection and 2. Envelop detection, superhetrodyne receiver.

Unit 6:- Demodulation of FM or frequency discriminators: Single tuned discriminators, double tuned discriminators, foster seely discriminators, ratio detectors, and phase locked loop (PLL) demodulator.

Unit 7:- Noise: SNR (signal to noise ratio), noise figure, noise temperature of a cascaded system, S/N in DSB-SC receiver, S/Nin SSB-SC receiver, S/N in FM receiver, pre-emphasis and de-emphasis.

Reference Books

1. Communication systems   -   B.P. Lathi
2. Communication system   -   Simon Haykin
3. Principles of communication   -   George Kennedy
4. Communication system   -   R.P. Singh & S.D. Spare
5. Principles of communication system -   Taub Shilling

Unit 1:- General features of Microprocessor: Microprocessor architecture and its operation, Memory, Memory Organisation, Memory Mapped I/O mapped I/O Scheme.

Unit 2:- Architecture of 8085 Microprocessor: 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 3:- 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 4:- Interrupts of 8085 Microprocessor: Hardware and software interrupts, interrupts call locations, RIM, SIM, RST 7.5, 6.5 and 5.5.

Unit 5:- Programmable interfaces of 8085 microprocessor: Programmable peripheral interface 8255, programmable interval timer 8253/8254, DMA controller 8257, and interrupt controller 8259.

Unit 6:- Microprocessor Applications: Delay subroutine, seven segment display, water level indicator, microprocessor based traffic control.

Unit 7:- Introduction of 8086 microprocessor: 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.

Unit 8:- 8087 Coprocessor, Features and internal organization, RS-232, RS-442, IEEE-488, Features and architecture of 80186, 80286, 80386 & 80486.

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.

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: 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.

Unit 6:- Display and Recorders: 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: Integrated Circuit Technology and Design   *Code: EI-305T*   *Credits: 4*

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

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, Features of Hybrid IC technology, Basics of thick film technology and thin film technology.

Unit-2 Overview of Monolithic IC Processes: Refining and Growth of Silicon Crystals; Silicon Wafer Preparation; Diffusion: Fick's Laws, 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, Growth and properties of Thin Oxides, Oxide Masking and Oxide passivation; Photolithograph-Photolithographic process steps, Photo-resists, Various printing techniques; Etching-Wet and Dry Etching; Epitaxy-Epitaxial Growth of Silicon, Epitaxial Reactors; Chemical Vapour Deposition (CVD)- CVD Processes and Reactors; Metallization-Aluminium for Metallization, Metallization Processes and its applications.

Unit-3 Basic electrical properties of MOS circuits: Ids-Vds relationship, MOS transistor threshold voltage V_t, Transconductance 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, Dynamic Register Element.

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 Mc Graw –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.

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 P T: 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 P T: 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

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: Power Electronics Lab   *Code: EE-303P*   *Credits: 2*
Branches: EE, EI   *Semester: V*   *L T P: 0 0 3*

LIST OF EXPERIMENTS

1. To Study R Firing Circuit.

2. To Study R-C Firing Circuit.

3. To Study the Transfer Characteristics of FET.

4. To Study SCR Characteristics.

5. To Study UJT Firing Circuit.

6. To Study UJT Relaxation Oscillate Circuit.

7. To Study TRIAC using Lamp Load.

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

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

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

B.Tech. Sixth Semester

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:- Discrete-time signals, discrete time systems, analysis of discrete time linear system-invariant systems.

Unit 2:- The Z-transform:- The Z-transform, properties of Z-transform, Inversion of Z-transform, one sided Z-transform.

Unit 3:- Discrete Fourier Transform:- Its properties & applications; Discrete Fourier Transform, properties of Discrete Fourier Transform, linear filtering methods based on DFT.

Unit 4:- Efficient computation of the DFT:- Fast Fourier Transform, FFT algorithms, application of FFT algorithms.

Unit 5:- Implementation of Discrete-time system:- Structure of the realization of discrete-time systems, structures, of FIR systems, structures of HR systems.

Unit 6:- Design of digital Filters:- General considerations, design of FIR filter, design of HR filters from analog filters.

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.

Unit 1:- Introduction of Microcontrollers: Introduction, basis architecture, differences between microprocessors and microcontrollers, overview of the 8051 family, 8-bit and 16-bit microcontroller.

Unit 2:- 8051 Microcontroller: Architecture, pin description, input-output port and their functions, Memory organization, Timer/Counters, Serial port, Parallel ports.

Unit 3:- 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 4:- Real world interfacing of 8051 with: LED, Seven segment display, LCD, push button and Relay, keyboard, ADC and DAC, Stepper motor, Bridge and DC motor.

Unit 5:- Introduction to Advanced Microcontrollers: Introduction and Architecture of PIC, ARM, AVR and AT 89C2051 Microcontroller.

Unit 6:- Embedded Systems: An introduction to embedded system, classification of embedded systems.

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-304T*   *Credits: 4*

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

Unit 1:- Introduction to Digital Communication, Basic Building Blocks, Sampling Process, natural & flat Top samplings, Aperture effect, equalization, PAM, channel BW for PAM signals, signal recovery through holding.

Unit 2:- Quantization of signals, Quantization error, Companding, PCM, and PCM Building blocks, multiplexing PCM Signals, T1 Digital System, Line Coding, Bit rate, DPCM.

Unit 3:- Delta Modulation, Slope overloading, Adaptive delta Modulation, Digital Modulation Techniques, BPSK, ASK, ASK, DPSK, QLSK, Transmitter & Receiver Probability of error of Different Modulation Techniques, Expansion.

Unit 4:- 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 5:- 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, 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.

REFERENCES

1. Communication System, Taub Schilling Pub-Tata McGraw Hill.
2. Communication System, Kennedy Pub-Tata McGraw Hill
3. Communication System, Singh & Spare Pub-Tata McGraw Hill
4. Digital Communication; L.A. Glover Pub-PHI, New Delhi.
5. Electronics Communication; Dennis Reddy & John Cooten
6. Communication Systems by Simon Haykins.

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

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

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

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

Unit 3:- Optoelectronic Devices: LED: - Introduction, power and efficiency, structures-Planar, Dome, Surface emitter, edge emitters and super luminescent, LED Characteristics and modulation.

Semiconductor Laser:- Basic concepts, Optical emission from semiconductors, semiconductor injection laser, injection laser structures, injection laser characteristics, semiconductor injection laser to fibre coupling mid-infrared lasers.

Detector:- Introduction, optical detection principles, absorption, quantum efficiency, responsivity, long wavelength cut-off, Semiconductor photodiodes without internal gain-p.n, p-i-n photodiodes, Semiconductor photodiodes with internal gain-Avalanche photodiodes, mid-infrared photodiodes.

Unit 4:- Optical Amplification and Integrated Optics: Introduction, optical amplifiers, Semiconductor laser amplifier, fibre amplifiers, Integrated optics-Planner waveguides, Some integrated optical devices-Beam splitters, directional couples, switches and modulation, Optoelectronic Integration, Optical biastability and digital optics, optical computation.

Unit 5:- Physical Phenomenon for Optical Sensors: Fibre birefringence, the state of polarization, Electro optic, photo elastic and magneto optics effect.

Unit 6:- Optical Fibre Sensor: Introduction, Classification of Optical fibber sensors, Temperature sensor, pressure sensor; sound pressure sensor, liquid level sensor, flow sensor, magnetic sensor, displacement sensor, pollution sensor, medical application, fibre interferometers, optical fiber gyroscope.

Unit 7:- Passive applications of Optical Fibre in Instrumentation: Introduction, Fibre bundle, GRIN-rod lenses, non-semiconductor laser, optical fibre in Medicine, industry, military, commercial, instrumentation industry and other application.

REFERENCES BOOKS

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

Unit 1: Introduction to Power Plant and Signal Transmission:
Introduction to power plant, Types of Power Plant, 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 AnalyserAnalysers 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.

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

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

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

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 andphase margin.

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

1. To learn the optical Fibre Characteristics & Simulation Software:-

    a)   V-value and no. of guided modes
    b)   Gaussian beam
    c)   Guided and refracted rays in MMSI fibre
    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 fibre
    m)   Design consideration for SM fibre
    n)   Design aspects of Fibre optic communication system
2. To study the light emitting diode and photo detector used for optical fiber systems.
3. Study of losses in optical fibre.
4. Measurement of numerical aperture of optical fibre

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

B.Tech Seventh Semester

Subject: Biomedical Instrumentation   *Code: EI-401T*   *Credits: 4*
Branches: EI   *SEM: VII Semester*   *L P T: 310*

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.

Unit 4:- Pacemakers: Classification of pacemakers, Classification codes of pacemakers, Leads and Electrodes, Defibrillators: D.C. defibrillator circuit, Defibrillator electrodes.

Unit 5:- Blood gas Analyzers: Blood pH measurement, electrodes for blood pH measurement, measurement for blood PCO_2, blood PO_2 measurement.

Unit 6:- Measurement of Heart rate: Average heart rate measurement, instantaneous heart rate meter.

Unit 7:- 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.

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-Thermocouple gage, 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, Tata McGraw 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 Education Private Limited, Third Edition, New Delhi.

Unit-1 The Metrology and Calibration

Introduction, Categories of metrology, Concept of Calibration, general terms related to calibration, Calibration standards, Traceability, Traceability chart, Standard labs. Conditions, Example of calibration chain, Calibration interval, Calibration errors, Validation of standard labs., Calibration certificate; Introduction to ISO-9000 standards, Need of calibration in ISO standards.

Unit-2 The Calibration Procedures

The Calibration Procedure, Calibration of temperature sensors-Thermocouple, RTD and thermister, Calibration of Pressure Gauges, Calibration of Dimensional Gauges and Calibration of Flow meter.

Unit-3 Errors and Uncertainties

Definitions, Types of Errors and Uncertainties, External and Internal estimation of uncertainties, propagation of Uncertainties in compound quantities, Examples of uncertainty calculations.

Unit-4 Basic Statistical Concepts

Introduction, Types of measured quantities, central tendency of data-Mean, Mode, Median; Best estimate of true value of data, Measures of dispersion, Standard deviation of mean, Evaluation of sample mean and standard deviation by method of coding.

Unit-5 Normal Distribution

Introduction, 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, Chi-square test for goodness of fit, criterion of goodness of fit, Contingency tables.

Unit-6 Graphical Representation and Curve Fittings

Introduction, Equation of approximating curves, Graphical Representation of Functional relationships, determination of parameters in linear relationship, Least squares equation of second order or higher.

Reference Books:

1.　Instrumentation, Measurement and Analysis by BC Nakra and KK Chowdhary Tata Mc-Graw Hill Publishing Company Limited
2.　Metrology and Calibration for Industrial Quality Control, Sanjeev Tyagi, Employment News, 13-19 July 2002.
3.　Calibration Principles, Subburaj Ramaswamy, Vijay Nicole Imprints Pvt. Limited, Chennai.
4.　Electronic Instruments and Instrumentation Technology, MMS Anand, Prentice Hall of India, New Delhi.
5.　The Metrology Handbook, Jay L. Bucher, ASQ Quality Press Milwaukee, Wiscosin.

List of Pool Elective:
1.   EI-437T   Analytical Instrumentation
2.   EI-439T   Virtual Instrumentation
3.   EC-433T   Digital System Design
4.   EC-452T   PC Interfacing
5.   EE-411T   Non Conventional Energy Sources
6.   CS-451T   Wireless Network and Mobile Computing
7.   ME-473T   Work Study
8.   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

Subject: Industrial Training   *Code: EI-407*   *Credits: 2*

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

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 P T: 0 0 3*

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: Digital Signal Processing Lab   *Code: EC-401P*   *Credits: 2*
Branches: EC, EI   *Semester: VII*   *LTP: 003*

LIST OF EXPERIMENT

1. (a) To generate the discrete exponential sequence.
   (b) To generate the discrete complex exponential sequence.
2. To make a program for linear convolution between two sequences.
3. To find out the Discrete Fourier Transform (DFT) of a rectangular pulse.
4. To find out the linear convolution between two sequences using Discrete Fourier Transform (DFT).
5. To design a Chebyshe type filter.
   High Pass Filter
   Low Pass Filter
6. To design Butterworth Filter.
   Band pass filter
   High pass filter
   Low pass filter
7. Design of Elliptic IIR Filter.
   (a) High pass filter
   (b) Low pass filter
8. Design of Equirriple linear phase FIR filter.

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

Subject: Product Design & PCB Lab   **Code: EI-403P**   **Credits: 2**
Branches: EI   **SEM: VII**   **LPT: 003**

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 P T: 0 0 3**

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.

B.Tech Eighth Semester

Subject: Process Control Instrumentation   *Code: EI-402T*   *Credits 4*
Branches: EI   *SEM: VIII*   *LPT: 310*

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 - problems.

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 – Problems.

Unit-3 Types of Controllers

Pneumatic, Hydraulic and Electronic Controllers to realize various control actions.
Tuning of controllers

Tuning process curve reaction method – continuous oscillation method – damped oscillation method – problems.

Unit-4 Final Control Elements

I/P Converter, P/I converter - pneumatic, electric and hydraulic actuators – valve positioner.

Unit-5 Control Valves

Control valves – characteristic of control valves – valve body – Globe, Butterfly, diaphragm, Ball valves – Control valve sizing – Cavitations, flashing - problems.

Unit-6 Multiloop Control System

Feed forward control – Ratio control – Cascade control – Split range – Multivariable control and examples from distillation column and Boiler system.

Unit-7 PLC

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

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

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 s\theorem, advantage of digital control system.

Unit-2   **Transform analysis of sampled-data systems:** Linear difference equation, the Z-transform Definition Properties, Inverse Z-transform, the pulse transfer function, methods of discretization: Impulse invariance, step invariance (ZDH equation), finite difference approzimation of derivatives bilinear transformation, stability, Jury stability criterion the routh 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 fo state variable, conversion of state variable models to transfer function, conversion of transfer functions to canonical static variable models I & II companion forms, Jordan canonical form, 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. Miroprocessor 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.
3. Digital control systems by Kuo B.C. PHI

Subject: Project-II *Code: EI-402P* *Credits: 12*

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

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.

EI-404P *Advanced Instrumentation lab* *Credit: 2*

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

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

List of Pool Elective:
1. EI-456T   PCB Design & Technology
2. EI-458T   Digital System Design Using VHDL
3. EI-460T   Instrument Design & Reliability
4. EC-458T   Digital Image Processing
5. EC-460T   Monolithic Microwave Integrated Circuit
6. EC-416T   Mobile Communication

List of Open Elective:
1. HU-402T   Engineering Economics
3. PH- 429T   Material Imperfection and Applications
4. HU-409T   Quantitative Methods in Economics
5. HU-407T   Foreign Trade

Syllabus of Pool Elective Subjects

Subject: Analytical Instrumentation   *Code: EI-437T*   *Credits: 04*
Branch: EI (Pool Elective)   *Sem: VII*   *L T P: 3 1 0*

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 Spectrocalorimeters/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:
X-Ray Spectrometers: Introduction, X-ray Spectrum, Instrumentation for X-ray Spectroscopy: X-ray generating equipment, Collimator, Monochromator and Detectors; X-ray Diffractometer, X-ray Absorption Meter; X-ray Fluorescence Spectrometry: X-ray Fluorescence Spectrometer.

Unit-6: Nuclear Radiation Measurement:
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.

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

UNIT 1: DIGITAL DESIGN FUNDAMENTALS: Hardware Aspects Related to ASSERTED and NOT-ASSERTED Conditions, Concepts of gates.

UNIT 2: MINIMIZATION AND DESIGN OF COMBINATIONAL CIRCUITS: Introduction, Minimization with Theorems, The Karnaugh Map, Plotting a Karnaugh Map, Labeling a K-Map. Five and Sis Variable Maps, Prime and Essential Implicants, Don't Care Map Entries, Map Reduction Resulting in Product-of-sum Expressions, Using the Map for Simplifying Partially Simplified Expressions, Variable-Entered Mapping, VEM Plotting Theory, VEM Reading theory.

UNIT 3: SEQUENTIAL MACHINE
Introduction, The Need for Sequential Circuits, Basic Architectural Distinctions between Combinational and Sequential Circuits, Concept of Memory, The Binary Cell, Fundamental Differences between sequential Machines, Fundamentals of Sequential Machine Operation, Using Variations of the General Model to Classify Sequential Machines, The SET/Flop, CLOCK and OSCILLATORS, Types of Traditional Clocked Flip-Flops, The SET/RESET Flip-Flop, The "D" Latch Flip-Flop, The CLOCKED "I" Flip-Flop, The CLOCKED JK" Flip-Flop, The Design of a Clocked Flip-Flop Conversion from one type to another.

UNIT 4: TRADITIONAL APPROACHES TO SEQUENTIAL ANALYSIS AND DESIGN:
The State Diagram, Analysis of Synchronous Sequential Circuits, A Synchronous Analysis Process, Approaches to the Design of Synchronous Sequential Finite State Machines, Design Steps for Traditional Synchronous Sequential Circuits, State Reduction, Minimizing the Next State Decoder,

UNIT 5: ASYNCHRONOUS FINITE STATE MACHINES: Introduction, Why Asynchronous Circuits, Scope, Asynchronous Analysis. Design steps Leading to Next State Decoders, Trying a JK or T Flip-Flop, Output Decoder Design, Counters, Design of Single-Mode Counters, Multi-Mode Counters, Design of Specialized Multi-Mode Counters, Ripple Counters, Multi-Mode Counters, Design of Specialized Multi-Mode Counters, Ripple Counters, Ring Counters, Applications of Ring Counters, Shift Register, Shift Register Sequences, Ring Counters Using Shift Register, Shift Registers and Memory.

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

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 (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

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-2 WLAN: 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 all layers.

UNIT-5 Introduction & issues in Ad Hoc wireless networks: introduction (cellular vs adhoc 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 adhoc 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 Book:
 (1) Murthy and Manoj, Ad Hoc Wireless Networks, Pearson Education publication.

Subject: WORK STUDY   *Code: ME-473T*   *Credits: 4*
SEM: VII (Pool Elective)   *LPT: 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.

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:- General procedure, types of audits, features of effective auditing, program planning, commitment by management, confidentiality, organization of an auditing team, audit protocol, schedule, onsite audit, evaluation & presentation, audit report of action plan, 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: Engineering ethics:- Scope and aim of engineering ethics, engineering as social experimentation; code of ethics, responsibilities and rights; rights of engineers; engineer as managers; consultants and leaders, environmental ethics, ethical audit, case studies

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.

Subject: PCB Design & Technology   *Code: EI-456T*   *Credits: 04*
Semester: VIII (Pool Elective)   *L T P: 3 1 0*

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.

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

Unit-3: 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-4: Solders & soldering techniques: Iron soldering, Mass soldering, Flux removal After soldering, PCB cleaning after soldering.

Reference:

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

Subject: Digital System Design Using VHDL   **Code: EI-458T**   *Credits: 4*
SEM: VIII (Pool Elective)   *LPT: 310*

Unit-1 Review of Logic Design Fundamentals: Combinational logic, hazards in combinational networks, Mealy and Moore sequential circuit design, sequential circuit timing, setup and hold times.
VHDL: Introduction, VHDL terms, code structure, data types, operators and attributes, concurrent and sequential code, variables and signals, subprograms and procedures, packages and libraries, pre-defined attributes.

Unit-2 VHDL Description of Combinational Circuits: Multiplexers, decoders, encoders, code converters.
VHDL Description of Sequential Circuits: Flip-flops, registers, counters, clock synchronization.

Unit-3 Design of Programmable Logic Devices: Read-only memories, programmable logic arrays, programmable array logics,
Design of Circuits with Arithmetic Operations: Serial adder, binary multiplier, multiplication of signed numbers, binary divider.

Unit-4 Design of Memories: VHDL models for memories and buses, simplified bus model, interfacing memory to a microprocessor bus.
Design with Programmable Gate Arrays: Introduction of FPGAs, designing with FPGAs and CPLDs.

Unit-5 Hardware Testing and Design: Testing combinational logic, testing sequential logic, scan testing.
Case Study: Design of UART, design of microcontroller CPU, top- level CPU design, sample instruction representation.

Text Books:
1. Roth C. H., "Digital System Design Using VHDL", Thomson Learning. 2008
2. Wakerly J. F., "Digital Design – Principles and Practices", 4th Ed., Pearson Education. 2008
3. Mano M. M. and Ciletti M. D., "Digital Design", 4th Ed., Pearson Education. 2008

Reference Books:
1. Brown S. and Vranesic Z., "Fundamentals of Digital Logic with VHDL Design", 2nd Ed, Tata McGraw-Hill Publishing Company Limited. 2008
2. Perry D. L., "VHDL Programming by Example", 4th Ed., Tata McGraw-Hill Publishing Company Limited. 2008
3. Pedroni V. A., "Circuit design with VHDL", Prentice Hall of India Private Limited. 2008

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. Rs. 350/-
2. Relaibility- An article by BE Noltingk

UNIT 1: Introduction to Digital Image Processing- Image enhancement, Image rep- resentation and modelling, Image Reconstruction, Z-transform and fourier transform, Optical and modulation transfer function, Matrix theory.

UNIT 2: Image sampling and quantization, Two dimensional theory Reconstruc- tion, Nyquist rate, Aliasing, foldrerIneq., Hexagonal sampling, Optimum Sampling, compounder designing, visual quantization.

UNIT 3: Image transforms: orthogonal and UNITary transforms, transform freq., optimum transform, properties of UNITary transforms, DFT, Dimensional and 2 Dimensional, Cosine transform, fine transform Hadamard. Harr, Slant, KL transforms and properties.

UNIT 4: Image enhancement: point operation, Histogram modelling, spatial operation, Multispectral image enhancement, false color and pseudocolor, color image enhancement, **Image filtering:** Inverse and wiever filtering, FIR filters, filtering using image transforms, casual models and recursive filtering.

UNIT 5: Image Reconstruction: Tomographies, Radon transform, Back projection operator, Projection theorem, Image data compression: Pinel coding, predictive techniques, Transform calling theory, Hybrid coding and vector DPCM, Interframe coding.

Reference books: Fundamentals 0f DIP By Anil K. Jain. PHI India Ltd

UNIT:-1
History of Monolithic Integrated Circuits.

UNIT:-2
Monolithic circuit components: Planar transmission lines, Lumped and distributed passive elements, GaAs MESFET, Other active devices.

UNIT:-3
Metal Semiconductor functions and their characteristics.

UNIT:-4
S-parameter measurement and their use in GaAs MESFET circuit design, S- parameter: General concept, Measurement of S-parameters of active devices, On wafer S-parameter of active devices, On wafer S-parameter measurements, Utilization, S-parameter in circuit design.

UNIT:-5
MMIC process.

UNIT:-6
Optical control of MMICs

Subject: Mobile Communication,　　　　　*Code: EC-416T,*　　　　　*Credits: 4*
Sem: VIII (Pool Elective)

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 , hand off 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

Syllabus of Open Elective Subjects

Subject: Operations Research   *Code: MA-491T*   *Credits: 4*
Semester: VII (Open Elective)   *LPT: 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.

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.

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

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.

UNIT:1   **Economics Micro and Macro:** Definition, Importance and Uses, Interdependence between Micro and Macro Economics.

UNIT:2   **Concept in Economics:** Law of Demand, Law of Diminishing Marginal Utility, Law of Equi-marginal Utility, elasticity of Demand, Indifference Curve Analysis-Price effect. In-come effect and substitution effect.

UNIT:3   **Theory of Production:** Production Function, Laws of Variable proportions, Laws of Returns of to Scale, Cost Function-Meaning of Fixed Cost and Variable Cost, Location of Firms, Wabers theory of Location of the firms.

UNIT:4   **Theory of the Firm:** Perfect Competition, Monopoly and monopolistic Competition:- Meaning, Assumptions, Equilibrium of the firm in Short run and Long run period of time.

UNIT:5   **International Trade:** Meaning, Nature and Scope of International Trade, Types and Effects of Tariffs and Quotas, Objective and Functions of International Monetary Fund (I.M.F.).

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

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.

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.