COURSES FOR B. TECH. IN ELECTRONICS & COMMUNICATION ENGINEERING

Semester – I

UNIT	COURSE NAME	L	T	P	CR	CH
MS 101:	Mathematics I	3	1	0	4	4
PH 101:	Physics I	2	1	1	4	5
CH 101 :	Chemistry	2	1	1	4	5
EL 101:	Basic Electrical Engineering	2	1	1	4	5
ME 101:	Engineering Graphics	1	0	2	3	5
ME 103	Workshop Practice	0	0	2	2	4
Humanities Elective:						
EG 101	Communicative English	3	0	0	3	3
SO 101	Sociology					
BM 101	Elementary Economics					
	Total	13	4	7	24	31

Semester – II

UNIT	COURSE NAME	L	T	P	CR	CH
MS 103	Mathematics – II	3	1	0	4	4
PH 102	Physics – II	2	1	1	4	5
ME 102	Engineering Mechanics	3	1	0	4	4
EL 102	Basic Electronics	3	1	1	5	6
CO 101	Introductory Computing	2	1	0	3	3
CO 102	Computing Laboratory	0	0	2	2	4
Science Elective:						
BT 101	Elements of Modern Biology	3	0	0	3	3
ES 101	Environmental Science					
CH 102	Introductory Material Science					
	Total	16	5	4	25	29

Semester – III

UNIT	COURSE NAME	L	T	P	CR	CH
MS 201	Mathematics – III	2	1	0	3	3
EL 201	Switching Circuits & Digital Logic	2	1	1	4	5
EL 202	Electrical Technology	2	1	1	4	5
EL 203	Analog Electronic Devices and Circuits	2	1	1	4	5
EL 204	Signals and Systems	2	1	0	3	3
CO 212	Computer Architecture and Organization	3	1	1	5	5
	Total	13	6	4	23	26

Semester – IV

UNIT	COURSE NAME	L	T	P	CR	CH
EL 205	Integrated Circuit	3	0	1	4	5
EL 206	Principles of Communication	3	0	1	4	5
EL 207	Instrumentation	3	0	1	4	5
EL 208	Engineering Electromagnetic	3	0	0	3	3
CO 221	Data Structures and Object Oriented Programming	3	0	1	4	5
CO 222	System Software& Operating Systems	3	0	1	4	5
	Total	18	0	5	23	28

Semester – V

UNIT	COURSE NAME	L	T	P	CR	CH
EL 301	Digital Communication	3	0	1	4	5
EL 302	Microprocessors & Interfacing	2	0	1	4	6
EL 303	Digital Signal Processing	3	0	1	4	5
EL 304	Control System Engineering	3	0	1	4	5
EL 305	Microwave Engineering	3	0	1	4	5
BM 321	Fundamental of Management	3	0	0	3	3
	Total	17	0	6	23	29

Semester – VI

UNIT	COURSE NAME	L	T	P	CR	CH
EL 306	Communication Networks	3	0	1	4	5
EL 307	Device Modeling & Simulation	3	0	1	4	5
EL 308	VLSI Design	3	0	1	4	5
BM 322	Social Responsibility and Professional Ethics in Engineering	3	0	0	3	3
	ECE Elective – I	3	0	0	3	3
	Open Elective – I*	3	0	0	3	3
	Total	18	0	3	21	24

* Open Elective : Any course of level 400 and above offered in the University and recommended by the department.

Semester – VII[¥]

UNIT	COURSE NAME	L	T	P	CR	CH
EL 401	Digital Systems Design & VHDL	3	0	1	4	5
	ECE Elective – II	3	0	0	3	3
	ECE Elective – III	3	0	0	3	3
	Open Elective – II	3	0	0	3	3

EL 471	Industrial Summer Training #	-	-	-	2	-
EL 481	Project I	0	0	6	6	12
	Total	12	0	7	21	26

Semester – VIII

UNIT	COURSE NAME	L	T	P	CR	CH
	ECE Elective – IV	3	0	0	3	3
	Open Elective – III	3	0	0	3	3
EL 482	Project – II	0	0	12	12	24
	Total	6	0	12	18	30

ECE Elective

UNIT	COURSE NAME
EL 421	Image Processing
EL 422	Electronics Design Automation
EL 423	Medical Electronics
EL 424	Fiber Optic Communication
EL 425	Mobile Communication
EL 426	Fuzzy Logic and Neural Networks
EL 427	Satellite Communication Systems
EL 428	Information and Coding Theory
EL 429	Graph Theory
EL 430	Computer Vision
EL 431	MEMS and Microsystems Technology
EL 432	Advance Semiconductor Devices
EL 433	Biomedical Signal Processing
EL 434	Bioneuro Engineering
EL 435	Nanoelectronics
EL 436	Intelligent Instrumentation
EL 437	Wireless Communication
EL 438	Digital Signal Processor
EL 439	Power Electronics

Also any other course of level 400 and above offered in the department of ECE.

¥ The 7^{th} semester will start a month later than usual and therefore be shorted by a month. To compensate for it there shall be 4 class hours per week for a 3 credit course.

Industrial Summer Training: Training of 12 weeks duration carried out during the summer break after the 6^{th} semester. The report will be submitted in the 7^{th} semester.

Semester – I

MS 101: Mathematics I 3 1 0 4 4

Analysis:

Properties of real numbers, Sequence and series of real numbers, continuity and differentiability of single variable, Rolle's theorem, Cauchy's mean value theorem (Taylor's and Maclaurin theorems with remainders), Indeterminate forms, Concavity and convexity of curve, points of inflexion. Asymptotes and curvature.

Limit, continuity and differentiability of functions of several variables, partial derivatives and their geometrical interpretation, differentials, derivatives of composite and implicit functions, derivatives of higher order and their commutativity , Euler's theorem on homogeneous functions, harmonic functions, Taylor's expansion of functions of several variables, maxima and minima of functions of several variables – Lagrange's method of multipliers.

Scalar and vector fields, level surfaces, directional derivative, Gradient, Curl, Divergence, Laplacian, line and surface integrals, theorems of Green, Gauss and stokes, orthogonal curvilinear coordinates.

Riemann integration, fundamental theorem of integral calculus, mean value theorems, evaluation of definite integrals – reduction formulae.

Differential equation:

First order differential equations – exact, linear and Bernoulli's form, second order differential equations with constant coefficients, Euler's equations.

Books

1. T M Apostol, "Calculus", Vol. – I, 2nd Ed. Wiley, 1967
2. T M Apostol, "Calculus", Vol. – II, 2nd Ed. Wiley, 1969
3. G B Thomas and R L Finney, " Calculus and Analytic Geometry", 6th/9th Ed. Narosa/Addision Wesley/Pearson, 1985/1996
4. Piskunov, "Differential & Integral Calculus", Vol – I & II, Mir Pub.
5. B S Grewal, "Engineering Mathamatics", S Chand & Co. New Delhi.
6. R G Bartle and DR Sherbert, "Introduction to Real Analysis", 3rd Ed., Wiley, 1999.

PH 101: Physics I 2 1 1 4 5

Conservation Principles, Rotational Dynamics, free, forced and damped oscillation coupled oscillations, wave motion, reflection and refraction, interference, diffraction, polarization.

Vector calculus: Curvilinear co-ordinates, gradient of a scalar fields, divergence and curl of a vector field, Gauss's and Stoke's theorem.

Electrostatics, magnetostatics, motion of charges in electric and magnetic fields, electromagnetic induction, displacement current, Maxwell's equations, electromagnetic Waves.

Laboratory Experiments

1. To determine the coefficient of viscosity of a liquid from its rate of flow though a capillary tube.
2. To determine the velocity of sound in a solid by Kundt's tube method.
3. To determine the acceleration due to gravity (g) by Kater's pendulum.
4. To determine the wavelength of a monochromatic light by Fresnel's biprism and Lloyd's mirror.
5. To determine the wavelength of light and radius of curvature of the convex surface of a lens by Newton's ring method.
6. To determine the wavelength of light by diffraction through a plane transmission grating.
7. To determine the value of Planck's constant using photocells.
8. To determine the melting point of a solid with a thermocouple.
9. To determine the value of e/m of an electron by using a cathode ray tube and a pair of bar magnets (Thompson's method).
10. To observe waveforms and to measure amplitude, frequency and phase with cathode ray oscilloscope.
11. To verify Thevenin's Norton's and maximum power transfer theorems.
12. To study the performance of inverting and non-inverting amplifiers using an operational amplifiers.

Text/Reference

1. Introduction to Electrodynamincs, David J Griffiths, Prentice Hall of India.
2. Electricity and Magnetism, AS Mahajan and AA Rangwala, Tata McGraw Hill.
3. Optics, A K Ghatak, Tata McGraw Hill
4. Vibrations and Waves in Physics, Jain G Main, Amazon Books
5. Fundamentals of Physics, D Halliday and R. Resnick, John Wiley

CH 101 : Chemistry **2 1 1 4 5**

Thermodynamics of Chemical Process: Concept of Entropy, Chemical potential, Equilibrium conditions for closed systems, Phase and reaction equilibria, Maxwell relations, Real gas and real solution.

Electrochemical System: Electrochemical cells and EMF measurements: Thermodynamic data, activity coefficients, solubility product and p^H corrosion.

Kinetics of Chemical Reaction: Reversible, consecutive and parallel reactions, Steady state approximation, chain reactions, Photochemical kinetics.

Bonding Models in Inorganic Chemistry: Molecular orbital theory, valence-bond theory, Crystal field theory.

Fundamental of Microwave, IR and UV-VIS Spectroscopy: Basic concepts of spectroscopy, selection rule, Determination of molecular structure.

Coordination Chemistry: Coordination numbers, chelate effect, Coordination complexes and application, Bio inorganic chemistry: Metal ions in Biological systems, environmental aspects of Metals, NOx, CO, CO_2.

Organic Reaction Mechanism: Mechanisms of selected organic, Bio-organic, polymerization and catalytic reaction.

Stereochemistry of Carbon Compounds: Selected Organic Compounds: Natural products and Biomolecules (Amino Acid/ Nucleic acid/ proteins).

Laboratory Experiments

(At least nine of the experiments listed below)

1. Surface tension and parachor
2. Measurements of the coefficient of viscosity.
3. Conductometric titration
4. p^H- metric / potentiometric titration
5. Solubility product
6. Kinetics of ester hydrolysis
7. Estimation of Fe2+
8. EDTA titration
9. Estimation of base content and acid content of commercially available antacid and vitamin C respectively.
10. Synthesis of Mohr's salt
11. Synthesis of aspirin
12. Demonstration of a few important physico-chemical processes. (e.g. Gel electrophoresis, Oscillatory reactions).
13. Determination of CMC of a surfactant.

Books

1. Physical Chemistry, Rakshit P C
2. Inorganic Chemistry, Dutta R L
3. Organic Chemistry, Finar I L
4. Text Book of Physical Chemistry, Glasston Samuel
5. Concise Inorganic Chemistry, Lee J D

EL 101: Basic Electrical Engineering 2 1 1 4 5

Engineering Circuit Analysis : Current, Voltage, Power, Circuit elements, Ohm's law, Kirchoff's law, Nodal Analysis, Mesh Analysis, Source transformations, Linearity and Superposition, Thevenin's and Norton's Theorems, Maximum power transfer theorem, Star-Delta and Delta-Star Conversion, Simple RL and RC Circuits, Unit Step Forcing Function, source free RLC Circuits, Sinusoidal Forcing Function, Complex Forcing Function, Phasor Concept, Impedance and Admittance, Phasor diagrams, Response as a Function of ω, Instantaneous Power, Average Power, RMS values of Current and Voltage, Apparent Power and Power Factor, Complex Power, Introduction to Three Phase Circuits. Two port n/w, Z-parameter, Y-parameter, Transmission (ABCD) parameter, Hybrid(H) Parameter, Interconnection of two port n/ws, T and π representation.

AC Machines: Transformer : Working principle, Ideal Transformer, Equivalent Circuit, Transformer tests, Voltage regulation, Efficiency. Three Phase Induction Motor: working Principle, Single Phase induction motor, Principle of Operation, Application, Stepper motor.

DC Machines: Principle of DC Generator, Methods of excitation, Characteristics and Applications, Principle of DC Motor.

Electrical Measuring Instruments : Basic Characteristics of Measuring Devices, Error Analysis, Standards and Calibration, Moving Coil, Moving Iron and Electrodynamic Meters, AC/DC ammeters and voltmeters, Ohmmeters, Watt meter, Watt-hour meter, AC bridges, Q.meter, Cathode Ray Oscilloscope.

BASIC ELECTRICAL ENGINEERING LABORATORY

Experiments on Circuits : Verification of Network Theorems, Design and Study on circuits using R,L and C, Power measurement in single phase A.C. Circuits.
Transformer: Open circuit and Short Circuit Tests

D.C machines : Open Circuit Characteristic of Generator, Speed Control of D.C. motors.
Electrical Measuring Instruments : Calibration of meters, Power measurement in 3-φ circuit, AC bridges.
Power System : Design and Physical model of domestic wiring.

Text:

1. W H Hayt and J E Kemmerly, "Engineering Circuit Analysis", McGraw Hill, 1993
2. V. Del Toro, "Electrical Engineering Fundamentals", PHI, 1994
3. R J Smith and R C Dorf, "Circuits, Devices and Systems", John Wiley & Sons, 1992
4. D Helfrick and W D Copper, "Modern Electronic Instrumentation and Measuring Techniques", PHI, 1990

Reference:

1. Golding and Widdis, " Electrical Measurements and Measuring Instruments", A H Wheeler & Co., Kolkata, 1993
2. H Cotton, "Advanced Electrical Technology", Issac Pitman, London
3. D P Kothari, I J Nagrath, " Basic Electrical Engineering", 2nd Ed., McGraw Hill, 2002.
4. Rana, " Basic Electrical Science".

ME 101: Engineering Graphics 1 0 2 3 5

Introduction to IS code of drawing; Conics and Engineering Curves – ellipse, parabola, hyperbola, cycloid, trochoid, involute; projection of lines – traces, true length; projection of planes and solids; sold objects – clube, prism, pyramid, cylinder, cone and sphere; projection on Auxiliary planes; Isometric projection, isometric scale; section of solids – true shape of section; Introduction to CAD tools – basics; Introduction of Development and Intersection of surfaces.

Books

1. Engineering Graphics, K L Narayana, P K Kannaaiah, Tata McGraw Hill, New Delhi
2. Elementary Engineering Drawing, N D Bhatt, Charotar Book Stall, Anand

3. Engineering Graphics, V Lakshminarayanan, R S VaishWanar, Jain Brithers, New Delhi
4. Engineering Graphics, A M Chandra, S Chandra, Narosa
5. Engineering Drawing and Graphics + AutoCAD, K Venugopal, New Age International, New Delhi.

ME 103 Workshop Practice 0 0 2 2 4

Machining: Introducing to various machine tools and demonstration on various machining process. Making jobs as per drawings.

Fitting Practices: Study of different vices, power hammer, Making jobs as per drawing.

Welding Practices: Introduction to different welding processes. Practices on Oxy-acetylene gas welding and manual metal arc welding.

Carpentry: Introduction to different hand tools and wood turning lathe, Making jobs.

Books

1. M L Begeman and B H Amstead, "Manufacturing Process", John Wiley
2. W A J Chapman and E Arnold, " Workshop Technology", Vol. I & II, Viva Low Priced Students Ed.
3. B S Raghuwanshi, "Workshop Technology", Vol. I & II, DhanpatRai& Sons.

Humanities Elective:

EG 101 Communicative English 3 0 0 3 3

Objectives

1. To develop overall proficiency in English with a view to enabling the students to use English for communication and for study purposes:
2. To develop the student's interactive skills by developing their ability to listen to English for formal as in class lectures and informal as in face to face interactive situations with a high degree of understanding, and helping them to speak English with a reasonable degree of fluency and with acceptable pronunciation of the sounds of English.
3. To develop students ability to read English texts-both of scientific and non-scientific nature silently with a high degree of comprehension.
4. To develop the student's skill of writing short paragraphs, formal and informal letters, curriculum vitae/resume, applications of various types, study notes, summery and appropriate words – both scientific and non-scientific.

Course content and activities

A. **Oral Communication Activities**: Information transfer activities: Pair and group works involving transfer of information (reading a brochure and advertise/a notice a schedule or programme/ drawing etc. and discussing these, finding a solution, arriving at a decision through speaking): extempore speech using clues, group discussion etc.

Pair works: describing pictures, interpreting diagrams, gleaning information from different types of written materials including articles etc and talking about them, formal seminar presentation, formal group discussion.

B. Reading : Reading and comprehension: global and local comprehension, drawing interferences Materials: Stories and essays (preferably a collection of comparatively short essays on scientific, interestingly written topics, biographical/autobiographical writings, short stories – adventure and scientific fiction), Reading silently in class followed by a short comprehension questions, brief writing exercise summaries in brief, personal responses (not typical question-answer type) both oral and written. Reading material from internet and talking and writing about them; reading scientific reports, articles collected from newspapers and magazines, Internet ete. and writing notes etc. on them.

C. Writing: Preparing reports, project proposals, writing applications of various types and for various purposes curriculum vitae/resume, letters to the editors, letters to various agencies. Writing short notes on article/reports read summary of articles/paragraphs read, notes on lectures (talk-radio/TV/Audio, Video cassettes). Opinions on discussions/letters heard, notice both formal and informal/friendly, notes to inform others etc. interpreting pictures, advertisements, visual (video, TV etc.) and writing briefly about them.

D. Vocabulary and grammar: Using useful but unfamiliar words and phrases in conversation and in writing; group verbs, idiomatic ezpressions; synonyms and antonyms.

Structure of simple sentences; use of adverbials, longer sentences, combining sentences, Tenses, use of passive in scientific discourse, various types of questions, direct and indirect narration.

Evaluation:
Oral Skills: 15% of total marks.

Interview/interacting: group discussion; formal seminar
presentation Reading – Comprehension: 25% of total marks

Continuous text; chart/graph/drawing/pictures
etc. Vocabulary
Writing: 40% of total marks

Notes/summary/writing; letters; report writing; short
essay Grammar and usages 20% of total marks

Questions on grammar in use (using texts/passages from texts);questions to test knowledge of grammar.

Books and equipment:

1. AnnaUniversity, Madras, "English for Engineers and Technologists: a skill approach", Vol 182, Hyderabad, Orient Longman, 1990
2. "Collins Cubuild English Grammar", Harper Collins India, 1990
3. Graves, Graham, "Foundation English for Science Students", DelhiOxfordUniversity Press, 1975
4. Oxford Advanced Learner's Dictionary (with CD –ROM), 7th Ed. 2005
5. Thomson and Martinet, "A Practical English Grammar", DelhiOxfor ELBS, 1980
6. Sudarsanam K, "Understanding Technical English", New Delhi, Sterling Publishers Pvt. Ltd., 1988.

SO 101 Sociology 3 0 0 3 3

1. **Society:** Meaning and element of society – Distinction between society, Aggregation and Organization – relationship between Individual and society.

   Social group: Meaning and brief classification of social group – primary group-meaning, characteristic and importance of primary ground – method of making decision in a primary group – secondary group – meaning and characteristics – organization of authority in a secondary group.

2. **Social Change:** concepts and direction of social change – deterioration – and cycle theory – causes of social change – deterministic theories of social change – a brief explanation of biological, physical, cultural and technical factors influencing the rate and direction of social change.

   Social Disorganization: Meaning, characteristics and causes – social problem – meaning classification and causes – methods for solving social problems.

3. **Personal Administration:** Concept, aims and objectives, functions and principles of personal administration, Interview – types of interview – training – importance and methods – induction.

4. **Human Relations &Behavioural Approach to Manpower:** Concept of human relations – origin and growth –(a brief reference to the Hawthrone Experiments, Mechanical or Commodity concept and social or Human concept of Labour – classification made by DoghlasMegxg theory – X and Theory – Y – importance of Human relations.

   Workmotivation - meaning and kinds – Baslow's need Hierarchy – Motivational techniques – meaning and significance of group Dynamics – Employees morale – meaning and importance of and steps to promote employee morale.

5. Concept, characteristics and techniques of leadership – types of leader – functions and qualities of a leader.

Books

1. Induction of Sociology, Dr. Sachdeva and VidyBhusan
2. Business Administration and Management, Dr. S C Saksena
3. Principle of Sociology, R N Sarma
4. Human Relation in Management, S G Huneryager& L LHechkm.

BM 101 Elementary Economics 3 0 0 3 3

Semester – II

MS 103 Mathematics – II 3 1 0 4 4

Linear Algebra: Vector spaces – Linear dependence of vectors, basis, linear transformations, rank and inverse of a matrix, solution of algebraic equations – consistency conditions. Eigenvalues and eigenvectors, Systems of differential equations, Hermitian and skew Hermitian matrices.

Complex Analysis: Limit, continuity, differentiability and analytical of functions, Cauchey-Reimann equations, Elementary complex functions, Line integrals, Cauchy's integral theorem, Cauchy's integral formula, Power series, Taylor's series, Laurent's series, Zeros and singularities, Residue theorem..

Laplace and Fourier Transforms: Polynomials – Orthogonal Polynomials – Lagrange's Chebysev Polynomials; Trigonometric Polynomials – Fourier Series, Fourier transforms, Laplace transforms, z-transform, Wavelet transforms.

Numerical Analysis: Finite differences, Newton's forward and backward interpolation formulae, Central difference interpolation. Trapezoidal rule and Simpson's $1/3^{rd}$ rule of integration.Solution of polynomial and transcendental equations – bisection method, Newton Raphson method and Regulafalsi method.

Books

Linear Algebra

1. K. Hoffman and R Kunze, "Linear Algebra" Prentice Hall, 1996
2. Krishnamurthy V, Mainra V P, Arora J L, *An Introduction to Linear Algebra*.
3. T M Apostol, "Calculus", Vol – II, 2^{nd} Ed. Wiley, 1969

Complex Analysis

4. R V Churchill and J W Brown, "Complex Variables and Applications", 5^{th} Ed. McGraw Hill, 1990
5. J H Mathew and R W Howell, " Complex Analysis for Mathematics and Engineering", 3^{rd} Ed. Narosa, 1998

Laplace and Fourier Transforms

6. K SankaraRao, "Introduction to Partial Differential Equations", PHI, 1995
7. Kreyszig E, "Advance Engineering Mathematics".
8. Grewal B S., "Engineering Mathematics".

Numerical Analysis

9. Kreyszig E, "Advance Engineering Mathematics".
10. Grewal B S., "Engineering Mathematics".

PH 102 Physics – II 2 1 1 4 5

Elements of special theory of relativity: postulates, Galilean and Lorentz transformations, equivalence of mass and energy.

Introduction to quantum mechanics and applications: limitations and failure of classical physics, wave-particle duality, uncertainty Principle, atomic and molecular spectra, elements of lasers and holography.

Solid state physics: Bravais lattice, reciprocal lattice, X-ray diffraction, Brillouin zones, Band theory of solids.
Statistical physics: Quantum statistics, Fermi Energy of metals.

Nuclear Physics: Nuclear force, properties and models of nuclei, nuclear excitations and decay, nuclear reactions, elementary particles.

Laboratory experiments:

1. To verify Hooke's law and determination the Young's modulus of elasticity of the material of a bar the method of flexure.
2. To determine the thermal conductivity of a bad conductor in the form of a disc by the Lees and Chorlton method.
3. To determine the thermal conductivity of a good conductor by Searl's method.
4. To determine the Rydberg constant by studying the Hydrogen spectrum.
5. B-H curve and determination of Curie temperature of a ferromagnetic material.
6. To determine the value of Stefan's constant.
7. To determine the Lande's g-factor with Electron Spin Resonance spectrometer.
8. To study the current voltage, power output versus load, aerial characteristics and spectral response of the photoelectric solar cell.
9. To determine the hall co-efficient of a given semiconductor.
10. To determine the band gap by measuring the resistance of a thermistor at different temperatures.
11. To construct AND, OR and NOT gates from NOR and NAND gates using IC chips.
12. To determine the dielectric constant of a given dielectric material.

Books

1. Arthur Beiser, "Concepts of Modern Physics", McGraw Hill, Int. Student Ed.
2. Robert Resnick, "Introduction to Special Relativity"

Reference:

1. C. Kittel, "Introduction to SolidState Physics", VII Ed., Wiley Eastern Ltd.
2. L S Schiff, "Quantum Mechanics", Tata McGraw Hill
3. Ghatak and Lokanathan, "Quantum Mechanics".

ME 102 Engineering Mechanics 3 1 0 4 4

Force System: Moment of a force about a point and about an axis; couple moment; reduction of a force system to a force and a couple.

Equilibrium: Free body diagram; equations of equilibrium; problems in two and three dimensions; plan frames and trusses.

Friction: Laws of Coulombs friction, problems involving large and small contact surfaces; square threaded screws; belt friction; rolling resistance.

Properties of Areas: Moments of inertia and product of inertia of areas, polar moment of inertia, principal axes and principal moments of inertia.

Principle of Virtual Works

Kinematics and Kinetics of Particles: Particle dynamics in rectangular coordinates cylindrical coordinates and in terms of path variables; central force motion.

Rigid Body Dynamics: Relative velocity, Translation, pure rotation and plane motion of rigid bodies, D'Alembert's principle, linear momentum, principle of conservation of momentum, Impact of solid bodies, work, energy, power, principle of conservation of energy.

Books

1. F P Beer and F R Johnston, "Mechanics for Engineering" McGraw Hill
2. I H Shames, "Engineering Mechanics", PHI
3. Timoshenko and Young, " Engineering Mechanics", McGraw Hill

Reference:

1. R C Hibbler, "Engineering Mechanics", McMillan
2. K L Kumar, "Engineering Mechanics", Tata McGraw Hill

EL 102 Basic Electronics 3 1 1 5 6

Diodes and Transistors : Semiconductor Materials, Semiconductor Diode, Equivalent Circuits, Diode Testing, Zener Diodes, Load Line Analysis, Rectifier Circuits, Wave Shaping Circuits, Bipolar Junction Transistors, Field-Effect Transistors, Transistors Biasing, Transistors Small Signal Analysis, Transistor Amplifier Circuits.

Operational Amplifiers: Operational Amplifier Basics, Equivalent Circuit, Practical Op-amp Circuits, DC Offset, Constant Gain Multiplier, Voltage Summing.

Passive filters: Low pass, high pass and band stop filters, single and higher order passive filter topologies (RC and LC), specifications (cutoff frequency, roll off etc.)

Digital Systems: Number Systems and Codes, r's Complements and (r-1)'s Complements, Binary Addition and Subtraction, Representation of Negative Number, Floating Point Representation. Logic Gates: Basic and Universal, Boolean Theorems, De' Morgan's theorems, Sum-of-Products form, Algebraic Simplification, Karnaugh Map, Basic Combinational Circuit Concept : Half Adder, Full Adder, Sequential circuit concept : Basic Flip-Flops (RS, D, JK Flip-Flop).

LABORATORY:

Experiments using diodes and bipolar junction transistor (BJT) : diode characteristics, designs and analysis of half-wave and full-wave rectifiers, Clipping circuits and Zener regulators, BJT characteristics and BJT amplifiers.

Experiments using Operational amplifiers : Summing amplifier, Comparator, Oscillators.

Experiments using logic gates : Digital IC testing, Realization of Boolean Equation, Realization of Adder, Subtrator.

Experiments using flip-flops : Realization of Basic Flip-Flops.

Text Books :

1. R.L. Boylestad and L.Nashelsky : Electronic Devices and Circuit Theory; PHI, 6e, 2001.
2. R.J. Tocci : Digital Systems; PHI, 6e, 2001

References:

1. A.P. Malvino : Electronic Principles; New Delhi, Tata McGraw-Hill, 1993
2. J. Millman& A. Grabel, "Micro electronics", 2nd Edition, McGraw-Hill, 1987
3. R.A. Gayakward, "OpAmps and Linear Integrated Circuits, New Delhi : PHI, 2002

CO 101 Introductory Computing 2 1 0 3 3

Computer Fundamentals:

- History, Generations, Classification of Computers;
- Organization of a Computer;
- Concept of Programming and Programming Languages.

Introduction to Programming

- Concept of algorithm, flow chart, Pseudocode, Illustrative Problem solving Examples.
- Feature of a Programming Language: Character Set, Identifiers, Keywords, Data Types, Variables, Declarations, Operators & Expressions; Statements: Assignment, Input/Output; Flow control – Conditionals and Branching; Iteration; Functions, Function Types, Scope Rule; Recursion; Arrays, pointers, structures. (A programming language like C/C++ shall be used as a basis language. The same language is to be used for the laboratory)

Books:

1. Balaguruswamy, "Programming in C"
2. Kanetkar Y, " Let us C"
3. Gotfreid, "Programming in C", McGraw Hill.
4. Rajaram V, "Fundamentals of Computers".

Reference:

1. Kerningham B W, "The Elements of Programming Style"
2. Yourdon E, "Techniques of Program Structures and Design"
3. Schied F S, "Theory and Problems of Computers and Programming"
4. Kerningham& Ritchie, "The C Programming Language"

CO 102 Computing Laboratory 0 0 2 2 4

Laboratory exercises shall involve the following:

1. Familiarization of a computer and the environment and execution of sample programs.
2. Expression evaluation.
3. Conditionals and branching
4. Iteration
5. Functions
6. Recursion
7. Arrays
8. Structures

9. Linked list
10. Data structures

It is suggested that some problems related to continuous domain problems in engineering and their numerical solutions are given as laboratory assignments. It may be noted that some of basic numerical methods are taught in the Mathematics course.

Books

1. Kerningham B W, "The Elements of Programming Style"
2. Kerningham& Ritchie, "The C Programming Language"
3. Balaguruswamy, "Programming in C"
4. Kanetkar Y, " Let us C"
5. Gotfreid, "Programming in C", McGraw Hill.

BT 101 Elements of Modern Biology 3 0 0 3 3

Biological Structures and Organization:

- Biological macromolecules, cellular organization, cell types, membrane structures and functions.
- Cellular energetics: Structure of Mitochondria, Energy transduction; Structure of Plastids(chloroplast), Photosynthetic light and dark reaction.

Biological systems:

- Muscular skeletal system, Nervous system (overview of the major human sensory organs and their (functioning), Cardiovascular system.

Biological Information:

- DNA : Structure, Genetic code, Central dogma in Molecular Biology.
- Protein synthesis
- Biological data and Bioinformatics.
- Signal transduction in plants and animals – Basic concepts.

Text/Reference:

1. N Hopkins, J W Roberts, J A Steitz and A M Weiner, "Molecular Biology of the Gene", J Watson, 4th Ed. Benjamin Cummings, Singapor, 1987.
2. J L Tymoczko, L Stryer, " Biochemistry", J M Berg, 5th Ed. W H Freeman & Co, New York, 2002
3. Dr. C CChatterjee, "Human Physiology", 11th Ed., Vol I & II, Medical Allied Agency, Kolkata, 1987
4. Guyton, "Human Physiology".

ES 101 Environmental Science 3 0 0 3 3

General: Basic ideas of environment, basic concepts related to environmental perspective, man, society and environment, their inter relationship. 1L

Mathematics of population growth and associated problems, definition of resource, types of resource, renewable, nonrenewable, potentially renewable, effect of excessive use vis-à-vis population growth, definition of pollutant and contaminant. Environmental impact assessment. 2L

Environmental degradation: Acid rain, toxic element, particulates, noise pollution, air pollution and its effect on man. 1 L

Overall methods for pollution prevention, environmental problems and sustainable development, components of environment. 1L

Ecology: Elements of Ecology: System, open system, closed system, definition of ecology, species, population, community, definition of ecosystem, biotic and abiotic components. Ecological balance and consequence of change: Effect of abiotic factor on population, flow chart of different cycles with only elementary reaction [oxygen, nitrogen, phosphate, sulphur], food chain [definition and one example of each food chain]. 3L

Air Pollution and Control:

Atmospheric composition: troposphere, stratosphere, mesosphere, thermosphere, tropopause, stratopause, and mesopause. 1L

Energy Balance: conductive and convective heat transfer, radiation heat transfer, simple global temperature modal [Earth as a black body, earth albedo] problem. 3L

Green – house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food. 1 L

Climate, weather: Difference between climate and weather, Global warming and its consequence: adiabatic lapse rate atmospheric stability, temperature inversion, radiation inversion, Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, smokestack plumes and atmospheric lapse rate. 3L

<u>The point –source Gaussian plume model excluded:</u>

Source and effect of pollutants: Toxic chemicals in the environment, toxic chemicals in air, suspended particulate matter, carbon dioxide, sulphur dioxide, nitric oxide, lead, carbon monoxide. 2L

Primary and secondary pollutants: Emission standard, criteria pollutant, oxides of carbon, oxide of nitrogen, oxide of sulphur, particulate, PAN. 1L

Deplection Ozone layer: CFC, destruction of ozone lair by CFC, impact of other greenhouse gases, effect of ozone modification. 1L

Standard and control measures: Industrial, commercial and residential air quality air quality standard, control measure (ESP, cyclone separator, bag house, catalytic converter, scrubber (ventury). Statement with brief reference. 1L

Water Pollution and Control:

Hydrosphere: Hydrological cycle. 1L

Natural water, pollutants: their origin and effects: Oxygen demanding wastes, pathogens, nutrients, salts, thermal application, heavy metals, pesticides, volatile organic compounds. 1L

River/ Lake/ground water pollution:

River: Do, 5 day BOD test, BOD reaction rate constants, temperature dependents of BOD, effect of oxygen demanding wastes on river (Deoxygenation, reaeration), COD, Oil, Grease, p^H. 2L

Lake: Eutrophication (Defination, source and effect). 1L

Ground water:Aquifers, hydraulic gradient, ground water flow. (definition only)1L

Standard and Control: Wast water standard (BOD, COD, Oil, Grease), water treatment system (coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening), wastewater treatment, primary treatment, secondary treatments (trickling filters,

rotating biological contractor, activated sludge, sludge treatment, oxidation ponds), tertiary treatment definition. 3L

Arsenic pollution: Biochemical effect, contamination, speciation 2L

Land Pollution: Lithosphere composition, pollutants: Municipal, Industrial, commercial, agricultural, hazardous solid wastes. 1L

Recovery and conversion method waste and waste management land filling, incineration, composting. 1L

Noise pollution, sources, effects: Definition of noise, effect of noise pollution, noise classification, transport noise, occupational noise, neighborhood noise, definition of noise intensity, noise threshold limit value. 2L

Books:

1. Maters, G M, "Introduction to Environmental Engineering and Science", PHI, 1991
2. Nebel B J, "Environmental Science", PHI, 1987
3. Odum E P, "Ecology: The Link between the natural and social Sciences", IBH Publishing Co. Delhi.

CH 102 Introductory Material Science 3 0 0 3 3

Structure of Materials:

Atomic bonding and bonding types, crustallography and x-ray diffraction, defect structures, amorphous structures in metals, ceramics and polymers.

Kinetics:

Diffusion and diffusion pathways, Fick's 1^{st} and 2^{nd} law, Avrami-rate equation, T. T. T. diagrams, specific attentation shown to Fe-Fe_3C system.

Phase Equilibria:

Uniary and binary phase diagrams, Gibb's phase rule, cooling curves and setermination, solid solution, eutectics, peritectics, eutectoids, peritectoid reaction.

Mechanical Properties:

Elastic and plastic behaviourconstrasted in ceramics, metals and polymers, stress-strain curves, Hardening mechanisms in polymers and metals.Time dependent mechanical properties, creep mechanisms, Fracture toughness.

Composite Materials:

Designing composite materials, Average property description, connectivity.

Electrical properties:

Conductivity (metal), semiconductors, intrinsic versus extrinsic, Insulators, superconductors, Magnetic materials, optical materials, refractive indices and colour.

Books:

1. J F Shaklefor, "Introduction to Material Science and Engineering".
2. W D Callister, "Material Science and Engineering: An Introduction", Wiley, 2002
3. V Raghavan, "Material Science and Engineering", Prentice Hall, 1996

Reference:

1. W F Smith, "Principles of Materials Science", McGraw Hill, 1996
2. G E Dieter, "Mechanical Metallurgy", McGraw Hill, 1988

Semester – III

MS 201 Mathematics – III 210 3 3

Discreate Probability:
- Randomness, finite probability space, probability measures, events
- Conditional Probability, independence, Bayes' theorem
- Discreate random variables
- Bionomial, Poisson, geometric distributions
- Mean and variance: concepts, significance, computations, applications
- Integer random variables

Continuous Probability :
- Continuous random variables, the nature of these, illustrations of use
- Exponential and normal distribution: probability density functions, calculation of mean and variance
- The central limit theorem and the implications for the normal distribution
- Joint distribution

Expections :
- Moments, transform methods, mean time to failure
- Conditional expections, examples
- Imperfect fault coverage and reliability

Stochastic processes :
- Introduction: Bernoulli and poisson processes, renewal process, renewal model of program behavior
- Queuing: M/M 1 and M/G/1, birth and death process
- Finite Markov chains, program execution times

Sampling distribution:
- Purpose and the nature of sampling , its uses and applications
- Random approaches to sampling : basic method, stratified sampling and various thereof, cluster sampling
- Non-random approaches : purposive methods, sequential sampling
- Data analysis; tools; graphical and numerical summaries
- Multivariate distributions, independent random variables

Estimation :
- nature of estimates: point estimates, interval estimates
- Criteria to be applied to single point estimators: unbiased estimators, consistent estimators, efficiency and sufficiency of estimators
- Maximum likelihood principle approach, least squares approach; applicability conditions for these
- Confidence intervals
- Estimates for one or two samples

Hypothesis tests :
- Development of models and associated hypotheses, the nature of these
- Hypothesis formulation : null and alternate hypothesis

- Testing hypothesis based on a single parameter, choice of test statistics; choice of samples and distributions
- Criteria for acceptance of hypothesis
- T-test, chi-squared test; applicability criteria for these

Correlation and regression :
- The nature of correlation and regression , defination
- Definition and calculation of correlation coefficients
- Approaches to correlation : the linear model approach, the least squares fitting approach, strengths and weaknesses of these and conditions for applicability

Books:

1. Statistical Methods for Engineeris and scientists, R.m.Bethea, B.S.Duran, T.L.Boullion, Marcell Dekker Inc.
2. Statistics : Concepts and Applications, H.Frank, S.C.Altheon, Cambridge Low Priced Edition
3. Theory and Problens of Probability and Statistics, M.R.Spiegal, Scaum's Outline Series, McGrawHill.
4. Probability, Random Variables, and Stochastic Processes, Papoulis, McGrawHill

EL 201 Switching Circuits & Digital Logic 2 1 1 4 5

Simplification of Digital Circuits: Simplification of switching function – K-map and quine – Variable entered map - McClueskey tabular minimization methods; computer aided minimization of switching functions, synthesis of combinational logic circuits – NAND and NOR networks.

Logic families: Introduction to different logic families; operational characteristics of BJT in saturation and cut-off regions; operational characteristics of MOSFET as switch; TTL inverter – circuit description and operational; CMOS inverter – circuit description and operation; other TTL and CMOS kits; electrical behaviour of logic circuits – noise margins, fanout, transmission time, propagation delay, power dissipation.

Combinational logic modules: Decoders, encoders, multiplexers, de-multiplexers and their applications ; three state devices and busses; code converter; binary adders; half adder and full adder, ripple carry adder, carry-loop-ahead adder; subtracters; multipliers; ALU; comparators; parity circuits; circuit timing – timing diagrams and specifications; combinational circuit design examples.

Sequential logic devices and circuits: Latches; flip-flops, SR, JK, D and T flip-flops, Data storage, serial data transfer, frequency division, registers, shift-registers; counters- ripple counters, synchronous counters, up-down counters, BCD counters, ring counters, timing diagrams and specifications; state machine models – synchronous state machines ; state machine design examples; design using ASM charts; timing hazards and races; design and analysis of a synchronous sequential circuits: pulse mode and fundamental mode.

SWITCHING CIRCUITS AND DIGITAL LOGIC LABORATORY

Experiments using SSI and MSI digital integrated circuits: logic gates, Staircase switch, majority detector, quality detector, flip-flops, non overlapping pulse generator, ripple counter,

synchronous counter, pulse generator, multiplexers, demultiplexers, shift registers, seven – segment decoders, monostablemultivibrators, latches, memories; some examples of the experiments: arbitrary wave form generator, stop watch, logic probe, time clock.

Texts:

1. J.F. Wakerly, "Digital Design – Principles and Practices", Pearson Education, 2001, 3/e.
2. V.P. Nelson, H.T. Nagle, B.D. Carroll & J.D. Irwin, "Digital Logic Circuit Analysis and Design", PHI, 1995.
3. R. F. Tinder, "Engineering Digital Design," Harcourt India, 2001 2/e.

Reference:

1. F. J. Hill and GR Peterson, " Computer Aided Logical Design," John Willey, 1993, 4/e
2. M. D. Ercegovac, T Lang and JH Moreno, "Introduction to Digital Systems", John Wiley, 2000
3. M. Mano, Digital Design, PHI, 1997.2/e
4. Z. Kohavi, Switching and Finite Automata Theory, TMH, 2000
5. P. K. Lala, Practical Digital Logic Design and Testing, PHI, 1996,
6. D. D. Gajski, Principles of Digital Design, PHI, 1996

EL 202 Electrical Technology 2 1 1 4 5

Electrical machines: Principles of electromechanical energy conversion, DC machines,

AC machines: synchronous machines, synchronous condensers, three phase and single phase induction motors, applications of special types of motors (linear stepper, reluctance).
Transformers: Single phase and three phase transformers, parallel operations, autotransformers.

Power transmission and distribution: High-voltage AC (HV AC) and high-voltage DC (HVDC) transmissions, industrial and domestic loads, power factor improvement, safety and protection-fuses, circuit breakers, earthing, lighting rods, earth leakage detectors.
Power electronic devices: Thyristors, electronic control of motors.

ELECTRICAL TECHNOLOGY LABORATORY

Open circuit and Load characteristics of D.C shunt generator, Load characteristic of the D.C shunt / compound motor and speed reversal, Regenerative braking of D.C series motor, Methods of starting and speed control of the 3-Phase induction motor, Parallel operation of 3-phase transformer, Synchronous motor V curves.

Texts/References

1. Cotton,H., "Advanced Electrical Technology", CBS Publishers and Distributors, New Delhi, 1984.
2. Nagrath I.J. and Kothari, D.P., "Electrical Machines", TMH, New Delhi, 2001.
3. Hambley, A.R., Electrical Engineering: Principles and Applications, 2nd Edition, Prentice Hall, 2002.
4. Yamayee,Z.A and Bala, JL, Electromechanical Energy Devices an Power Systems, John Wiley & Sons Inc., 1994
5. Mohan, N., Power Electronics: Converters, Applications & Design, John Wiley and Sons, 2003.

EL 203 Analog Electronic Devices and Circuits 2 1 1 4 5

Semiconductor materials: Energy bands and carrier concentrations in thermal equilibrium, Carrier transport phenomena.

Bipolar junction transistors (BJTs) and Junction Field Effect Transistors (JFETs) : Principle of operation and characteristics of BJTs and JFETs, biasing, small signal models, basic single stage amplifier configuration, multi stage amplifiers, Small signal analysis.

Frequency response :Dominant pole approximation, methods of shunt circuit and open circuit time constants, frequency response of basic and compound configurations, effect of negative feedback, basic feedback topologies and their properties, analysis of practical feedback amplifiers, stability, frequency compensation.

Power amplifiers: Push-pull amplifiers, Class A, B, AB, C, D stages.

Metal Oxide Semiconductor Field Effect Transistors (MOSFETs): MOS Capacitor analysis, Modes of operation, MOSFET basic operation, output and transfer characteristics.

BJT and FET differential amplifiers: Small signal analysis, frequency response.

Optoelectronic Devices: PIN photodetectors, Solar cells, Light emitting diode.

SPICE models: SPICE models of p-n diode and BJT, MOS geometry in SPICE, Model parameters.

ANALOG ELECTRONIC DEVICES AND CIRCUITS LABORATORY

Experiments using bipolar junction transistor (BJT) and Field effect transistor:Multistage amplifier's frequency response, JFET's characteristics, MOSFET's characteristics, differential amplifier's frequency response, simulation using SPICE.

Texts:

1. A.S. Sedra and K.C. Smith, "Microelectronic Circuits", OxfordUniversity Press, 1997.
2. Ben G. Streadman, "SolidState Electronic Devices", PHI, 5th Edition, 2001
3. J. Singh, "Semiconductor Devices- Basic Principles", 5th Edition, John Wiley and Sons, 2001

Reference:

1. M.N Horenstein, "Microelectronic Circuits and Device', Prentice Hall of India, 1996.
2. A.P. Malvino, "Electronic Principles" Tata McGraw Hill, 1993
3. P. Horowitz and W. Hill, "The Art of Electronics', CambridgeUniversity Press, 1995.
4. G.W. Roberts and A.S. Sedra, "SPICE", OxfordUniversity Press, 1997.
5. S.M. Sze, "Semiconductor Devices : Physics and Technology" , John Wiley & Sons, 2nd Edition, 2001

EL 204 Signals and Systems 2 1 0 3 3

Introduction: Signals and Systems, Examples of signals and systems. Signal types: energy and power signals, continuous and discrete time signals, analog and digital signals, deterministic and random signals. Signal properties: symmetry, periodicity, and absolute integrability. Elementary signals: unit step, unit impulse, the sinusoid, the complex exponential; representation of signals as vectors.

Systems and system properties: linearity, shift-invariance, causality, stability, realizability; continuous time and discrete time linear shift-invariant (LSI) systems : the impulse response and step response; response to arbitrary inputs : convolution, interconnections; characterization of causality and stability of linear shift-invariant systems; system representation through differential equations and difference equations; eigen functions of LSI systems, frequency response and its relation to the impulse response.

Signal representation: signal space and orthogonal bases of signal, Fourier series representation; Fourier Transform and properties, Parseval's Theorem, time-bandwidth product; Phase and group delays; Hilbert transform, pre-envelope.

Discrete-time Fourier Transform (DTFT): DTFT and properties, Parseval's Theorem; Discrete Fourier Transform (DFT) and properties.

Laplace Transform for continuous time signals and systems:region of convergence, properties; s-domain analysis of LSI systems, poles and zeros of system functions and signals, stability, Minimum phase systems.

Z-Transformation of discrete time signals and systems : region of convergence, properties, generalization of Parseval's theorem; Z-domain analysis of linear discrete-time systems, system functions, poles and zeros of systems and sequences, stability, minimum phase systems.

Sampling theorem and its implications: spectra of sampled signals; reconstruction: Ideal interpolator, zero-order hold, first-order hold; aliasing and its effects.

Text/ Reference:

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", PHI, 1983
2. R.F. Zeimer, W.H. Tranter and D. R. Fannin, "Signals and Systems-Continuous and Discrete", 4th edition, PHI, 1998
3. B. P. Lathi, "Signal Processing and Linear Systems", OxfordUniversity Press, 1998
4. Douglas K. Lindner, "Introduction to Signals and Systems", McGraw-Hill International Edition, 1999
5. Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia) Private Limited, 1998

CO 212 Computer Architecture and Organization 3 1 1 5 5

Basic organization of the computer and block level functional units from program execution point of view; Fetch, decode and execute cycle;

Assembly language programming: Instruction set, instruction cycles, registers and storage, addressing models; discussions about RISC versus CISC architectures;

Inside a CPU: information representation , computer arithmetic and their implementation;

control and data path, data path components, design of ALU and data path, control unit design;

Memory and I/O access: Memory maps, Read Write operations, Programmed I/O, concept of handshaking, Polled and Interrupt driven I/O, DMA data transfer; I/O subsystems: Input-Output devices such as Disk, CD-ROM, Printer etc; Interfacing with IO devices, Keyboard and display interfaces;

Inside the Memory memory organization, static and dynamic memory; Cache memory and Memory Hierchy-Cache memory access techniques; Virtual memory;

Introduction to Parallel Architectures: Instruction Level Parallel Processors- Pipelined , VLIW, Superscaler; Multiprocessor and Multicomputer Architectures, Vector Processing

Laboratory experiments:
The assignments should cover the following:

1. Assignments on assembly programming
2. Experiments on synthesis/design of simple data paths and control unit;
3. Assignments on interfacing devices and system like data acquisition systems; Development kits as well as PCs/Workstations may be used for the laboratory, along with design /simulation tools as and when necessary

Books :

1. Computer Architectures and Organization , Hayes J.P. McGrawHill
2. Computer Organization , Hamacher, Zaky, Vranesic, McGrawHill
3. Computer System Architectures, Mano M.M.

Semester – IV

EL 205 Integrated Circuit 3 0 1 4 5

Introduction : Classification of integrated circuits (ICs), Chip size and circuit complexity, Monolithic IC technology, Fabrication of circuits, Fabrication of FETs, Thin and Thick film technology, IC production cycle.

BJT and FET integrated circuits: Current mirrors and sources, active load, Cascaded configurations.

Operational amplifiers circuits: Operational amplifier basics, FET Op-Amp , Op-Amp DC and AC characteristics, Small signal analysis, Frequency response, CMOS and BiCMOS Op-Amp circuits, V to I and I to V converters, Precision rectifier, Log and Antilog amplifier, Lock-in amplifier, Sample and Hold circuit, Comparator, Schmitt Trigger, Sinusoidal and Relaxation Oscillators, Wave shaping circuits. Series and Shunt Voltage regulators, Switching regulator; Active filters, Butterworth and Chebyshev approximation, Switched capacitor filters, Basic D/A and A/D converters, Phase detector comparator, Voltage controlled oscillator (VCO), Phase Locked Loop (PLL).

INTEGRATED CIRCUITS LABORATORY
Op-Amps and other integrated circuits: Precision rectifier, Active filters, Voltage regulators, Wave form generators, Phase Locked Loop.

Text:

1. R.A. Gayakwad, "Op-Amps and Linear Integrated Circuit", Prentice Hall of India, 2002.
2. R.L. Boylestad and L.Nashelsky : Electronic Devices and Circuit Theory; PHI, 6e, 2001.

Reference:

1. D.Roy Choudhury and Shail Jain, "Linear integrated circuits" New Age International(P) Limited,1999
2. Thomas L. Floyd and David M. Buchla,"Basic Operational Amplifiers and Linear Integrated Circuits" 2nd Edition.

EL 206 Principles of Communication 3 0 1 4 5

Review of Signals and Systems.

Basic blocks in a communication system: Transmitter, channel and receiver, concept of modulation and demodulation; base band and pass band signals.

Continuous wave (CW) modulation: Amplitude Modulation (AM) – generation & demodulation; Modified forms of AM – Double sideband suppressed carrier (DSBSC), single sideband suppressed carried (SSBSC) and Vestigial sideband (VSB) modulation; mixers; frequency division multiplexing;

Angle modulation – phase modulation (PM) & frequency modulation (FM); narrow and wideband FM; generation & demodulation; Phase locked loop (PLL);

Homodyne & heterodyne receivers.

Elements of TV broadcast and reception.

Noise in CW modulation systems: Receiver model; signal to noise ratio (SNR), noise figure, noise temperature; noise in DSB-SC, SSB, AM & FM receivers; pre-emphasis and de-emphasis.

Pulse Modulation: Sampling process; pulse amplitude modulation; other forms of pulse modulation; quantisation process; pulse code modulation (PCM); line coding; noise consideration in PCM; time division multiplexing; deferential pulse code modulation; delta modulation; adaptive delta modulation.

COMMUNICATION LABORATORY:

Generation, testing and verification of AM,FM,PM, DSBSC, SSB &SSBSC wave, Transmitter & receiver, phase detection using PLL, PCM Codec.

Texts:

1. Simon Haykin, "Communication Systems", 4th edition, John Willey & Sons, 2001.
2. J. Proakis& M. Salehi, "Communication System Engineering", 2nd Edition, Pearson Education Asia, 2002.
3. B. P. Lathi, "Modern Analog and Digital Communication Systems", 3/e, OxfordUniversity Press, 1998.

References:

1. R. E. Ziemer, W. H. Tranter: Principles of Communication: Systems, Modulation, and Noise, 5/e, John Willey & Sons, 2001.
2. Herbert Taub and Donald L Schilling, "Principles of Communication Systems", McGraw Hill, 1998, 2/e.
3. K. Sam Shanmugam, Digital and Analog Communication, John Willey & Sons 1979.
4. A. B. Carlson, Communication Systems, McGraw Hill, 1986, 3/e.

EL 207 Instrumentation 3 0 1 4 5

Concept of instrumentation system, performance characteristics of instrumentation system, system performance measurement, systems linearity and distortion, Fourier analysis and synthesis, Sine wave, impulse and step inputs and random noise as test signals.

Classification of Transducers: Input and output Transducers, Primary and secondary Transducers, Active and Passive Transducer, Inverse transducer, classification based on Electrical Principle involved – Resistive Position Transducer- Resistive Pressure Transducer -: Inductive Pressure Transducer – Capacitive Pressure Transducer – Self generating inductive Transducers – Linear Variable Differential Transformer (LVDT) – Piezoelectric Transducer – Strain Gauge Temperature Transducers – Resistance Temperature Detectors – Thermistor – Thermocouple.

Signal conditioning: differential amplifier, instrumentation amplifier, isolation amplifier, charge amplifier.

Signal recovery: Signal filtering, averaging and correlation, Lock-in amplifier, Phase sensitive detection.

Data transmission and telemetry: Two wire, three wire transmitters, modulation and encoding methods, multiplexing, interference, grounding and shielding.

Data Acquisition and conversion . Data display and recording.

Electronic test equipment: Oscilloscope, DMM, Frequency counter, Wave/Harmonic distortion/Spectrum analyzers. PC based instrumentation. Computer controlled test system.

INSTRUMENTATION LABORATORY

Development of circuits for signal conditioning, signal recovery, telemetry; PC based instrumentation; Computer controlled test systems; experiments using modern electronic test equipment.

Text :

1. D. Helfric and W.D. Cooper, "Modern Electronic Instrumentation and measuring techniques.", PHI, 1990.
2. E.Jones, "Instrumentation, measurement and feedback", Tata McGraw-Hill, 1986
3. E.O. Deobelin, "Measurement Systems - Applications and design", Tata McGraw-Hill, 1990

References:

4. F. Coombs, "Electronics Instruments Handbook", Tata McGraw-Hill, 1995
5. R.P. Areny and T.G. Webster, "Sensor and Signal Conditioning", John Wiley, 1991
6. B.M. Oliver and J.M. Cage, "Electronic Measurements and Instrumentation", Tata McGraw-Hill, 1975
7. B.G. Liptak, "Instruments Engineers Handbook : Process measurement and

analysis", Randor : Chilton Book, 1995

EL 208 Engineering Electromagnetics 3 0 0 3 3

Static Electric Fields: Fundamental postulates of Electrostatics; Coulomb's Law, electric field & electric flux density, Gauss's law with application, boundary conditions, capacitance & capacitors, electrostatic energy, Laplace's & Poisson's equations, uniqueness of electrostatic solutions, method of images, solution of boundary value problems in different coordinate systems.

Steady Electric Current: Current density and ohm's law, EMF and Kirchoff's voltage law, continuity equation and Kirchoff's current law, power dissipation and Joule's law, boundary conditions.

Static Magnetic Fields: Fundamental Postulates, Vector magnetic potential, Biot-Savart Law and Application, Magnetic dipole, Behaviour of magnetic materials, Boundary conditions, Inductances and inductors, Magnetic energy.

Time varying fields & Maxwell's Equations: Faraday's Law of electromagnetic induction, Maxwell's equations, electromagnetic boundary conditions, wave equations and their solutions, time harmonic fields.

Electromagnetic Waves: Plan wave in loss less media, plan waves in lossy media, pointing vector and power flow in electromagnetic field. Wave polarization, plan wave reflection from a media interface.

Antennas and Radiating systems: Fundamentals of radiation, radiation field of an elemental dipole, antenna pattern and antenna parameters, thin linear wire antennas, loop antennas, basics of antenna arrays, aperture antennas.

Introduction to method of moments (MOM): Linear operator equation, basic steps of the method of moments, formulation of integral equations, MOM application to wire antennas and scatterers.

Texts:

1. David K Cheng, "Field and Wave Electromagnetic", 2/e, Pearson Education Asia, 2001.
2. Mathew N O Sadiku, " Elements of Electromagnetic", 3/e, OxfordUniversity Press, 2001.
3. S. Ramo, J R Whinnery and T V Duzer, "Fields and Waves in Communication Electronics", 3/e John Willey, 1994.

References:

1. J. D. Kraus, Flesch, Daniel, "Electromagnetics, 2/e, McGraw Hill, 1999.
2. J Griffiths, "Introduction to Electrodynamics", 2/e PHI, 1995.
3. J D Kraus, "Antennas", 2/e, McGraw Hill, 1988.
4. E C Hordan and K G Balmain, "Electromagnetic Waves and Radiating Systems", 2/e PHI 1995.

Balanis, "Antennas Theory and Design", 2/e, John Willey, 1996

CO 221 Data Structures and Object Oriented Programming 3 0 1 4 5

Review of elementary programming

Recursion: the concept of recursion ; recursive specification of mathematical functions (such as factorial and Fibonnaci); simple recursive procedures (Towers of Hanoi, permutations, fractal patterens);divide and conquer strategies; recursive backtracking ; implementation of recursion

Ntroduction to computational complexity: Asymptotic analysis of upper and average complexity bounds; big – O notation; standard complexity classes; empirical measurements of performance

Fundamentals computing algorithms: O(N log N) sorting algorithms (quicksort, heapsort, mergesort); hashing, including collision –avoidance strategies; binary search trees.

Fundamentals data structures: Linked structures; implementation strategies for stacks, queues, hash tables, graphs, and trees; strategies for choosing data structures

Object oriented programming: object – oriented design; encapsulation and information hiding; separation of behavior and implementation; classes, subclasses, and inheritance; polymorphim; class hierarchies; collection classes and iteration protocols; fundamental patterns

Books :

1. Data Structures and Algorithms, A.V.Aho, J.E.Hoppersoft, J.E.Ullman, Addision Wesley
2. Fundamentals of data structures, E. Horowitz, S.Sahni, Galgotia Publ.
3. Data structures using C, A.S.Tanenbaum, PHI
4. Herbert Schild : the complete Reference to C++, Osborne McGrawHill
5. BjarneStroustrup: The C++ Programming Language, Addison Wesley

CO 222 System Software & Operating Systems 3 0 1 4 5

History and Overview of system software and their classification

Language Processors*:* Compiler, Interpreter, Assembler, Linker and Loader- Functions and design principles

Operating Systems : Overview of functions , types and organizations,Process management, Memory management, Device management and file system-Basic concepts and algorithms

Books:

1. Dhandhere, System programming and operating systems, Tata McGrawHill
2. System Software, Beck
3. Sumitabha Das, Unix System V.4 Concepts and Applications, TMH
4. Operating System Concepts, Silversatz
5. Opearating Systems, Tanenbaum, PH1
6. Operating Systems, Milenkovic, McGrawHill

Semester – V

EL 301 Digital Communication 3 0 1 4 5

Geometric representation of signal waveforms: baseband and bandpass signals, constellations.

Baseband transmission through AWGN channel: binary and M-ary hypothesis testing and optimum receiver structures; probability of error in binary and M-ary PAM.

Bandpass transmission through AWGN channel: bandwidth, power and error probability; basic digital bandpass modulation schemes-ASK, PSK, QAM and FSK; coherent demodulation and detection; probability of error in ASK, PSK, QAM and FSK schemes; optimum receiver structures for non-coherent detection; various differential PSK schemes and their error performance. DBPSK, DMPSK, π/4-QSK, offset π/4-QSK; M-ary FSK-non-coherent detection and error performance; symbol error probability in M-ary systems (MPSK, MFSK); bit error probability and symbol error probability in MPSK and MFSK; comparison of modulation schemes.

Digital transmission through band limited (BL) channel: ISI, Nyquist criterion for zero ISI; design of BL signals with zero ISI; design of BL signals for controlled ISI-partial response signals; maximum-likelihood sequence detector (MLSD) for partial response signaling; design of transmitter and receiver for known channel; channel equalization.

Synchronization: frequency and phase synchronization; symbol synchronization; frame synchronization.

Channel capacity and coding: channel modes, channel capacity and bounds on communication; channel coding for reliable communication.

Spread- spectrum (SS) communication systems: direct sequence SS systems, frequency hopped SS systems; synchronization in SS systems; some applications.

Text :

1.J.G. Proakis and S. Salehi:Communication Systems Engineering,Pearson,2002
2. S.Haykin: Communication Systems; John Wiley&Sons, 1994,3/e

References:

1.P.Chakraborty: Principles of Digital Communication.
2.J.Proakis: Digital Communication; McGraw-Hill, 1995,4/e

EL 302 Microprocessors & Interfacing 2 0 1 4 6

8085 Microprocessor: Programmers model: register structure, addressing modes and assembly languages.

8086.8088 Microprocessor: Architecture of 8086/8088, segmented memory, addressing modes, assembly language instruction, assembler, linkers and software development tools; debugging an 8086/8088 system and microprocessor development systems.

CPU model design: 8086/8088-clock generation, timing diagram analysis, CPU module design in minimum and maximum mode.

Memory system design: Address decoding technique, static RAM interfacing, dynamic RAM (DRAM): refreshing techniques, interfacing and DRAM controller; direct memory access (DMA).

Input/output (I/O) design: Isolated I/O, memory mapped I/O, design of parallel I/O, serial I/O, interrupt driven I/O and DMA.

Peripherals: Programmable interrupt controller (8259), programmable peripheral interface (8255), serial communication (8251), programmable timer and event counter (8254) and DMA controller (8257).

Introduction to x86: Architecture, operating modes (real, protected and virtual), memory management and protection; overview of advanced processor (P-I to P-IV).

Micro-controllers and their interfacing.

Microprocessor laboratory

Assembly language programming for 8085/8086: interfacing of 8085/8086: memory interfacing. Design of I/O modules and interfacing of different peripherals, parallel interfacing using A/D and D/A converters; 8051 based control of stepper motor.

Text:

1. R.S Gaonkar: "Microprocessor Architecture, Programming & application with 8085/8080A";New Age, 1995,2/e
2. John Uffenbeck; "8086 family, programming and interfacing", PHI 2001.

References:

1. D.V Hall: "Microprocessing and interfacing";TMH,1995.

EL 303 Digital Signal Processing 3 0 1 4 5

Review of discrete-time signals and systems: Discrete time signals, signal classification, discrete time systems and analysis of discrete time linear time invariant systems.

Frequency selective filters: ideal filter characteristics, low pass, high pass and band pass filters; digital resonators, notch filters, comb filters, all-pass filters, digital sinusoidal oscillators; invertibility of LTI systems, minimum phase, maximum phase and mixed phase systems.

Structures for discrete time systems: signal flow graph representation, basic structures of FIR and IIR systems (direct, parallel, cascade and poly phase forms), transposition theorem, and ladder and lattice structures.

Design of FIR and IIR filters: Design of FIR filters using windows, frequency sampling method; computer aided design of FIR filters; equiripple linear phase FIR filters, Parks-McClellan algorithm and Remez algorithm, least-mean-square error filter design; design of FIR differentiators, Hilbert transformer, design of IIR filters using impulse invariance, bi-linear transformation and frequency transformations.

Computation of Discrete Fourier Transform (DFT): the computational problem, commonly used fast Fourier transform (FFT) algorithms (radix-2, decimation -in –time, decimation-in frequency); Goertzel algorithm and possible generalizations.

Finite word-length effects in digital filters: fixed and floating point representation of numbers, quantization noise in signal representations, finite word length effects in coefficient representation, round off noise, SQNR computation and limit cycle.

Multi-rate signal processing: decimation and interpolation.

Laboratory:

Texts:

1. J.G. Proakis and D.G. Manolakis: Digital signal processing: Principles, Algorithms and Applications, PHI, 1997
2. A.V Oppenheim and R.W. Shafer:Discrete-Time Signal Processing,PHI,2/E,2000.

Reference:

1.S.JOrfandis:Introduction to signal Processing, Prentice - Hall, 1978.

EL 304 Control System Engineering 3 0 1 4 5

Introduction to Automatic Control: Basic elements of control systems, Functional block diagram of a control system. Control terminology, Open loop and closed loop control systems, examples of automatic control systems. Basic elements of a servo machines.

The Control Problem: Models of physical systems, differential equations, transfer functions and state variable models of simple control components like mass spring damper, thermometer: block diagram reduction, signal flow graph and Mason's gain formula : time and frequency response of first and second order systems.

Control System Characteristics: Standard test signals, Order of systems, concepts of time constant, Dynamic characteristics of systems, Linear and non-linear systems, step response of first order and second order systems – overshoot and undershoot, damping ratio, Steady state response and error. Stability, sensitivity and disturbance rejection and steady-state accuracy, stability analysis.Characteristic equation.Routh's stability criteria. Relative stability indices – phase margin and gain, root locus analysis: frequency response plots, Bode plots and Nyquist criterion.

Design of Control System: Classical design – root locus and frequency response based design for phase-lead, phase-lag and PID controllers: modern design: pole placement design, controllability and observability.

Introduction to Advanced Control Systems: Digital computer system and applications, adaptive control, Fuzzy Logic control, Neural Control, Neuro-Fuzzy control.

Laboratory:

Books:

1. K. Ogata, Modern Control Engineering, Prentice Hall India
2. M.Gopal: control system; Tata McGraw Hill

EL 305 Microwave Engineering 3 0 1 4 5

Transmission lines and Waveguides: Lumped element circuit model for a transmission line, Field analysis of transmission lines, Terminated lossless lines, Smith chart, Lossy transmission line. General solution for TEM, TE and TM waves, Rectangular and circular wave-guides. Impendance transformation and matching: Matching with lumped elements, stub matching, Quarter wave transformer, the theory of small reflections, multi section matching transformer, tapered lines. Microwave circuits: scattering matrix technique, directional couplers, hybrid junctions, power dividers, ferrite devices, circulators, cavity resonators, microwave filters.

Microwave tubes and Microwave solid-state devices: Limitations of conventional tubes in the microwave frequency ranges, klystron amplifier, reflex klystron oscillator, Magnetrons, Traveling wave tubes, characteristics of microwave bipolar transistor and FET, Transferred electron devices, avalanche diode oscillators.

Microwave integrated circuits: different planar transmission lines. Characteristics of Microwave integrated circuits. Design of single stage amplifier and oscillator using transistor. PIN diode based control circuits.

Micro-strip and printed antennas: Basic characteristics, types and feeding methods of micro-strip antenna. Analysis of rectangular micro-strip antennas using simplified models.

Microwave Laboratory:

Books:

1. R.E. Collin: Foundations for Microwave Engineering, McGraw Hill, 1992,2/e
2. S.M. Liao: Microwave devices and circuits, PHI, 1995, 3/e

BM 321 Fundamental of Management 3 0 0 3 3

Part – I

Meaning, Objectives and scope of Management.

Functions of Management – Planning, Organizing, Staffing, Directing and Controlling. Styles of Management.

Part – II

Basics of Financial Management: Marketing Management; Human Resource. Management; and Production Management.

Books:

1. L M Prasad, “Principles and Practice of Management”, Sultan Chand & Sons, New Delhi
2. V S Ramaswamy and S Namakumari, “Marketing Management”, Macmilan India Pvt. Ltd., New Delhi
3. S S Khanka, “Human Resource Management”, S Chand & Co., New Delhi
4. P Rama Murty, “Production and Operations Management”, New Age International Publishers, New Delhi.

Semester – VI

EL 306 Communication Networks 3 0 1 4 5

Packet switching and circuit switching; layered network architecture (OSI model), point to point protocols and links: physical layer, error detection and correction, ARQ retransmission strategy, framing, X.25 standard, queuing theory and delay analysis: Little's theorem, analytical treatment of M/M/1 and M/M/m queuing systems, simulation of queuing systems, delay analysis for ARQ system, multi-access protocols, ISDN, ATM, network security, design of a LAN system with commercially available functional units., Wireless LAN: Adhoc network, security issues.

Communication Networks Laboratory:

Text:

1. A.S. Tanenbaum: Computer Networks; PHI, 1997, 3/e
2. W. Stallings: Data and Computer Communication; PHI, 1997

EL 307 Device Modeling & Simulation 3 0 1 4 5

Charge Transport in Semiconductors, Two terminal devices, Bipolar junction transistors, FETs, Advanced FET modeling, Universal MESFET modelk, Universal HFET model, BSIM MOSFET model. Introduction to SPICE modeling.

Laboratory:

Text:

1. Fjeldly, Tor A, YtterdalTrond, Shur Michael "Introduction to Device Modeling and Circuit simulation" John Willy & Sons, INC, 1998

EL 308 VLSI Design 3 0 1 4 5

Issues of digital IC design: general overview of design hierarchy, layers of abstraction, integration density and Moore's law, VLSI design styles, packaging styles, design automation principles; MOSFET fabrication: basic steps fabrication, CMOS p-well and n-well processes, layout design rules, Bi-CMOS fabrication processes; basic electrical properties of MOS and Bi-CMOS circuits: MOS transistor operation in linear and saturated regions, MOS transistor threshold voltage, MOS switch and inverter, Bi- CMOS inverter, latch-up in CMOS inverter, inverter properties (robustness, dynamic performance, regenerative property, inverter delay times, switching power dissipation), MOSFET scaling (constant voltage and constant field scaling);logic design with MOSFETs: switch logic (networks derived from canonical form and Shannon expression theorem, universal logic modules, networks derived from iterative structure), gate restoring) logic, programmable logic array (PLAs), finite state machine (FSM) as a PLA, personality matrix of a PLA, PLA folding, pseudo-nmos logic; basic circuit concepts: sheet resistance and area capacitances of layers, driving large capacitive loads, supper-buffers, propagation delay models of cascaded pass transistors, wiring capacitances; dynamic CMOS design: steady state behavior of dynamic gate circuits, noise considerations in dynamic design, charge sharing, cascading dynamic gates, domino logic, np-CMOS logic,

problems in single phase clocking, two phase non overlapping clocking scheme; low power CMOS logic gates: low power design through voltage scaling, estimation and optimization of switching activity, reduction of switched capacitance, adiabatic logic circuits: subsystem design: design of arithmetic building blocks like adders (static, dynamic, Manchester carry-chain, look ahead, linear and square root carry select, carry bypass and pipelined adders) and multipliers (serial-parallel, Braun, Baugh-Wooley and systolic array multipliers), barrel and logarithmic shifters, area time tradeoff, power consumption issues; Semiconductor memories: Dynamic random access memories (DRAM), static RAM, non volatile memories, flash memories; bipolar ECL inverter: Features of ECL gate, robustness and noise immunity, logic design in ECL, signal ended and differential ECL; physical design: brief ideas on partitioning, placement, routing and compaction, Kernighan-Lin and FiducciaMattheyses partitioning algorithms, area routing and channel routing algorithms; testability of VLSI: Fault types and models, stuck-at fault models, scan based techniques, built-in self test (BIST) techniques, Boolean differences, PLA testability.

Laboratory:

Specifying the design of digital circuits including moderately complex computer, traffic light controller, divider, multiplier, fibonacci sequence generator etc. in Verilog orVHDL language and simulating the same under ModelSim simulator.

Books:

1. D.A. Pucknell and K.Eshraghian, Basic VLSI Design, PHI, 1995
2. Fabricius, Introduction to VLSI design, McGraw Hill,1991

BM 322 Social Responsibility and Professional Ethics in Engineering **3 0 0 3 3**

Engineering and Society: What is Engineering? The Engineering view, The Engineering Image; The Engineer's Challenge: Cost, Deadline and Safety

Moral Dilemmas in Engineering: Engineering and Business.

Frameworks for Engineering ethics: Moral Thinking and moral theories, codes of Engineering ethics, support for ethical engineers.

Engineering ethics and public policy: Risk Assessment and Communication, product liability, engineering and sustainable development.

Intellectual property: Foundations of intellectual property, copyrights, patents, and trade secrets, software piracy, software patents, transnational issues concerning intellectual property. Entrepreneurship: prospects and pitfalls, Monopolies and their economic implications, Effect of skilled labor, supply and demand of the quality computing products, pricing strategies.

Case studies in Engineering ethics: Challenger Disaster, Hyatt Regence Walkway collapse, The Pfizer Heart Valve Case, The Therac-25 case etc.

Reference:

1. Computers, Ethics and Social Values, Johnson &Nissenbaum, Prentice Hall
2. Social Issues in Computing: Putting Computing in Place, Huff &Finholt, McGraw Hill.

3. A Gift of Fire: Social, Legal and Ethical Issues in Computing, Prentice Hall.
4. Cyber Ethics: Morality and Law in Cyber Space, Jones & Bartlett.

ECE Elective – I		3	0	0	3	3
Open Elective – I*		3	0	0	3	3
	Total	18	0	3	21	24

* Open Elective : Any course of level 400 and above offered in the University and recommended by the department.

Semester – VII

EL 401	**Digital Systems Design & VHDL**	**3**	**0**	**1**	**4**	**5**

Modeling digital systems, modeling languages, VHDL modeling concepts, Design of digital circuits using Verilog or VHDL,Computer architecture and organization: control design-hardwired control, micro- programmed control; CPU design- complex instruction set computer (CISC), reduced instruction set computer (RISC); memory organization- virtual memory, high speed memory; input-output systems and communication. Programmable logic devices: programmable logic design techniques, modular designs and hierarchy, field programmable gate arrays (FPGAs) and complex programmable logic devices (CPLDs). Hardware structures for digital signal processing (DSP): computer arithmetic- number representations, CORDIC method for computing elementary and special functions; measures for enhancing performance-parallel processing and pipelining; array processor architectures-algorithmic representation, linear mapping method, systolic arrays; digital filter structures.

Laboratory:
Implementations of digital systems on FPGA platforms.

Books:
1. J.Hayes: Computer Architecture and Organization; McGraw-Hill, 1998,3/e.
2. J.H.Jenkins: Designing with FPGAs and CPLDs; PHI, 1994

	ECE Elective – II	3	0	0	3	3
	ECE Elective – III	3	0	0	3	3
	Open Elective – II	3	0	0	3	3
EL 471	Industrial Summer Training	-	-	-	2	-
EL 481	Project I	0	0	6	6	12

Semester – VIII

UNITCOURSE NAME	L	T	P	CR	CH
ECE Elective – IV	3	0	0	3	3
Open Elective – III	3	0	0	3	3
EL 482Project – II0	0	12	12	24	

ECE Elective

EL 421 Image Processing **3 0 0 3 3**

Human visual system and image perception; monochrome and color vision models; image acquisition and display: video I/O devices; standard video formats; image digitization, display and storage; 2-D signals and systems; image transforms-2D DFT, DCT, KLT, Harr transform and discrete wavelet transform; image enhancement: histogram processing, spatial filtering, frequency domain filtering; image restoration: linear degradation model, inverse filtering, Wiener filtering; image compression: lossy and loseless compression, video compression standards; image analysis: edge and line detection, segmentation, feature extraction, classification; image texture and analysis; morphological image processing: binary morphology- erosion, dilation, opening and closing operations, applications; basic gray scale morphology operations; color image processing: color models and color image processing. MATLAB implementation of algorithms covered in the course.

Text:

1. R.C. Gonzalez and R.E. Woods: Digital Image Processing, Pearson Education, 2001.
2. A.K, Jain, Fundamentals of Digital Image Processing, Pearson Education, 1989.

EL 424 Fiber Optic Communication **3 0 0 3 3**

Forms of communication systems, Elements of a optical fiber transmission link; optical laws and definitions, mode theory of circular wave-guides, fiber modes and configurations, single mode fibers and multimode fibers; attenuation, absorption, scattering, signal distortions; intermodal dispersion and intermodal dispersion in an optical fiber, mode coupling phenomenon; light emitting diodes, LASER, photodiodes, and avalanche photodiodes; modulation techniques, system considerations, link power budget and rise time budget, line coding and eye pattern; wavelength division multiplexing (WDM), optical amplifiers and photonic switching.

Books:

1. J.Senior: Optical Fiber Communications: Principles; PHI, 1996, 2/e
2. G. Keiser: Optical Fiber Communications; McGraw Hill, 1991, 2/e

EL 426 Fuzzy Logic and Neural Networks **3 0 0 3 3**

Introduction to Fuzzy sets, Fuzzy relation, Approximate reasoning, Rules. Fuzzy control design parameters, Rule base, database, and choice of fuzzificationprocedure, choice of defuzzification procedure.Nonlinear fuzzy control, adaptive fuzzy control.

Introduction to neural networks, biological neurons, artificial neurons, artificial neural networks-various structures, learning strategies, applications.

Books:

1. D. Driankov, H. Hans, R. Michael: An Introduction to Fuzzy Control; Springer-Verlag,1993
2. R.Beale, T. Jackson: Neural Computing-An Introduction; Adam Hilger, 1990

EL 430 Computer Vision **3 0 0 3 3**

Image formation and image models; image filtering; lines, blobs, edges and boundary detection; representation of 2-D and 3-D structures; Bayes decision theory for pattern recognition; supervised and unsupervised classifications; parametric and non- parametric schemes; clustering for knowledge representation; application of neural networks and fuzzy logic in pattern recognition; feature extraction in images; texture analysis and classification; image segmentation; optical character recognition; 2-D and 3-D object recognition; surface extraction from monocular images; stereo image pair analysis; optical flow and 3-D motion analysis.

Books:

1. D.H. Ballard and C.M. Brown: Computer Vision; PHI, 1982
2. R.C. Gonzalez and R.E. Woods: Digital Image Processing, Pearson Education, 2001

EL438 Digital Signal Processors **3 0 0 3 3**

Computational characteristics of DSP algorithms: basic DSP operations, a genetic instruction-set architechture for DSPs, architectural requirement of DSPs, high throughput, enhanching computational throughput, multiple on chip memories and buses, on chip peripherals, control unit of DSPs

Books

1. P.Pirsch, Architectures for Digital Signal Processing,John Wiley, 1999
2. R.J.Hggins, Digital Signal Processing in VLSI, Prentice-Hall,1990

EL 425 Mobile Communication3 **0 0 3 3**

Representation of a mobile radio signal; propagation path loss and fading: causes, types of fading and classification of channels; prediction of propagation loss; measurements, prediction over flat terrain; point –to-point prediction, microcell, prediction model; calculation of fades; amplitude fades, random PM and random FM selective fading, diversity schemes, combining techniques, bit-error-rate and word-error-rate, mobile radio interference; co-channel and

adjacent-channel interference, intermodulation, intersymbol and simulcast interference; frequency plans:

Text Books:

1. W. C. Y. Lee: Mobile Communications Design Fundamentals, Wiley, 1993, 2/e
2. T. S. Rappaport: Wireless Communications: Prentice Hall, 1996.

El 439: POWER ELECTRONICS 3 0 0

OBJECTIVES

- To study about power electronic circuits for voltage and current control and protection.
- To learn the switching characteristics of transistors and SCRs. Series and parallel functions of SCRs,Programmable triggering methods of SCR.
- To learn controlled rectification AC supplies.
- To study of converters and inverters.
- To learn about motor control, charges, SMPS and UPS.

UNIT I POWER ELECTRONICS DEVICES

Characteristics of power devices –Power Transistors- Power MOSFETs, characteristics of SCR(Silicon Controlled Rectifier), DIAC(diode for alternating current'), TRIAC(Triode for alternating current'), SCS(Silicon Controlled Switch), GTO(Gate turn off thyristor)–FETs – LASCR(Light Activated SCR) – two transistor model of SCR – Protection of thyristors against over voltage – over current, dv/dt and di/dt.

UNIT II TRIGGERING TECHNIQUES

Turn on circuits for SCR – triggering with single pulse and train of pulses – synchronizing with supply – triggering– forced commutation – different techniques – series and parallel operations of SCRs.

UNIT III CONTROLLED RECTIFIERS

Converters – single phase – three phase – half controlled and fully controlled rectifiers – Waveforms of load voltage and line current under constant load current – effect of transformer leakage inductance – dual converter.

UNIT IV INVERTERS and CHOPPERS

Voltage and current source inverters, resonant, Series inverter, PWM inverter. AC and DC choppers – DC to DC converters – Buck, boost and buck – boost.

UNIT V INDUSTRIAL APPLICATIONS

DC motor drives – Induction and synchronous motor drives – switched reluctance and brushless motor drives – Battery charger – SMPS – UPS – induction and dielectric heating.

TEXT BOOKS

1. MuhamedH.Rashid,*Power Electronics Circuits, Devices and Applications*, 3rd Edn. 2004 PHI.
2. P C Sen, Power *Electronics*, 2nd Edition, 1992, McGraw-Hill Inc.
3. Ned Mohan, Tore M.Undeland, William P. Robbins, *Power Electronics*, 3rd Edition 2002,Wiley.

REFERENCES

1. G.K.Dubey,*Thyristorised power controllers*, Wiley Eastern, 1986.
2. Joseph Vithayathil,*Power Electronics–Principles and applications,* McGraw-Hill, 1995.
3. Cyril W.Lander,*Power Electronics*, 3rd Edition, McGraw-Hill, 1994.
4. T. J Maloney, *Modern Industrial Electronics*, 5th Edition, Prentice Hall, 2003.
5. R Krishnan, *Electric Motor Drives, Modeling, Analysis and Control*,Prentice Hall. 2001.