ELECTRONICS & COMMUNICATION ENGINEERING YEAR: II SEMISTER: III

Sl. No.	Course No.	Subject	Periods			Evaluation Scheme					Credit
Theory			L	T	P	SESSIONAL EXAM				SUB TOTAL	
						TA	CT	TOT	ESE		
1	CS1312	NUMERICAL ANALYSIS & COMPUTER PROGRAMMING(C,C++)	2	1	-	15	10	25	50	75	3
2	ME1312	MATERIAL SCIENCE	2	1	-	15	10	25	50	75	3
3	ME1302	MATHEMATICS III	3	1	-	30	20	50	100	150	4
4	ME1303	STRENGTH OF MATERIALS	3	1	-	30	20	50	100	150	4
5	EC1301	SWITCHING & PULSE THEORY	3	1	-	30	20	50	100	150	4
6	MH1306	ELECTRONICS MEASUREMENTS	3	1	-	30	20	50	100	150	4
PRACTICAL/DRAWING/DESIGN											
7	ME1307-P ME1308-P	MATERIAL SCIENCE/ STRENGTH OF MATERIALS LAB	-	-	3	25	-	25	25	50	2
8	CS1303-P	NUMERICAL ANALYSIS & COMPUTER PROGRAMMING(C,C++)LAB	-	-	3	25	-	25	25	50	2
9	EC1303-P	SWITCHING & PULSE THEORY LAB	-	-	3	25	-	25	25	50	2
10	EC1304P	ELECTRONICS INSTRUMENTS LAB	-	-	3	25	-	25	25	50	2
11	HS1303-P	GENERAL PROFICIENCY III	-	-	-	-	-	50	-	50	2
		TOTAL	16	6	12	-	-	-	-	1000	32

TA-TEACHERS ASSESSMENT CT-CLASS TEST ESE- END SEMESTER EXAMINATION
TOTAL MARKS: 1000 TOTAL PERIODS : 34 TOTAL CREDITS : 32

ELECTRONICS & COMMUNICATION ENGINEERING YEAR: II SEMISTER: IV

Sl. No.	Course No.	Subject	Periods			Evaluation Scheme					Credit
Theory			L	T	P	SESSIONAL EXAM				SUB TOTAL	
						TA	CT	TOT	ESE		
1	EC1401	ELECTROMAGNETICS	2	1	-	15	10	25	50	75	3
2	EC1402	LINEAR IC's & APPLICATIONS	2	1	-	15	10	25	50	75	3
3	EC1403	ELECTRONICS THEORY	3	1	-	30	20	50	100	150	4
4	EC1404	SOLID STATE DEVICES	3	1	-	30	20	50	100	150	4
5	EC1405	NETWORK THEORY	3	1	-	30	20	50	100	150	4
6	EC1406	DATA COMMUNICATION	3	1	-	30	20	50	100	150	4
PRACTICAL/DRAWING/DESIGN											
7	EC1407-P	NETWORK ANALYSIS LAB	-	-	3	25	-	25	25	50	2
8	EC1408-P	ELECTRONICS CIRCUIT LAB	-	-	3	25	-	25	25	50	2
9	EC1409-P	SOLID STATE DEVICES LAB I	-	-	3	25	-	25	25	50	2
10	EC1410-P	LINEAR IC's & APPLICATIONS LAB	-	-	3	25	-	25	25	50	2
11	HS1404-P	GENERAL PROFICIENCY IV	-	-	-	-	-	50	-	50	2
		TOTAL	16	6	12	-	-	-	-	1000	32

TA-TEACHERS ASSESSMENT CT-CLASS TEST ESE- END SEMESTER EXAMINATION
TOTAL MARKS: 1000 TOTAL PERIODS: 34 TOTAL CREDITS: 32

ELECTRONICS & COMMUNICATION ENGINEERING YEAR: III SEMISTER: V

Sl. No.	Course No.	Subject	Periods			Evaluation Scheme					Credit
Theory			L	T	P	SESSIONAL EXAM				SUB TOTAL	
						TA	CT	TOT	ESE		
1	HS1501	MANAGEMENT SCIENCE	2	1	-	15	10	25	50	75	
2	EC1501	ELECTRONICS INSTRUMENTATION	2	1	-	15	10	25	50	75	
3	CS1512	COMPUTER ORGANISATION	3	1	-	30	20	50	100	150	
4	EC1503	COMMUNICATION SYSTEM I	3	1	-	30	20	50	100	150	
5	EC1503	MICROPROCESSOR THEORY	3	1	-	30	20	50	100	150	
6	EC1503	AUTOMATIC CONTROL SYSTEMS	3	1	-	30	20	50	100	150	
PRACTICAL/DRAWING/DESIGN											
7	EE1517-P	ELECTRONICS INSTRUMENTATION LAB	-	-	3	25	-	25	25	50	
8	EE1518-P	COMMUNICATION SYSTEM I LAB	-	-	3	25	-	25	25	50	
9	EE1519-P	MICROPROCESSOR THEORY LAB	-	-	3	25	-	25	25	50	
10	EE1520-P	AUTOMATIC CONTROL SYSTEMS LAB	-	-	3	25	-	25	25	50	
11	HS1521-P	GENERAL PROFICIENCY V	-	-	-	-	-	50	-	50	
		TOTAL	16	6	12	-	-	-	-	1000	

TA-TEACHERS ASSESSMENT CT-CLASS TEST ESE- END SEMESTER EXAMINATION
TOTAL MARKS: 1000 TOTAL PERIODS: 34 TOTAL CREDITS: 32

ELECTRONICS & COMMUNICATION ENGINEERING YEAR: III SEMISTER: VI

Sl. No.	Course No.	Subject	Periods			Evaluation Scheme					Credit
Theory			L	T	P	SESSIONAL EXAM				SUB TOTAL	
						TA	CT	TOT	ESE		
1	EC1601	INDUSTRIAL ELECTRONICS	2	1	-	15	10	25	50	75	
2	EC1602	ADVANCE SOLID STATE DEVICES	2	1	-	15	10	25	50	75	
3	EC1603	ADVANCE ELECTRIC CIRCUITS	3	1	-	30	20	50	100	150	
4	EC1604	COMMUNICATION HARDWRE DESIGN	3	1	-	30	20	50	100	150	
5	EC1605	MICROWAVE ENGINEERING	3	1	-	30	20	50	100	150	
6	EC1606	COMMUNICATION SYSTEM II	3	1	-	30	20	50	100	150	
PRCTICAL/DRAWING/DESIGN											
7	EC1607-P	COMMUNICATION SYSTEM II LAB	-	-	3	25	-	25	25	50	
8	EC1608-P	MICROWAVE ENGINEERING LAB	-	-	3	25	-	25	25	50	
9	EC1609-P	ADVANCE ELECTRIC CIRCUITS LAB	-	-	3	25	-	25	25	50	
10	EC1610-P	COMMUNICATION HARDWRE DESIGN LAB	-	-	3	25	-	25	25	50	
11	HS1606-P	GENERAL PROFICIENCY VI	-	-	-	-	-	50	-	50	
		TOTAL	16	6	12	-	-	-	-	1000	

TA-TEACHERS ASSESSMENT CT-CLASS TEST ESE- END SEMESTER EXAMINATION
TOTAL MARKS: 1000 TOTAL PERIODS: 34 TOTAL CREDITS: 32

ELECTRONICS & COMMUNICATION ENGINEERING YEAR: IV SEMISTER: VI I

Sl.No	Course No.	Subject	Periods			Evaluation Scheme					Credit
THEORY			L	T	P	SESSIONAL EXAM				SUB TOTAL	
						TA	CT	TOT	ESE		
1	EC1701	OPTICAL COMMUNICATION	3	1	-	15	10	25	50	75	4
2	EC 1702	DIGITAL SIGNAL PROCESSING	3	1	-	15	10	25	50	75	4
3	EC 1703	MICRO ELECTRONIC DEVICES & VLSI TECHNOLOGY	3	1	-	30	20	50	100	150	4
4		OPEN ELECTIVE I	3	1	-	30	20	50	100	150	4
5		PROFESSIONAL ELECTIVE I	3	1	-	30	20	50	100	150	4
PRACTICAL/DRAWING/DESIGN											
7	EC 1704-P	OPTICAL COMMUNICATION LAB	-	-	3	30	20	50	100	150	2
8	EC 1705-P	DIGITAL SIGNAL PROCESSING LAB	-	-	3	25	-	25	25	50	2
9	CS1712-P	COMPUTER NETWORKING LAB	-	-	3	25	-	25	25	50	2
10	EC 1706-P	PROJECT I	-	-	3	25	-	25	25	50	2
11	HS1707-P	GENERAL PROFICIENCY VII	-	-	-	-	-	50	-	50	2
		TOTAL	15	5	12	-	-	-	-	1000	30

TA-TEACHERS ASSESSMENT CT-CLASS TEST ESE- END SEMESTER EXAMINATION
TOTAL MARKS: 1000 TOTAL PERIODS: 34 TOTAL CREDITS: 32

	Sl.No.	Code	PAPER
OPEN ELECTIVE I	01	HS2711	Enterprise Resource Management
	02	CS2711	E-Commerce Strategic IT
	03	HS2712	Technology Management.
	04	HS2713	Decision Support and Executive Information system.
	05	CS2712	Software Technology
PROFESSIONAL ELECTIVE II	01	EC2711	Active filters
	02	EC2712	Speech signal Processing
	03	CS2713	Digital Image Processing
	04	EC2713	Satellite Communication System
	05	EC2714	Optical Network
	06	CS2714	Computer Network

ELECTRONICS & COMMUNICATION ENGINEERING YEAR : IV SEMISTER : VIII

Sl. No.	Course No.	Subject	Periods			Evaluation Scheme					Credit
THEORY			L	T	P	SESSIONAL EXAM				SUB TOTAL	
						TA	CT	TOT	ESE		
1		OPEN ELECTIVE II	3	1	-	30	20	50	100	150	4
2		PROFESSIONAL ELECTIVE II	3	1	-	30	20	50	100	150	4
3		PROFESSIONAL ELECTIVE III	3	1	-	30	20	50	100	150	4
4	EC1801	DIGITAL HARDWARE DESIGN	3	1	-	30	20	50	100	150	4
5	EC1802	SATELLITE COMMUNICATION	3	1	-	30	20	50	100	150	4
PRACTICAL/DRAWING/DESIGN											
6	ME1803-P	PROJECT II	-	-	12	100	-	100	100	200	6
7	ME1808-P	GENERAL PROFICIENCY VIII	-	-	-	-	-	50	-	50	2
		TOTAL	15	5	12	-	-	-	-	1000	28

TA-TEACHERS ASSESSMENT CT-CLASS TEST ESE- END SEMESTER EXAMINATION
TOTAL MARKS: 1000 TOTAL PERIODS: 32 TOTAL CREDITS: 28
Total Credit of All the Four Years

	Sl.No.	Code	Paper
OPEN ELECTIVE I	1	CS2811	IT in Marketing Management
	2	CS2812	IT in HR Management
	3	HS2811	IT in Finance Management
	4	CS2813	Project Management & Software Tools
	5	HS2812	Human Values
PROFESSIONAL ELECTIVE II	1	EC2811	Data Communication And Design
	2	EC2812	Microprocessor based System Design
	3	EC2813	Advance Topic in Microprocessor & Microcontroller
	4	CS2814	Personnel Computer Systems
	5	EC2814	Biomedical Instrumentation
	6	EC2815	Power Electronics
PROFESSIONAL ELECTIVE III	1	CS2815	System Software
	2	CS2816	Computer Graphics
	3	EC2816	Modeling And Simulation
	4	EC2817	Television Engineering
	5	EC2818	VLSI Design
	6	EE2811	Neural Network & Fuzzy System
	7	CS2817	Computer Network

Syllabus of B. Tech. in Mechanical Engineering
Semester III

CS 1312 - NUMERICAL ANALYSIS AND COMPUTER PROGRAMMING (2-1-0)

Numerical analysis

Approximations and round of errors, truncation errors and Taylor series,

Determination of roots of polynomials and transcendental equations by Newton-Raphson, Secant and Bairstow's method.

Solutions of linear simultaneous linear algebraic equations by Gauss Elimination and Gauss-Siedel iteration methods, curve fitting — linear and nonlinear regression analysis.

Backward, forward and central difference relations and their uses in Numerical differentiation and integration, Application t of difference relations in the solution of partial differential equations. Numerical solution of ordinary differential equations by Eular, Modified Eular, Runge-Kutta and Predictor-Corrector method.

Computer Programming

Introduction to computer programming in C and C++ languages. Arithmetic expressions, simple programs. The emphasis should be more on programming techniques rather than the language, itself. The C programming language is being chosen mainly because of the availability of the compilers, books and other reference materials.

Example of some simple C program. Dissection of the program line by line. Concepts of variables, program statements and function calls from the library(printf for example).

C data-types, int, char, float etc.

C expressions, arithmetic operations, relational and logic operations.

C assignment statements, extension of assignment to the operations. C primitive input output using getchar and putchar, exposure to the scanf and printf functions.

C statements, conditional execution using if, else. Operationally switch and break statements may be mentioned.

Concepts of loops, example of loops in C using for, while and do-while. Optionally continue may be mentioned.

One dimensional arrays and example of iterative programs using arrays, 2-d arrays. Use in matrix computations.

Concept of Sub-programming, functions. Example of functions. Argument passing mainly for the simple variables.

Pointers, relationship between arrays and pointers. Argument passing using pointers.

Array of pointers, Passing arrays as arguments.

Strings and C string library.

Structure and unions**,** Defining C structures, passing structures as arguments. Program examples. File I/O, Use of fopen, fscan and fprintf routines_

Suggested Text Books and References

- Shastry-S,S., "Numerical Methods", Prantice Hall Inc., India, 1998.
- Noble Ben, "Numerical Methods", New Tork International Publications, New York, 1964.Stanson Ralph, G., "Numerical Methods for Engineering", Englewood Cliffs, N.J..,
- Prentice Hall Inc., 1961.
- Buckingham, R.A., "Numerical Methods", Sir Isac Pitman Sons. Ltd., London, 1957.
- Bakhvalov, N.S., "Numerical Methods", Mir. Pub., Moscow, 1977.
- Grewal, B.S., "Numerical Methods", Khanna Pub., New 13c1hi, 1998.
- Sudhit Kaicker, "The complete ANSI C", BPB Publications, New Delhi, 1996.
- Kernighan, B.W. and Ritchie., DAM., "The C Programming Language", Prantice Hall of India, 1998.
- Byron. S.Gottfried. "Programming with C", Tata McGraw Hill. 2'ledition 1998.

ME1312 Materials Science (2-1-0)

History of materials: Source of engineering materials; categorization of engineering materials [2 .or 3 materials, their properties and hence their application just to make an illustrative point],
Periodic table approach to engineering materials 2 hours
Atomic bonding vis-a-vis properties of materials: Crystal structure and non crystalline structure; Miller indices;
X-ray diffraction, 2hours
Defects, their origin, Frenkel and Schottky defects; Order-disorder transformations, association of defects, non-stoichiometric solids; ' role of defects in defining electronic properties of materials - Si, GaAs, Dislocations 3 hours
Diffusion in solids, atom mobilities, temperature and impurity dependence of diffusion, various diffusion processes 2 hours
Binary phase diagrams (Pb-Sr, AI-Si, Ge-Si, Au-Si etc), microstructure and its effect on properties. 2 hours
Materials for use in electronic devices: Polymers, ceramics. Semi-conductors and metals - their structure and properties', insulators; superconductors; dielectric, ferroelectric, memory and magnetic materials:- Case studies, 7 hours
Quantum mechanical approach to structure of materials . Energy bands in solids; electrical conductivity; extrinsic and intrinsic semiconductors; Carrier concentration; work function. 6 hours
Carrier transport mechanism: Scattering and drift of electrons and holes; diffusion and drift of carriers; Hall effect. 3 hours
Technology of fabrication of semiconductor devices; Unit operations: Thin film deposition; oxidation; diffusion; implantation lithography; etching; metallization, bonding; encapsulation and packaging; Description of a discrete device fabrication; IC fabrication technology. - 6 hours
Sensors and actuators: classification and terminology; acoustic sensor, mechanical sensors, magnetic sensors, radiation sensors, thermal sensors, biosensors, chemical sensors and mechanical sensors Examples of integrated sensors. 4 hours
Opto-electronic materials and devices: Modulation of light: birefringence; Kerr effect, magneto- optic effects, acousto-optic effects. Display devices' CRTs. LEOs, LCDs, photoconductors, IR detectors, Photon devices, Lasers, Optical switching devices. 4 hours
Structural, chemical characterization of materials - introduction to X-ray Analysis, optical microscopy, ESCA, SEM-EDAX, STM, AFM; case studies of Si, Ga As, ferrites, lithium niobate 3 hours

Environmental assessment of semiconductor device production' retrospect and prospect. 1 hour

MH 1302 - MATHEMATICS —III **(34-0)**

Complex Variable

Complex number, Arc and diagram, complex functions, limit, continuity and differentiability Cauchy-Reimann equations, harmonic functions, constructions of analytic functions, by mile- Thomson method, conformal mapping, transformations W=Z", I/z, e, (az+b)/cz=d).

Fourier Series

Periodic functions, Fourier series of functions with period 2 change of interval, Half range sine and cosine series.

Laplace Transform

Laplace Transform, existence theorem, first shifting theorem, multiplication and division by T, laplace Transform of deviated Inverse laplace transform, application to solve Linear differential equations.

Unit step function, Dirac delta function- their Laplace transforms, second shifting theorem, laplace transform of periodic-function, Applications.

Series Solution of Differential Equation

Series Solution, Forbenious method, legendre and bessels equations.

Partial Differential Equation

Linear and nonlinear partial differential equations of first order, four standard forms.

ME 1303 - STRENGTH OF MATERIAL (3-1-0)

Stress (Axial Load)

Normal stress, Shear stress, Factor of safety.

Stress-strain diagram

Hook's Law, Poission's ratio.

Torsion

Basic assumptions, Torsion formula, Hollow and Stepped circular shafts, Angular Deflection, Shaft couplings.

Flexural Loading

Theory of pure bending, Flexural formula, Shear force and Bending moments diagrams for different types of loading and support conditions on beams. Transverse shear stress distribution in circular, hollow circular, t box and T, angle sections.

Deflection of Beams

Strain curvature and moment curvature relation, Solution of beam deflection problems by Direct integration method, Area moment method.

Principal Stresses and Strains

Normal and shear stress, Concept of equivalent bending & equivalent twisting moment, Mohr's circle of stress and strain, Strain Rosette's.

Columns

Euler's formula for different end conditions, Concept of equivalent length, Eccentric loading. Rankine formula.

Energy Methods

Strain energy for Uniaxial stress, Pure bending, Shearing stresses, Use of energy theorems to determine deflection and twist of shafts.

Suggested Text Books & **References**

- Ramamurtham, S., "Strength of Materials", Dhanpat Rai & Sons, 1991
- Popov, E.P., "Mechanics of Materials", Prentice Hall Inc., 1984
- Andrew, P. and Singer, F.L., "Strength of Materials", Happer & Row Publishers, New York, 1987

EC 1301 - SWITCHING AND PULSE THEORY (3-1-0)

Logic families — RTL, DTL, TTL, ECL, NMOS/CMOS, Switching algebra, minimization functions using K-maps; Combination logic circuits — Adder / subtractor, multiplexes / demultiplexer, encoder / decoders, parity checker and generator etc

Sequential logic circuits — flip — flops, latches, shift registers, counters etc.

Pulse response of RC circuits: HP & LP. Pulse response of a band limited circuit. Switching properties of diodes: Clipper, clamper and voltage multiplier. Multivibrators: Astable, monostable, and bistable.

Suggested Text Books and References

- Kohavi, "Switching and Finite Automata Theory", 2nd ed., Tata McGraw Hill; 1978,
- Hill F.J. & Patterson, G.L., "Switching Theory and Logical Design", 3rd Ed: Hohn Wiley 1981.
- Millmnn, I & Taub, H., "Pulse, Digital and Switching Waveforms", McGraw Hill.
- Allen. Mottershed, "Electronic Devices and circuits", An Introduction: Prentice Hall; 1989.

EC1302 - ELECTRONICS MEASUREMENTS (3-1-0)

Indicating instruments

Review of fundamental and derived units — Measurement errors — Standards of measurements — Deflecting and restoring torques in moving coil, moving iron and induction type meters — Ammeters, Voltmeters, Watt-meters and Energy meters.

Voltage, Current and Power

Measurement of direct current and voltage — methods of measuring alternating voltages and currents — Rectifier Instruments — Thermocouple instruments — VTVM — TVM — Amplifier rectifier type volt meters, Power measuring techniques — Bolometer method — Calorimeter method.

RLC Measurements

DC resistance - AC Wheatstone bridge — common types of bridges: Maxwell, Hay, Wein and Schening bridges — Twin T and Bridged — T null networks — resistance and Q of resonant circuits — Q meter — Impedance Measurement by substitution I Tuned circuit — Measurement of low -value _____ capacitances — Measurement of incremental inductances.

Frequency and Period Measurements

Standards of frequency — Frequency measurement by the absorption method — Comparison methods - Hetrodyne frequency meter — Capacitpr charge discharge method — Pulse counting method — Digital Frequency meter.

Waveform and Phase Measurements

Wave and distortion analyzer for audio frequency waves — spectrum analyzer — wave analyzer for RF signals — Phase measurements using oscilloscope — Null balance method — Phase shift to pulse conversion method — *DigiW* phasemeter.

Amplifier Measurements

Definition of amplification and gain — Voltage gain measurement — Insertion gain — Available power gain — Impedance measurements — Phase shift characteristics — Square wave testing of amplifier — Measurements of non linear distortion — Measurement of noise figure of amplifiers.

Suggested Text Books and References

- Sawhney, A.K., "A course in Electrical and Electronic Measurements and instrumentation''' Dhanpat Rai & Sons, 11 th edition, 1995.
- Kushnir, F., "Radio Measurements" MLR Publishers, Moscow, 1978.
- Terman, F.E. and Petit, J.M., "Electronic measurements", McGraw Hill Book Co., 1984.

Cooper, W.D., "Electronic instrumentation and measurement Techniques", Prantice Hall of India, 3rd Reprint 1995.

PRACTICAL / DRAWING / DESIGN

ME 1307 - P - Material Science Lab. (0-0-3)

List of experiments

- To study the lattice structure of various types of unit cell. Observe the Miller Indices for various Planes and directions in a unit cell.
- To study the microstructure of cast iron, mild steel, brass, solder under annealed, cold worked, forged / rolled conditions.
- To verify the Hall effect
- To determine the fracture characteristics of ductile and brittle materials
- To determine the chemical composition of a few common alloys
- To determine percentage of C and S content in an alloy with Fe as main constituent.,

ME 1308 —P - Strength of Material Lab. **(0-0-3)**

List of experiments

- Introduction to testing equipments
- Uniaxial tension test (Mild steel, Timber)
- Uniaxial compression test (Timber— along and across, concrete, bricks, etc.)
- Torsion test (Mild steel / aluminum)
- Bending stress distribution in beams using demac gauges and extensometer
- Analysis of truss model with spring members
- Compression test on brick masonry specimen
- Hardness test
- Creep test
- Impact test
- Strength of etched and un-etched glass
- Spring test
- To study the microstructure of various metals

CS 1313 - P - Numerical Analysis And Computer Programming Lab. (0-0-3)

List of experiments

- Development of computer program for
- Numerical integration by Trapezoidal and Simpson's rule
- Gauss - Siedel iteration method
- Various matrix operation and their use as sub-routines
- Uses of pointers, data structures, loops, arrays.

EC 1303-P - Switching and pulse theory lab. **(0-0-3)**

List of experiments:

- Verification of logic gates,
- Verification and realization of different flip-flops (RS, JK ,D and T),
- Study of 4-bit register, study of b. C. D. Counter,
- Study of bi-stable multi-vibrator (using 555 timer or 1),
- Study of astable multivibrator, study of high pass and low pass single order filter.

EC 1304-P - Electronics Measurements Lab. **(0-0-3)**

List of experiments:

- Study of Thermocouple Instruments like VTVM - TVM.
- Study of Power Measuring Techniques — Bolometer & Calorimeter Method.
- Study of A C Wheatstone bridge.
- Measurement of Low Value Capacitances.
- Measurement of Incremental Inductances.
- Study of Digital Frequency Meter.
- Phase measurement using C. R. 0. Square Wave Testing of amplifiers.
- Study of digital frequency meter.

HS 1303 — P GENERAL PROFICIENCY —III **(0-0-0)**

SEMESTER -IV

THEORY

EC140l – ELECTROMAGNETICS (2-1-0)

Scalar and vector fields, vector representation of surfaces, physical interpretation of gradient, divergence and curl, gauss's law, stokes theorem, Helmholtz theorem, different co-ordinate systems points pointing vector.

Time varying fields: Gauss's flux theorem Laplace and Poisson's equation, Continuity equation, displacement current, Maxwell's equation "boundary condition wave equation and its solution in deferent media, phasor notation polarization, reflection and refraction of traveling waves at plane boundaries, phase and group velocity.

Transmission lines: Evaluation of line parameters, design concept, cutoff frequency attenuation, dispersion, power handling capacity, traveling wave, standing_waves, smith chart and matching techniques, wave guide.

Antenna: Radiation concept, Elementary dipole, half wave dipole, radiation pattern, gain, pattern multiplication, basic antenna.

EC1402 - LINEAR IC'S & APPLICATIONS (2-1-0)

Operational Amplifiers

Ideal op-amp. characteristics, Inverting and non-inverting op-amp; difference Amplifier - Transfer characteristics; offset error voltages and currents, CMRR, PSRR, slew rate; measurement of op-amp. parameters.

Analog System with Operations Amplifier As a Building Block

Basic applications - Inverter, scale changer, adder, voltage to current / current to voltage converter, voltage follower; Differential amplifier, Bridge amplifier; Instrumentation amplifier; analog Integrator and Differentiator; Nonlinear systems - comparator, zero crossing detector, timing mark generator, sample & hold circuit, precision diode, precision rectifier, average detector, peak detector, Logarithmic amplifier, anti-log amplifier, logarithmic multiplier.

Active filters

Introduction, Frequency response characteristics, First order LP and HP filter. Second order filter model, Sallen - Key unity gain filters, Sallen - key equal component filters, higher order filter, Band pass ____ and-Band reject filters.

Wave shaping and waveform Generation

Oscillators - RC phase shift oscillator, Colpitts and Hartley oscillator, square wave generator. pulse generator, triangular wave generator, Schmitt Trigger, voltage controller oscillator.

Regulated Power Supplies

Transistorized Series pass regulator, overload, short - circuited and thermal shutdown protection; three terminal IC regulators, Basic idea of switching regulators.

Analog to Digital / Digital to Analog Conversion

Weighted resistor and Binary ladder D/A converters; Single and dual slope integration, counter, servo, successive approx., Resistor type Analog to digital converters.

Suggested books and references

- Millman, and Halkias, C.C., "Integrated electronics", Tata McGraw Hill, 1998.
- Schilling and Belove, C., "Electronics Circuit: Discrete and integrated", McGraw Hill, 1989
- Soclof, "Applications of Analog Integrated Circuits", Prantice Hall of India, 1996.
- Franco, "Design with Op-amps & Analog Ice", Tata McGraw Hill, 1997.
- Jacob, "Applications & design with analog Ics", Prantice Hall of India, 1996.
- Tietze and Schenk, "Advanced Electronics Circuits", Springer - Verlag, 1978.

EC1403 - ELECTRONIC CIRCUITS (3-1-0)

Power supplies

Rectifiers - Half wave Rectifiers - Average and RMS values — Ripple factor — Regulation — Rectification — Efficiency — Transformer utility factor — filters — Inductors, capacitors, L type, PI type — Ripple factor and regulation — Need for voltage regulator — Series and Shunt regulators Comparison — Current limiting and protection — circuits — Switched mode power supplies (qualitative).

Small signal amplifiers

General principle of operation — classifications — RC coupled amplifiers — Gain frequency response — Input and output impedence calculations — Transformer coupled amplifier — Equivalent circuit at low medium and high frequencies — Analysis and frequency response.

DC Amplifiers

Problems in DC Amplifiers — Minimisation — Chopper Amplifiers — Differential and common mode gain CMRR — Cascode and Darlington pair Amplifiers.

--Feedback Amplifiers

Basic concept of Feed-back amplifiers — Characterization — Effect of negative feedback on gain, gain stability distoʳtion and bandwidth- Voltage and current feedback circuits.

Harmonic Oscillators

Barkhausen criteria — Hartley, Clapp and Collpit's oscillators — RC Phase shift oscillators — Wein bridge oscillators — Frequency stability of oscillators — Crystal oscillators.

Power Amplifiers

Classification — Class A/B/C — Single ended and Push — Pull configuration — Power dissipation and output power Conversion efficiencies — Complementary symmetry power amplifier.

Suggested textbooks & **References:**

- Millman, and Halkias, "Integrated Electronics", Mc graw Hill, Fifth Reprint, 1993.
- Boylestad, Robert L. and Louis Nashelsk, "Electronic Devices and Circuit Theory", Prantice Hall of India New Delhi, 1997.
- Schillin g., and Belove., "Electronic Circuits — Discrete and integrated" MacGraw Hill international edition 1989.
- Mottershead, **A.,** "Electronic Devices & Circuits: As Introduction", Prantice Hall of India, 18th Reprint, 1996.

EC 1404 - SOLID STATE DEVICES (3-1-0)

Semiconductors: Energy band diagram, covalent band, bond and free electrons, and hole mobilities, intrinsic and extrinsic semiconductors, Fermi and impurity revels impurity compensation, charge neutrality equation and semiconductor conductivity, Einstein relation, sift and diffusion, photoconductivity and hall effect.

Semiconductor Diode: Theory and band diagram of p-n junction as a diode, current component and I-V characteristics of p-n diode, effect of temperature on diode current, breakdown mechanisms, avalanche and zener diode LED, optional absorption in a semiconductor, photovoltaic effect, solar cell, photodiode, avalanche photodiode, negative conductor in semiconductor, transit time devices, IMPATT, TRAPATT, Gunn device.

Transistor: Basic structure and principle of operation of BJT. Current components and amplifying property of BJT, CB, CE & CC configuration and its VP, 0/P characteristics, current gain, and active, saturation and cutoff region of 0/P char..

FET: Basic structure, characteristics of JFET, drain conductance and trans conductance of JFET, important properties of JFET. Static and dynamic characteristics MOS structure MOS capacitance, MOS static char. and equivalent ckt.

Suggested textbooks & **References:**

- Dekker, A.J., "Electronic Engineering Materials", PHI, New Delhi, 1998.
- Allision, A.J., "Electronic Engineering Materials and Devices", Teta McGraw Hill Publishing Company Ltd., New Delhi, 1998.
- Millman, J. and Halkias C.C., "Electronic Devices and Circuits", Tata McGraw Hill, 1998.
- Runyan, W.R., "Semiconductor Measurements and Instrumentation", McGraw Hill, New York, 1975.
- Millman, J. and Halkias, C.C., "Electronic Devices and circuits", Tata Mc Graw Hill, 1998.

EC 1405 - NETWORK THEORY **(3-1-0)**

Network theorems: Superposition theorem, Thevenin's & Norton's theorem, maximum power transfer theorem, Tellegen's theorem.

Coupled circuits: Self inductance, coefficient of coupling, dot conversion, analogy of coupled circuits.

Network Transients: Transient response of simple RL, RC & RLC series & parallel circuits, solution of RL,RC,RLC series & parallel circuit for step & sinusoidal excitation using Laplace's transform method.

Two Port Network: Open & Short circuit parameters, transmission & Hybrid parameter & their interrelations.

Network Function: Two port network parameters —poles and zeros, properties of network functions, time domain behavior for pole zero plot

Network synthesis: stability concept —Hurwitz property, positive realness properties of positive real functions. Synthesis of RL, RC, LC driving point impedance function using simple canonical networks-Foster and Caour forms.

Suggested textbooks & **References:**

- Paranjothi, S.R., "Electric Circuit Analysis", New age International Publishers,Madras, 1996.
- Sinha, Umesh., "Network Analysis and systhesis", Satya Prakashan, New Delhi, Reprinted Edition, 1997.
- Arumugam, M., and Premkumar, N., "Electric circuit theory", Khanna Publishers, New Delhi, 1987.
- Loseph, A. **Edminister.,** "Theory arid problems of electric circuits", Tata McGraw Hill Publishing Compant, 1992.

EC 1406 - DATA COMMUNICATION (3-1-0)

Introduction a Digital Communication System.

Characterization of Signals and Systems

Representation of Band pass signals and systems; Representation of Digitally Modulated signals; Linear. Less modulation, nonlinear modulation methods with memory, Base band signals, Spectral characteristics of the above Digitally Modulated Signals.

Modulation and Demodulation Schemes

Demodulation for completely known signals in Additive Gaussian noise; Binary antipodal

Binary orthogonal signals, Multiphase signals, QAM signals, M-ary orthogonal signals, M-ary orthogonal signals, Simplex signals; Probability of Error calculations for these signals

Carriers and Symbol Synchronization Schemes

Convolution Codes:

Transfer function of a Convolution code, optimum decoding of Convolution codes - Vitter algorithm; probability of Error for soft decision and hard decision decoding.

Digital Communication over Linear Band-limited Channels

Characteristics of Band limited channels; Signal design for band limited channels for no ISI and controlled 1ST Optimum Demodulator for ISI and Additive Gaussian noise; various methods of linear equalization, Decision -Feedback Equalization, Adaptive Equalization, Echo cancellation in Data transmission over telephone channels

PRACTICAL / DRAWING / DESIGN

EC **I407-P - Network Analysis Lab** (0-0-3)

List of Experiments:

- Measurement of Power in a three-phase circuit by two-wattmeter method for
- Balanced & Unbalanced Load and (i) Power Factor Calculation, (ii) Reactive Power Calculation.
- Polarity Test of Transformer.
- Transient Response of R-L, R-C and R-L-C Series & Parallel Circuits for (a) Step Input, (b) Sinusoidal method using Laplace Transform Method.
- Synthesis of R-L, R-C and Driving Point Impedance pull using Foster and Cauer Forms,

EC 1408-P - Electronics circuits Lab. (0-0-3)

List of experiments:

- Generation of square and triangular wave using op-amp IC.
- Study of Class A amplifier and its waveform.
- Study of Class B amplifier and its waveform
- Determining the frequency of a wein bridge oscillator.
- Determining the frequency of a phase shift oscillator.
- Determining the frequency of a Hartley oscillator.
- Determining the frequency of a Colpitt oscillator.

EC 1409-P - Solid State Devices Lab. (0-0-3)

List of experiments:

- Rectifying and Breakdown Characteristics of P-N Junction and Point Contact diodes.
  Input and Output characteristics of Bipolar Transistor in (a) Common base, and (b) Common Emitter configurations.
- Drain Current (Drain to Source Voltage (VDS), Characteristics of Junction Field Effect Transistor (JFET).Study of SCR Characteristics.
- Measurement of h-parameters of Bipolar Junction Transistor.
- Study of basic properties of Operational Amplifier.
- Measurement of Energy Band Gap and Resistivity of semiconductor sample.
- Measurement of Carrier Concentration in a semiconductor by Hall measurements.
- Measurement of Junction Capacitance and Ideality Factor of semiconductor diode.
- Study of effect of Temperature on Leakage current and Breakdown voltage of P-N Junction Study of UJT and Relaxation Oscillator.
- Study of Frequency Response R-C Coupled Amplifier.

EC 1410-P - Linear IC's & Applications Lab. (0-0-3)

List of experiments:

- Study of Transfer Characteristics of Op-amp.
- Fabrication of Voltage to Current / Current to Voltage Converter using Op-amp.
- Fabrication of Non-linear system Comparator, Zero Crossing Detector using Op-amp.
- Study of Band Pass & Band Reject Filter.Study of R-C Phase Shift Oscillator.
- To generate Square Wave, Pulse, Triangular Wave using C. R. 0.
- Study of Switching Regulator.
- Study of Binary Ladder D/A Converters.

HS 1404 — P GENERAL PROFICIENCY IV (0-0-0)

SEMESTER - V

HS 1501 - **MANAGEMENT SCIENCE** **(2-1-0)**

Principles of management

Definition and concept of management. Evolution of management thought. Systems approach and decision. Theory approach to management. Process of decision-making.

Functions of Management Planning: types of plans, Major steps in managerial planning. Strategies MBO. Organization; nature and purpose, Process of organization. Basic departmentation. Co-ordinating supervision, communication and direction. Leadership, Motivation. Controlling; nature and purpose control techniques and information technology. International Management; Japanese Management vs. U.S. Management Managerial functions in International Business.

Organization Theory

Group Dynamics; Defining and classifying groups, Group Processes. Group task.

Group cohesiveness

Conflict Management: discovery of conflicts, Processing of grievances, conflicts resolution, conflict and intergroup relations.

Stress Management: Nature of stress, Potential Sources of stress, consequences strategies.

Suggested text books & **references**

- Koontz, H. and Weihrich, H., "Essential of Management".
- Mathur, S.S., "Principles of Management".
- Agarwal, R.D., "Organisation and management"
- Robbin, S.P., "Organisational Behaviour".
- Hicks and Gullet,"Organisations: Theory and Behaviour".
- Allen, "Management and Organisation".

EC 1501 - ELECTRONIC INSTRUMENTATION (2-1-0)

Measurement basics

Errors, resolution, unit of measurement and standards. moving coil instrument and its variations, micro voltmeters, gain phase meter.

Cathode ray oscilloscope

Basic block diagram, function of blocks, dual trace oscilloscope, analog and digital storage oscilloscope.

Transducer

Transducers for measurement of temp, pressure level and flow, linear and angular position, velocity and acceleration, digital transducer, transducer interfacing and data acquisition, computer controlled instrumentation and 1EEE4888 interfacing.

Process instrumentation

First and second order process, controllers, final control element, close loop response of process. Analysis of a complete process stability analysis.

Distributed digital-control-system

Computer based process control system: - Case study.

Suggested Text Books & **References**

- Helfrick, and Cooper, W.O., 'Modern Electronic Instrumentation and Measurement Techniques ",PHI 1992..
- Barney, "Inteliegent Instrumentation", PHI 1992.
- Sahweny, A.K.,"Electrical and Electronic Measurements & Instrumentation", Dhanpat Roy & Sons.

CS 1512 - COMPUTER ORGANISATION (3-1-0)

Representation of information

Number systems, integer & floating point representation, character code (ASCII, EBCDIC). Error detection & correction codes.

Basic Building Block:

Boolean Algebra, combination logic design, flip-flops, registers, counter, ALU, Arithmetic and logic operation, faster algorithms and their implementation. Organisation of central units (Hardware and Micro programmed), Microprogramming organisation. Memory types and Organisation. Address decoding and selecting.

Peripheral devices: I10 devices (tape and disks) Programmed & Interrupt control mechanisms. I10 controllers, Bus bandwidths. Assembly Language Programming.

Programmers Model of a machine. Example of a typical 16 to 20 bit processor Registers, Addressing modes, instruction set, use of an assembly language for specific programs for typical programs like: Table search, subroutines Symbolic and numeric manipulations, and I10.

Suggested Text Books & **Reference**

- Gear, C.W., "Computn Organisation and Programming", Mc Graw Hill, 1975.
- Tannenbaum, A.S., "Structured Computer Organisation", Prentice Hall of India.
- Mano, M.M., "Computer System Architecture", Prentice Hall of India 1983.
- Langholz, G., Grancioni, J. and Kandel, A.L., "Elements of Computer Organisation Prentice Hall International, 1988.
- Assembler "Manual for the Chosen Machine".
- Hayes, "Computer Architecture and Organisation", McGraw-Hill International Edition.
- Sloan, F.E., "Computer Hardware and Organisation", 2nd Edn, Galgotia Publc,Pvt. Ltd

EC 1502 - COMMUNICATION SYSTEMS — I (3-1-0)

Representation of Signals

Analog between vectors and signals, Examples of Orthogonal Basis Functions Fourier series Fourier transform, Properties of the Fourier Transform, Fourier Transforms involving impulse functions, Spectral density and Correlation functions of deterministic signals.

Transmission of Signals through Systems

Linear time Invariant systems, causality, stability, transfer function and frequency response, graphical interpretation of convolution, distortion less transmission, ideal low pass filter, Hilbert Transform, Pre-Envelope.

Random signals

Probability, Random variables, Probability density and distribution functions, Statistical averages, Joint movements, Transformation of random variables, Random processes, Stationary, Cu variance functions, Ergodicity, Autocorrelation function and power spectral density, transmission of random processes through a linear filter, Gaussian process.

Continuous wave modulation

Motivation for modulation, Amplitude modulation, Double Sideband Suppressed Carrier modulation, Vestigial Sideband modulation, Single Sideband modulation, Frequency Division multiplexing, Angle modulation: Phase & Frequency, Modulation, Narrow Band Frequency Modulation, Stereophonic FM.

Pulse modulation

Sampling Theorem, Pulse Amplitude Modulation, Time Division Multiplexing, Pulse Position Modulation and pulse Width Modulation; Uniform and non uniform quantization of signals, Pulse code modulation, Delta modulation, Differential Pulse Code Modulation, Coding Speech at low bit rates.

Suggested Text Books & **References**

- Simon Haykin, "Communication Systems", 3rd Ed, John Wiley & Sons, 1997.
- Simon Haykin, "Communication Systems", 2'd Ed., John Wiley & Sons, 1996..
- Taub and Shilling, "Principles of Communication Systems", Tata McGraw Hill, 1998.
- Lathi, "Modem Digital and Analog Communication Systems"; 3rd Ed., Oxford University Press, Delhi, 1998.
- 3ruce Carlson, "Communication Systems", McGraw Hill Kogakusha,• 1986.
- Sbanmugam K. Sam, "Digital and Analog Communication Systems", John Wiley& Sons,1997.

EC 1503 - MICROPROCESSOR THEORY (3-1-0)

Introduction to 8-bit Microprocessor &16 bit Microprocessor

8-bit Microprocessor:

Internal architecture in details, pin description, flags, Instruction set, Addressing mode, testing and running of simple programmes using Debug/MASM assembler, interrupts and related instructions, Programs on - 8-bit addition, 16-bit addition, data transfer.

16 —bit Microprocessor

Introduction to 16 — bit processor (8086) - architecture details, flags, addressing modes, interrupts, programming.

Interfacing (With8bit,16bit processors)

Data transfer schemes; Memory interfacing RAM; ROM & Address decoding; Input Output interfacing -parallel 110; Serial I/O, Keyboard and display interfacing, 1/0 mapped (mapped 1/0, DMA concepts (using 8255, 8254, 8251, 8237, 8259 etc.), application programmes**.**

Microcontroller

8051/8751architecture programming modes, internal RAM/ROM, registers, 1/0 ports, interrupt system insertion set typical application. Advanced Microprocessor; Introduction to Intel * 86 processors; Pentium I, II, III of Motorola 68 xxx processors.

Suggested Text Books and References

- Hall, D, V, "Microprocessor. and Interlacing "Tata McGraw Hill (2^{nd} edition)
- Brey," The Intel Microprocessor" Prentice Hall OF India (4^{TH} edition).
- Rafiquek kuzzman, v, "Microprocessor and Application."

EC 1504 - AUTOMATIC CONTROL SYSTEMS (3-1-0)

The control problem, open and closed loops, Illustrative examples. Mathematical equations and transfer function; Basic components and their models: Block diagram, Signal flow graph analysis; Multivariable systems and transfer function matrix.

Transient and Steady State Response

Test inputs; First, second and higher order systems, Static and dynamic error coefficient, Transient response and performance specifications,

Basic Control Actions

Proportional, Derivative and Integral control, Tachogenerator feedback.

Root locus Technique

Introduction, general rules for construction of root loci, root locus analysis,. Roof contours,

Frequency Response

Polar plot Nyquist diagram; Bode diagrams, gain magnitude -phase shift plot, closed loop frequency response, frequency domain specifications.

Compensation Design

Concept of compensation, Design of lag and lead networks both in the s-plane and in the frequency

State Space Methods

Introduction to state variable formulation and its solution.

Suggested Text Books & **References**

- Ogata. K., "Modern Control Engineering", Prentice Hall ofIndiaPvt.Ltd.,1998.
- Gopal, M., "Control Systems: Principle and Design", Tata McGraw
- Hi11,1990 T Kuo, B.C., "Automatic Control Systems", Prentice Hall of India Pvt Ltd.; 1990.

PRACTICAL / **DRAWING / DESIGN**

EC 1505-P - Electronic Instrumentation Lab. (0-0-3)

List of Experiments:

- Study of Electronic type voltmeters.
- Measurement of Capacitance using:
    - Maxwell's bridge
    - Hay's bridge
    - Anderson's bridge
- Transducer interfacing.
- IEEE 488 interface
- Study of computer controlled instrumentation

EC 1506 - P - Communication Systems **(0-0-3)**

List of experiments:

- Study of Amplitude Modulated Transmitter and Receiver.
- Study of Frequency Modulation.
- Study of **SSB** Suppressed Carrier (SSB-SC).
- Study of **PAM/PWM/PPM** Modulator and Demodulator.
- Study of Delta Modulator.

EC 1507-P - Microprocessor Theory Lab. (0-0-3)

List of experiments:

- A Program to add: Two 8-bit numbers and Two 16-bit numbers
- A Program to find the smallest number in a data array.
- A Program to find multiplication of two 8-bit numbers.
- A Program to find a square root of a number.
- Program and verification of Speed control of stepper motor.
- Program and verification of Seven-segment display.

EC1508 P - Automatic Control Systems Lab. (0-0-3)

List of experiments:

- Conversion of angular displacement corresponding to voltage by synchros
- Study of open loop and closed_loop system
- Study of P, PI and PID controllers
- Find the stability of second order system by Bode — plot / root — locus techniques
- Study the techniques (Led and Lag compensation) for improving the stability of second order systems

HS1505; P GENERAL PROFICIENCY —V **(0-0-0)**

SEMESTER - VI

EC 1601 — INDUSTRIAL ELECTRONICS (2-1-0)

Thyrestor characteristics, Two-Transistor Model of Thyristor, thyristor Turn-On di /dt Protection, dv/dt Thyristor Turn-On, Series Operation of Thyristor, Parallel Operation of Thyristors, Snubber reverse Recovery Transients.

Thyristor Commutation Techniques

Natural Commutation, Forced Commutation, Self Commutation, Impulse Commutation; resonant pulse commutation, complementary commutation, External Pulse commutation, Load side commutation, line side commutation.

Controlled rectifiers

Introduction, principle of phase controlled converter operation, Single phase semi Converters, single phase dual converters, single phase series converters, three phase half wave converters, three phase semi converters, three phase full converters, three phase dual converters.

AC Voltage Controllers

Introduction, principle of on-off control; principle of phase control, single-phase didirectional kontrbllers with resistive loads, single phase controllers with Inductive loads. Three phase half wave controllers,

Three phase full wave controllers, three phase bi-directional delta connected controllers, singe phase transformer tap changers, cycloconverters, single phase cycloconverters, three phase cycloconverters, reduction of output harmonics.

DC Choppers

Introduction, principle of step-down operation, Step-down choppers with RL Load principle of step-up operation, performance parameters, switch-mode regulators, thyristor, chopper circuits' Impulse communicated choppers, Effects of source and load inductance, Impulse-commutated three thyristor choppers, resonant pulse choppers.

Inverters

Introduction, principle of operation, performance parameters, single phase bridge Inverters, three phase inverters, voltage control of three phase inverter, Harmonic Reductions.

Suggested Text Booys & References

- Rasid , "Power Electronics", Prentice Hall.
- Sen, P.C., "Power Electronics", Wiley eastern.
- Dubey. G.K., 'Theimistor Engineering", Prentice Hall

EC 1602 — ADVANCED SOLID STATE DEVICES (2-1-0)

Resonant c-dc converters: Analysis, design equations, control techniques and application, SMPS (forward, fly back, and push-pull configurations), current controlled PWM inverters —SPWM, advanced modulation techniques (bang-bang and space vector modulation techniques etc.) Resonant voltage source inverters-operation, control, and design. Intelligent power Electronic Modules (IPEC), Non-drive applications of inverters; Ups, induction heating, metal cutting, active power line conditioning. Drive applications: Scalar, vector and direct torque control of ac drives, self-controlled synchronous motor drive-constant power factor and constant margin angle control. Modem application case studies of power Electronics and drives.

EC 1603 — ADVANCED ELECTRIC CIRCUITS (3-1-0)

Introduction to Networks and Layered Architecture. OSI model. Data Communication Concepts. Transmission media Topology, Multiplexing. Circuit switching & packet switching Data Link Layer. Layer 2 switches and ATM, SONET/SDH. Medium Access Control. CSMA CD, TDMA. FDMA, COMA. Network Layer and address version 4 and 6. Routing Algorithms. Transmission Layer, TCP and UDP. Congestion Control Technique. ATM. Internetworking. Wireless communications. Network Management and security.

Suggested text books and references

- Black, "computer networks".
- Schwartz, "Communication network".
- Stevens, "UNIX Network Programming".
- Dugglas, "TCP/IP and internetworking".

EC 1604 - COMMUNICATION HARDWARE DESIGN (3-1-0)

Amplitude Modulation & Demodulation AM, DSB-SC, SSB and VSB signals; Low level AM using diodes, transistors, ICs; High level modulators Class B and Class C, ring modulators and balanced modulators; Generation of SSB signal using frequency discrimination and phase discrimination; Envelope detectors and coherent detectors; Square Law Detectors; Costas receiver, Squaring loop.

Frequency Modulation and Demodulation

NBFM and WBFM, Reactance modulator, Varactor modulator; Modulators using voltage controlled oscillators and function generators; Armstrong modulator, slope detector, ratio detector, Foster-Seeley discriminator.

Receivers

Motivation and principles of super-heterodyne receivers, sensitivity, selectivity and image frequency rejection; Sub-systems of a communication receiver; Receiver evaluation and measurements.

Amplifier and Mixers

Amplifier design using admittance parameters; Broad banding techniques; mixers using diodes; transistors, IC; Multipliers.

Phase locked loops and Frequency Synthesizers

Linear model of PLL, phase detectors, voltage controlled oscillators, loop filters, FM demodulation using PLL; PLL Applications: Digital PLL; Steady state, stability and transient analysis of PLL, Direct frequency synthesis, PLL as a Frequency synthesizer, Direct Digital Synthesis.

Introduction to Electronic Switching

Single stage, two stage networks; Non blocking networks, Networks with concentrators, switching centres, store program control, Distributed SPC, CPU based exchange, switching Hierarchy and Routing

Introduction to Television

interlaced scanning, luminance and chrominance signals, composite video signal, Television Transmitters.

Suggested Text Books & References

- Smith, Jack, "Modem Communication Circuits", McGraw Hill, 1986.,
- Clarke, K.K. and Hess, D. I. "Communication Circuits: Analysis & Design", Addison Wesley Publishing Co., 1971.
- Kennedy, George, "Electronic Communication Systems", 3rd Ed., McGraw Hill, 1984,
- Gulati, R.R., 'Monochrome and Colour Television", Wiley Eastern Ltd,, 1986, Grinsec, "Electronic Switching", Elsevier Science Publishers, 1983.

EC 1605 - MICROWAVE ENGINEERING (3-1-0)

Microwave tubes:
UHF and microwave frequency limitations of a conventional tubes, Cavity resonator (single & two-cavity) Analysis and operation of klystron amplifier, Two- cavity klystron amplifier, reflex klystron oscillator, Travelling wave tube, Backward wave oscillator, GUNN oscillator, Magnetron oscillator, avalanche diode oscillator, Transferred electron oscillator.

Microwave components:
Tees, E-plane tee, H- plane tee, Magic tee, two-hole directional coupler, isolators, linear & rotary phase shifters, Microwave variable attenuators, Matched loads.
Microwave Integrated circuits - strip line, microstrip line, slotted line, microstrip antenna.
Ferrite devices — property, faraday rotation in isolators, faraday rotation in two & four — port circulator.
Scattering Matrix representation and its properties.

Microwave devices:
Basic principal of- IMPATT diode, GUNN diode, PIN diode, Tunnel diode.

Suggested Text books &References

- Liao, "Microwave Devices and Circuits" Prentice hall of India.
- Reich, "Microwave Principles" CBS.
- Kulkami, "Microwave and Radar Engineering",
- Watson, "Microwave Semiconductor Devices and their Circuit applications", McGraw Hill

EC 1606 — COMMUNICATION SYSTEMS —II (3-1-0)

Baseband Pulse Transmission

Matched filter, inter-symbol Interference, Eye pattern, Nyquist's criterion for Distortionless Baseband Binary Transmission, Correlative level coding (Partial response signalling) and line coding; Adaptive Equalization, Clock recovery schemes.

Ba nd pass Digital Transmission

BPSK, QF'SK, MSK, PDSK, FSK, OOK and QAM techniques, Carrier recovery schemes.

Performance of Continuous Wave and Digital Modulation Schemes in Noise

White noise, Narrow band noise, Noise Analysis of AM, DSB-SC and SSB using coherent detection, Noise Analysis of AM using envelope detection, Noise analysis of FM, Threshold effect in FM, Pre emphasis and de-emphasis in FM. Quantization noise, Noise considerations in PCM, Probability of Error, Analysis for the above digital modulation techniques.

Noise Sources and Characterizations

Shot noise, thermal noise, Available noise power Available power gain of a two port network, noise figure Noise Bandwidth, Noise Temperature, Noise Figure measurement, System noise calculations

Information Theory

Entropy and information rate of a discrete memory less source, entropy of a Markov source, Source coding Theorem, Huffman coding, Mutual information and channel capacity, capacity with additive white Gaussian noise.

Error Control Coding

Channel coding Theorem, Linear block codes and syndrome decoding, Cyclic codes, Introduction to convolution codes and Viterbi algorithm.

Suggested Text books &References

- Simon, Haykin, "Communication Systems", 3rd Ed., John Wiley & Sons, 1997.
- Simon, Haykin, "Communication Systems", 2nd Ed., John Wiley & Sons, 1996.
- Taub and Schilling, "Principles of Comrmwicalion Systems", Tata MGraw Hill, 1998.
- Lathi, "Analog and Digital Communication Systems", 2nd ed., John Wiley & Sons, 1993.
- Bruce CarlsOn, A., "Communication Systems", McGraw Hill Kogakuslla, 1986.
- Sam Shanmugam, K., "Digital and Analog Communication Systems", John Wiley & Sons, 1997.

PRACTICAL / DRAWING / DESIGN

EC1607-P - Communication Systems Lab-II (0-0-3)

List of experiments:

- IF amplifier using Transistors
- AmplitudeModulator using transistors and demodulation by envelope detection
- IC based Balanced Modulator and Demodulator
- Frequency Modulators using 8038 and 566
- Capture range & Lock range measurement of a PLL
- Frequency demodulation using PLL
- IC based Sample and Hold
- Pulse Width Modulator
- Delta Modulator using D-Flip Flop
- IF Amplifier using IC 3018
- Frequency Synthesizer using PLL

EC **1608 -P - Microwave Engineering Lab (0-0-3)**

List of experiments

- Study of Microwave Bench and its components and instruments.
- Measurement of Klystron characteristics.
- Measurement of VSWR and Standing wave ratio
- Study Measurement of dielectric constants.
- Measurement of directivity and coupling coefficient of a Directional coupler.
- Determination of attenuation constant of an Attenuator.
- Determination of phase shift of a Phase shifter.
- Measurement of Q of a cavity.

EC 1609-P — Advanced Electric circuits Lab. (0-0-3)

- Simulation Experiments for protocol performance,
- Configuring, testing and measuring Network devices and parameters/policies;
- Network management experiments;
- Exercises in Network programming;

EC 1610 - **P Communication Hardware Design Lab. (0-0-3)**

- Study of SSB, DSB modulators
- Study of Square law detectors
- Design of superhetrodyne receiver
- Study of EN modulation using PLL and its application
- Study of EN modulation using PLL and its application
- Design of FM communication system

HS 1606-P GENERAL PROFICIENCY-IV (0-0-0)

SEMESTER - VII

EC 1701 - OPTICAL COMMUNICATION (2-1-0)

Optical Transmission Medium

Fibere-step index; graded index; single mode, multimode; Dispersion and attenuation in fibre; Splicing -techniques, Atmosphere & Free space as medium.

Optical Sources and Amplifiers

Light Emitting Diode, Semiconductor lasers, fiber lasers, semiconductor optical amplifiers.

Optical Detectors

Si, Ge, GaAs, Detection Characteristics; Avalanche Photodiode, PIN photodiode.

Modulation and Demodulation

Internal and external modulation, Electro-optic effect, accousto-optic effect, PCM, PCM/PL, Digital PPM, PRM, PFM; Direct detection, integrated and trans-impedance amplifier; Coherent receivers - Homodyne and Heterodyne. Phase Locked Loops,

Noise Sources

Phase noise, Polatisation fluctuation noise, AM noise, Shot noise in photodiode, Thevmal noise, ASE noise in optical amplifier..

Applications

Optical WDM, CDM and TDM networks and switching, SDH/SONET, Optical ATM.

Suggested Text books &References

- Keiser, G., "Optical Fiber Communications", 2nd Ed., McGraw Hill, 1991.
- Agrawal, G.P., "Optical COnimunication Systems", John Wiley, 1992.
- Yariv, A., "Optical Electronics", Saunders College Publishing, 1991.
- Gowar, J., "Optical Gommunication Systems", Prentice Hall of India, 1998.

EC 1702 - DIGITAL SIGNAL PROCESSING (2-1-0)

Introduction: Limitations of analog signal processing, Advantages of digital signal processing.

Discrete Time Characterization of Signals & **Systems**

Some elementary discrete time sequences and systems; Concepts of stability, causality; linearity, time invariance and memory; Linear time invariant systems and their properties; Linear constant coefficient difference equations.

Frequency Domain Representation of Discrete Time Signal and Systems

Complex exponentials as eighteen functions of LTI systems; Fourier Transform of sequences. Fourier transform theorems and symmetry properties of Fourier Transform

Sampling of Continuous Time Signals

Frequency Domain Representation of Uniform sampling Reconstruction of a continuous time signal from its sample; Discrete Time Processing of Continuous time signals and vice,-versa; Decimation & Interpolation; Changing the sampling rate by integer and non integer factors using discrete time processing.

The Z transform

Limitations of the Fourier Transform; Z-TransfornOtegion of convergence; Properties of the Z-transform; Inverse transform using contour integration; Complex convolution theorem; Parseval's relation; Unilateral Z-transform and its application to difference equations with non zero initial conditions.

Discrete Fouiier Transform

DFT and its properties; Linear, Periodic and Circular convolution; Linear Filtering Methods based on DFT; Filtering of long data sequences; Fast Fourier Transform algorithm using decimation in time and decimation in frequency techniques; Linear filtering approaches to computation of DFT.

Transform Analysis of LTI systems

Frequency response of LTI systems, System functions for systems characterized by linear constant coefficient difference equations, Relationship between magnitude and phase; All pass systems, Minimum phase systems.

Structure for Discrete Time Systems

Signal flow graph representation, Transposed forms, Lattice structure

Design of Digital Filters

Linear Phase FIR filters; FIR differentiators and Hilbert Transformers; HR filter design by Impulse Invariance, Bilinear Transformation; Matched Z-Transformation, Frequency transformations in the Analog and Digital Domain.

Finite Precisien Effects

Fixed point and Floating point representations, Effects of coefficient quantization. Effects of Roundoff noise in digital filters, Limit cycles.

Digital Signal Processors

Architecture and various features of TMS/ADSP series of digital signal processors; Instruction set and few applications of TMS 320 CXX

Suggested Text books &References

- Oppenheim, A.v. & Schafer,R.W., "Discrete Time Signal Processing", Prentice Hall, 1989.
- Proakis.J.G.& Manolakis.. D.G., ': Digital Signal Pmcessing", Prentice Hall, 1992.

EC 1703 - MICRO ELECTRONIC DEVICES AND VLSI TECHNOLOGY (3-1-0)

Basic Device Technology

Single crystal growth and purification, epitaxy, oxidation, diffusion, ion implantation and pn junction formation; semiconductor measurements.

Integrated Circuit Fabrication Process

Monolithic, hybrid, thin film and thick film technology; pattern generation and photo mask fabrication, photolithography, isolation technique, metallization, interconnection; encapsulation and testing.

Monolithic Circuit Components

Epitaxial diffused system, diffused collector process, triple diffused process, bipolar transistor formation; diode formation, basic diode connections of IC transistors, diode as capacitor, thin film capacitor; sheet resistance; diffused resistor, thin film resistor, parasitics in integrated circuits; layout considerations.

MOS Technology

MOSFET as basic IC component, comparison of MOSFET with BJT as IC component, MOS isolation techniques, poly-silicon gate technology, self aligned gate technology; NMOS process sequence, NMOS inverter, pass transistor and gates; N-tub, P-tub and twin-tub CMOS structures; CMOS-process sequence.

VLSI Technology

Scaling theory and device miniaturization, E beam masks, plasma etching, choice of photo resists; stick, stick diagram, VLSI design rules and layout diagrams, computer aids. VLSI **Circuit Concepts**

Inverter delays, driving large capacitive loads, propagation delays and effect of wiring capacitances; pull **up and** pull clown ratios of NMOS and CMOS inverter, alternative forms of pull up, NMOS and CMOS inverter transfer characteristics, CMOS **gates.**

Suggested Text books &References

- Warner, Jr. M., (Ed.), "Integrated Circuits-Design Principles And Fabrication",McGraw Hill Book Company, New York, 1965.
- Veronis, A., "Integrated Circuits Fabrication Technology", Reston Publishing Company Inc., Virginia, 1979.
- Allison, "Electronic Integrated Circuits-Their Technology and Design, McGraw Hill Book Company, 1975.
- Szc (Ed.), "VLSI Technology", McGraw Hill Book Company, USA, 1983.
- Mead and Conway, L.A., "IntroducLion to VLSI Systems", Addison Wesley, USA, 1980.

OPEN ELECTIVE —1 (3-1-0)

PROFESSIONAL ELECTIVE — 1 (3-1-0)

PRACTICAL / DRAWING / DESIGN

EC 1704 -P - Optical Communication Lab. (0-0-3)

List of experiments:

- Splicing technique of optical fiber.
- Study of PIN photodiode and its application.
- Study of Fiber LASER, Semiconductor LASER.
- Study of Hetrodyne and Homodyne receiver.
- Study of Optical ATM.

EC 1705 -P - Digital Signal Processing Lab. (0-0-3)

List of experiments:

- To plot the frequency response of low pass filter using Kaiser Window.
- To generate a tringular wave using fourier series.
- To design a Butterworth Low Pass Filter for given specifications.
- Generation of Unit Step, Exponential and Sinusoidal sequence on MATLAB.
- To compute the DFT of a sequence and plot magnitude and phase response.

CS 1712-P - Computer Networking Lab. (0-0-3)

- Simulation Experiments for protocol performance,
- Configuring, testing and measuring Network devices and parameters/policies;
- Network management experiments;
- Exercises in Network programming.

EC 1706-P — Project-I. (0-0-3)

HS 1707 — P GENERAL PROFICIENCY— VII (0-0-0)

SEMESTER - VIII

OPEN ELECTIVE —II

PROFESSIONAL ELECTIVE -II

PROFESSIONAL ELECTIVE – III

EC 1801 - DIGITAL HARDWARE DESIGN (3-1-0)

IEEE Logic symbol: Mixed logic representation: review of POS and SOP minimization: multi output function: variable entered mapping: CAD tools for minimizing functions of mote than six variables: ED-CR canonic forms and minimization.

Iterative arrays — time and space iteration: examples of arithmetic and code conversion circuits: Wired logic: practical consideration — fan in, fan — out and delay: partitioning functions. Sequential Machines: Mealy and Moore machines:_Counter_design examples: State reduction and next state decoders: Multimode counters: Shift register sequencers: timing and triggering: Clock skew.

System controllers: functional partition and flow diagram development: state specification; state assignment and next sated decoder: output decoders: use of MSI decoders, multiplexer ROMs and PLAs in system controllers: Programmable controllers — use of shift registers and counters: Controllers with fixed and variable instruction seats: Control sequencers: RTL description of simple machines: design from RTL descriptions.

Interfacing with microprocessors: Using custom PLAs and ROMs for interfacing: Displays: Floppy disk storage:

Asynchronous and synchronous serial data communication.

Asynchronous machines-analysis and design: races and hazards.

Suggested Text books &References

- Fletcher, W.I., "An Engineering Approach to Digital Design", Prantice Hall of India (1990)
- Hall D.V., "Micropcocessors & Interfacing", Tata McGraw Hill 1986.
- Hill, F.J. & Peterson, G.R., "Dgital Logic & Microprocessors", Wiley 1984.

EC 1802 — **SATELLITE COMMUNICATION** **(3-1-0)**

Introduction

Origin and brief history of satellite communication; Elements of a satellite communication link; Current status of satellite communication.

Orbital Mechanism and Launching of satellite

Equation of orbit, describing the orbit, locating the satellite in the orbit, locating the satellite with respect to earth, orbital elements, look angle determination, Elevation and Azimuth calculation, Geostationary and other orbits, orbital perturbations, orbit determination, Mechanics of launching a synchronous satellite, selecting a launch vehicle.

Space craft

Satellite subsystems, Altitude and orbit control system (AOCS), Telemetry, Tracking and Command (TT & C), Communication systems, Transponders, Spacecraft antennas, Frequency re-use antennas.

Satellite Channel and Link Design

Basic transmission theory, noise temperature, calculation of system noise temperature, noise figure, GiT: ratio of earth stations, design of down links and uplinks using C/N ratio. FM improvement factor for multichannel signals, Link Design for FDM/FM, TV signals and Digital Signals.

Multiple Access Techniques

Frequency Division Multiple Access (FDMA), FDM/FM/FDMA, Time Division Multiple Access, Frame structure and Synchronization, Code Division Multiple Access, Random Access.

Earth Station Technology

Earth station design, basic antenna theory, antenna noise temperature; Tracking; Design of small earth station antennas, low noise amplifiers; High power amplifiers, FDM and TDM systems. **Operational Satellites**

INTELSAT, INMARSAT and 1NSAT systems, Applications of INSAT, Satellite Television Receivers, Direct Broadcast Satellites, Direct Reception system for television and other applications.

Suggested Text books &References

- Pratt, T & Bostian",-C.W., "Satellite Telecommunication", John Wiley & Sons, 1986.
- Roddy, D., "Satellite Communication", Prentice Hall, 1989.

Note: *The Institutions can frame Syllabi of E-ofCss;cnal Electives and Open electives to be offered by them in the particular area.*

PRACTICAL / DRAWING / DESIGN

EC 1803 - P PROJECT –II **(0-0-12)**

HS 1808 - P GENERAL PROFICIENCY – VIII **(0-0-0)**