Bundelkhand Institute of Engineering and Technology

(BIET) Jhansi, UP

Syllabus

1st Year

B.Tech. Electronics & Communication Engg.

Bundelkhand Institute of Engineering and Technology, Jhansi
Study and Evaluation Scheme B. Tech. in Electronics & Communication Engineering
YEAR I, SEMESTER-I

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY											
1.	EAS-103	Mathematics-I	3	1	0	30	20	50	100	150	4
2.	EAS-101	Engg. Physics-I	2	1	0	15	10	25	50	75	3
3.	EAS-102/ EME-102	Engg. Chemistry/ Engg. Mechanics	3	1	0	30	20	50	100	150	4
4.	EEE-101/ ECS-101	Electrical Engg. / Computer Concepts & Programming in C	3	1	0	30	20	50	100	150	4
5.	EEC-101/ EAS-104	Electronics Engineering / Professional Communication	3	1	0	30	20	50	100	150	4
6.	EME-101/ EAS-105	Manufacturing Processes/ Environment & Ecology	2	0	0	15	10	25	50	75	2
7.	EAS-109	*Remedial English Language**	*2*	*0*	*0*	-	-	-	*50**	*50**	*0*
PRACTICAL/TRAINING/PROJECT											
8.	EAS-152/ EME-152	Engg. Chemistry Lab/ Engg. Mechanics Lab	0	0	2	10	10	20	30	50	1
9.	EEE-151/ ECS-151	Electrical Engg Lab / Computer Programming Lab	0	0	2	10	10	20	30	50	1
10.	EWS-151/ ECE-151	Workshop Practice/ Computer Aided Engg. Graphics	0	1	3	10	10	20	30	50	2
11.	EAS-151/ EAS-154	Physics Lab / Professional Communication Lab	0	0	2	10	10	20	30	50	1
			0	0	2	30	20	50	-	50	1
12.	GP-101	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**18**	**6**	**9**	**190/210**	**140/150**	**380/410**	**670/640**	**1000**	**27**

**Remedial English language is compulsory Audit-course. Candidate has to secure minimum 30% pass marks*

L - Lecture
T - Tutorial
P - Practical
CT - Cumulative Test
TA - Teacher's Assessment
ESE - End Semester Exam.

Bundelkhand Institute of Engineering and Technology, Jhansi
Study and Evaluation Scheme B. Tech. in Electronics & Communication Engineering
YEAR I, SEMESTER-II

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY											
1.	EAS-203	Mathematics-II	3	1	0	30	20	50	100	150	4
2.	EAS-202	Engg. Physics-II	2	1	0	15	10	25	50	75	3
3.	EME-202/ EAS-202	Engg. Mechanics/ Engg. Chemistry	3	1	0	30	20	50	100	150	4
4.	ECS-201/ EEE-201	Computer Concepts & Programming in C / Electrical Engg.	3	1	0	30	20	50	100	150	4
5.	EAS-204/ EEC-201	Professional Communication/ Electronics Engineering	3	1	0	30	20	50	100	150	4
6.	EAS-205/ EME-201	Environment & Ecology/ Manufacturing Processes	2	0	0	15	10	25	50	75	2
PRACTICAL/TRAINING/PROJECT											
7.	EME-252/ EAS-252	Engg. Mechanics Lab/ Engg. Chemistry Lab	0	0	2	10	10	20	30	50	1
8.	ECS-251/ EEE-251	Computer Programming Lab/ Electrical Engg. Lab	0	0	2	10	10	20	30	50	1
9.	ECE-251/ EWS-251	Computer Aided Engg. Graphics/ Workshop Practice	0	1	3	10	10	20	30	50	2
10.	EAS-254/ EAS-251	Professional Communication Lab/ Physics Lab	0	0	2	30	20	50	-	50	1
			0	0	2	10	10	20	30	50	1
11.	GP-201	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**16**	**6**	**9**	**210/190**	**150/140**	**410/380**	**590/620**	**1000**	**27**

EAS-103 - MATHEMATICS –I

L	T	P
3	1	0

Unit - I : Differential Calculus-I
Leibnitz theorem, Partial differentiation, Eulers theorem, Curve tracing, Change of variables, Expansion of function of several variables.

Unit – II : Differential Calculus-II
Jacobian, approximation of errors, Extrema of functions of several variables, Lagranges method of multipliers (Simple applications).

Unit – III : Matrices
Elementary row and column transformation, Rank of matrix, Linear dependence, Consistency of linear system of equations and their solution, Characteristic equation, Caley-Hamition theorem, Eigen values and eigen vectors, Diagonalisation, Complex and unitary matrices, Application of matrices to engineering problems.

Unit – IV : Multiple Integrals
Double and triple integral, Change of order, Change of variables, Beta and Gamma functions, Application to area, volume, Dirichlet integral and applications.

Unit – V : Vector Calculus
Point function, Gradient, divergence and curl of a vector and their physical interpretations, Line, surface and volume integrals, Statement and problems of Green's, Stoke's and Gauss divergence theorems (without proof).

Test Books:-

1. B.V.Ramana, Higher Engineering Mathmatics, Tata Mc Graw-Hill Publishing Company Ltd., 2008.
2. R.K.Jain & S.R.K.Iyenger, Advance Engineering Mathematics, Narosa Publishing House, 2002.

Reference Books:-

1. B.S.Grewal, Engineering Mathematics, Khanna Publishers, 2004.
2. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 2005.
3. E.Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2005.
4. C.Ray Wylie & Louis C. Barrett, Advanced Engineering Mathematics, Tata Mc Graw-Hill Publishing Company Ltd. 2003
5. Peter V. O'Neil, Advanced Engineering Mathematics, Thomson (Cengage) Learning, 2007.

EAS-101 : ENGINEERING PHYSICS-I

L	T	P
2	1	0

Unit – I

Relativistic Mechanics:

Inertial & non-inertial frames, Michelson- Morley experiment, Einsteins postulates. Lorentz transformation equations. Length contraction & Time dilation, Addition of velocities; Variation of mass with velocity Mass energy equivalence. 06 Hrs.

Unit - II

Optics:

Interference: Interference of light, Biprism experiment, displacement of fringes, Interference in thin films- wedge shaped film, Newton's rings,

Diffraction - Single, Double & N- Slit, Diffraction grating, Grating spectra, Rayleigh's criterion and resolving power of grating. 10 Hrs.

Unit - III

Polarization- Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Fresnel's theory of optical activity, Polarimeters .

Laser: Spontaneous and stimulated emission of radiation, Einstein's Coefficients, construction and working of Ruby, He-Ne lasers and laser applications. 08 Hrs.

Unit – IV

Fiber Optics and Holography

Fundamental ideas about optical fiber, Types of fibers, Acceptance angle and cone, Numerical aperture, Propagation mechanism and communication in optical fiber. Attenuation, Signal loss in optical fiber and dispersion.

Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography. 06 Hrs.

Reference Books:

(i)	Concepts of Modern Physics	-	Aurthur Beiser (Mc-Graw Hill)
(ii)	Introduction to Special theory of Relativity	-	Robert Resnick - Wiely
(iii)	Optics	-	Ajoy Ghatak (TMH) Brijlal & Subramanian (S. Chand)
(iv)	Optical Fibre & Laser	-	Anuradha De. (New Age)
(v)	Fundamental of Physics	-	Resnick, Halliday & Walker (Wiely)
(vi)	Principles of Physics	-	R.A. Serway & J.W. Jewett (Thomson Asia Pvt. Ltd.)

EAS102/EAS202 : ENGINEERING CHEMISTRY

L	T	P
3	1	0

UNIT-I : CHEMICAL BONDING AND STATES OF MATTER

M.O. theory and its applications in diatonic molecules. Hydrogen bond, metallic bond and their applications. Various states of matter including liquid crystallite state, classification and applications of liquid crystals. Types of unit cell, space lattice (only cubes, Bragg's Law. Calculation and density of the unit cell, one and two dimensional solids such as graphite and its conduction properties. Fullerenes and their applications.

UNIT-II: REACTION KINETICS, PHASE RULE AND ELECTROCHEMISTRY

Order and molecularity of reactions, Zero order, first order and second order reactions. Integrated rate equations. Theories of reaction rates. Phase rule and its applications to one component system (water). Equilibrium potential, electrochemical cells, galvanic and concentration cells, electrochemical theory of corrosion and protection of corrosion. Fuel cells.

UNIT-III : STRUCTURAL AND MECHANISTIC CONCEPTS OF ORGANICS

Inductive, electromeric mesomeric and hyperconjugative effects. Stability of reaction intermediates e.g. carbocation and free radicals. Mechanism of nucleophilic substitutions. Mechanism of the following reactions:

(i) Aldol condensation

(ii) Cannizaro reaction

(iii) Beckman rearrangement

(iv) Hoffmann rearrangement and

(v) Diels-Alder reaction.

E-Z nomenclature, R.S. configuration, optical isomerism, chirality and its implications, conformations of butene.

UNIT-IV : POLYMERS AND ORGANOMETALLICS

Polymerization and its classification. Thermoplastic and Thermosetting resins. Eleastomers and synthetic fibres. Ion exchange resins. Organic conducting and biodegradable polymers. Classification and general methods of synthesis of organics and their applications in polymerizations and catalysis.

UNIT-V : ANALYTICAL METHODS AND FUELS

Titrimetric analysis with reference to acid-base, redox, precipitations and complexometric titrations. Elementary ideas and simple applications of u.v., visible, infra-red and ^{H}NMR spectral techniques. Water treatment methods for boiler feed water by calgon process, zeolites and ion-exchange resins. Classification of fuels. Analysis of coal, determination of colorific values. Biomass and biogas.

Text Books

1. Advanced Inorganic Chemistry, by Cotton, F.A., Wilkinson G., Murrillo, C.A. and Bochmann, Wiley, ehichester, 1999.
2. March's Advanced Organic Chemistry : Reactions, Mechanisms and Structure Smith, Michael B./March, Jerry, John Willey & sons, 6th Edition, 2007.
3. Elements of Physical Chemistry, Glasstonne, Samuel B. ELBS, 2005.
4. Organic Chemistry, Finar, I.L. : Addision – Wesley Longman, Limited, 2004.

Reference Books

1. Text Book of Polymer Science by F.W. Billmeyer, John Wiley & sons, 1994.
2. Liquid Crystals and Plastic Crystals, vol.-I, edited by G.W. Gray and P.A. Winsor, Ellis Harwood Series in Physical Chemistry, New York.
3. Corrosion Engineering by M.G. Fontana McGraw Hill Publications.

EME-102 / 202 : ENGINEERING MECHANICS

L T P
3 1 0

UNIT I

Two Dimensional Force Systems: Basic concepts, Laws of motion, Principle of Transmissibility of forces, Transfer of a force to parallel position , Resultant of a force system, Simplest Resultant of Two dimensional concurrent and Non-concurrent Force systems, Distributed force system, Free body diagrams, Equilibrium and Equations of Equilibrium, Applications. 5

Friction: Introduction, Laws of Coulomb Friction, Equilibrium of Bodies involving Dry-friction, Belt friction, Application. 3

UNIT II

Beam: Introduction, Shear force and Bending Moment, Differential Equations for Equilibrium, Shear force and Bending Moment Diagrams for Statically Determinate Beams. 5

Trusses: Introduction, Simple Truss and Solution of Simple truss, Method f Joints and Method of Sections. 3

UNIT III

Centroid and Moment of Inertia: Centroid of plane, curve, area, volume and composite bodies, Moment of inertia of plane area, Parallel Axes Theorem, Perpendicular axes theorems, Principal Moment Inertia, Mass Moment of Inertia of Circular Ring, Disc, Cylinder, Sphere and Cone about their Axis of Symmetry. 6

UNIT IV

Kinematics of Rigid Body: Introduction, Plane Motion of Rigid Body, Velocity and Acceleration under Translation and Rotational Motion, Relative Velocity. 4

Kinetics of Rigid Body: Introduction, Force, Mass and Acceleration, Work and Energy, Impulse and Momentum, D'Alembert's Principles and Dynamic Equilibrium. 4

UNIT V

Simple Stress and Strain: Introduction, Normal and Shear stresses, Stress- Strain Diagrams for ductile and brittle material, Elastic Constants, One Dimensional Loading of members of varying cross-sections, Strain energy. 3

Pure Bending of Beams: Introduction, Simple Bending Theory, Stress in beams of different cross sections. 3

Torsion: Introduction, Torsion of shafts of circular section, torque and twist, shear stress due to torque. 3

Text books:

1. Engineering Mechanics by Irving H. Shames, Prentice-Hall
2. Mechanics of Solids by Abdul Mubeen, Pearson Education Asia.
3. Mechanics of Materials by E.P.Popov, Prentice Hall of India Private Limited.

EEE101/EEE201 : ELECTRICAL ENGINEERING

L	T	P
3	1	0

Unit-I

1. D C Circuit Analysis and Network Theorems:

Circuit Concepts: Concepts of network, Active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, R, L and C as linear elements, source transformation.

Kirchhoff's laws; loop and nodal methods of analysis; star-delta transformation; Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem (simple numerical problems). 9

Unit-II

2. Steady- State Analysis of Single Phase AC Circuits:

AC Fundamentals: Sinusoidal, square and triangular waveforms – average and effective values, form and peak factors, concept of phasors, phasor representation of sinusoidally varying voltage and current. Analysis of series, parallel and series-parallel RLC Circuits: apparent, active & reactive powers, power factor, causes and problems of low powerfactor, powerfactor improvement; resonance in series and parallel circuits, bandwidth and quality factor (simple numerical problems). 8

Unit-III

3. Three Phase AC Circuits:

Three phase system-its necessity and advantages, meaning of phase sequence, star and delta connections, balanced supply and balanced load, line and phase voltage/current relations, three-phase power and its measurement (simple numerical problems). 3

4. Measuring Instruments:

Types of instruments, construction and working principles of PMMC and moving iron type voltmeters & ammeters, single phase dynamometer wattmeter and induction type energy meter, use of shunts and multipliers (simple numerical problems on energy meter, shunts and multipliers). 4

Unit-IV

5. Introduction to Power System:

General layout of electrical power system and functions of its elements, standard transmission and distribution voltages, concept of grid (elementary treatment only). 2

6. Magnetic Circuit:

Magnetic circuit concepts, analogy between electric & magnetic circuits, magnetic circuits with DC and AC excitations, magnetic leakage, B-H curve, hysteresis and eddy current losses, magnetic circuit calculations, mutual coupling. 3

7. Single Phase Transformer:

Principle of operation, construction, e .m. f. equation, equivalent circuit, power losses, efficiency (simple numerical problems), introduction to auto transformer. 3

Unit-V

8. Electrical Machines:

Principles of electro mechanical energy conversion,

DC machines: types, e. m. f. equation of generator and torque equation of motor, characteristics and applications of dc motors (simple numerical problems).

Three Phase Induction Motor: types, Principle of operation, slip-torque characteristics, applications (numerical problems related to slip only).

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications. 8

Text Books:

1. V. Del Toro, " Principles of Electrical Engineering" Prentice Hall International
2. I.J. Nagarath, " Basic Electrical Engineering" Tata McGraw Hill
3. D.E. Fitzgerald & A. Grabel Higginbotham, " Basic Electrical Engineering Mc- Graw Hill

Reference Books:

1. Edward Hughes, " Electrical Technology" Longman
2. T.K. Nagsarkar & M.S. Sukhija, " Basic Electrical Engineering" Oxford University Press.
3. H. Cotton, " Advanced Electrical Technology" Wheeler Publishing
4. W.H. Hayt & J.E. Kennely, " Engineering Circuit Analysis" Mc Graw Hill.

ECS-101/ECS-201 : COMPUTER CONCEPTS AND PROGRAMMING IN C

L T P
3 1 0

UNIT 1:

Introduction to any Operating System [Unix, Linux, Windows], Programming Environment, Write and Execute the first program, Introduction to the Digital Computer; Concept of an algorithm; termination and correctness. Algorithms to programs: specification, top-down development and stepwise refinement. Introduction to Programming, Use of high level programming language for the systematic development of programs. Introduction to the design and implementation of correct, efficient and maintainable programs, Structured Programming, Trace an algorithm to depict the logic, Number Systems and conversion methods

UNIT 2:

Standard I/O in "C", **Fundamental Data Types and Storage Classes:** Character types, Integer, short, long, unsigned, single and double-precision floating point, storage classes, automatic, register, static and external, **Operators and Expressions:** Using numeric and relational operators, mixed operands and type conversion, Logical operators, Bit operations, Operator precedence and associativity,

UNIT 3:

Conditional Program Execution: Applying if and switch statements, nesting if and else, restrictions on switch values, use of break and default with switch, **Program Loops and Iteration:** Uses of while, do and for loops, multiple loop variables, assignment operators, using break and continue, **Modular Programming:** Passing arguments by value, scope rules and global variables, separate compilation, and linkage, building your own modules.

UNIT 4:

Arrays: Array notation and representation, manipulating array elements, using multidimensional arrays, arrays of unknown or varying size, **Structures:** Purpose and usage of structures, declaring structures, assigning of structures, **Pointers to Objects:** Pointer and address arithmetic, pointer operations and declarations, using pointers as function arguments, Dynamic memory allocation, defining and using stacks and linked lists.

UNIT 5:

Sequential search, Sorting arrays, Strings, Text files, **The Standard C Preprocessor:** Defining and calling macros, utilizing conditional compilation, passing values to the compiler, **The Standard C Library:** Input/Output : fopen, fread, etc, string handling functions, Math functions : log, sin, alike Other Standard C functions.

Lecture-wise Break-UP

Week	Lecture 1	Lecture 2	Lecture 3	Lab Meeting
Week-1	Introduction to any OS, Programming Environment	A Simple C program	Need of Datastructures & Algorithms	Get familiar with OS and Environment.
Week-2	An Example, Termination, Correctness	Different Types of Programming Languages	Number Systems	Get familiar with C compiler Implement and Test Small

				Routine in C
Week-3	Number Systems	Standard I/O in C	Data Types and Variables	Implement and Test Small Routine in C
Week-4	Data Types and Variable	Data Types and Variable	Operators & Expression	Evaluation of Expression
Week-5	Operators & Expression	Operators & Expression	Operators & Expression	Evaluation of Expression
Week-6	IF, SWITCH Statements	IF, SWITCH Statements	Nested If Statement	Iteration
Week-7	Repetition structure in C	Repetition structure in C	Modular Programming	Iteration, Function
Week-8	Modular Programming	Modular Programming	Arrays	Recursion, Function
Week-9	Arrays	Structures	Structures	Arrays, Structures
Week-10	Pointers	Pointers	Pointers	Linked Lists
Week-11	Searching	Selection	Sorting	Searching, Selection
Week-12	Sorting	Strings	Strings	Sorting, Strings
Week-13	Files	Files	Std C Preprocessor	Files
Week-14	Std C Library	Std C Library	Std C Library	Use of Std. C Library

Text Books :

1. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
2. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition [India Edition], 2007.

EEC-101/EEC-201 : ELECTRONICS ENGINEERING

L T P
3 1 0

Unit – I (10 pds)

Semiconductor Diodes and Applications:

p-n junction, depletion layer 1
v-i characteristics, ideal and practical, diode resistance, capacitance 1
diode ratings (average current, repetitive peak current, peak-inverse voltage) 1
p-n junction as rectifiers (half wave and full wave) 1
filter (Shunt capacitor filter), calculation of ripple factor and load regulation 2
clippling circuits, clamping circuits, voltage multipliers 1

Breakdown diodes:

breakdown mechanism (zener and avalanche) 1
breakdown characteristics, zener resistance, zener diode ratings 1
zener diode application as shunt regulator 1

Unit – II (08 pds)

Bipolar Junction Transistor (BJT):

basic construction, transistor action 1
CB, CE and CC configurations, input/ output characteristics 1
biasing of transistors, fixed bias, emitter bias, potential divider bias, comparison of biasing circuits 2
graphical analysis of CE amplifier, concept of voltage gain, current gain, h-parameter model (low freq.) 2
computation of Ai, Av, Ri, Ro of single transistor CE amplifier configuration 2

Unit – III (10 pds)

Field Effect Transistor (FET):

JFET: Basic construction, principle of working, concept of pinch-off 1
maximum drain saturation current, input and transfer characteristics 1
characteristic equation, CG, CS and CD configurations, fixed and self biasing of JFET amplifier 2
MOSFET: depletion and enhancement type MOSFET- construction, operation and characteristics 2

Operational Amplifier (Op-Amp):

concept of ideal operational amplifier, ideal and practical Op-Amp parameters 1
inverting, non-inverting and unity gain configurations 1
applications of Op-Amp as adders, difference amplifiers, integrators and differentiator 2

Unit – IV (07 pds)

Switching Theory and Logic Design (STLD):

number system, conversion of bases (decimal, binary, octal and hexadecimal numbers) 2
addition and subtraction, fractional numbers, BCD numbers 1
Boolean algebra, logic gates, concept of universal gates 2
canonical forms, minimization using K-map (don't care conditions also) 2

Unit – V (05 pds)

Electronics Instruments:

working principle of digital voltmeter, digital multimeter (block diagram approach) 2
CRO (its working with block diagram) 1
measurement of voltage, current, phase and frequency using CRO 2

Books and references:

1. Robert L. Boylestad/ Louis Nashelsky "Electronic Devices and Circuit Theory", 9th Edition, Pearson Education 2007
2. Devid A. Bell "Electronic Devices and Circuits", 5th Edition, OXFORD University Press 2008
3. Jacob Millman/ Christos C. Halkias/ Satyabrata Jit "Electronics Devices and Circuits", 3rd Edition, TMH 2008
4. Morris Mano "Digital Computer Design", PHI 2003
5. H.S. Kalsi "Electronic Instrumentation", 2nd Edition, TMH 2007

EAS-104/EAS-204 : PROFESSIONAL COMMUNICATION

L T P
3 1 0

Unit -1 Basics of Technical Communication

Technical Communication: features; Distinction between General and Technical communication; Language as a tool of communication; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of Communication: Downward, Upward, Lateral or Horizontal (Peer group); Importance of technical communication; Barriers to Communication. 5

Unit - II Constituents of Technical Written Communication

Words and Phrases: Word formation. Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; Requisites of Sentence Construction: Paragraph Development: Techniques and Methods - Inductive, Deductive, Spatial, Linear, Chronological etc; The Art of Condensation- various steps. 8

Unit - III Forms of Technical Communication

Business Letters: Sales and Credit letters; Letter of Enquiry; Letter of Quotation, Order,

Claim and Adjustment Letters; Job application and Resumes.

Official Letters: D.O. Letters; Govt. Letters, Letters to Authorities etc.

Reports: Types; Significance; Structure, Style & Writing of Reports.

Technical Proposal; Parts; Types; Writing of Proposal; Significance.

Technical Paper, Project. Dissertation and Thesis Writing: Features, Methods & Writing. 10

Unit - IV Presentation Strategies

Defining Purpose; Audience & Locale; Organizing Contents; Preparing Outline; Audio-visual Aids; Nuances of Delivery; Body Language; Space; Setting Nuances of Voice Dynamics; Time- Dimension. 7

Unit - V Value- Based Text Readings

Following essays form the suggested text book with emphasis on Mechanics of writing,

(i) The Aims of Science and the Humanities by M.E. Prior

(ii) The Language of Literature and Science by A.Huxley

(iii) Man and Nature by J.Bronowski

(iv) The Mother of the Sciences by A.J.Bahm

(v) Science and Survival by Barry Commoner

(vi) Humanistic and Scientific Approaches to Human Activity by Moody E. Prior

(vii) The Effect of Scientific Temper on Man by Bertrand Russell. 10

Text Book

1. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, New Delhi .

2. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press 2007, New Delhi.

Reference Books

1. Effective Technical Communication by Barun K. Mitra, Oxford Univ. Press, 2006, New Delhi
2. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., New Delhi.
3. How to Build Better Vocabulary by M.Rosen Blum, Bloomsbury Pub. London.
4. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. & Distributors; Delhi.
5. Developing Communication Skills by Krishna Mohan, Meera Banerji- Macmillan India Ltd. Delhi.
6. Manual of Practical Communication by L.U.B. Pandey & R.P. Singh; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, Delhi.

EME-101/EME-201 : MANUFACTURING PROCESSES

L	T	P
2	0	0

Unit-I Basic Metals & Alloys : Properties and Applications

Properties of Materials: Strength, elasticity, stiffness, malleability, ductility, brittleness, toughness and hardness. Elementary ideas of fracture, fatigue & creep. **2**

Ferrous Materials: Carbon steels, its classification based on % carbon as low, mild, medium & high carbon steel, its properties & applications. Wrought iron. Cast iron. Alloy steels: stainless steel, tool steel. Elementary introduction to Heat- treatment of carbon steels: annealing, normalizing, quenching & tempering and case-hardening. **3**

Non-Ferrous metals & alloys: Common uses of various non-ferrous metals & alloys and its composition such as Cu-alloys: Brass, Bronze, Al-alloys such as Duralumin. **2**

Unit-II Introduction to Metal Forming & Casting Process and its applications

Metal Forming: Basic metal forming operations & uses of such as : Forging , Rolling , Wire & Tube-drawing/making and Extrusion, and its products/applications. Press-work, & die & punch assembly, cutting and forming, its applications. Hot-working versus cold-working. **4**

Casting: Pattern & allowances. Molding sands and its desirable properties. Mould making with the use of a core. Gating system. Casting defects & remedies. Cupola Furnace. Die-casting and its uses. **3**

Unit-III Introduction to Machining & Welding and its applications

Machining: Basic principles of Lathe-machine and operations performed on it. Basic description of machines and operations of Shaper-Planer, Drilling, Milling & Grinding. **4**

Welding: Importance & basic concepts of welding, classification of welding processes. Gas-welding, types of flames. Electric-Arc welding. Resistance welding. Soldering & Brazing and its uses. **3**

Unit-IV Misc. Topics

Manufacturing: Importance of Materials & Manufacturing towards Technological & Socio-Economic developments. Plant location. Plant layout – its types. Types of Production. Production versus Productivity. **3**

Non-Metallic Materials: Common types & uses of Wood, Cement-concrete, Ceramics, Rubber, Plastics and Composite-materials. **2**

Misc. Processes: Powder-metallurgy process & its applications, Plastic-products manufacturing, Galvanizing and Electroplating. **2**

EAS105/EAS205 : ENVIRONMENT & ECOLOGY

2 -0 -0

UNIT-I

Definition, Scope & Importance, Need For Public Awareness- Environment definition, Eco system – Balanced ecosystem, Human activities – Food, Shelter, Economic and social Security. 3

Effects of human activities on environment-Agriculture, Housing, Industry, Mining and Transportation activities, Basics of Environmental Impact Assessment. Sustainable Development. 3

UNIT-II

Natural Resources- Water Resources- Availability and Quality aspects. Water borne diseases, Water induced diseases, Fluoride problem in drinking water. Mineral Resources, Forest Wealth, Material cycles- Carbon, Nitrogen and Sulphur Cycles. 4

Energy – Different types of energy, Electro-magnetic radiation. Conventional and Non-Conventional sources – Hydro Electric, Fossil Fuel based, Nuclear, Solar, Biomass and Bio-gas. Hydrogen as an alternative future source of Energy. 4

UNIT-III

Environmental Pollution and their effects. Water pollution, Land pollution. Noise pollution, Public Health aspects, Air Pollution, Solid waste management. 3

Current Environmental Issues of Importance : Population Growth, Climate Change and Global warming-Effects, Urbanization, Automobile pollution. 3

Acid Rain, Ozone Layer depletion, Animal Husbandry. 3

UNIT-IV

Environmental Protection- Role of Government, Legal aspects, Initiatives by Non-governmental Organizations (NGO), Environmental Education, Women Education. 3

Text Books

1. Environmental Studies – Benny Joseph – Tata McgrawHill-2005
2. Environmental Studies – Dr. D.L. Manjunath, Pearson Education-2006.
3. Environmental studies – R. Rajagopalan – Oxford Publication - 2005.
4. Text book of Environmental Science & Technology – M. Anji Reddy – BS Publication..

Reference Books

1. Principles of Environmental Science and Engineering – P. Venugoplan Rao, Prentice Hall of India.
2. Environmental Science and Engineering – Meenakshi, Prentice Hall India.

EAS-109 : REMEDIAL ENGLISH LANGUAGE

L T P
2 0 0

Unit -1 Basic Applied Grammar and Usage

The Sentences; Kinds of Sentences; Kinds of Phrases; Parts of Speech: Noun: Kinds, Gender; Case; Usage: Rules for Singular Nouns, Nouns in Plural form but Singular in sense etc. Nouns ending in - ics. Nouns ending in - es etc;

Pronoun: Definition, Kinds; Number, Gender, Person, Usage.

Adjectives and Determiners: Kinds, Position; Comparatives and Superlatives,

Conversion of Adjectives as Nouns, as adverbs, as Verbs. Determiners- Kinds. Usage of Adjectives and Determiners.

Articles: Kinds, Articles and Number System, Articles and Gender System, Omission of Articles, Repetition of Articles.

Adverbs: Kinds; Formation, Position of Adverbs, Degree of Comparison, Usage.

Preposition: Kinds, Prepositions and Adverbial Participles, Position; correct Usage, Meaning & Usage.

Verbs: Kinds; Auxiliaries; Principal Auxiliaries: Usage; Be, Have, Do, Modal

auxiliaries: Usage- Can/Could, May/Might; Must; Shall/Should; Will/Would; Ought to, Semi-Modals- Need; Dare; Used to.

Non-Finite Verbs: Kinds of Non-Finite: Infinitives, Gerund; Participle.

Concord: Of Numbers, Of Person. Exceptions to Grammatical; Concord; Concord System.

Conjunction: Coordinating Conjunction; Subordinating Conjunction.

Interjection: Definition, Types.

Mood: Indicative, Imperative, Subjunctive.

Active and Passive Voice.

Conditional Sentences. 10

Unit - II The Structure of Sentences/Clauses

Adverb Clause; Adjective Clause; Noun Clause. Sentences: Simple, Double, Multiple and Complex. Transformation of Sentences:

Simple to complex and vice versa; Transformation of Degree; Simple to Compound and vice versa; Interrogative into Assertive; Affirmative into Negative and vice versa:

Transformation of Statement into Exclamation. Sequence of Tenses: Usage. 8

Unit - III Paragraph Writing

Structure of Paragraph; Construction of Paragraph; Techniques of Paragraph Writing, Unity; Coherence; Emphasis. Expansion: Definition, Method of Expansion; Making of Expansion. Paraphrasing : Use of Paraphrasing; Exercises. 5

Unit - IV Comprehension & Precis Writing

Role of Listening; Ear Training, Reading Comprehension; Reasons for poor Comprehension; Improving Comprehension Skills; Developing Skills of Comprehension; Exercises. Precis Writing: Difference from Comprehension; Techniques of Precis Writing; Topic Sentences and its Arrangement.

Short Essay Writing

Definition of Essay; Types of Essay, Relevant Essay Writing for Engineers/Professionals; Use of Essay Writing,

Dimensions of Essay Writing : Literary, Scientific, Sociological: Contemporary

Problem Solving Essays.

Horizons of Essay Writing: Narrative Essays; Descriptive Essays; Reflective Essays;

Expository Essays; Argumentative and Imaginative Essays. Exercise. 5

Text Book

1. A Remedial Course in English for Colleges Books 1-3 by B.K. Das & A. David, Oxford Univ. Press, New Delhi.

Reference Books

1. Current English Grammar and Usage with composition by R.P. Sinha, Oxford Univ. Press, New Delhi.
2. English Grammar, Composition and Usage by J.C. Nesfield, Macmillan India Ltd. Delhi.
3. Oxford Practice Grammar by John Eastwood, Oxford Univ. Press, New Delhi.
4. Fowler's Modem English Usage by R.W. Burchfield, O.U.P. New Delhi.
5. English Grammar & Composition by P.C. Wren & Martin, S. Chand & Co. Ltd., New Delhi.

EAS152/EAS-252 : ENGINEERING CHEMISTRY (PARACTICALS)

List of Experiments

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA as standard solution.
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in bleaching powder.
5. Determination of iron content in the given water sample by Mohr's methods.
6. pH-metric titration.
7. Determination of Equivalent weight of iron by the chemical displacement method. The equivalent weight of copper is 63.5.
8. Viscosity of an addition polymer like polyester by Viscometer.
9. Determination of iron concentration in sample of water by colorimetric method. The method involves the use of KSCN as a colour developing agent and the measurements are carried out at λ_{max} 480nm.
10. Element detection and functional group identification in organic compounds.
11. Preparation of Bakelite resin.

EME-152/252 : ENGINEERING MECHANICS LAB.

L	T	P
0	0	2

(Any 10 experiments of the following or such experiments suitably designed)

1. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a steel specimen.
2. To determine the compression test and determine the ultimate compressive strength for a specimen
3. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the toughness.
4. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine..
5. To study the slider-crank mechanism etc. of 2-stroke & 4-stroke I.C. Engine models.
6. Friction experiment(s) on inclined plane and/or on screw-jack.
7. Simple & compound gear-train experiment.
8. Worm & worm-wheel experiment for load lifting.
9. Belt-Pulley experiment.
10. Bending of simply-supported and cantilever beams for theoretical & experimental deflection.
11. Torsion of rod/wire experiment.
12. Experiment on Trusses.
13. Statics experiment on equilibrium
14. Dynamics experiment on momentum conservation
15. Dynamics experiment on collision for determining coefficient of restitution.
16. Experiment on Moment of Inertia.

EEE151/EEE251 : ELECTRICAL ENGINEERING LABORATORY

L	T	P
0	0	2

List of Experiments

Note : A minimum of 10 experiments from the following should be performed

1. Verification of Kirchhoff's laws
2. Verification of (i) Superposition theorem (ii) Thevenin's Theorem (iii) Maximum Power Transfer Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor.
6. Determination of parameters of ac single phase series RLC circuit
7. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
8. To study speed control of dc shunt motor using (i) armature voltage control (ii) field flux control.
9. Determination of efficiency of a dc shunt motor by load test
10. To study running and speed reversal of a three phase induction motor and record speed in both directions.
11. To measure energy by a single phase energy meter and determine error.
12. To study P-N diode characteristics
13. To study full wave and half wave rectifier circuits with and without capacitor and determine ripple factors.
14. To study various logic gates (TTL)
15. To study Operational Amplifier as Adder and Subtractor
16. To study transistor as a switch.

ECS 151/ECS 251 : COMPUTER PROGRAMMING LAB

L	T	P
0	0	2

Suggested Assignments to be conducted on a 3-hour slot. It will be conducted in tandem with the theory course so the topics for problems given in the lab are already initiated in the theory class. The topics taught in the theory course should be appropriately be sequenced for synchronization with the laboratory. A sample sequence of topics and lab classes for the topic are given below:

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 lists
10. Data structures

Week	Lecture 1	Lecture 2	Lecture 3	Lab Meeting
Week-1	Introduction to any OS, Programming Environment	A Simple C program	Need of Datastructures & Algorithms	Get familiar with OS and Environment.
Week-2	An Example, Termination, Correctness	Different Types of Programming Languages	Number Systems	Get familiar with C compiler Implement and Test Small Routine in C
Week-3	Number Systems	Standard I/O in C	Data Types and Variables	Implement and Test Small Routine in C
Week-4	Data Types and Variable	Data Types and Variable	Operators & Expression	Evaluation of Expression
Week-5	Operators & Expression	Operators & Expression	Operators & Expression	Evaluation of Expression
Week-6	IF, SWITCH Statements	IF, SWITCH Statements	Nested If Statement	Iteration
Week-7	Repetition structure in C	Repetition structure in C	Modular Programming	Iteration, Function
Week-8	Modular Programming	Modular Programming	Arrays	Recursion, Function
Week-9	Arrays	Structures	Structures	Arrays, Structures
Week-10	Pointers	Pointers	Pointers	Linked Lists
Week-11	Searching	Selection	Sorting	Searching, Selection
Week-12	Sorting	Strings	Strings	Sorting, Strings
Week-13	Files	Files	Std C Preprocessor	Files
Week-14	Std C Library	Std C Library	Std C Library	Use of Std. C Library

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.

EWS-151/251 : WORKSHOP PRACTICE

L	T	P
0	1	3

1. **Carpentry Shop:** 1. Study of tools & operations and carpentry joints. 2. Simple exercise using jack plane.
3. To prepare half-lap corner joint, mortise & tennon joints. 4. Simple exercise on woodworking lathe.

2. **Fitting Bench Working Shop:** 1. Study of tools & operations 2. Simple exercises involving fitting work.
3. Make perfect male-female joint. 4. Simple exercises involving drilling/tapping/dieing.

3. **Black Smithy Shop:** 1. Study of tools & operations 2. Simple exercises base on black smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging.

4. **Welding Shop:** 1.Study of tools & operations of Gas welding & Arc welding 2. Simple butt and Lap welded joints. 3. Oxy-acetylene flame cutting.

5. **Sheet-metal Shop:** 1. Study of tools & operations. 2. Making Funnel complete with 'soldering'.
3. Fabrication of tool-box, tray, electric panel box etc.

6. **Machine Shop:** 1. Study of machine tools and operations. 2. Plane turning. 3. Step turning 4. Taper turning. 5. Threading 6. Single point cutting tool grinding.

7. **Foundry Shop:** 1. Study of tools & operations 2. Pattern making. 3. Mould making with the use of a core.
4. Casting

ECE-151/251 : COMPUTER AIDED ENGINEERING GRAPHICS

L	T	P
0	1	3

Unit-I

1. Introduction to Computer Aided Sketching

Introduction, Drawing Instruments and their uses, BIS conventions, lettering Dimensioning and free hand practicing.

Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Coordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line convention, material conventions and lettering. **2-Sheet**

2. Orthographic Projections

Introduction, Definitions- Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes (No application problems). **2-Sheet**

3. Orthographic Projections of Plane Surfaces
(First Angle Projection Only)

Introduction, Definitions-projections of plane surfaces-triangle, square rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only (No problems on punched plates and composite plates.) 1-**Sheet**

4. Projections of Solids (First Angle Projection Only)

Introduction, Definitions- Projections of right regular- tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions. (No problems on octahedrons and combination solid) **2-Sheet**

5. Sections and Development of Lateral Surfaces of Solids

Introduction, Section planes, Sections, section views, Sectional views, apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. (No problems on section of solids) **1-Sheet**

Development of lateral surface of above solids, their frustums and truncations. (No problems on lateral surfaces of trays, Tetrahedrons spheres and transition pieces).

6. Isometric Projection (Using Isometric Scale Only)

Introduction, Isometric scale, Isometric Projection of simple plane figures, Isometric Projection of tetrahedron, hexahedron (cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres and combination of solids (Maximum of three Solids). **1-Sheet**

Note : At least 3 drawing assignments must be on AUTOCAD.

Text Book

1. Engineering Drawing – N.D. Bhatt & V.M. Panchal, 48th edition, 2005 Charotar Publishing House, Gujarat.
2. A Primer on Computer Aided Engineering Drawing-2006, Published by VTU, Belgaum.

Reference Book

1. Computer Aided Engineering Drawing – S. Trymbaka Murthy, - I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition-2006.
2. Engineering Graphics – K.R. Gopalakrishna, 32nd edition, 2005 – Subash Publishers Bangalore.
3. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production – Luzadder Warren J., duff John M., Eastern Economy Edition, 2005 – Prentice-Hall of India Pvt. Ltd., New Delhi.

EAS-151/EAS-251 : PHYSICS LAB

L T P

0 0 2

List of Experiments

Any ten experiments, at least four from each group.

Group -A

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To study the polarization of light by simple reflection using laser.
7. Measurement of Wavelength of a laser (He- Ne) light using single slit diffraction.

Group – B

8. To determine the specific resistance of a given wire using Carey Foster's bridge.
9. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of the coil.
10. To verify Stefan's Law by electrical method.
11. To calibrate the given ammeter and voltmeter by potentiometer.
12. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of a given semiconductor using Hall effect set up.
13. To determine the energy band gap of a given semiconductor material.
14 To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
15. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
16. To determine the ballistic constant of a ballistic galvanometer.
17. To determine the coefficient of viscosity of a liquid.
18. Measurement of fiber attenuation and aperture of fiber.
19. High resistance by leakage method.
20. Magnetic Susceptibility of paramagnetic solution.

EAS-154/EAS-254 : PROFESSIONL COMMUNICATION LABORATORY

L	T	P
0	0	2

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A.)

LIST OF PRACTICALS

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational Skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics/Kinesics.
4. Presentation Skills for Technical Paper/Project Reports/ Professional Reports based on proper Stress and Intonation Mechanics.
5. Official/Public Speaking based on suitable Rhythmic Patterns.
6. Theme- Presentation/ Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehension Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

Reference Books

1. Bansal R.K. & Harrison: Phonetics in English, Orient Longman, New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B.Pandey & R.P.Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.

EAS-203 - MATHEMATICS –II

L	T	P
3	1	0

Unit - I : Differential Equations

Linear differential equations of nth order with constant coefficients, Complementary functions and particular integrals, Simultaneous linear differential equations, Solution of second order differential equation by changing dependent and independent variables, Method of variation of parameters, Applications to engineering problems (without derivation).

Unit – II : Series Solution and Special Functions

Series solution of ordinary differential equations of 2^{nd} order with variable coefficients (Frobenius Method), Bessel and Legendre equations and their series solutions, Properties of Bessel functions and Legendre polynomials.

Unit – III : Laplace Transform

Laplace transform, Existence theorem, Laplace transform of derivatives and integrals, Inverse Laplace transform, Unit step function , Dirac delta function, Laplace transform of periodic functions, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Unit – IV : Fourier Series and Partial Differential Equations

Periodic functions, Trignometric series, Fourier series of period 2π , Eulers formulae, Functions having arbitrary period, Change of interval, Even and odd functions, Half range sine and cosine series, Harmonic analysis.

Solution of first order Lagrange's linear partial differential equatins, Linear partial differential equations with constant coefficients of 2^{nd} order and their classifications - parabolic, elliptic and hyperbolic with illustrative examples.

Unit – V : Applications of Partial Differential Equations

Method of separation of variables for solving partial differential equations, Wave equation up to two-dimensions, Laplace equation in two-dimensions, Heat conduction equations up to two-dimensions, Equations of transmission lines.

Test Books:-

1. B.V.Ramana, Higher Engineering Mathmatics, Tata Mc Graw-Hill Publishing Company Ltd., 2008.
2. R.K.Jain & S.R.K.Iyenger, Advance Engineering Mathematics, Narosa Publishing House, 2002.

Reference Books:-

1. B.S.Grewal, Engineering Mathematics, Khanna Publishers, 2004.
2. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 2005.
3. E.Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2005.
4. C.Ray Wylie & Louis C. Barrett, Advanced Engineering Mathematics, Tata Mc Graw-Hill Publishing Company Ltd. 2003
5. Peter V. O'Neil, Advanced Engineering Mathematics, Thomson (Cengage) Learning, 2007.
6. G.F.Simmons, Differential Euations, Tata Mc Graw-Hill Publishing Company Ltd. 1981.
7. Chandrika Prasad, Advanced Mathematic for Engineers, Prasad Mudranalaya,1996.

EAS-202 : ENGINEERING PHYSICS- II

L	T	P
2	1	0

Unit - I

Wave Mechanics and X-ray Diffraction

Wave- particle duality, de-Broglie matter waves, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation – particle in one dimensional box.

Diffraction of X-rays by crystal planes, Bragg's spectrometer, Compton's effect. 10 Hrs.

Unit – II

Dielectric and Magnetic Properties of Materials:

Dielectric constant and Polarization of dielectric materials, Types of Polarization (Polarizability) . Equation of internal fields in liquid and solid (One- Dimensional), Claussius Mussoti- Equation, Ferro and Piezo electricity (Qualitative), Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material, Langevin's theory for dia and paramagnetic material, Phenomena of hysteresis and its applications.

Ultrasonic: Generation, detection and application of ultrasonics 08 Hrs.

Unit-III

Electromagnetics

Displacement Current, Maxwell's Equations (Integral and Differential Forms). Equation of continuity, EM-Wave equation and its propagation characteristics in free space and in conducting media, Poynting theorem and Poynting vectors.

06 Hrs. **Unit-IV**

Superconductivity and Science and Technology of Nanomaterials:

Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Type I and Type II superconductors, Temperature dependence of critical field, BCS theory (Qualitative), High temperature superconductors. Characteristics of superconductors in superconducting state, Applications of Super-conductors.

Introduction to Nanomaterials- Basic principle of nanoscience and technology, creation and use of buckyballs, structure, properties and uses of Carbon nanotubes, Applications of nanotechnology. 06 Hrs. **Reference books:**

1-	Concept of Modern Physics	-	by Beiser (Tata Mc-Graw Hill)
2-	Solid State Physics	-	by C. Kittel, 7th edition (Wiley Eastern)
3-	Materials Science and Engineering	-	by V. Raghavan (Prentice- Hall India)
4-	Solid State Physics	-	by S.O. Pillai, 5th edition (New Age International)
5-	Nanotechnology	-	by Rechard Booker and Earl Boysen (Wiley Publishing)
6-	Introduction to Electrodynamics	-	by David J. Griffith (PH I)

Bundelkhand Institute of Engineering and Technology (BIET) Jhansi, UP

Syllabus

2nd & 3rd Year

B.Tech. Electronics & Communication Engg.

Bundelkhand Institute of Engineering and Technology, Jhansi
Study and Evaluation Scheme B. Tech. in Electronics & Communication Engineering

YEAR 2nd, SEMESTER-III

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	EHU-301/ EHU-302	Industrial Psychology/ Industrial Sociology	2	0	0	15	10	25	50	75	2
2.	EAS-301/ EOE-031-EOE-038	Mathematics III/ Science based open Elective**	3	1	0	30	20	50	100	150	4
3.	EEC-301	Fundamentals of Electronics Devices	3	1	0	30	20	50	100	150	4
4.	EEC-302	Digital Electronics	3	1	0	30	20	50	100	150	4
5.	EEC-303	Electromagnetic Field Theory	3	1	0	30	20	50	100	150	4
6.	EEC-304	Fundamentals of Network Analysis & Synthesis	3	1	0	30	20	50	100	150	4
7.	EHU-111	*Human Values & Professional Ethics	2	2	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											

8	EEC-351	Electronics Engineering Lab I	0	0	2	--	20	20	30	50	1
9.	EEC-352	Digital Electronics Lab-I	0	0	2	--	20	20	30	50	1
10.	EEC-353	PCB & Electronics Workshop	0	0	2	--	10	10	15	25	1
11.	GP 301	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	17	5	6	165	160	375	625	1000	26

* Human Values & Professional Ethics will be offered as compulsory Audit Course for which passing marks are 40% in theory & 50% in aggregate. Students will be required to audit it within the period of their study. There will not be carry over facility for this course and a failure student will be required to repeat this course.

** **Science based open Elective**

EOE031/EOE041 Introduction to soft computing (Neural network, Fuzzy logic and Genetic algorithm)
EOE032/EOE042 Nano-sciences
EOE033/EOE043 Laser systems and applications
EOE034/EOE044 Space sciences
EOE035/EOE045 Polymer science and technology
EOE036/EOE046 Nuclear science
EOE037/EOE047 Material science
EOE038/EOE048 DISCRETE mathematic

Bundelkhand Institute of Engineering and Technology, Jhansi
Study and Evaluation Scheme B. Tech. in Electronics & Communication Engineering

YEAR 2nd, SEMESTER-IV

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	EHU-402/ EHU-401	Industrial Sociology/Industrial Psychology	2	0	0	15	10	25	50	75	2
2.	EOE-041-EOE-048/ EAS-401	Science based open Elective**/ Mathematics III	3	1	0	30	20	50	100	150	4
3.	EEC-401	Electronic circuits	3	1	0	30	20	50	100	150	4
4.	EEC-402	Computer Architecture & Organization	3	1	0	30	20	50	100	150	4
5.	EEC-403	Electronic Instrumentation and Measurements	3	1	0	30	20	50	100	150	4
6.	EEC-404	Signals and Systems	3	1	0	30	20	50	100	150	4
7.	EHU-111	*Human Values & Professional Ethics	2	2	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
8.	EEC-451	Electronics Engineering lab II	0	0	2	--	20	20	30	50	1
9	EEC-452	Digital Electronics Lab II	0	0	2	--	20	20	30	50	1
10	EEC-453	Measurement lab	0	0	2	--	10	10	15	25	1
11.	GP 401	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**17**	**5**	**6**	**165**	**160**	**375**	**625**	**1000**	**26**

****Science based open Elective**

EOE031/EOE041 Introduction to soft computing (Neural network, Fuzzy logic and Genetic algorithm)
EOE032/EOE042 Nano-sciences
EOE033/EOE043 Laser systems and applications
EOE034/EOE044 Space sciences
EOE035/EOE045 Polymer science and technology
EOE036/EOE046 Nuclear science
EOE037/EOE047 Material science
EOE038/EOE048 DISCRETE mathematics

Bundelkhand Institute of Engineering and Technology, Jhansi
Study and Evaluation Scheme B. Tech. in Electronics & Communication Engineering

YEAR 3rd, SEMESTER-V

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1	EEC 501	Integrated Circuits	3	1	0	30	20	50	100	150	4
2	EEC 502	Principles of Communications	3	1	0	30	20	50	100	150	4
3	EEC 503	Microprocessors	3	1	0	15	10	25	50	75	3
4	EEC 504	Antenna &Wave Propagation	3	1	0	15	10	25	50	75	3
5	EIC 501	Control Systems - I	3	1	0	30	20	50	100	150	4
6	EHU 501	Engineering and Managerial Economics	3	1	0	30	20	50	100	150	3
7	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
8.	EEC 551	Integrated circuits Lab	0	0	2	--	20	20	30	50	1
9.	EIC 551	Control Systems Lab	0	0	2	--	20	20	30	50	1
10.	EEC 552	Communication Lab- I	0	0	2	--	20	20	30	50	1
11.	EEC 553	Microprocessors Lab	0	0	2	--	20	20	30	50	1
12.	GP 501	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**18**	**6**	**8**	**150**	**180**	**380**	**620**	**1000**	**26**

Bundelkhand Institute of Engineering and Technology, Jhansi
Study and Evaluation Scheme B. Tech. in Electronics & Communication Engineering

YEAR 3rd, SEMESTER-VI

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	EHU 601	Industrial Management	3	0	0	30	20	50	100	150	3
2.	EEC 601	Digital communication	3	1	0	30	20	50	100	150	4
3.	EEC 602	Digital Signal Processing	3	1	0	30	20	50	100	150	4
4.	EEC 603	Microwave Engineering	3	1	0	30	20	50	100	150	4
5.	EEC 604	Microcontrollers	3	1	0	15	10	25	50	75	3
6.		Departmental Elective-I**	3	1	0	15	10	25	50	75	3
7.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
8.	EEC 654	Seminar	0	0	2	--	50	50	-	50	1
9.	EEC 651	Communication Lab – II	0	0	2	--	20	20	30	50	1
10.	EEC 653	CAD of Electronics Lab	0	0	2	--	20	20	30	50	1
11.	EEC 652	DSP Lab	0	0	2	--	20	20	30	50	1
12.	GP 601	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**18**	**5**	**8**	**150**	**210**	**410**	**590**	**1000**	**26**

LIST OF ELECTIVES:

Elective – I**

1. EEC 011 Analog signal processing
2. EEC 012 Data Structures
3. EEC 013 Advance Semiconductor Devices
4. EEC014 Introduction to Electric Drives

Syllabus third semester:

THEORY SUBJECTS

EEC 301 FUNDAMENTALS OF ELECTRONICS DEVICES			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	Crystal Properties and charge Carriers in Semiconductors: Elemental and compound semiconductor materials, crystal lattice structure, Bonding forces and energy bands in solids, charge carriers in semiconductors, carrier concentrations, drift of carriers in electric and magnetic fields.	1.1 to 1.2 3.1 to 3.4	8
II	Excess Carriers in Semiconductors: Optical absorption, luminescence, carrier life time and photo conductivity, diffusion of carriers.	4.1 to 4.3 and 4.4.1 to 4.4.4	8
III	Junction Properties: Equilibrium conditions, biased junctions, steady state conditions, reverse bias break down, transient and AC conditions. Metal semiconductor junctions.	5.2 to 5.5 5.7	10
IV	Transistors: Metal-semiconductor-field-effect-transistors (MESFET), Metal-insulator-semiconductor-field-effect-transistors (MISFET), Metal oxide semiconductor field effect transistor (MOSFET): Construction, Operation and characteristics of above devices. Bipolar junction transistors: Fundamentals of BJT operation, amplification with BJTs,	6.3.1 to 6.3.2, 6.4.1 to 6.4.2, 6.5.1 to 6.5.2 7.1 to 7.2	6
V	Some special devices: Photodiodes, photo detectors, solar cell, light emitting diodes, semiconductor lasers, light emitting materials. Tunnel Diode: degenerate semiconductors, IMPATT diode; The transferred electron mechanism: The GUNN diode. P-N-P-N diode, semiconductor controlled rectifier (SCR), bilateral devices: DIAC, TRIAC, IGBT.	8.1, 8.2.1, 8.2.3, 8.3, 8.4; 10.1 10.2 10.3.1, 10.3.2 11.1 to 11.3	8
Text Book: B. G. Streetman and S. Banerjee "Solid state electronics devices", 5th Edition, PHI.			
Reference Books: 1. Alok Dutta, "Semiconductor Devices and circuits", Oxford University Press. 2. Donald A Neaman, "Semiconductor Physics and Devices Basic Principles" 3rd Ed TMH India.			

EEC 302 DIGITAL ELECTRONICS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	Digital system and binary numbers: Signed binary numbers, binary codes, cyclic codes, error detecting and correcting codes, hamming codes. Floating point representation Gate-level minimization: The map method up to five variable, don't care conditions, POS simplification, NAND and NOR implementation, Quine Mc-Clusky method (Tabular method).	1.6, 1.7, 7.4 3.1 to 3.7, 3.10	8
II	Combinational Logic: Combinational circuits, analysis procedure, design procedure, binary adder-subtractor, decimal adder, binary multiplier, magnitude comparator, decoders, encoders, multiplexers	4.1 to 4.11	8
III	Synchronous Sequential logic: Sequential circuits, storage elements: latches, flip flops, analysis of clocked sequential circuits, state reduction and assignments, design procedure. Registers and counters: Shift registers, ripple counter, synchronous counter, other counters.	5.1 to 5.5, 5.7 to 5.8 6.1 to 6.5	8
IV	Memory and programmable logic: RAM, ROM, PLA, PAL. Design at the register transfer level: ASMs, design example, design with multiplexers.	7.1 to 7.3, 7.5 to 7.7 8.4, 8.5, 8.10	8
V	Asynchronous sequential logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flow table, race free state assignment, hazards.	9.1 to 9.7	8
Text Book: M. Morris Mano and M. D. Ciletti, "Digital Design", 4th Edition, Pearson Education			
Reference Books: 1. Hill & Peterson, "Switching Circuit & Logic Design", Wiley.			

EEC 303 ELECTROMAGNETIC FIELD THEORY			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	Coordinate systems and transformation: Cartesian coordinates, circular cylindrical coordinates, spherical coordinates Vector calculus: Differential length, area and volume, line surface and volume integrals, del operator, gradient of a scalar, divergence of a vector and divergence theorem, curl of a vector and Stoke's theorem, Laplacian of a scalar.	2.1 to 2.4 3.1 to 3.8	6
II	Electrostatics: Electrostatic fields, Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses's Law – Maxwell's equation, Electric dipole and flux lines, energy density in electrostatic fields. Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, dielectric constants, continuity equation and relaxation time, boundary condition. Electrostatic boundary value problems: Poission's and Laplace's equations, general procedures for soling Poission's or Laplace's equations, resistance and capacitance, method of images.	to 4.9 5.1 to 5.6, 5.8, 5.9 6.1, 6.2, 6.4 to 6.6	10
III	Magnetostatics: Magneto-static fields, Biot-Savart's Law, Ampere's circuit law, Maxwell's equation, application of ampere's law, magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential. Magnetic forces, materials and devices: Forces due to magnetic field, magnetic torque and moment, a magnetic dipole, magnetization in materials, magnetic boundary conditions, inductors and inductances, magnetic energy.	7.1 to 7.7 8.1 to 8.9	8
IV	Waves and applications: Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, displacement current, Maxwell's equation in final form. Electromagnetic wave propagation: Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane wave in free space, plain waves in good conductors, power and the pointing vector, reflection of a plain wave in a normal incidence.	9.1 to 9.5 10.1, 10.3 to 10.8	8
V	Transmission lines: Transmission line parameters, Transmission line equations, input impedance, standing wave ratio and power, The Smith chart, Some applications of transmission lines.	11.1 to 11.6	8
Text Book: M. N. O. Sadiku, "Elements of Electromagnetics", 4th Ed, Oxford University Press.			
Reference Books: W. H. Hayt and J. A. Buck, "Electromagnetic field theory", 7th Ed., TMH.			

EEC 304 FUNDAMENTAL OF NETWORK ANALYSIS & SYNTHESIS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	Signal analysis, complex frequency, network analysis, network synthesis General characteristics and descriptions of signals, step function and associated wave forms, The unit impulse Introduction to network analysis, network elements, initial and final conditions, step and impulse response, solution of network equations,	1.1 to 1.4 2.1 to 2.3 5.1 to 5.5	10
II	Review of Laplace transforms, poles and zeroes, initial and final value theorems, The transform circuit, Thevenin's and Norton's theorems, the system function, step and impulse responses, the convolution integral. Amplitude and phase responses. Network functions, relation between port parameters, transfer functions using two port parameters, interconnection of two ports.	7.1 to 7.5 8.1 9.1 to 9.4	8
III	Hurwitz polynomials, positive real functions. Properties of real immittance functions, synthesis of LC driving point immittances, properties of RC driving point impedances, synthesis of RC impedances or RL admittances, properties of RL impedances and RC admittances.	10.2,10.3 11.1 to 11.5	8
IV	Properties of transfer functions, zeroes of transmission, synthesis of Y_{21} and Z_{21} with 1Ω terminations.	12.1 to 12.3	6
V	Introduction to active network synthesis Active Network Synthesis	Material available on UPTU website & 8.7 (Text Book 2)	8

Text Book:

1. Franklin F. Kuo, "Network Analysis and synthesis", 2nd Edition, Wiley India Pvt Ltd.
2. Behrouz Peikari, "Fundamentals of Network Analysis & synthesis", Jaico Publishing House, 2006.

Reference Books: M. E. Van Valkenberg, "Network Analysis", 2nd Edition, Prentice Hall of India Ltd.

LABORATORY

EEC 351 ELECTRONICS ENGINEERING LAB I

Objective: To attain expertise in lab equipment handling and understanding the basic devices, their properties, characteristics in detail. Along with their practical usage in the circuit

1. **Study of lab equipments and components:** CRO, Multimeter, Function Generator, Power supply- Active, Passive Components & Bread Board.
2. **P-N Junction Diode**: Characteristics of PN Junction diode-Static and dynamic resistance measurement from graph.
3. **Applications of PN junction diode**: Half & Full wave rectifier- Measurement of Vrms, Vdc, and ripple factor-use of filter- ripple reduction (RC Filter)-Clipper & Clamper
4. **Properties of junctions** Zener diode characteristics. Heavy doping alters the reverse characteristics. Graphical measurement of forward and reverse resistance.
5. **Application of Zener diode:** Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.
6. **Characteristic of BJT**: BJT in CB and CE configuration- Graphical measurement of h parameters from input and output characteristics. Measurement of A_v, A_I, R_o and R_i of CE amplifier with potential divider biasing.
7. **Characteristic of FET**: FET in common source configuration. Graphical measurement of its parameters gm, rd & m from input and output characteristics.
8. **Characteristic** of silicon-controlled rectifier.
9. **To plot** V-I Characteristics of DIAC.
10. **To draw** V-I characteristics of TRIAC for different values of Gate Currents.

EEC 352 DIGITAL ELECTRONICS LAB

Objective: To understand the digital logic and create various systems by using these logics.

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, concept of V_{cc} and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder/De-multiplexer and Encoder using logic gates.
5. Implementation of 4x1 multiplexer using logic gates.
6. Implementation of 4-bit parallel adder using 7483 IC.
7. Design, and verify the 4-bit synchronous counter.
8. Design, and verify the 4-bit asynchronous counter.
9. Mini Project.

EEC 353 ELECTRONIC WORKSHOP & PCB LAB

Objective: To create interest in Hardware Technology.

1. Winding shop: Step down transformer winding of less than 5VA.
2. Soldering shop: Fabrication of DC regulated power supply
3. PCB Lab: (a) Artwork & printing of a simple PCB.
   (b) Etching & drilling of PCB.
4. Wiring & fitting shop: Fitting of power supply along with a meter in cabinet.
5. Testing of regulated power supply fabricated.

Fabricate and test the audio amplifier circuit by using above power supply

Syllabus fourth semester:

THEORY SUBJECTS

EEC 401 ELECTRONIC CIRCUITS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	**Operational Amplifier:** Inverting and non-inverting configurations, difference amplifier, Effect of finite open loop gain and bandwidth on circuit performance, Large signal operation of op-amp.	2.2 to 2.6	8
II	**MOSFET:** Review of device structure operation and V-I characteristics. Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, small-signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier	4.3 to 4.9 and 4.11	8
III	**BJT:** Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, frequency response of CE amplifier.	5.3 to 5.9	8
IV	**Differential Amplifier:** MOS differential pair, small signal operation of the MOS differential pair, BJT differential pair, other non-ideal characteristic of the Differential amplifier (DA), DA with active load.	7.1 to 7.5	9
V	**Feedback:** The general feed back structure, properties of negative feed back, the four basic feed back topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, the shunt-shunt and shunt series feedback amplifier. **Oscillators:** Basic principles of sinusoidal oscillators, op-amp RC oscillator circuits, LC oscillator.	8.1 to 8.6 13.1 to 13.3	4+3
Text Book: A. S. Sedra and K. C. Smith, "Microelectronic Circuits", Oxford University Press, 5th Ed.			
Reference Books: **1.** Neamen D A, "Electronics Circuits", 3rd Ed TMH **2.** Jacob Millman and Arvin Grabel, "Microelectronics", 2nd Ed TMH			

EEC 402 COMPUTER ARCHITECTURE AND ORGANIZATION			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	Introduction to Design Methodology: System Design - System representation, Design Process, the gate level (revision), the register level components and PLD (revision), register level design The Processor Level: Processor level components, Processor level design.	2.1.1, 2.1.2, 2.1.3, 2.2.1, 2.2.2, 2.2.3 2.3.1, 2.3.2	8
II	Processor basics: CPU organization- Fundamentals , Additional features Data Representation – Basic formats, Fixed point numbers, Floating point numbers. Instruction sets – Formats, Types, Programming considerations.	3.1, 3.1.1, 3.1.2, 3.2, 3.2.1, 3.2.2, 3.2.3, 3.3.1, 3.3.2, 3.3.3	8
III	Datapath Design: Fixed point arithmetic – Addition and subtraction, Multiplication and Division, Floating point arithmetic, pipelining.	4.1.1, 4.1.2, 4.1.3, 4.2.1, 4.2.2, 4.3.1, 4.3.2	6
IV	Control Design: basic concepts – introduction, hardwired control, Micro programmed control –introduction, multiplier control unit, cpu control unit, Pipeline control- instruction pipelines, pipeline performance.	5.1.1, 5.1.2, 5.1.3, 5.2.1, 5.2.2, 5.2.3, 5.3.1, 5.3.2, 5.3.3	8
V	Memory organization: Multi level memories, Address translation, Memory allocation, Caches – Main features, Address mapping, structure vs performance, System Organisation: Communication methods- basic concepts, bus control. Introduction to 8085	6.2.1, 6.2.2, 6.2.3, 6.3.1, 6.3.1, 6.3.2, 6.3.3, 7.1.1, 7.1.2 Teachers choice	10 2
Text Book: John P Hayes “Computer Architecture and Organisation” McGraw Hilll 3rd Edition			
Reference Books: M Morris Mano, “Computer System Architecture” PHI 3rd Edition			

EEC 403 ELECTRONIC INSTRUMENTATION AND MEASUREMENTS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	Unit, dimensions and standards: Scientific notations and metric prefixes. SI electrical units, SI temperature scales, Other unit systems, dimension and standards. Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, basics of statistical analysis. PMMC instrument, galvanometer, DC ammeter, DC voltmeter, series ohm meter,	1.1 to 1.7 2.1 to 2.5 3.1 to 3.4	8
II	Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, multimeter probes Digital voltmeter systems, digital multimeters, digital frequency meter system	4.1, 4.2, 4.4, 4.5, 4.7 6.1 to 6.3	8
III	Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, low resistance measuring instruments AC bridge theory, capacitance bridges, Inductance bridges, Q meter	7.1, 7.3, 7.4, 7.5 8.2 to 8.4, 8.9	8
IV	CRO: CRT, wave form display, time base, dual trace oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Oscilloscope specifications and performance. Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO applications	9.1, 9.3, 9.4, 9.5, 9.7, 9.9, 9.12 10.1, 10.3, 10.4, 10.5	8
V	Instrument calibration: Comparison method, digital multimeters as standard instrument, calibration instrument Recorders: X-Y recorders, plotters	12.1, 12.2, 12.3 13.2, 13.4	8

Text Book: David A. Bell, "Electronic Instrumentation and Measurements", 2nd Ed., PHI , New Delhi 2008.

Reference Books:

1. Oliver and Cage, "Electronic Measurements and Instrumentation", TMH, 2009.
2. Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (Buterworth Heinmann), 2008.

EEC 404 SIGNALS AND SYSTEMS			3 1 0
Unit No.	Topics	Chapter/ Section	Proposed number of Lectures
I	**Signals:** Definition, types of signals and their representations: continuous-time/discrete-time, periodic/non-periodic, even/odd, energy/power, deterministic/ random, one-dimensional/multi-dimensional; commonly used signals (in continuous-time as well as in discrete-time): unit impulse, unit step, unit ramp (and their inter-relationships), exponential, rectangular pulse, sinusoidal; operations on continuous-time and discrete-time signals (including transformations of independent variables).	1.1 to 1.5	6
II	**Laplace-Transform (LT) and Z-transform (ZT):** (i) One-sided LT of some common signals, important theorems and properties of LT, inverse LT, solutions of differential equations using LT, Bilateral LT, Regions of convergence (ROC) (ii) One sided and Bilateral Z-transforms, ZT of some common signals, ROC, Properties and theorems, solution of difference equations using one-sided ZT, s- to z-plane mapping	2.1 to 2.15	3+5
III	**Fourier Transforms (FT):** (i) Definition, conditions of existence of FT, properties, magnitude and phase spectra, Some important FT theorems, Parseval's theorem, Inverse FT, relation between LT and FT (ii) Discrete time Fourier transform (DTFT), inverse DTFT, convergence, properties and theorems, Comparison between continuous time FT and DTFT	4.1 4.11; 5.1 to 5.7	6+4
IV	**Systems:** Classification, linearity, time-invariance and causality, impulse response, characterization of linear time-invariant (LTI) systems, unit sample response, convolution summation, step response of discrete time systems, stability. convolution integral, co-relations, signal energy and energy spectral density, signal power and power spectral density, properties of power spectral density,	7.1 to 7.12; 9.2, 9.6 to 9.8	8
V	**Time and frequency domain analysis of systems** Analysis of first order and second order systems, continuous-time (CT) system analysis using LT, system functions of CT systems, poles and zeros, block diagram representations; discrete-time system functions, block diagram representation, illustration of the concepts of system bandwidth and rise time through the analysis of a first order CT low pass filter	8.1-8.6; 8.8	10

Text Book: P. Ramakrishna Rao, `Signal and Systems' 2008 Ed., Tata McGraw Hill, New Delhi

Reference Books:

1. Chi-Tsong Chen, `Signals and Systems', 3rd Ed., Oxford University Press, 2004
2. V. Oppenheim, A.S. Willsky and S. Hamid Nawab, 'Signals & System', Pearson Education, 2nd Ed., 2003.

LABOROTARY

EEC 451 ELECTRONICS ENGINEERING LAB II

Objective -To design and implement the circuits to gain knowledge on performance of the circuit and its application.

1. **Measurement of Operational Amplifier Parameters**-Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.
2. **Applications of Op-amp**- Op-amp as summing amplifier, Difference amplifier, Integrator and differentiator
3. **Field Effect Transistors**-Single stage Common source FET amplifier –plot of gain in dB Vs frequency, measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier
4. **Bipolar Transistors**- Design of single stage RC coupled amplifier –design of DC biasing circuit using potential divider arrangement –Plot of frequency Vs gain in dB. Measurement of bandwidth of an amplifier, input impedance and Maximum Signal Handling Capacity of an amplifier.
5. **Two stage Amplifier**. Plot of frequency Vs gain. Estimation of Q factor, bandwidth of an amplifier
6. **Common Collector Configuration-Emitter Follower** (using Darlington pair)-Gain and input impedance measurement of the circuit.
7. **Power Amplifiers**-Push pull amplifier in class B mode of operation –measurement of gain.
8. **Differential Amplifier** –Implementation of transistor differential amplifier .Non ideal characteristics of differential amplifier
9. **Oscillators** -Sinusoidal Oscillators- (a) Wein bridge oscillator (b) phase shift oscillator
10. **Simulation of Amplifier** circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.

EEC 452 DIGITALLAB II

1. TTL Transfer Characteristics and TTL IC Gates.
2. CMOS Gate Transfer Characteristics.
3. Implementation of a 3-bit SIPO and SISO shift registers using flip-flops.
4. Implementation of a 3-bit PIPO and PISO shift registers using flip-flops.
5. Design of Seven segment display driver for BCD codes.
6. BCD Adders & Subtractors
7. A L U
8. 8085 Assembly Language Programming

EEC 453 MEASUREMENT LAB

1. Study of semiconductor diode voltmeter and its us as DC average responding AC voltmeter .
2. Study of L.C.R. bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given oscillator.
4. Study of the transistor tester and determination of the parameters of the given transistors.
5. Study of the following transducer (i) PT-100 trans (ii) J- type trans. (iii) K-type trans (iv) Presser trans
6. Measurement of phase difference and frequency using CRO (lissajous figure)
7. Measurement of low resistance Kelvin's double bridge.
8. Radio Receiver Measurements

Syllabus fifth semester: **THEORY SUBJECTS**

(Revised) **EEC 501 INTEGRATED CIRCUITS**			3 1 0
Unit	Topic	Chapter/ Section From Text [1]	Proposed number of Lectures
I	**Analog Integrated circuit Design: an overview:** Current Mirrors using BJT and MOSFETs, Simple current Mirror, Base current compensated current Mirror, Wilson and Improved Wilson Current Mirrors, Widlar Current source and Cascode current Mirror **The 741 IC Op-Amp:** Bias circuit, short circuit protection circuitry, the input stage, the second stage, the output stage, and device parameters; D**C** Analysis of 741: Small Signal Analysis of input stage, the second stage, the output stage; Gain, Frequency Response of 741; a Simplified Model, Slew Rate, Relationship Between f_t and SR	5.6, 6.4, 6.5 10.1-10.6	8
II	**Linear Applications of IC op-amps:** An Overview of Op-Amp (ideal and non ideal) based Circuits V-I and I-V converters, generalized Impedance converter, simulation of inductors Filters: First and second order LP, HP, BP BS and All pass active filters, KHN, Tow-Thomas and State Variable Biquad filters; Sinusoidal oscillators	2.2-2.7 11.4, 11.7, 12.1, 12.2	8
III	**Digital Integrated Circuit Design-An Overview**: CMOS Logic Gate Circuits**:** Basic Structure CMOS realization of Inverters, AND, OR, NAND and NOR Gates Latches and Flip flops**:** The Latch, The SR Flip-flop, CMOS Implementation of SR Flip-flops, A Simpler CMOS Implementation of the Clocked SR Flip-flop, D Flip-flop Circuits.	13.2-13.3 13.7	8
IV	**Non-Linear applications of IC Op-amps:** Log–Anti Log Amplifiers, Precision Rectifiers, Peak Detectors, Simple and Hold Circuits, Analog Multipliers and their applications. Op-amp as a comparator, Zero crossing detector, Schmitt Trigger, Astable multivibrator, Monostable multivibrator, Generation of Triangular Waveforms	12.1, 12.4, 12.5 12.9	8
V	**D/A and A/D converters** **Integrated Circuit Timer:** The 555 Circuit, Implementing a Monostable Multivibrator Using the 555 IC, Astable Multivibrator Using the 555 IC. **Phase locked loops (PLL):** Ex-OR Gates and multipliers as phase detectors**,** Block Diagram of IC PLL, Working of PLL and Applications of PLL.	10.9-10.11 12.7 6.5 of Ref [2]	8
Text Book: [1] Sedra and Smith, "Microelectronic Circuits", 4th Edition, Oxford University Press.			
Reference Books: [2] Michael Jacob, `Applications and Design with Analog Integrated Circuits', PHI, 2nd Edn, 2006 [3] Jacob Milliman and Arvin Grabel, "Microelectronics", 2nd Edition, TMH, 2008.			

EEC 502 PRINCIPLES OF COMMUNICATIONS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	Introduction: Overview of Communication system, Communication channels Need for modulation, Baseband and Pass band signals, Amplitude Modulation: Double side band with Carrier (DSB-C), Double side band without Carrier, Single Side Band Modulation, DSB-SC, DSB-C, SSB Modulators and Demodulators, Vestigial Side Band (VSB), Quadrature Amplitude Modulator, Radio Transmitter and Receiver.	1.1, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6	10
II	Angle Modulation, Tone Modulated FM Signal, Arbitrary Modulated FM Signal, FM Modulators and Demodulators, Approximately Compatible SSB Systems, Stereophonic FM Broadcasting, Examples Based on Mat Lab.	4.1-4.6	8
III	Pulse Modulation Digital Transmission of Analog Signals: Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation. Their generation and Demodulation, Digital Representation of Analog Signals, Pulse Code Modulation (PCM), PCM System, Issues in digital transmission: Frequency Division Multiplexing, Time Division Multiplexing ,Line Coding and their Power Spectral density, T1 Digital System, TDM Hierarchy,.	5.1-5.5	8
IV	Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation, Voice Coders, Sources of Noises, Frequency domain representation of Noise, Super position of Noises, Linear filtering of Noises ,Mathematical Representation of Noise,	5.6-5.7 7.1-7.5	7
V	Noise in Amplitude Modulation: Analysis ,Signal to Noise Ratio, Figure of Merit ,Noise in Frequency Modulation: Pre emphasis ,De Emphasis and SNR Improvement, Phase Locked Loops Analog and Digital	8.1-8.3 9.1, 9.2,9.4, 9.6, 10.1-10.3	7

Text Book:

1. H. Taube, D L Schilling, Goutom Saha, "Principles of Communication", 3rd Edition, Tata McGraw-Hill Publishing Company Ltd.

Reference Books:

1. B.P. Lathi, "Modern Digital and Analog communication Systems", 3rd Edition, Oxford University Press, 2009.

1. Simon Haykin, "Communication Systems",4th Edition, Wiley India.

2. H. P. HSU & D. Mitra , "Analog and Digital Communications", 2nd Edition, Tata McGraw-Hill Publishing Company Ltd.

EEC- 503 MICROPROCESSORS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	Introduction to Microprocessor, Microprocessor architecture and its operations, Memory, Input & output devices, Logic devices for interfacing, The 8085 MPU, Example of an 8085 based computer, Memory interfacing.	1.1, 3.1, 3.2, 3.3, 3.5, 4.1, 4.2, 4.3,	8
II	Basic interfacing concepts, Interfacing output displays, Interfacing input devices, Memory mapped I/O, Flow chart symbols, Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation, Writing assembly language programs, Programming techniques: looping, counting and indexing.	5.1, 5.2, 5.3, 5.4, 6.1, 6.2, 6.3, 6.4, 6.5, 7.1	8
III	Additional data transfer and 16 bit arithmetic instruction, Arithmetic operations related to memory, Logic operation: rotate, compare, counter and time delays, Illustrative program: Hexadecimal counter, zero-to-nine, (module ten) counter, generating pulse waveforms, debugging counter and time delay, Stack, Subroutine, Restart, Conditional call and return instructions, Advance subroutine concepts, The 8085 Interrupts, 8085 vector interrupts.	7.2, 7.3, 7.4, 7.5, 8.1, 8.2, 8.3, 8.4, 8.5, 9.1, 9.2, 9.3, 9.4, 12.1, 12.2	8
IV	Program: BCD-to-Binary conversion, Binary-to-BCD conversion, BCD-to-Seven segment code converter, Binary-to-ASCII and ASCII-to-Binary code conversion, BCD Addition, BCD Subtraction, Introduction to Advance instructions and Application, Multiplication, Subtraction with carry.	10.1, 10.2, 10.3, 10.4, 10.5, 10.6, 10.7, 10.8, 10.9	8
V	8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller. Introduction to 8086 microprocessor: Architecture of 8086 (Pin diagram, Functional block diagram, Register organization).	15.1, 15.2, 15.4, 15.5, 15.6, 2.11*, 2.12*	8

Text Book:

1. Ramesh Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", 5th Edition, Penram International Publication (India) Pvt. Ltd.
2. * Douglas V. Hall, "Microprocessors and Interfacing", 2nd Edition, TMH, 2006.

Reference Book: Kenneth L. Short, "Microprocessors and programmed Logic", 2nd Ed, Pearson Education Inc.

EEC 504 ANTENNA AND WAVE PROPAGATION			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	**Antennas Basics** Introduction, Basic Antenna Parameters, Patterns, Beam Area (or Beam Solid Angle)ΩA, Radiation Intensity, Beam Efficiency, Directivity D and Gain G, Directivity and Resolution, Antenna Apertures, Effective Height, The radio Communication link, Fields from Oscillating Dipole, Single-to-Noise Ratio(SNR), Antenna Temperature, Antenna Impedance, Retarded Potential, Far Field due to an alternating current element, Power radiated by a current element, Field variation due to sinusoidal current distribution.	2.1 to 2.12, 2.18 to 2.20 4.3 to 4.7	8
II	**Point Sources and Their Arrays** Introduction, Point Source ,Power Theorem and its Application to an Isotropic Source, Radiation Intensity, Arrays of Two Isotropic Point Sources, Non-isotropic but Similar Point Sources and the Principle of Pattern Multiplication, Pattern Synthesis by Pattern Multiplication, Linear Arrays of n Isotropic Point Sources of Equal Amplitude and Spacing, Linear Broadside Arrays with Non-uniform Amplitude Distributions. General Considerations. **Electric Dipoles, Thin Liner Antennas and Arrays of Dipoles and Apertures** The Short Electric Dipole, The Fields of a Short Dipole, Radiation Resistance of Short Electric Dipole, Thin Linear Antenna, Radiation Resistance of λ/2 Antenna, Array of Two Driven λ/2 Elements: Broadside Case and End-Fire Case, Horizontal Antennas Above a Plane Ground, Vertical Antennas Above a Plane Ground, Yagi-Uda Antenna Design, Long-Wire Antennas, folded Dipole Antennas.	5.1 to 5.5 5.9 to 5.11, 5.13, 5.15, 6.2 to 6.6, 6.10, 6.11, 6.14 to 6.15, 6.16 to 6.17, 6.21	10
III	The Loop Antenna. Design and its Characteristic Properties, Application of Loop Antennas, Far Field Patterns of Circular Loop Antennas with Uniform Current, Slot Antennas, Horn Antennas, Helical Antennas, The Log-Periodic Antenna, Micro strip Antennas	6.23,6.24,7.4, 7.5,7.13,7.19, 8	7
IV	**Reflector Antennas** Flat Sheet Reflectors, Corner Reflectors, The Parabola-General Properties, A comparison Between Parabolic and Corner Reflectors, The Paraboloidal Reflector, Patterns of Large Circular Apertures with Uniform Illumination, Reflector Types(summarized), Feed Methods for Parabolic Reflectors, **Antenna Measurements** Introduction, Antenna Measurement ranges, Radiation pattern Measurements, Gain and Directivity Measurements, Spectrum Analyzer	9.2,9.3,9.5 to 9.9, 9.10, 10, 11.7, 14	8
V	**Ground Wave Propagation** Plane Earth Reflection, Space Wave and Surface Wave, **Space Wave Propagation** Introduction, Field Strength Relation, Effects of Imperfect Earth, Effects of Curvature of Earth, **Sky wave Propagation** Introduction structural Details of the ionosphere, Wave Propagation Mechanism, Refraction and Reflection of Sky Waves by ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation Between MUF and the Skip Distance, Multi-Hop Propagation, Wave Characteristics	23.2 to 23.3, 24.1 to 24.4, 25.1 to 25.6, 25.8, 25.12	10
Text Book: 1- John D Krauss, Ronald J Marhefka and Ahmad S. Khan,"Antennas and Wave Propagation", Fourth Edition, Tata McGraw Hill, 2010 Special Indian Edition.			

Reference Books:

1. A .R. Harish, M. Sachidananda, "Antennas and Wave Propagation", Oxford University Press, 2009.
2. Jordan Edwards C. and Balmain, Keith G."Electromagnetic Waves and Radiating Systems", PHI.
3. A. Das, Sisir K. Das, "Microwave Engineering", Tata McGraw Hill.

Unit	**EIC 501 CONTROL SYSTEM I**	Text Book/ Chapter	Proposed number of Lectures
I	Basic Components of a control system, Feedback and its effect, types of feedback control systems. Block diagrams and signal flow graphs, Modeling of Physical systems: electrical networks, mechanical systems elements, equations of mechanical systems, sensors and encoders in control systems, DC motors in control systems.	1.1 to 1.3 3.1 to 3.2 4.1 to 4.6	8
II	State-Variable Analysis: Vector matrix representation of state equation, state transition matrix, state-transition equation, relationship between state equations and high-order differential equations, relationship between state equations and transfer functions.	5.1 to 5.6	8
III	Time domain Analysis of Control Systems: Time response of continuous data systems, typical test signals for the time response of control systems, the unit step response and time-domain specifications, Steady-State error, time response of a first order system, transient response of a prototype second order system	7.1 to 7.6	8
IV	Stability of Linear Control Systems: Bounded-input bounded-output stability-continuous data systems, zero-input and asymptotic stability of continuous data systems, methods of determining stability, Routh Hurwitz criterion.	6.1 to 6.5	8
V	Frequency Domain Analysis: M_r *(resonant peak) and* ω_r *(resonant frequency)* and bandwidth of the prototype Second order system, effects of adding a zero to the forward path, effects of adding a pole to the forward path, Nyquist stability criterion, relative stability: gain margin and phase margin, stability analysis with the Bode plot	9.1to 9.11	10

Text Book: B.C. Kuo & Farid Golnaraghi, "Automatic Control Systems", 8th Edition, John Wiley India, 2008.

Reference Books:

1. William A. Wolovich, "Automatic Control Systems", Oxford University Press, 2010.
2. Joseph J. Distefano III, Allen R. Stubberud, Ivan J. Williams, "Control Systems" Schaums Outlines Series, 3rd Edition, Tata McGraw Hill, Special Indian Edition 2010.
3. I. J. Nagrath & M. Gopal, "Control System Engineering", New Age International Publishers

LABOROTARY

EEC 551 INTEGRATED CIRCUITS LAB

Objective: - To design and implement the circuits to gain knowledge on performance of the circuit and its application. These circuits should also be simulated on Pspice.

1. Log and antilog amplifiers.
2. Voltage comparator and zero crossing detectors.
3. Second order filters using operational amplifier for–
    a. Low pass filter of cutoff frequency 1 KHz.
    b. High pass filter of frequency 12 KHz.
    c. Band pass filter with unit gain of pass band from 1 KHz to 12 KHz.
4. Wien bridge oscillator using operational amplifier.
5. Determine capture range; lock in range and free running frequency of PLL.
6. Voltage regulator using operational amplifier to produce output of 12V with maximum load current of 50 mA.
7. A/D and D/A convertor.
8. Voltage to current and current to voltage convertors.
9. Function generator using operational amplifier (sine, triangular & square wave)
10. Astable and monostable multivibrator using IC 555.

EEC 552 COMMUNICATION LAB-I

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 PLL 565 as frequency demodulator.
5. To study sampling and reconstruction of Pulse Amplitude modulation system.
6. To study the Sensitivity, Selectivity, and Fidelity characteristics of super heterodyne receiver.
7. To study Pulse Amplitude Modulation
    a. using switching method
    b. by sample and hold circuit
8. To demodulate the obtained PAM signal by 2nd order LPF.
9. To study Pulse Width Modulation and Pulse Position Modulation.
10. To plot the radiation pattern of a Dipole, Yagi-uda and calculate its beam width.
11. To plot the radiation pattern of Horn, Parabolic & helical antenna. Also calculate beam width & element current.
12. Design and implement an FM radio receiver in 88-108 MHz.

EEC 553 MICROPROCESSOR LAB

1. Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
2. Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers.
3. To perform multiplication and division of two 8 bit numbers using 8085.
4. To find the largest and smallest number in an array of data using 8085 instruction set.
5. To write a program to arrange an array of data in ascending and descending order.
6. To convert given Hexadecimal number into its equivalent ASCII number and vice versa using 8085 instruction set.
7. To write a program to initiate 8251 and to check the transmission and reception of character.
8. To interface 8253 programmable interval timer to 8085 and verify the operation of 8253 in six different modes.
9. To interface DAC with 8085 to demonstrate the generation of square, saw tooth and triangular wave.
10. Serial communication between two 8085 through RS-232 C port.

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

EIC 551 CONTROL SYSTEM LAB

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

Syllabus sixth semester: **THEORY SUBJECTS**

EEC 601 DIGITAL COMMUNICATIONS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	Digital Data transmission, Line coding review, Pulse shaping, Scrambling, Digital receivers, Eye diagram, Digital carrier system, Method of generation and detection of coherent & non-coherent binary ASK, FSK & PSK, Differential phase shift keying, quadrature modulation techniques. (QPSK and MSK),M-ary Digital carrier Modulation.	7.1-7.10, 10.11	10
II	Concept of Probability, Random variable, Statistical averages, Correlation, Sum of Random Variables, Central Limit Theorem, Random Process, Classification of Random Processes, Power spectral density, Multiple random processes,	8.1-8.7, 9.1-9.4	8
III	Performance Analysis of Digital communication system: Optimum linear Detector for Binary polar signaling, General Binary Signaling, Coherent Receivers for Digital Carrier Modulations, Signal Space Analysis of Optimum Detection, Vector Decomposition of White Noise Random processes, General Expression for Error Probability of optimum receivers,	10.1-10.7	8
IV	Spread spectrum Communications: Frequency Hopping Spread Spectrum(FHSS) systems, Direct Sequence Spread Spectrum, Code Division Multiple Access of DSSS, Multiuser Detection, OFDM Communications	11.1-11.7,12.7	6
V	Measure of Information, Source Encoding, Error Free Communication over a Noisy Channel capacity of a discrete and Continuous Memory less channel Error Correcting codes: Hamming sphere, hamming distance and Hamming bound, relation between minimum distance and error detecting and correcting capability , Linear block codes, encoding & syndrome decoding; Cyclic codes, encoder and decoders for systematic cycle codes; convolution codes, code tree & Trellis diagram, Viterbi and sequential decoding, burst error correction, Turbo codes.	13.1-13.5, 14.1-4.4, 14.6-14.11	8

Text Book:

1. B.P. Lathi, "Modern Digital and Analog communication Systems", 4th Edition, Oxford University Press, 2010.

Reference Books:

1. H. Taub, D L Schilling, Goutom Saha, "Principles of Communication", 3rd Edition, Tata McGraw-Hill Publishing Company Ltd.
2. John G. Proakis, "Digital Communications", 4th Edition, McGraw-Hill International.
3. Simon Haykin, "Communication Systems",4th Edition, Wiley India.
4. H P HSU & D Mitra, "Analog and Digital Communications", 2nd Edition, Tata McGraw-Hill Publishing Company Ltd.

EEC 602 DIGITAL SIGNAL PROCESSING			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	**Realization of Digital Systems:** Introduction, direct form realization of IIR systems, cascade realization of an IIR systems, parallel form realization of an IIR systems, Ladder structures: continued fraction expansion of H(z), example of continued fraction, realization of a ladder structure, example of a ladder realization.	4.1, 4.5, 4.6, 4.7, 4.8	8
II	**Design of Infinite Impulse Response Digital Filters**: Introduction to Filters, Impulse Invariant Transformation, Bi-Linear Transformation, All-Pole Analog Filters: Butterworth and Chebyshev, Design of Digital Butterworth and Chebyshev Filters	5.2-5.6	8
III	**Finite Impulse Response Filter Design:** Windowing and the Rectangular Window, Other Commonly Used Windows, Examples of Filter Designs Using Windows ,The Kaiser Window	6.2-6.5	8
IV	**Discrete Fourier Transforms:** Definitions, Properties of the DFT, Circular Convolution, Linear Convolution	7.1-7.4	8
V	**Fast Fourier Transform Algorithms:** Introduction, Decimation –In Time(DIT) Algorithm, Computational Efficiency, Decimation in Frequency(DIF) Algorithm	8.1-8.4	8
Text Books: Johnny R. Johnson, "Digital Signal Processing", PHI Learning Pvt Ltd., 2009.			
Reference Books: 1. John G Prokias, Dimitris G Manolakis, "Digital Signal Processing", Pearson Education. 2. Oppenheim & Schafer, " Digital Signal Processing" PHI			

EEC 603 MICROWAVE ENGINEERING			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	Rectangular Wave Guide: Field Components, TE, TM Modes, Dominant TE_{10} mode, Field Distribution, Power, Attenuation. Circular Waveguides: TE, TM modes. Wave Velocities, Micro strip Transmission line (TL), Coupled TL, Strip TL, Coupled Strip Line, Coplanar TL, Microwave Cavities,	4.1-4-3,11.0-11.3	8
II	Scattering Matrix , Passive microwave devices: Microwave Hybrid Circuits. , Terminations, Attenuators, Phase Shifters, Directional Couplers: Two Hole directional couplers, S Matrix of a Directional coupler, Hybrid Couplers, Microwave Propagation in ferrites, Faraday Rotation, Isolators, Circulators. S parameter analysis of all components.	4.4-4.6	8
III	Microwave Tubes: Limitation of Conventional Active Devices at Microwave frequency, Two Cavity Klystron, Reflex Klystron, Magnetron, Traveling Wave Tube, Backward Wave Oscillators: Their Schematic, Principle of Operation, Performance Characteristic and their applications.	9.0-9.5, 10.0-10.2	8
IV	Solid state amplifiers and oscillators: Microwave Bipolar Transistor, Microwave tunnel diode, Microwave Field-effect Transistor, Transferred electron devices, Avalanche Transit –time devices: IMPATT Diode, TRAPPAT Diode,	5.0-5.1,5.3,6.0-6.1,7.0-7.3	10
V	Microwave Measurements: General set up of a microwave test bench, Slotted line carriage, VSWR Meter, microwave power measurements techniques, Crystal Detector, frequency measurement, wavelength measurements, Impedance and Refection coefficient, VSWR, Insertion and attenuation loss measurements, measurement of antenna characteristics, microwave link design.	14.1-14.4 (Book 2)	8

Text Books:

1. Samuel Y. Liao, "Microwave Devices and Circuits", 3rd Ed, Pearson Education.
2. A. Das and S. K. Das, "Microwave Engineering", TMH.

Reference Books:

1. R.E Collin, "Foundation for Microwave Engineering ", 2nd Ed., John Wiley India.

EEC 604 MICROCONTROLLER			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	Introduction , Microcontrollers and Embedded processors, Overview of the 8051, Inside the 8051, Addressing modes,	0.3, 1.1, 1.2, 2.1, 5.1-5.4,	6
II	Introduction to 8051 assembly programming, Assembling and running an 8051 program, The program counter and ROM space in the 8051, 8051 data types and directives, 8051 flag bits and the PSW register, 8051 register banks and stack, 8051 I/O programming, I/O bit manipulation programming.	2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 4.1, 4.2	8
III	Programming the 8051 timers, Counter programming, Basics of serial communications, 8051 connection to RS-232, 8051 serial port programming assembly, 8051 interrupts, Programming timer interrupts, programming external hardware interrupts, programming the Serial communication interrupts, Interrupts priority in the 8051,	9.1, 9.2, 10.1, 10.2, 10.3, 11.1, 11.2, 11.3, 11.4, 11.5	10
IV	Interfacing with 8051: Memory address decoding 8031/ 51 interfacing with external ROM, 8051 data memory space, LCD, Keyboard, Parallel and Serial ADC, DAC interfacing, Sensor interfacing and Signal Conditioning, Stepper motor and DC motor,	14.2, 14.3, 14.4, 12.1, 12.2, 13.1, 13.2, 13.3, 17.2, 17.3,	10
V	Programming the 8255 and Interfacing, Introduction to Intel 8096 and MC68HC11 microcontroller*.	15.1, 15.2, Text Book 2: Ch. 3 & 4	6

Text Book:

1. Mazidi Ali Muhammad, Mazidi Gillispie Janice, and McKinlay Rolin D., " The 8051 Microcontroller and Embedded Systems using Assembly and C", Pearson, 2nd Edition.
2. Chhabra Bhupendra Singh, "Microcontrollers & its Applications" Dhanpat Rai Publishing Company

Reference Book:

1. Ayala Kenneth, "The 8051 Microcontroller", Cengage Learning, 3rd Edition
2. Shah Satish, " 8051 Microcontrollers MCS 51 Family and its variants", Oxford
3. Ghoshal Subrata, " 8051 Microcontroller Internals, Instructions, Programming and Interfacing" Pearson

Departmental Electives I:

EEC- 011 ANALOG SIGNAL PROCESSING			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	Liner Analog Functions: Addition , Subtraction, Differentiation, Integration, Impedance Transformation and Conversion	4.1-4.5 Text book 1	8
II	AC/DC Signal Conversion: Signal Rectification, Peak and Valley Detection, rms to dc Conversion, Amplitude Demodulation	5.2-5.5 Text book 1	8
III	Other Nonlinear Analog Functions: Voltage Comparison, Voltage Limiting(Clipping), Logarithmic Amplifiers, Analog Multipliers, Analog Dividers	6.1-6.6 Text book 1	8
IV	Continuous time op-amp RC filters: Second order LP, HP, BP, Notch and AP transfer functions, Kirwin-Huelsman-Newcomb biquad, Ackerberg-Mosberg Circuits, Tow-Thomas biquad, compensated integrators, Sallenkey Circuits, Generalized convertor, GIC biquads.	4.2, 4.3, 4.4, 4.5 Text book 2	8
V	Transconductance-C filters: Transconductance cells, realization of resistors, integrators, amplifiers, summers and gyrators, first order and second order sections, Ladder design.	16.1, 16.2, 16.3, 16.4.2 Text book 2	8

Text Books:

1. Ramon Pallas-Areny, John G. Webster, "Analog Signal Processing", John Wiley& Sons
2. R. Schaumann and M. E. Valkenberg, "Design of Analog Circuits", Oxford University Press, 2001.

EEC 012 DATA STRUCTURE			3 1 0
Unit	**Topic**	Chapter/ Section	Proposed number of Lectures
I	**Introduction:** Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, time-Space trade-off, Abstract Data Types (ADT) **Arrays:** Definition, Single and Multidimensional Arrays, Representation of Arrays: Row major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations. **Linked lists:** Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List, Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List.		8
II	**Stacks:** Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of Postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion**.** **Queues:** Operations of Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue		8
III	Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: In-order, Pre-order and Post-order, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.		8
IV	**Graphs:** Terminology, Sequential and linked Representations, of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal: Depth First Search and Breadth first Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kurskal algorithm, Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks.		8
V	**Searching:** Sequential search, Binary search, Comparison and Analysis, Internal Sorting: Insertion Sort, selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration for Internal Sorting. Search Trees: Binary Search Trees (BST), Insertion and Deletion in BST, Complexity of search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees Storage Management: Garbage Collection and Compaction.		8

Text Book:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein "Data structures Using C and C++", PHI
2. Lipschutz, "Data Structures" Schaum's Outline Series, TMH

Reference Books:

1. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication

EEC 013 ADVANCE SEMICONDUCTOR DEVICES			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	**Review of Fundamentals of Semiconductors:** Semiconductor Materials and their properties Carrier Transport in Semiconductors Excess Carriers in Semiconductor	3.1 to 3.8 4.1 to 4.9 5.1 to 5.7	10
II	**Junctions and Interfaces:** Description of p-n junction, Action, The Abrupt Junction, Example of an Abrupt Junction, The linearly graded Junction. The Ideal Diode Model, Real Diodes, Temperature Dependence of I-V Characteristics, High Level Injection Effects, Example of Diodes. Description of Breakdown Mechanism, Zener and Avalanche Breakdown in p-n Junction	6.1 to 6.4 7.1 to 7.5 8.1,8.3,8.5,8.7	8
III	**Majority Carrier Diodes:** The Tunnel Diode, The Backward Diode, The Schottkey Barrier Diode, Ohmic Contacts Heterojunctions.	10.1 to 10.5	6
IV	**Microwave Diodes**: The Varactor Diode, The p-i-n Diode, The IMPATT Diode, TRAPATT Diode, The BARITT Diode, Transferred Electron Devices **Optoelectronic Devices**: The Solar Cell, Photo detectors, Light Emitting Diodes, Semiconductor Lasers.	11.1 to 11.6 12.1 to 12.4	8
V	**Metal Semiconductor Field Effect Transistors**: Basic Types of MESFETs, Models for I-V Characteristics of Short – Channel MESFETs, High Frequency Performance, MESFETs Structures. **MOS Transistors and Charge Coupled Devices:** Basic Structures and the Operating Principle, I-V Characteristics, Short-Channel Effects, MOSFET Structures, Charge Coupled Devices.	15.4 to 15.7 16.4 to 16.9	8
Text Book: M.S. Tyagi, "Introduction To Semiconductor Materials And Devices", John Willy-India Pvt. Ltd.			
Reference Books: 1. S. M. Sze, "Physics of Semiconductor Devices", 2nd Edition, John Willy-India Pvt. Ltd. 2. B. G. Streetman and S. Banerjee, "Solid state electronics devices", 5th Edition, PHI.			

EEC 014 INTRODUCTION TO ELECTRIC DRIVES			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	**Thyristor:** Principles and Characteristics Gate Triggering Circuits	1.1-1.16 2.1-2.10	8
II	**Phase Controlled Rectifiers** Phase Angle Control, Single-phase Half-wave Controlled Rectifier (One quadrant), Single-phase Full-wave Controlled Rectifier (Two quadrant Converters),Performance Factors of Line-commutated Converters, The Performance Measures of Two-pulse Converters, Three phase Controlled Converters **Inverters:** Introduction Thyristor Inverter Classification, Series Inverters, Parallel Inverter, Three-phase Bridge Inverters, Three-phase Bridge Inverter with Input-circuit Commutation.	4.2 – 4.4 4.6 – 4.8 5.1 – 5.3, 5.5. 5.7-5.8	8
III	**Choppers:** Introduction, Principle of Chopper Operation, Control Strategies, step-up/Down Chopper, Jones Chopper **Cycloconverters:** Introduction, The Basic Principle of Operation, Single-phase to Single-phase Cycloconverter, Three-phase half-wave Cycloconverters, Cycloconverter Circuits for Three-phase Output	6.2 – 6.5, 6.8 7.1 – 7.5	8
IV	**Control of D.C. Drives:** Introduction, Basic Machine Equations, Breaking Modes, Schemes for D.C. Motor Speed Control, Single-phase Separately Excited Drives, Braking Operation of Rectifier Controlled Separately excited Motor, Single-phase Separately Excited Drives, Power Factor Improvement, Three-phase Separately Excited Drives, D.C. Chopper Drives	12.1 – 12.10	8
V	**Control of A.C. Drives:** Introduction, basic Principle of Operation, Squirrel-cage Rotor Design, Speed Control of Induction Motors, stator Voltage Control, Variable Frequency control, Rotor Resistance Control, Slip Power Recovery Scheme, Synchronous Motor Drives	13.1 – 13.9	8
Text Book: M.D. Singh & K. Khan chandani, "Power Electronics", Tata McGraw Hill 1998 Edition			
Reference Books: M H Rashid, "Power Electronics", 3rd Ed., Pearson Education, 2009.			

LABOROTARY

EEC 651 COMMUNICATION LAB – II

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

EEC-652 DIGITAL SIGNAL PROCESSING LAB

1. With the help of Fourier series, make a square wave from sine wave and cosine waves. Find out coefficient values.
2. Evaluate 4 point DFT of and IDFT of $x(n) = 1, 0 \leq n \leq 3; 0$ elsewhere.
3. Implement the FIR Filters for 2 KHz cutoff frequency and 2 KHz bandwidth for band pass filter.
4. Design FIR filter using Fourier series expansion method.
5. Implement IIR low pass filter for a 4 KHz cutoff frequency and compare it the FIR filter with the same type use chirp as input signal.
6. Verify Blackman and Hamming windowing techniques for square wave as an input which window will give good results.
7. Implement the filter functions.
8. Generate DTMF sequence 1234567890*# and observe its spectrogram.
9. Generate an Amplitude Modulation having side low frequencies 1200 Hz and 800 Hz. Observe and verify the theoretical FFT characteristics with the observed ones.
10. Generate Frequency Modulation having carrier frequencies 1 KHz and modulating frequency 200 Hz with the modulation index of 0.7. Observe and verify the theoretical FFT characteristics with the observed ones.
11. Generate an FSK wave form for transmitting the digital data of the given bit sequence. Predict and verify the FFT for the same one.
12. To study the circular convolution.

EEC-553 CAD OF ELECTRONICS LAB

PSPICE Experiments

1. (a) Transient Analysis of BJT inverter using step input.
   (b)DC Analysis (VTC) of BJT inverter with and without parameters.
2. (a) Transient Analysis of NMOS inverter using step input.
   (b) Transient Analysis of NMOS inverter using pulse input.
   (c) DC Analysis (VTC) of NMOS inverter with and without parameters.
3. (a) Analysis of CMOS inverter using step input.
   (b) Transient Analysis of CMOS inverter using step input with parameters.
   (c) Transient Analysis of CMOS inverter using pulse input.
   (d) Transient Analysis of CMOS inverter using pulse input with parameters.
   (e) DC Analysis (VTC) of CMOS inverter with and without parameters.
4. Transient & DC Analysis of NOR Gate inverter.
5. Transient & DC Analysis of NAND Gate.

VHDL Experiments

1. Synthesis and simulation of Full Adder.
2. Synthesis and Simulation of Full Subtractor.
3. Synthesis and Simulation of 3 X 8 Decoder.
4. Synthesis and Simulation of 8 X 1 Multiplexer.

5. Synthesis and Simulation of 9 bit odd parity generator.
6. Synthesis and Simulation of Flip Flop (D, and T).

Bundelkhand Institute of Engineering and Technology, Jhansi
Study and Evaluation Scheme B. Tech. in Electronics & Communication Engineering

YEAR 4th, SEMESTER-VII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			Es		
			L	T	P	CT	TA	Tota 1	E		
THEORY SUBJECTS											
1.	EOE 07*	Open Elective-I**	3	1	0	30	20	50	100	150	4
2.	EOE 02*	Departmental Elective-I1	3	l	0	30	20	50	100	150	4
3.	EEC 701	Optical Communication	3	1	0	30	20	50	100	150	4
4.	EEC 702	Data Communication Networks	3	1	0	30	20	50	100	150	4
5.	EEC 703	VLSI Design	3	1	0	30	20	50	100	150	4
6.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
7.	EEC 751	Microwave & Fiber Optic Lab	0	0	2	-	20	20	30	50	1
8.	EEC 752	Electronics Circuit Design Lab	0	0	3	-	20	20	30	50	2
9.	EEC 753	Industrial Training Viva-Voce	0	0	2	-	50	50	0	50	1
10.	EEC 754	Project	0	0	2	-	50	50	-	50	1
11.	GP 701	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**15**	**5**	**9**	**150**	**210**	**410**	**590**	**1000**	**26**

**** Open Electives-I**

EOE071	Entrepreneurship Development
EOE-072	Quality Management
EOE-073	Operation Research
EOE-074	introduction to Biotechnology
E0E-075/EIC-034	Micro and smart systems

Bundelkhand Institute of Engineering and Technology, Jhansi
Study and Evaluation Scheme B. Tech. in Electronics & Communication Engineering

YEAR 4th, SEMESTER-VIII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			Es E		
			L	T	P	CT	TA	Tota 1			
THEORY SUBJECTS											
1.	EOE 08*	Open Elective-II**	3	1	0	30	20	50	100	150	4
2.	EEC 03*	Departmental Elective-III	3	1	0	30	20	50	100	150	4
3.	EEC 801	Wireless & Mobile Communication	3	1	0	30	20	50	100	150	4
4.	EEC 802	Electronics Switching	3	1	0	30	20	50	100	150	3
5.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
6.	EEC 851	Project	0	0	12	-	100	100	250	350	8
7..	GP 801	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**12**	**4**	**12**	**120**	**180**	**350**	**650**	**1000**	**24**

**** Open Electives-II**

EOE081 Non Conventional Energy Resources
EOE-082 Nonlinear Dynamic System
EOE-083 Product Development
EOE-084 Automation and Robotics

LIST OF ELECTIVES:

Elective – I

1. EEC 011 Analog Signal Processing
2. EEC 012 Data Structure
3. EEC 013 Advance Semiconductor Devices
4. EEC 014 Introduction to Electric Drives

Elective – II

1. EEC 021 Satellite Communication
2. EEC 022 Digital Image Processing
3. EEC 023 ANN
4. EEC 024 Filter Design

Elective – III

1. EEC 031 Optical Networks
2. EEC 032 Digital System Design using VHDL
3. EEC 033 Speech Processing
4. EEC 034 Integrated Circuit Technology
5. EEC 035 Introduction to RADAR systems

SYLLABUS

EEC 701 OPTICAL COMMUNICATION		3 1 0
UNIT	TOPICS	LECTURES
I	Overview of optical fiber communication- The general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Optical fiber Modes and configuration, Mode theory for circular Waveguides, Step Index fibers, Graded Index fibers. Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index. Fiber Material and its Fabrication Techniques	8
II	Signal distortion in optical fibers- Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses. Information capacity determination, Group delay, Attenuation Measurements Techniques, Types of Dispersion - Material dispersion, Wave-guide dispersion, Polarization mode dispersion, Intermodal dispersion. Pulse broadening. Overall fiber dispersion in Multi mode and Single mode fibers, Fiber dispersion measurement techniques, Non linear effects. Optical fiber Connectors: Joints, Couplers and Isolators.	8
III	Optical sources- LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Laser Diodes- Basic concepts, Classifications, Semiconductor injection Laser: Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, resonant frequencies, reliability of LED & ILD	8
IV	Source to fiber power launching - Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling. Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors. Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of error, Quantum limit, Analog receivers	8
V	Link Design: Point to Point Links, Power Penalities, Error control,Multichannel Transmission Techniques, WDM concepts and component overview, OTDR and optical Power meter	8

TEXT BOOKS:

1. John M. Senior, "Optical Fiber Communications", PEARSON, 3rd Edition, 2010.
2. Gerd Keiser, "Optical Fiber Communications", TMH, 4th Edition, 2008.

REFERENCE BOOKS

1. Govind P. Agrawal, "Fiber Optic Communication Systems", John Wiley, 3rd Edition, 2004.
2. Joseph C. Plais, "Fiber Optic Communication", Pearson Education, 4th Ed, 2004.

EEC 702 DATA COMMUNICATION NETWORKS		3 1 0
Unit	**Topic**	**Lectures**
I	Introduction to Networks & Data Communications The Internet, Protocols & Standards, Layered Tasks, OSI Model, TCP / IP, Addressing, Line Coding Review, Transmission Media: Guided and unguided Media Review.	8
II	Switching: Datagram Networks, Virtual Circuit Networks, Structure of a switch ,Ethernet Physical Layer, Data Link Layer: Error detection and Correction Data Link Control: Framing, Flow and Error Control Protocols, Noiseless Channel and Noisy Channel Protocol, HDLC, Point-to-Point Protocol	8
III	Multiple Access : RANDOH, CDMA, CSMA/CD, CSMA/CA, Controlled Access, Channelization Wired LANs: IEEE Standards, Standard Ethernet, Fast Ethernet, Gigabit Ethernet, Wireless LAN IEEE 802.11, Bluetooth IEEE 802.16	8
IV	Network Layer : Design Issues. Routing Algorithms. Congestion control Algorithms.IPV4 Addresses, Connecting Devices, Virtual LAN IPV6 Addresses, Internet Protocol, Hardware Addressing versus IP Addressing, IP Data Gram	8
V	Transport Layer Protocol : UDP and TCP, ATM ATM, Cryptography, Network Security	8

Text Books:

1. B. A. Forouzan, "Data Communications and Networking", MGH, 4th ed. 2007

Reference Books:

1. A. S. Tanenbaum, "Computer Networks", PHI.
2. W. Stallings, "Data and Computer Communication", PHI.

EEC 703 VLSI DESIGN		3 1 0
Unit	Topic	Lectures
I	Introduction: Overview of VLSI Design Methodologies, VLSI Design Flow, Design Hierarchy, Concepts of Regularity, Modularity and Locality. MOSFET Fabrication: Fabrication process flow, NMOS and CMOS fabrication, layout design rules, stick diagram and mask layout design. MOS Transistor : MOS Structure, The MOS System under external bias, Operation of MOSFET, MOSFET - Current /Voltage Characteristics, Scaling and Small geometry effects and capacitances	8
II	MOS Inverters: Introduction, Resistive Load Inverter, Inverters with n-type MOSFET load, CMOS Inverter. MOS Inverters - Switching Characteristics: Introduction, Delay – Time Definitions, Calculation of Delay Times, and Inverter Design with Delay Constraints.	8
III	Combinational MOS Logic Circuits: Introduction, MOS logic circuits with depletion NMOS Loads, CMOS logic circuits, complex logic circuits, CMOS transmission gates (pass gates) Sequential MOS Logic Circuits: Introduction, behaviour bistable elements, SR latch circuits, clocked latch and FF circuits, CMOS D latch and edge triggered FF.	8
IV	Dynamic logic circuits: Introduction, basic principle of pass transistor circuits, synchronous dynamic circuit techniques, dynamic CMOS circuit techniques, domino CMOS logic. Semiconductor memories: Introduction, DRAM, SRAM, ROM, flash memory.	8
V	Low – Power CMOS Logic Circuits: Introduction, Overview of Power Consumption, Low – Power Design through voltage scaling, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits. Design for Testability: Introduction, Fault Types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based and BIST Techniques	8

Text Book:

1. Sung-Mo Kang & Yosuf Leblebici, "CMOS Digital Integrated Circuits: Analysis & Design", TMH, 3rd Edition.

Reference Books:

2. D. A. Pucknell and K. Eshraghian, "Basic VLSI Design: Systems and Circuits", PHI, 3rd Ed., 1994.
3. W.Wolf, Modern VLSI Design: System on Chip, Third Edition, Pearson, 2002.

ELECTIVES II

EEC 021 SATELLITE COMMUNICATIONS		3 1 0
Unit	**Topic**	**Lectures**
I	Elements of Satellite Communication. Orbital mechanics, look angle and orbit determination, launches & launch vehicle, orbital effects, Geostationary Orbit.	8
II	Satellite subsystems, attitude and orbit control systems, TTC&M, communication subsystem, satellite antenna Satellite link design: basic transmission theory, system noise temperature and G/T ratio, downlink design, uplink design, satellite systems using small earth station, design for specified C/N.	8
III	Propagation effects and their impact on satellite-earth links: attenuation and depolarization, atmospheric absorption, rain, cloud and ice effects etc. Introduction of various satellite systems: VSAT, low earth orbit and non-geostationary,	8
IV	Direct broadcast satellite television and radio, satellite navigation and the global positioning systems, GPS position location principle, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal Levels, Timing accuracy, GPS Receiver Operation	8
V	Global Mobile Satellite Systems, Antenna System for mobile satellite applications, Evolution, Antenna Requirement and Technical Characteristics, Classification of Mobile Satellite Antenna(MSA), Low gain omni directional Antenna, Medium gain Directional Antenna, High gain Directional Aperture Antenna, Wire Quadrifilar Helix Antenna(WQHA) for Hand held Terminals, Antenna Systems for Mobile Satellite Broadcasting.	8

Text/ Reference Books:

1. B. Pratt, A. Bostian, "Satellite Communications", Wiley India.
2. D. Roddy, "Satellite Communications", TMH, 4th Ed.
3. S. D. Ilcev, "Global Mobile Satellite Communication", Springer
4. R. Pandya, "Mobile and Personal Communication Systems and Services ", PHI.

EEC 022 DIGITAL IMAGE PROCESSING		3 1 0
Unit	**Topic**	**Lectures**
I & II	Introduction: Fundamental steps in DIP, elements of DIP, Simple image model, sampling & quantization, basic relationships between pixels, colour image model. Image Transforms: One-dimensional & two-dimensional DFT, cosine, sine, Hadamard, Haar, and Slant & KL transforms. Image Enhancement: Introduction, point operations, histogram modelling, spatial operations, Transform operations.	8
III	Image Restoration: Introduction, image observation models, Inverse & Wiener filtering, difference between enhancement & restoration Restoration-spatial filtering, Noise reduction in frequency domain.	8
IV	Image Compression: Introduction, Pixel coding, Predictive coding, Transform coding, Inter-frame coding	8
V	Image Segmentation: Introduction, Spatial feature extraction, Transforms features, Edge detection, Boundary extraction, Segmentation techniques.	8

Text Books:

1. Rafael C. Gonzalez Richard E Woods, "Digital Image Processing", Pearson, 3rd Ed. 2009.
2. Anil K Jain, "Fundamentals of Digital Image Processing", PHI.

EEC-023 Artificial Neural Network		3 1 0
Unit	Topic	Lectures
I	Introduction: Introduction and history, human brain, biological neuron, models of neuron, signal flow graph of neuron, feedback, network architecture, knowledge representation, Artificial intelligence and neural networks. Learning Process : Supervised Learning, Unsupervised Learning, Reinforcement Learning, Competitive Learning	4 3
II	Artificial neurons, Neural networks and architectures Introduction, neuron signal function, mathematical preliminaries, Feed forward & feedback architecture. Geometry of Binary threshold neurons and their networks, Complex Neuron Model Learning Rules : Hebbian Learning rule, Perceptron Learning rule, Winner Take all Algorithm, Delta Learning rule Stochastic Machines Statistical mechanics, simulated annealing, Boltzmann machine.	2 1 3 2
III	Perceptrons and LMS Learning objective of TLN, pattern space & weight space, TDNN, Multilayered architecture, back propagation learning algorithm, applications of feed forward neural networks, RBF Networks Regularization networks, generalized RBF networks, RBF network for solving XOR problem, comparison of RBF networks & multilayer perceptrons.	4 3
IV	Adaptive Resonance Theory Building blocks of adaptive resonance, Adaptive Resonance Theory 1. Self Organizing Feature MAP, K means Algorithm Introduction, Maximal eigenvector filtering, principal component analysis,	7
V	Fuzzy Logic : Introduction, Membership Functions, Fuzzy Rules, Fuzzy System, Hybrid Neuro Fuzzy System, Applications	5

Text Books:

1. Kumar Satish, “Neural Networks”, TMH
2. Simon Haykin, ”Neural Networks”, PHI
3. J. M. Zurada, “Introduction to Artificial Neural Systems”, Jaico Publishers, 3rd Ed.

EEC 024 FILTER DESIGN		3 1 0
Unit	Topic	Lectures
I	Review of op-amps circuits, Categorization of filters-Low-pass filter, High-pass filter, band-pass filter, band-reject filter, Gain equalizers, and Delay equalizers.	8
II	Approximation Theory: Butterworth approximation, Chebyshev approximation, Inverse Chebyshev approximation, Basic of sensitivity, Frequency Transformations.	8
III	Three amplifier Biquad: Basic low pass and band pass circuit, realization of the general Biquadratic Functions, summing of four Amplifier biquad, feed forward three amplifier biquad, Passive Ladder structures, Inductor Substitution using Gyrator, Transformation of elements using the FDNR. Active ladder filters. Active R filters.	10
IV	Elementary transconductor building blocks, resistors, integrators, amplifiers, summers, gyrator, First and second order filters, higher order filters.	8
V	Switched capacitor filters: The MOS switch, The switched capacitor, first order building blocks, second order sections, sampled data operation, Switched capacitor first and second order filters, Bilinear transformation based SC filter design.	6

Text Book:

[1] Gobind Daryanani, "Principles of active network synthesis and design",John Wiley & Sons.

[2] R. Schaumann, M. E. Van Valkenburg, "Design of analog filters", Oxford University Press.

EEC 751 Microwave and Optical Communication Lab

Minimum Ten Experiments to be conducted:

Part – A (Any 6 Experiments):

1. Study of Reflex Klystron Characteristics.
2. Measurement of guide wavelength and frequency of the signal in a rectangular Waveguide using slotted line carriage in a Micro wave Bench.
3. Measurement of impedance of an unknown load connected at the output end of the slotted line carriage in a Micro wave Bench
4. Determine the S-parameter of any Three port Tee.
5. Determine the S-parameter of a Magic Tee.
6. Study various parameters of Isolator .
7. Measurement of attenuation of a attenuator and isolation, insertion loss, cross coupling of a circulator.
8. Determine coupling coefficient, Insertion loss, Directivity and Isolation coefficient of anty Multi-Hole directional coupler.
9. To study working of MIC Components like Micro strip Line, Filter, Directional Coupler, Wilkinson Power Divider, Ring resonator & coupler, antennas & amplifies.
10. Study of waveguide horn and its radiation pattern and determination of the beam width.
11. Study radiation pattern of any two types of linear antenna.

Part – B (Any 4 Experiments):

1. To setting up fiber optic analog link.
2. Study and measurement of losses in optical fiber.
3. Study and measurement of numerical aperture of optical fiber.
4. Study and perform time division multiplexing (digital).
5. Study of framing in time division multiplexing.
6. Study of Manchester coding and decoding.
7. Study of voice coding and codec chip.
8. Study and measure characteristics of fiber optic LED's and photo detector.

EEC 752 Electronic Circuit Design

In this practical course students will carry out a design oriented project work using various analog/ digital building blocks which they have already studied in their analog electronic/ digital electronic courses such as Electronic circuits, integrated circuits and filter design. The project may include but not restricted to any of the following:

1. Universal op-amp based biquad
2. Universal OTA biquad
3. Amplitude control or stabilization applied to any sinusoidal oscillators
4. Op-amp/ OTA based function generator
5. Any application of log/antilog circuits
6. Any applications of analog multiplier/ divider
7. Any digital system design and its hardware implementation using TTL/ CMOS ICs
8. Any circuit idea (not studied in the course) using 555 Timer in conjunction with any other ICs

The above must include

1. Design the circuit.
2. Make a hardware and measure various parameters.
3. Simulation in Spice of the designed circuit.
4. Comparison of measured and simulated results.
5. A report is to be made for evaluation.

EEC 801 Mobile and Wireless Communication		3 1 0
Unit	Topic	Lectures
I	Evolution of mobile radio communication fundamentals. Large scale path loss: propagation models, reflection, diffraction, scattering, practical link budget design using path loss model. Small scale fading & multipath propagation and measurements, impulse response model and parameters of multipath channels. Small scale Multipath Measurements, Parameters of Mobile Multipath Channels types of small scale fading.	8
II	Fundamentals of equalisation, Equalisers in communication receiver, Survey of equalisation techniques, linear equaliser, Algorithms for Adaptive Equalization, Diversity techniques, RAKE receiver. Characteristics of speech signals, quantisation techniques, vocoders, linear predictive coders, Multiple Access techniques for Wireless Communications.	8
III	Cellular concepts, Frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, improving coverage and capacity in cellular systems.	8
IV	GSM system for mobile: Services and features, System Architecture, Radio Sub system Channel types, Frame Structure. CDMA Digital Cellular Standard (IS 95): Frequency and Channel specifications, Forward CDMA channel and reverse CDMA channel	8
V	Introduction to Mobile Adhoc Networks, Mobile data networks, wireless standards IMT2000, Introduction to 4G and concept of NGN.	8

Text Book:

1. T.S. Rappaport, "Wireless Communication-Principles and practice", Pearson, Second Edition.
2. T L Singal ,"Wireless Communications ",McGraw Hill Publications.
3. R. Pandya, " Mobile and personal communication system", PHI.

Reference Books:

1. Andrea Goldsmith, "Wireless Communications", Cambridge University press.
2. Andreas F. Molisch, "Wireless Communications", Wiley Student Edition.
3. S. Haykin & M. Moher, "Modern wireless communication", Pearson, 2005.

EEC 802 ELECTRONIC SWITCHING			3 1 0
Unit	Topic	Text Book/ Chapter	Lectures
I	Evolution of Switching systems: Introduction: Message switching, circuits switching, functions of a switching system, register-translator-senders, distribution frames, crossbar switch, a general trunking, electronic switching, Reed electronic system, digital switching systems.	2/3	8
II	Digital switching: Switching functions, space division switching, Time division switching, two dimensional switching, Digital cross connect systems, digital switching in analog environment.	3/5	8
III	Telecom Traffic Engineering: Network traffic load and parameters, grade of service and blocking probability, modelling switching systems, incoming traffic and service time characterization, blocking models and loss estimates, Delay systems.	1/8	8
IV	Control of Switching Systems: Introduction, Call processing functions; common control, Reliability availability and security; Stored program control. Signalling: Introduction, Customer line signalling, AF junctions and trunk circuits, FDM carrier systems, PCM and inter register signalling, Common channel signalling principles, CCITT signalling system No. 6 and 7, Digital customer line signalling.	2/7 2/8	8
V	Packet Switching: Packets formats, statistical multiplexing, routing control, dynamic, virtual path circuit and fixed path routing, flow control, X.25 protocol, frame relay, TCP/IP, ATM cell, ATM service categories, ATM switching, ATM memory switch, space memory switch, memory-space, memory-space-memory switch, Banyan network switch.	3/10	8

Text Books:

1. Thiagarajan Viswanathan, "Telecommunication switching System and networks", PHI.
2. J.E. Flood, "Telecommunication switching, Traffic and Networks", Pearson education.
3. J.C. Bellamy, "Digital Telephony", John Wiley, 3rd Ed.

ELECTIVE III

EEC 031 OPTICAL NETWORKS		3 1 0
Unit	Topic	Lectures
I	Introduction to Optical Networks- Principles and Challenges and its Generation, Characteristics of Optical Fiber in non linear region ,Optical Packet Switching, Transmission Basics, Multiplexers & Filters,	8
II	Optical Amplifiers ,Tunable Lasers, Switches, Wavelength Converters. Sub-Carrier Modulation and Multiplexing,Spectral efficiency,Crosstalk,Introduction of Soliton systems.	8
III	SONET/SDH: Multiplexing, SONET/ SDH Layers, Frame Structure, Physical Layer, Elements of a SONET/SDH Infrastructure, Ethernet. Optical Transport Network, Generic framing Procedure, IP routing and forwarding and QOS. WDM Network Elements Optical Line Terminals, Optical Line Amplifiers, Optical Add/ Drop Multiplexers, Optical Cross Connects.	8
IV	WDM Network Design Cost Trade-offs, Light path Topology Design, and Routing and wavelength assignment problems, Dimensioning Wavelength Routing Networks, Network Survivability Basic Concepts, Protection in SONET/SDH, Protection in client layer, Optical Layer Protection, Different Schemes, Interworking between Layers Access Networks Network Architecture Overview, Enhanced HFC, FTTC, PON evolution	8
V	Optical Switching OTDM, Synchronization, Header Processing, Buffering, Burst Switching. Deployment Considerations- SONET/SDH core Network	

Text Books:

1. R. Ramaswami, & K. N. Sivarajan, "Optical Networks a Practical perspective", Morgan Kaufmann Publishers, 3rd Ed.
2. U. Black, "Optical Networks: Third Generation Transport Systems"/ Pearson Educations

Reference Books:

1. Biswanath Mukherjee "Optical WDM Networks" Springer Pub 2006.

EEC 032 DIGITAL SYSTEM DESIGN USING VHDL		3 1 0
Unit	Topic	Lectures
I	Introduction to VHDL, reserve words, structures, modeling, objects, data type and operators, sequential statements and processes, sequential modeling and attributes, conditional assignment, concatenation and case, array loops and assert statements, subprograms.	8
II	Digital System Design Automation– Abstraction Levels, System level design flow, RTL design flow, VHDL. RTL Design with VHDL – Basic structures of VHDL, Combinational circuits, Sequential circuits, Writing Test benches, Synthesis issues, VHDL Essential Terminologies VHDL Constructs for Structures and Hierarchy Descriptions – Basic Components, Component Instantiations, Iterative networks, Binding Alternatives, Association methods, generic Parameters, Design Configuration	8
III	Concurrent Constructs for RT level Descriptions – Concurrent Signal Assignments, Guarded signal assignment Sequential Constructs for RT level Descriptions – Process Statement, Sequential WAIT statement, VHDL Subprograms, VHDL library Structure, Packaging Utilities and Components, Sequential Statements. VHDL language Utilities - Type Declarations and Usage, VHDL Operators, Operator and Subprogram overloading, Other TYPES and TYPE – related issues, Predefined Attributes	8
IV	VHDL Signal Model – Characterizing hardware languages, Signal Assignments, Concurrent and Sequential Assignments, Multiple Concurrent Drivers Standard Resolution	8
V	Hardware Cores and Models - Synthesis rules and styles, Memory and Queue Structures, Arithmetic Cores, Components with Separate Control and Data parts. Core Design Test and Testability - Issues Related to Design Test, Simple Test benches.	8

TEXT BOOKS:

1. Z. Navabi, "VHDL-Modular Design and Synthesis of cores and Systems", TMH – 3rd Edition.
2. R.D.M. Hunter, T. T. Johnson, "Introduction to VHDL" Spriger Publication, 2010.

REFERENCE BOOKS:

3. C. H. Roth, "Digital System Design using VHDL", PWS Publishing
4. Douglas Perry, "VHDL- Programming by examples", MGH

EEC 033 SPEECH PROCESSING		3 1 0
Unit	Topic	Lectures
I	Digital models for speech signals: Mechanism of speech production & acoustic phonetics, the acoustic theory of speech production, lossless tube models, and digital models for speech signals.	10
II	Time Domain methods of speech sampling: Time dependent processing of speech, short time energy and average magnitude, short time average zero crossing rate, discrimination between speech& silence, pitch period estimation using parallel processing, short time autocorrelation function & AMDF, pitch period estimation using autocorrelation function.	10
III	Short time Fourier Analysis: Definition and properties, design of filter banks, implementation of filter bank summation method using FFT, spectrographic displays, pitch detection, analysis by synthesis phase, vocoder and channel vocoder.	10
IV	Homomorphic speech processing: Homomorphic system for convolution, complex cepstrum of speech, pitch detection using Homomorphic processing, formant estimation, Homomorphic vocoder.	6
V	Linear Predictive Coding of Speech: Basic principles of linear predictive analysis, the autocorrelation method, computation of the gain for the model, solution of LPC equations for auto correlation method, prediction error and normalized mean square error, frequency domain interpretation of mean squared prediction error relation of linear predictive analysis to lossless tube models, relation between various speech parameters, synthesis of speech from linear predictive parameters, application of LPC parameters.	10

Text / Reference Books:

1. R. L. Rabiner & R.W. Schafer, “Digital Processing of speech signals”, Pearson Education.
2. B. Gold and Nelson Morgon, “Speech and audio signal processing”, Wiley India Edition, 2006.

EEC 034 INTEGRATED CIRCUIT TECHNOLOGY		3 1 0
Unit	Topic	Lectures
I	Introduction To IC Technology: SSI, MSI, LSI, VLSI Integrated Circuits Crystal Growth and Wafer Preparation: Electronic Grade Silicon, Czochralski Crystal Growth, Silicon Shaping, Processing Considerations. Epitaxy: Vapor –Phase Epitaxy, Molecular Beam Epitaxy, Silicon on Insulators, Epitaxial Evaluation.	8
II	Oxidation: Growth Kinetics, Thin Oxides, Oxidation Techniques and Systems, Oxides Properties. Lithography: Optical Lithography. Photo masks, Wet Chemical Etching. Dielectric and Polysilicon Film Deposition: Deposition Processes, Polysilicon , Silicon Dioxide, Silicon Nitride.	8
III	Diffusion: Diffusion of Impurities in Silicon and Silicon Dioxide, Diffusion Equations, Diffusion Profiles, Diffusion Furnace, Solid, Liquid and Gaseous Sources , Sheet Resistance and its Measurement. Ion-Implantation: Ion-Implantation Technique, Range Theory, Implantation Equipment.	8
IV	Metallization: :Metallization Application, Metallization Choices, Physical Vapor Deposition, Vacuum Deposition, Sputtering Apparatus. Packaging of VLSI devices: Package Types, Packaging Design Consideration, VLSI Assembly Technologies, Package Fabrication Technologies.	8
V	VLSI Process Integration: Fundamental Considerations For IC Processing, NMOS IC Technology, CMOS IC Technology, Bipolar IC Technology, Monolithic and Hybrid Integrated Circuits, IC Fabrication	8

Text Book:

1. S. M. Sze, "VLSI Technology", 2nd Edition, McGraw –Hill Publication.

Reference Books:

1. S.K. Ghandhi, "VLSI Fabrication Principles", 2nd Edition,. Willy-India Pvt. Ltd.
2. J. D. Plummer, M. D. Deal and Peter B. Griffin, "Silicon VLSI Technology: Fundamentals, practice and modelling", Pearson Education.
3. Stephen A. Campbell, "Fabrication Engineering at the micro and nano scale", Oxford Univ Press.

EEC 035 INTRODUCTION TO RADAR SYSTEMS		3 1 0
Unit	Topic	Lectures
I	Introduction to Radar: Basic Radar, The Simply Form of the Radar Equations, Radar Block Diagram, Radar Frequencies, Applications of Radar. The Radar Equation: Detection of Signals in Noise, Receiver Noise and the Signal-to-Noise Ratio, Probabilities of Detection and False Alarm, Integration of Radar Pulses, Radar Cross Section of Targets, Radar Cross-Section of Targets, Radar Cross-Section Fluctuations, Transmitter Power, Pulse Repetition Frequency, Antenna Parameters, System Losses, Problems	8
II	MTI and Pulse Doppler Radar: Introduction to Doppler and MTI Radar, Delay-Line Cancelers, Staggered Pulse Repetition Frequencies, Doppler Filter Banks, Digital MTI Processing, Moving Target Detector, Limitations to MTI Performance.	8
III	Tracking Radar: Tracking with Radar, Mono pulse Tracking, Conical Scan and Sequential Lobing, Limitations to tracking Accuracy, Low-Angle Tracking, Tracking in Range, Other Tracking Radar Topics, Comparison of Trackers, Automatic Tracking with Surveillance Radars(ADT)	8
IV	Detection of Signals in Noise: Introduction, Detection Criteria, Detectors, Automatic Detection, Integrators, Constant-False-Alarm Rate Receivers.	8
V	Information from Radar Signals: Basic Radar Measurements, Theoretical Accuracy of Radar Measurements, Ambiguity Diagram, Pulse Compression, Target Recognition, Land Clutter, Sea Clutter, Weather Clutter	8

Text/ Reference Books:

1. Merrill I. Skolnik " Introduction to Radar Systems" Third Edition.
2. J.C. Toomay , Paul J. Hannen " Principles of Radar" Third Edition.

EIC-034/EOE-075 MICRO AND SMART SYSTEMS		3 1 0
UNIT	TOPICS	LECTURES
I	Introduction, Why miniaturization?, Microsystems versus MEMS, Why micro fabrication?, smart materials, structures and systems, integrated Microsystems, applications of smart materials and Microsystems,.	5
II	Micro sensors, actuators, systems and smart materials: Silicon capacitive accelerometer, piezoresistive pressure sensor, conductometric gas sensor, an electrostatic combo-drive, a magnetic microrelay, portable blood analyzer, piezoelectric inkjet print head, micromirror array for video projection, smart materials and systems.	8
III	Micromachining technologies: silicon as a material for micro machining, thin film deposition, lithography, etching, silicon micromachining, specialized materials for Microsystems, advanced processes for micro fabrication.	8
IV	Modeling of solids in Microsystems: Bar, beam, energy methods for elastic bodies, heterogeneous layered beams, bimorph effect, residual stress and stress gradients, poisson effect and the anticlastic curvature of beams, torsion of beams and shear stresses, dealing with large displacements, In-plane stresses. Modelling of coupled electromechanical systems: electrostatics, Coupled Electro-mechanics: statics, stability and pull-in phenomenon, dynamics. Squeezed film effects in electro-mechanics.	8
V	Integration of micro and smart systems: integration of Microsystems and microelectronics, microsystems packaging, case studies of integrated Microsystems, case study of a smart-structure in vibration control. Scaling effects in Microsystems: scaling in: mechanical domain, electrostatic domain, magnetic domain, diffusion, effects in the optical domain, biochemical phenomena.	

Text book:

1. G. K. Ananthasuresh, K. J. Vinoy, S. Gopalakrishnan, K. N. Bhat and V. K. Atre, “Micro and smart systems”, Wiley India, 2010.