CURRICULUM

FOR

BACHELOR OF TECHNOLGY IN "ELECTRONICS & COMMUNICATION ENGINEERING"

SRI SAI UNIVERSITY PALAMPUR (H.P.) INDIA

JULY 2017

CONTENTS

Foreword

Sri Sai University Palampur Himachal Pradesh has been established with a purpose of empowering people. The Vision and Mission of the university are:-

- **Vision**

To provide quality education for developing all round personality of students through curricular, co- curricular and extracurricular activities to meet ever growing manpower requirements of industry and other sectors of economy as per national priorities.

- **Mission**

a. To establish institutions for imparting quality education.
b. To promote creative and innovative research and development.
c. To ensure quality education by periodic review of curricula through industry- institute interaction.
d. To make efforts for updating knowledge of faculty/ staff through quality improvement programmes (Training and retraining)
e. To promote employability through development of requisite competency skills.
f. To work for cause of weaker sections, physically challenged and women welfare through education and enlightenment.
g. To make life healthier, better and modern by inculcating in students Indian values/ heritage.
h. To bring about out a holistic development of society by educating individuals.

At present programmes in Civil Engineering, Electrical Engineering, Mechanical Engineering, Electronics & Communication Engineering and Computer Science Engineering are being run here to develop manpower having global perspective, faith in our Indian values and culture and competencies desired for profession. In order to keep curriculum relevant and up to date, the University created a position of 'Director Curriculum Development' supported by Board of Studies of different discipline. The objective of this is to make teachers and students to become active partners in design of curriculum and instruction.

Director, Curriculum Development has involved Vice Chancellor, Executive Director and senior faculty members of SSU Palampur and Engineering & Technology Colleges at Pathankot and Amritsar in the revision of curriculum . This has created awareness and importance of systematic curriculum design seminar of various programmes and role expected from all the stake holders.

This curriculum has been designed by taking into account incorporating the existing programmes as being run at SSU Palampur and referring to courses of Punjab Technical University, Jalandhar; various IITs; VIT Vellore; Jamia Milia Islamabad New Delhi; PEC University of technology, Chandigarh and innovations undertaken by NITTTR Chandigarh in curriculum design. Hope this Curriculum will bring desired results.

Dr Naresh Nagpal
Executive Director
Sri Sai Group of Institutes
Corporate office, Chandigarh.

PREFACE

Curriculum is a plan comprising of learning experiences; to be given to students for developing competencies as desired by the 'world of work' in their professional life. Curriculum for SSU programmes has been designed with active involvement of the faculty and other stake holders. This process of designing the curriculum was a unique learning experience for all those involved in the process and understands the meaning and importance of scientific and systematic design of curriculum. A group of teachers provided feedback to the coordinator to up to date Curriculum. This group also scanned employment opportunities and job skills expected from an engineering graduate for inclusion in the curriculum, so as to make it relevant. This resulted in developing in the faculty a sense of ownership due to their involvement in the process.

The steps followed in the design of Curriculum of the degree programme were:

I. Discussions of Director, Curriculum Development with Chancellor, Vice Chancellor and Executive Director regarding their views on their Vision and Mission of the University vis a vis constraints of programme as well as expectations of Director, Curriculum Development.

II. Orientation programme for senior faculty of SSU to educate them about a rational approach to Curriculum design and to know about their experience of implementing the existing curriculum.

III. Interaction with the faculty from various Institutions to know their view point on their specific discipline, areas of employment, profile of an engineer and curriculum etc.

IV. Analyze the guidelines given by AICTE. ABET and NBA for programme accreditation so as to adhere to the norms and standards for Curriculum of Engineering Degree programmes.

V. Analysis of syllabus and test questions of engineering services examination to ensure that designed curriculum include most of the broad areas and their levels of expectations from fresh graduates.

VI. SSU faculty prepared Horizontal and Vertical organization of subjects of curriculum and learnt about taking decision on various components of Curriculum and their articulation and importance in terms of time. They also understood the logical and chronological placement of subjects in the whole Curriculum.

VII. A workshop was organized at SSCET Pathankot for having understanding of the common features of the programmes; present syllabus being followed at SSU, difference between PTU Curriculum and SSU curriculum and innovation possible in implementation of curriculum.

VIII. Feedback was collected from coordinators of SSU programmes on the aspects given in VII so as to incorporate these in Curriculum document.

IX. Obtain opinion of experts from industry and academic on the proposed curriculum for degree programme in different discipline of Engineering.

X. The curriculum documents were subsequently validated and finalized in consultation with SSU Faculty.

Curriculum provides requisite experiences to students through formal, nonformal and informal activities towards development of occupational, personal, social and continuing learning skills for

making students employable. Focus of teachers and students is all the time to active the objective and outcome of the programme stated in the document. Students are made responsible for their learning and teachers become facilitators in this process.

During the design of the curriculum, the constraints of resources of the system in which this curriculum has to be implemented have been considered. It is hoped that with the support of enlightened administration and motivated faculty, innovative methodology will be adopted in teaching-learning process for providing desired learning experiences to the students as stated in curriculum documents.

1. SALIENT FEATURES OF THE PROGRAMME

1. Name of the programme	:B. Tech in Electronics and Communication Engineering	
2. Duration of the programme:	:	4years
3. Entry Qualification	:	12+ Physics, Chemistry and Mathematics
4. Pattern of Programme	:	Semester system (8 Semesters)
5. Duration of the Semester	:	16 weeks
6. Total hours per week:	:	29 to 34 hours
7. Ecological and Environmental Awareness Camp and follow up	:	Second Semester (2-3) days
8. Entrepreneurship Development Camp and follow up	:	Fifth Semester (2-3)days
9. Industrial Training		*Workshop Practice of 4 weeks during summer vacation after second semester. It will also include Industrial exposure/tour also. • Industrial Training of Six weeks duration in summer vacation after fourth semester • Industrial Training of six months during seventh / eighth semester.
10. Student centered activity S.C.A will include	:	*library study/ independent study for searching and organization Information for use. • Library study • Market survey • Information search (industry/ in trust) • Seminar • Expert lectures • Camp for ecology & Environmental awareness, entrepreneurship development and personality development.

2. JOB OPPORTUNITY FOR B. TECH IN ELECTRONICS AND COMMUNICATION ENGINEERING

- **SCOPE FOR EMPLOYMENT**

Industries involving wireless communication and signal processing, micro and nano electronics lasers and optics, electronics devices, telecommunications, nanotechnology, robotics information systems, power systems, computer software-hardware integration, control systems and other advanced technologies.

Placement in leading core communication companies like BSNL, MTNL, Reliance communication, Tata telecom, Vodafone, Bharti telecom, Airtel, Nokia, CISCO, IBM, Intel ,Agilent, Alcatel, AT&T, Ericsson, Honeywell, Bosch, National Instruments, Texas Instruments, HCL, and others.

Employment in Government sector such as Railway, Defence, information and Broadcasting sector, space Research. A large number of employment opportunities

3. OUTCOME OF THE PROGRAMME

The Graduates of the ECE program:

- Will have a solid foundation in Electronics and communication engineering.
- Will have the analytical and practical skills to solve engineering problems along with competencies to apply knowledge in Mathematics and Science.
- Will have professional and communication skills to function as leaders and members of multi-disciplinary teams in engineering and other industries.
- Will have the capacity and motivation to function as ethically responsible professionals.
- Will be equipped to undertake lifelong learning.
- Will be prepared to ensure leadership role in addressing some of the technical issues of society.

4 STUDY AND EVALUATION SCHEME
(FIRST TO EIGHTH SEMESTER)

FIRST SEMESTER

Course Code	Course Title	Lecture Hours	Tutorial Hours	Practical Hours	L	T	P	Credits
MA101	Mathematics I	4	0	0	4	--	--	4
ES101	Basic Electrical Engineering	3	1	0	3	1	--	4
PH101	Physics	4	0	0	4	--	--	4
CS122	Fundamentals of Computer programming and IT	3	0	0	3	0	--	3
ES103	Basic of Mechanical Engineering	3	1	0	3	1	0	4
TA102	Engineering Drawings and Graphics	1	0	4	1	0	2	3
PH101	Physics Laboratory	0	0	2	--	--	1	1
ES101	Basic Electrical Engineering laboratory	0	0	2	--	--	1	1
CS122	Fundamentals of Computer Programming and IT laboratory	0	0	2	--	--	1	1
	Student Centered Activity	0	0	2	--	--	--	0
	Total	18	2	12	18	2	5	25

SECOND SEMESTER

Course Code	Course Title	Lecture Hours	Tutorial Hours	Practical Hours	L	T	P	Credits
MA102	Mathematics II	4	0	0	4	--	--	4
CH101	Chemistry	3	1	0	3	1	--	4
EC140	Basic Electronics Engineering	3	0	0	3	--	--	3
HU001	Communication Skill	3	0	0	3	0	--	3
CE038	Basics of civil engineering	4	0	0	4	--	--	4
ME141	Workshop Practice/ Manufacturing Practice	1	0	6	1	0	3	4
CH101	Chemistry Laboratory	0	0	2	--	--	1	1
HU001	Communication Laboratory	0	0	2	--	--	1	1
EC140	Electronics Engineering Laboratory	0	0	2	--	--	1	1
	Student Centered Activity	0	0	2	--	--	--	0
	Total	18	1	14	18	1	6	25

- **Workshop training of two to four weeks after second semester is to be conducted.**

THIRD SEMESTER

Course Code	Course Title	Lecture Hours	Tutorial Hours	Practical Hours	L	T	P	Credits
EC149	Transform Theory	4	0	0	4	--	--	4
EC101	Analog Electronics	3	0	0	3	--	--	3
EC102	Digital Electronics	3	1	0	3	1	--	4
EC103	Electronic Measurements & Instrumentation	3	0	0	3	--	--	3
EC104	Microprocessor and its Peripherals	3	0	0	3	0	--	3
EC105	Network Analysis & Synthesis	3	1	0	3	1	--	4
EC101	Analog Electronics Laboratory	0	0	2	--	--	1	1
EC102	Digital Electronics LABORATORY	0	0	2	--	--	1	1
EC103	Electronic measurements and Instrumentation Lab	0	0	2	--	--	1	1
EC104	Microprocessor and its peripherals laboratory	0	0	2	--	--	1	1
ME143	Workshop Training (Viva)	0	0	0	--	--	--	2
	Student Centered Activity	0	0	2	--	--	--	0
	Total	19	2	10	19	2	4	27

FOURTH SEMESTER

Course Code	Course Title	Lecture Hours	Tutorial Hours	Practical Hours	L	T	P	Credits
EC106	Analog Communication System	4	0	0	4	--	--	4
EN001	Environmental Science	3	0	0	3	--	--	3
EC108	Electromagnetic field theory	3	2	0	3	1	--	4
EC109	Linear Integrated Circuits	3	0	0	3	--	--	3
EC110	Signals & System	3	2	0	3	1	--	4
MA105	Numerical & statistical Methods	4	0	0	4	--	--	4
EC106	Analog Communication Laboratory	0	0	2	--	--	1	1
EC109	Linear integrated circuit Laboratory	0	0	2	--	--	1	1
	Student Centered Activity	0	0	2	--	--	--	0
	Total	20	4	6	20	2	2	24

FIFTH SEMESTER

Course Code	Course Title	Lecture Hours	Tutorial Hours	Practical Hours	L	T	P	Credits
EC113	Linear Control System	3	2	0	3	1	--	4
CA006	Object Oriented Programming using C++	3	0	0	3	--	--	3
EC111	Antenna and wave propagation	3	0	0	3	--	--	3
EC115	Pulse, Digital and switching circuits	3	0	0	3	--	--	3
EC112	Digital Communication system	3	2	0	3	1	--	4
	Elective I	3	0	0	3	--	--	3
EC113	Linear Control System Lab	0	0	2	--	--	1	1
CA006	Object Oriented Programming using C++ laboratory	0	0	2	--	--	1	1
EC112	Digital Communication System Lab	0	0	2	--	--	1	1
EC143	Industrial Training(Viva)	0	0	0	--	--	--	4
	Student centered Activity	0	0	2	--	--	--	0
	Total	18	4	8	18	2	3	27

ELECTIVE I

Bio Medical Engineering **EC124**

Image Processing **EC125**

Satellite Communication **EC142**

SIXTH SEMESTER

Course Code	Course Title	Lecture Hours	Tutorial Hours	Practical Hours	L	T	P	Credits
EC150	Microelectronics	3	2	0	3	1	--	4
EC117	Digital Signal Processing	3	2	0	3	1	--	4
EC114	Microcontrollers & Embedded System	3	0	0	3	--	--	3
EC151	Analog and Digital VLSI Design	3	0	0	3	--	--	3
CA013	Computer Networks	3	0	0	3	--	--	3
EC120	Industrial electronics	3	0	0	3	--	--	3
EC117	Digital signal processing using MAT LAB	0	0	2	--	--	1	1
EC114	Micro Controller & Embedded System Laboratory	0	0	2	--	--	1	1
EC120	Industrial Electronics Laboratory	0	0	2	--	--	1	1
	Student centered Activity	0	0	2	--	--	--	0
	Total	18	4	8	18	2	3	23

SEVENTH SEMESTER

Course Code	Course Title	Lecture Hours	Tutorial Hours	Practical Hours	L	T	P	Credits
EC123	VHDL	3	0	0	3	--	--	3
EC119	Optical Fiber Communication	3	2	0	3	1	--	4
EC122	Microwave Radar and Engineering	3	2	0	3	1	--	4
	Elective II	3	0	0	3	--	--	3
HU010	Principle of Business, Economics and Management	3	0	0	3	--	--	3
EC122	Microwave Radar and Engineering Laboratory	0	0	2	--	--	1	1
EC123	VHDL Laboratory	0	0	2	--	--	1	1
	Student centered Activity	0	0	2	--	--	--	0
	General Fitness	0	0	0	--	--	--	4
	Total	15	4	10	15	2	2	23

ELECTIVE II

- Television Engineering **EC137**
- Wireless Communication **EC134**
- Database Management system **CA006**
- Neural Network and Fuzzy logic **EC131**
- Advanced Microprocessor **EC148**

EIGHTH SEMESTER

Course Code	Course Title	Credits
EC144	Industrial Training	20
EC146	Major Project	4
	Total	24

5. DETAILED CONTENT OF VARIOUS SUBJECTS

A. FIRST SEMESTER

1.1 MATHEMATICS-I

Unit1. Infinite Series:

Basic idea of sequence and series, Convergence and divergence of infinite series, Geometric series test, Comparison tests, p-test, Ratio test, Root test, Raabe's test, Logarithmic test, Gauss test (All tests without proof), Alternating series, Power series, Radius of convergence, Interval of convergence.

Unit2. Differential Calculus:

Partial derivatives, Homogeneous function, Euler's theorem, Chain rule, Change of variables, Partial differentiation of implicit function.

Unit3. Maximum and Minimum Values of Function:

Taylor series of two variables, Maximum and minimum values of function of two variables, Jacobin, Error and increment, Asymptotes, Curve tracing.

Unit4. Integral Calculus:

Rectification, Quadrature, Order of integration, Change of variables, Area and volume by double and triple integral.

Unit5. Vector Calculus:

Differentiation of vector, Scalar and vector field, Gradient of scalar field, Directional derivatives, Divergence, Curl of vector field, Integration of vector, Line, surface and volume integral, Applications of Stokes theorem, Divergence theorem, Green's theorem (Theorems without proof).

Books:

1. Advanced Engineering Mathematics, R.K. Jain and S.R.K.Iyengar, Narosa Publication.
2. Higher Engineering Mathematics, B.S. Grewal, Khanna Publication.
3. Higher Engineering Mathematics, N.P.Bali,Laxmi Publication.

1.2 BASIC ELECTRICAL ENGINEERING

Introduction: Basic electrical quantities, Electric circuit sources and circuit elements and their behavior (Active and passive).

Supply Systems: AC Supply system (Single phase, three phase–three wire, Three phase–four wire), DC supply system, Their specifications and Comparison. D.C. Networks: Mesh and Nodal Analysis, Star–Delta Transformation, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Step voltage response of RL and RC series circuits.

Sinusoidal Steady-State Response of Circuits: Generation of A.C. sinusoidal voltage and currents, average and r.m.s. values, Form factor and peak factor Concept of Phasors, Phasor representation of circuit elements, Complex notation representation, Series and parallel circuits, Power and power factors, Resonance in series and parallel circuits, Balanced 3–phase voltage, Current and power relations, 3–phase power measurement.

Magnetic Circuits: Faradays Laws, Lenz's Law, Fleming's Rules, Statically and dynamically induced EMF; Concepts of self-inductance, mutual inductance and coefficient of coupling; Energy stored in magnetic fields, B–H curve, Calculation of Magnetic Circuits, Iron Losses.

Single–Phase Transformers: Constructional feature, EMF equation, Ideal transformer, Open and short circuit tests, Voltage regulation and efficiency.

DC Machines: Working principle of DC machine as a generator and a motor; Types and constructional features; EMF equation of generator, DC motor working principle; Back EMF and its significance, torque equation; Types of D.C. motors, characteristics and applications.

Three Phase Induction Motors: Principle of operation, types and constructional features; Slip and its significance; Applications of squirrel cage and slip ring motors, Single phase induction motor.

Synchronous Generator: Principle of operation; Types and constructional features; EMF equation

Books:-

1. Smith, I.M., Hiley, J. and Brown, K., Electrical and Electronic Technology, Dorling Kingsley.
2. Nagrath, I.J. and Kothari, D.P., Basic Electrical Engineering, TMH
3. Naidu, M.S. and Kamashaiah, S., Introduction to Electrical Engineering, TMH
4. Chakrabarti, A., Basic Electrical Engineering, TMH
5. Del Toro, V., Electrical Engineering Fundamentals, PHI, Sawhney A. K . "A Course in electrical and electronic Measurements & Instumentation" Dhanpat Rai & co

1.3 PHYSICS

MODULE I: LASER: Basic concept of Laser, maser, principle of Laser action Population Conversion pumping its types its types, Types of Laser, Solid, gas and liquid, Semiconductor and its application. Holography & its applications. **Optical Fibers:-** Basic Principle of Optical fibre, characteristic of Optical fibre, Numerical aperture, graded Index, Step Index, its relation with Δ, propagation of light in Optical fibre, energy loss during propagations (dispersion), optical communication, through free space, wave guide, its applications.

MODULE –II: Special Theory of relativity: Postulates of special theory of relativity, Michelson Morley Experiment, Lorentz Transformation, Length Contraction, Time dilation, addition velocity Relativity of mass Energy equivalence. **Quantum Mechanics:** Need and origin of quantum concept, Wave-particle duality, Matter waves, Group & Phase velocities, Uncertainty Principle, Significance & normalization of wave function, Schrodinger wave equation: time independent & dependent, Eigen functions & Eigen values, particle in a box. **Nanophysics:** Nanoscale, surface to volume ratio, electron confinement, nanoparticles (1D, 2D, 3D), Nanomaterials, Unusual properties of nanomaterials, synthesis of nanomaterials- ball milling and sol-gel techniques, Carbon nanotubes (synthesis and properties), applications of nanomaterials.

MODULE –III: Superconductivity & Magnetism: Basic ideas of Dia, Para, Ferro & Ferri, Ferrites, Magnetic Anisotropy, Magnetostriction, Superconductivity, Superconductors as ideal diamagnetic materials, Signatures of Superconducting state, Meissner Effect, Type I & Type II superconductors, London Equations, Introduction to BCS theory. **Electro Magnetism:** Physical significance of Gradient, Divergence & Curl, Relationship between Electric Field & Potential, Dielectric polarization, displacement Current, Types of polarization, Maxwell‟s Equations, Equation of EM waves in free space, velocity of EM waves, Poynting vector, Electromagnetic Spectrum (Basic ideas of different region).

Books:-

1. Beiser, A., Concept of Modern Physics, TMH
2. Griffiths, D.J., Introduction to Electrodynamics, PHI
3. Kittel, C., Introduction to Solid State Physics, Wiley,
4. Thyagarajan K & A K Ghatak, Lasers, Macmillan India Ltd. Banglore.
5. Gerd Keiser Optical Fiber Communication, TMH
6. Arora C.L. Practical Physics, S. Chand & Co.

1.4 FUNDAMENTAL OF COMPUTER PROGRAMMING & IT

Introduction: Elements of computer processing, Hardware and software, Introduction and feature wise comparison of various Operating Systems, Including DOS, Windows and Linux, Problem solving-algorithms and flowcharts.

C Programming Basics: Basic program construction, Structure of a C program, Compilation process. Various compilers available on different OS/ environments including Turbo C, Borland C, gc, gcc, MSVC. Console I/O (printf, scanf), preprocessor directives, Comments, Data types, Type conversions, Operators - arithmetic, Relational, Logical, Conditional, Increment/decrement, Library functions, Header files.

Loops and Decision Statements: *for* loop, *while* loop, *do* loop, Various forms of *if* statement, *switch* statement, *break* statement, *continue* statement, *goto* statement, arrays and strings, Declaring an array, Initializing arrays, Accessing the array elements, Working with multidimensional arrays, Declaring and initializing string variables, Arithmetic operations on characters, String handling functions (string.h), Pointers, Pointers to pointers, Declaring and initializing pointers, Pointer expressions, Pointer increment and scale factor, Pointers and arrays, Pointers and strings.

Functions: Defining functions, Passing arguments to functions, Returning values from functions, Reference arguments, Variables and storage classes, Static functions, Pointers and functions.

Structures and Union: Declaring and initializing a structure, Accessing the members of a structure, Nested structures, Array of structures, Using structures in functions, Pointers and structures, Declaring and initializing a union.

Files: Reading and writing to text and binary files, Character I/O, String I/O, File pointers, Error handling, Redirection, Command line arguments.

Structured Programming vs. Object Oriented Programming.

Books:

1. KernighanBrian W. and Ritchie, Dennis M, The C Programming language, Dorling Kingsley(2008) 2nd ed.
2. Balagurusamy, E., Programming in Ansi C, TMH.
3. Stroustrup, Bjarne, The C++ Programming Language,. Addison Wesley
4. Kanetkar, Yashavant, Let Us C, BPB

1.5 BASICS OF MECHANICAL ENGINEERING

Unit1. Thermodynamics: Heat, work and Internal Energy, Thermodynamic State, Process, Cycle, Thermodynamic System, First Law of Thermodynamics, Application of First Law to steady Flow and Non Flow processes, Limitations of First Law, PMM of first kind (Numerical Treatment), Second Law of Thermodynamics – Statements, Carnot Engine and Carnot Refrigerator, PMM of Second Kind, concept of enthalpy and entropy.

Unit2. Gas Laws & Gas Processes: Carnot, Joule, Otto Cycle, Properties at salient points, Air Standard efficiency (Numerical treatment on gas processes and Carnot, Otto cycles only).**Introduction to IC Engine:** Two stroke, Four Stroke Cycles, Construction and Working of C.I. and S.I. Engines, Air-Fuel ratio, (Descriptive Treatment only)

Unit3. Introduction to Refrigeration and Air Conditioning: Vapour compression and vapour absorption system, Psychometric properties of moist air. (Descriptive Treatment only), **Energy Sources**: Renewable and nonrenewable, solar flat plate collector, concentric collector – Parabolic and cylindrical, Photo voltaic cell, Solar energy application solar dryer, Solar pond, solar distillation, Solar refrigeration, Solar cooker, Wind, Geothermal, Wave, Tidal, Hydro power, Bio-gas, Bio-Diesel, Fuel cell, (Descriptive Treatment Only)

Unit4. Steam Generation: formation of steam, sensible head, latent heat, Layout of steam power plant (Descriptive Treatment only), **Introduction to Fluid Mechanics:** Fluid, properties of fluid, viscosity, Newton's law of viscosity, surface tension, types of fluid, buoyancy.

Unit5. Mechanical Power Transmission: Type of Belt and belt drives, chain drive, Types of gears and gear Trains, Types of Coupling (Numerical Treatment on velocity ratio of belt drive and gear drive),Pumps, compressor and Hydraulic Turbines: Types, Construction, working and applications

Books:-

1. Nag, P.K., "Engineering Thermodynamics", Tata McGraw – Hill, New Delhi.
2. Yadav, R., Thermal Science and Engineering, Central Publishing House, Allahabad.
3. G.H.Ryder "Strength of Materials" Macmillan India.
4. Mechanics of Materials – Dr. Kirpal Singh, Standard Publishers Distributors, New Delhi.

1.6 ENGINEERING DRAWING AND GRAPHICS

Unit1. Introduction:

Use of drafting tools, Lettering, Dimensions and Standards, Line Conventions. **Points, Lines and Planes:** Projection of Points, Lines and Planes: Concept of horizontal and vertical planes. First and third angle projections: projections of point and lines, true length of lines and their horizontal and vertical traces, projection of planes and their traces. Auxiliary planes.

Unit2. Projections of Solids:

Prisms, Pyramids, Cylinders and Cones, in simple positions only. **Sectioning of Solids:** Principal of sanctioning, types of sanctioning and their practice on projection of solids, sectioning by auxiliary planes

Unit3. Development of Surfaces:

Development of surfaces like Prism, Pyramid, Cylinder, Cone, Sphere etc.

Unit4. Orthographic Projections:

Extracting Orthographic projections from given pictorial views.

Unit5. Isometric Views:

Extracting Isometric projections from given Orthographic views

Books:-

1. Gill, P.S., Engineering Drawing - Geometrical Drawings, S.K. Kataria.
2. Bhatt, N.D. and Panchal, V.M., Engineering Drawing: Plane and Solid Geometry, Charotar Publishing House.

1.7 PHYSICS LABORATORY

List of Experiments

1. To find the frequency of A.C. mains using Electric Vibrator.
2. To determine the resistivity & Hall coefficient of a Semi-Conductor by four probe method at different temperature.
3. To study the variation of magnetic field of a circular coil Carrying current I & Calculate the radius of coil.
4. To study the divergence of a Laser beam.
5. To determine the wave length of Laser using diffraction grating.
6. Determine the numerical aperture of an optical fiber.
7. To determine attenuation and propagation Lasses in optical fiber.
8. Making up the hologram using advanced Laser hit.
9. To find the susceptibility of ferro magnetic material (Fecl3) by quince Method.
10. To study Laser interference using Michelson Morley Interferometer
11. To study the photovoltaic cell & hence to verify the inverse square law.
12. To convert a galvanometer into an ammeter of a given range.
13. To find the value of plank's constant by using a photo electric cell.
14. To find the Low resistance by Carry Foster's Bridge.

1.8 BASIC ELECTRICAL LABORATORY

List of Experiments

1. To verify KCL and KVL.

2. TO study frequency response of series RLC circuit and determine resonance frequency and factor for various values of R,L,C

3. TO study frequency response of parallel RLC circuit and determine resonance frequency and factor for various values of R,L,C

4. To perform direct load test of transformer and plot efficiency v/s load characteristics.

5. To perform direct load test of the DC shunt generator and plot load v/s current curve.

6. To study and verify Thevenins, Norton's, superposition, Milliman's, maximum power, reciprocity theorems.

7. To perform O.C and S.C test of transformer.

8. to study various types of meters

9. Measurement of power by 3 voltmeter/ 3 ammeter method.

10. Measurement of power in 3-phase system by 2-wattmeter

1.9 FUNDAMENTALS OF COMPUTER PROGRAMMING & IT LABORTAORY

LABORATORY WORK

Introduction to Hardware - CPU, Storage devices & media, VDU, I/O Devices.Basic Operating System (DOS/UNIX) commands. Simple programs to demonstrate the use of constants, Variables, printf, scanf and operators. Programs using Loops: Solution of quadratic equation, Summation of finite series, Fibonacci series, Prime numbers, Factorial. Menu driven programs using switch statement. Use of continue and break statements, Conditional operators. Passing variables to functions by values and by reference, Number conversion using array, Sorting, Merging, Arithmetic operations on matrices. String manipulation: Comparing, Copying, Reversing , Finding length, Extracting characters. Simple programs demonstrating the concept of Pointers, Passing values to functions using pointers for arrays, Structures. Creating various types of records using structures. Storing and retrieving records from a file, Copying a data file. Randomly accessing a record, Use of command line arguments.

B. SECOND SEMESTER

2.1 MATHMETICS-II

Unit1. Linear Algebra:

Rank of a matrix, Echelon form of a matrix, Normal rank, Rank of product of two matrices, Eigen values and eigen vector, Cayley hamilton theorem, Diagonalization, Linear transformation, Quadratic form and reduction to canonical form.

Unit2. Function of Complex Variable:

Complex number, Complex matrices, De-Movire's theorem and its application, Analytic function, Harmonic functions, Necessary and sufficient condition for a function to be analytic, Complex integrations, Cauchy's integral theorem, Cauchy's integral formula, Cauchy's integral formula for derivatives (all theorems without proof) Taylor's and Laurent's series, Zero's & singularities of complex function, Evaluation of real integral using residues.

Unit3. Ordinary Differential Equation:

Formation of differential equation, Exact differential equation, Equation of first order and higher degree, Clairut's equation, Linear differential equation, Bernoulli's equation,

Unit4. Methods to Solve Ordinary Differential Equation:

Linear differential equation with constant coefficient,Method of variation of parameter, Method of undetermined coefficient, Cauchy and Legendre equation, Simultaneous differential equation.

Unit5. Partial Differential Equations:

Partial differential equations of first order, Lagrange's solution, Partial differential equations of second and higher orders.

Books:

1. Advanced Engineering Mathematics,R.K. Jain and S.R.K.Iyengar, Narosa Publication.
2. Higher Engineering Mathematics, B.S. Grewal, Khanna Publishers.
3. Higher Engineering Mathematics, N.P.Bali, Laxmi Publication.

2.2 CHEMISTRY

MODULE I:

BASIC CONCEPTS AND WATER TECHNOLOGY: Atomic number, valancy, molecular weight, equivalent weight, morality, normality, how to write a molecular formula. Water: Structure of water, water as solvent, characteristic properties of water Sources of water, Specifications for water, BOD, COD and DO, Hardness and its determination (EDTA method only), Sewage treatment, Purification of municipal water, Water softening processes – Lime – Soda process, Ion exchange method, boiler feed water, boiler problems-scale, sludge, priming and foaming, caustic mbitterment and boiler corrosion, their causes and prevention, carbonate and phosphate conditioning, colloidal conditioning, calgon treatment, Desalination of water: Reverse osmosis, electro dialysis and multiple effect evaporation. Numerical problems of hardness and Lime-Soda process. **CORROSION SCIENCE:** Definition, cause, types and mechanism of corrosion, factors influencing corrosion protective measures against corrosion, metal finishing like electroplating of Au and Cr and electrolessplating of Ni on Al and also preparation of printed circuit board by electrolessplating. **NON- METALLIC ENGINEERING MATERIAL** (i) Cement : Chemical constitution of Portland cement, functions of different constituents. Theories of the setting of cement. (ii) Abrasives: Introduction, types of abrasives and applications.

MODULE II:

PHOTOCHEMISTRY: Difference between thermo chemical and photochemical reaction., Lambert and beer laws , quantum yield, classification of photochemical reaction, kinetics of some photochemical reaction, Jablonski' s diagram, mechanism of photosensitization, LASER and MASER. **FUELS AND LUBRICANTS:** Fuels: Definition, characteristics of good fuel, calorific value: gross and net calorific values and their determination by bomb calorimeter, Classification of fuels: primary and secondary fuels. **Lubricants:** Introduction, friction and wear, Lubricants, mechanism of Lubrications, base oils, additives, greases and emulsions, Lubricants :Types of lubrication, fluid film lubrication, boundary lubrication and extreme pressure lubrication. Function of lubricants .Classification of lubricants, solid, semisolid, liquid, emulsions, synthetic lubricants. Conditions for using different types of lubricants. Properties of lubricants.

MODULE III:

Liquid Crystal: Classification of liquid crystals, chemical constitution and liquid crystalline behavior in PAA and MBBA, liquid crystal homologous series, molecular ordering in nematic, smectic and columnar type liquid crystals, identification of liquid crystals using optical microscopy, electro optic properties of liquid crystals, polymorphism in thermotropic liquid crystal and application of liquid crystals.

High Polymers: Definition, classification of polymers, types of polymerization, methods of polymerization, glass transition temp., structure of polymers, plastics, synthesis, properties and applications of few commercial thermoplastic and thermosetting polymers, techniques of plastic moulding, elastomers, adhesive, compounding of resins and plastics, conducting polymers and conduction mechanism in polyacetylene.

Nano-materials: Introduction to nano-materials, Graphite, fullerenes, carbon nanotubes, nanowires, nanocones, Haeckelites. Their electronic and mechanical properties .. Production methods for CNTS. .. Applications of nano materials in i) Medicine ii) Catalysis iii) Environmental Technologies iv) Electronics v) echanics.

Books:-

1. Shashi Chawla "Engg. Chemistry"
2. Vasant Gowarikar "Polymer Chemistry"
3. Bandyopadhyay A.K., "Nano Materials" ,New age International Publisher
4. Palanna "Engg. Chemistry" TMH
5. Misra, G.S., Introductory Polymer Chemistry, New Age International (1993).

2.3 BASIC ELECTRONICS ENGINEERING

SEMI-CONDUCTORS AND DIODES: Introduction, Insulators, semiconductors and metals, Mobility and conductivity, Intrinsic and extrinsic semiconductors, Charge density, current components in semiconductors, Continuity equation, PN junction diode- Characteristics and analysis, Types of diodes- Zener, Photodiodes, LED, Varactor diode, tunnel diodes.

DIODE APPLICATIONS: Rectifiers and filter circuit: Half wave rectifier, Full wave rectifier, bridge rectifier and their analysis, L,C and Pi filters, Series and shunt diode clippers, Clipping at two independent levels, Clamping operation , Clamping circuit, Practical clamping circuits, Basic regulator supply using zener diode.

TRANSISTORS: Construction and characteristics of BJT, Transistor configuration: CB, CE, CC configuration, Transistor at low frequency, Small signal low frequency transistor model(h-parameters), Analysis of transistor amplifier using h-parameters, Transistor biasing and bias stabilization: Operating point, Stability factor, Analysis of fixed bias, collector to base bias, Emitter resistance bias circuit and self- bias circuit, Bias compensation techniques.

FIELD EFFECT TRANSISTOR: Construction and characteristics of JFET, JFET biasing circuit, JFET amplifier, MOSFET construction and characteristics.

AMPLIFIERS AND OSCILLATORS: Classification of amplifiers, concept of feedback, Characteristics of feedback amplifiers, Single stage RC coupled amplifier, Oscillators, Criterion for oscillation, Types of oscillators: Hartley oscillator, Colpitt oscillator, RC-phase shift oscillator, Wein bridge oscillator.

OPERATIONAL AMPLIFIERS: Introduction, inverting and non-inverting configuration, Applications of op-amp: Adder, subtractor, Integrator, Differentiator, Comparator and practical op-amps.

Books:

1. Integrated devices & Circuits by Millman & Halkias.
2. Electronics Devices and Circuit Theory by R. Boylestad.
3. Electronics Devices and Circuits-II by A.P.Godre & U.A. Bakshi.
4. Electronics Devices and Circuit by G.K. Mithal.

2.4 COMMUNICATION SKILLS

MODULE-I: The Process of Communication: Concept and process of communication; Barriers to Communication; Different Types of Communication; Written vs. Oral Communication; Different Types of Face-to-Face Interactions; Characteristics and Conventions of Conversation; Difference between Conversation and Other Speech Events; Telephone Techniques: Warm Up; Speaking and Listening: Commonly Used Phrases in Telephone Conversations; Reading: Conference Calls; Vocabulary; Writing and Listening: Leaving a Message; Grammar and Usage- The Perfect Tenses; Pronunciation- Contracted Forms. Job Applications and Interviews: Curriculum Vitae; Language Focus; Some Useful Words; Preparing for an Interview; Listening and speaking in the interview

MODULE-II: Group Discussions: How to be Successful in a Group Discussion; Study Skills; Language Focus; Speaking; Case discussions. Managing Organizational Structure: The Role of a Manager; Leadership; Language Focus; Writing Reports; Pronunciation. Meetings: A Successful Meeting; Speaking: One to One Meetings; Language Focus: Opening, Middle and Close; Editing; Criteria for Successful Meetings; Reporting Verbs; Memos

MODULE-III: Taking Notes and Preparing Minutes: Taking Notes- The Essential Components, Preparing Minutes- Format of Minutes, Language and Style of Minutes, Grammar. **Presentation Skills** : Presentation Skills; Importance of Body Language in Presentations; pronunciation; Structure of presentation; Visual Aids; Ending the presentation; Podium Panic Pronunciation: Emphasizing the Important Words in Context. **Technical Report Writing**: Format of the report and guidelines for a good report writing with illustrations of good writing. **Phonetics :**The organs of speech;The Respiratory System,The Phonatory System,The Articulatory System,Active and Passive Articulators. **Practice Sessions**: Students should be asked to prepare and present seminars during the practice session. Group discussions and case discussions should also be used and feedback given to students.

Books:

1. The Chicago Manual of Style, PHI
2. Gowers, Ernest, "The Complete Words". Penguin, 1973.
3. IEEE Transactions on "Written and Oral Communications" has many papers of relevance.

2.5 BASIC OF CIVIL ENGINEERING

Unit1. **Introduction to Civil Engineering:** Introduction, branches of civil engineering, application of civil engineering in other allied fields.

Unit2. Building Planning: Principle of planning, orientation of buildings, introduction to Bye-Laws regarding building line, height of building, open space requirements, F.S.I., setbacks, ventilation, sanitation as per municipal corporation area requirement.

Unit3. Components of Building: Sub-structure: Types of soil and rocks as foundation strata, concept of bearing capacity, types of foundation i.e. shallow and deep and their suitability. Shallow foundation such as wall foundation, isolated foundation, deep foundation such as pile foundation.

Super-structure: Elements of super-structures and their functions.

Unit4. Building Design: Introduction to types of loads, concepts of strength, stability, durability and factor of safety of building, load bearing and framed structures.

Unit5. Building Materials : Use and properties of the following materials : Concrete – ingredients and grades, plain and reinforced cement concrete and ready mix concrete, bricks, steel, aluminum, plastic, timber, roofing materials etc.

Unit6. Surveying : Principles of surveying, Classification of surveys, Chain Surveying, introduction to metric chain and tapes, error in chaining, nominal, scale and R.F., ranging, chaining and offsetting, index plan, location, sketch and recording of field book, Chain and compass survey, Meridian, bearing and its types, system of bearing, Types of compass : prismatic and surveyor's compass, Calculation of included angles, correction for local attraction.

Unit7. Levelling : Terms used in leveling, use of Dumpy level, temporary adjustments, Methods of reduction of levels, types of leveling, Contours, characteristics of contours, use of contour maps, Introduction to Auto level and use, Introduction and use of EDM's with special reference to Total Station. Measurement of area by planimeter – mechanical and digital.

Unit8. Transportation Engineering: Types of roads: introduction to NH, SH, MDR, ODR, VR, Express Way, Cross section of road – in cutting and filling, Railway – Gauges, Cross-section of railway track.

Books:

1. Gupta, Sushil Kumar, DR and Juneja BM;"A Text Book of Building Construction";Ludhiana, Katson Publishing House
2. Arora, SP and Bindra, SP; "A Text Book of Building Construction"; New Delhi Dhanpt Rai and Sons,
3. Sushil Kumar; "Building Construction"; Standard Publishers Distribution, Delhi
4. Peurifoy, RL, "Construction Planning, Equipment and Methods" Tokyo, McGraw Hill
5. Wakhlo, ON :Civil Engineering Management", New Delhi Light and Life Publishers

2.6 WORKSHOP PRACTICE/MANUFACTURING PRACTICE

1. **CARPENTRY AND PATTERN MAKING :** Various types of timber and practice boards, defects in timber, seasoning of wood; tools, wood operation and various joints; exercises involving use of important carpentry tools to practice various operations and making joints.

2. **FOUNDRY SHOP:** Introduction to molding materials; molds; use of cores; melting furnaces; tools and equipment used in foundry shops; firing of a cupola furnace; exercises involving preparation of small sand molds and castings.

3. **FORGING PRACTICE:** Introduction to forging tools; equipment and operations; forgability of metals; exercises on simple smithy; forging exercises.

4. **MACHINE SHOP:** machines, grinders, etc; cutting tools and operations; exercises involving awareness.

5. **WELDING SHOP:** Introduction to different welding methods; welding equipment; electrodes; welding joints; welding defects; exercises involving use of gas/electric arc welding.

6. **ELECTRICAL & ELECTRONICS SHOP:** Introduction to electrical wiring; preparation of PCBs involving soldering applied to electrical and electronic applications; exercises preparation of PCBs involving soldering applied to electrical and electronic applications.

7. **SHEET METAL:** Shop development of surfaces of various objects; sheet metal forming and joining operations, joints, soldering and brazing; exercises involving use of sheet metal forming operations for small joints.

8. **FITTING SHOP:** Introduction of fitting practice and tools used in fitting shop; exercise involving marking, cutting, fitting practice (Right Angles), male- Female mating parts practice, trapping practice.

Books:

1. Raghuwanshi, B.S. ; A course in Workshop technology, Vol 1 & II, Dhanpat Rai & Sons , New Delhi.

2. Jain, R.K. ; Production Technology, Khanna Publishers, New Delhi.

3. Singh, S, ; Manufacturing Practice, S.K. Kataria & Sons, New Delhi

2.7 CHEMISTRY LABORATORY

List of Experiments:-

1. Preparation and standardization of solutions: NaOH, HCl, H_2SO_4 and Oxalic acid
2. To determine the hardness of water sample by EDTA method. (ALL)
3. To determine the acidity of water sample.
4. To determine the amount of residual chlorine in water sample.
5. To determine the total cation conc. In natural water sample using ion exchange resin.
6. To determine COD of a effluent sample.
7. Estimation of rate of corrosion of aluminium in acidic and basic medium.
8. Calorimetric determination of Copper.
9. Verification of Beer's law
10. To determine the surface tension of a liquid using drop no. method.
11. To determine the viscosity of the given liquid by Redwood viscometer.
12. To determine the acid value of the given oil.
13. To determine flash point and fire point of a lubricating oil
14. To determine the mol. Wt. Of polystyrene by viscosity measurements.
15. To determine melting point and/or glass transition temperature of a polymer.
16. .To prepare the pure and dry sample of Urea Formaldehyde resin.
17. To prepare the copper ammonia complex
18. Preparation of nano-oxide using combustion method
19. .Estimation of moisture and ash content in a given sample of coal.

2.8 COMMUNICATION LABORATORY

Teacher should give following Assignments to students to develop skills of communicating effectively:

- communication cycle(with the help of Diagram)
- Communication Situation (List of 5 Communication situation stating the type of communication.
- Barriers that hinder a particular communication situation.(state the type of barrier, and how to overcome them)
- Developing a story or a paragraph for the given tiopic sentence (in a group of 5-6 students)
- Describing various equipments.
- Identifying the various sentences with their types of writing(e.g. Scientific , legal, colloquial etc.)
- Business letters
- Letters of suggestion
- Comparative Time Table of 2 students
- Description of two different person.
- Letter to the Librarian, Principal
- Report writing.

2.9 BASIC ELECTRONICS LABORATORY

List of Experiments:

1. To study the use and scope of using an oscilloscope as a measuring device in an electronic laboratory.

2. To study the use and scope of using a multimeter (digital and analog) as a measuring device in an electronics laboratory.

3. To study the use and scope of function generator as a signal source in an electronics laboratory.

4. Draw forward bias and reverse bias VI characteristics of a p-n junction diode.

5. Draw the characteristics of a zener diode.

6. To study and plot waveform of half wave rectifier with and without filter circuits.

7. To study and plot waveform of full wave rectifier with and without filter circuits.

8. Study Zener diode as voltage Regulator.

9. Draw characteristics of common base configuration of p-n-p transistor.

10. Draw characteristics of common emitter configuration of an npn transistor.

11. Draw characteristics of common drain configuration of a MOSFET.

C. THIRD SEMESTER

3.1 TRANSFORM THEORY

1. LAPLACE TRANSFORM: Definition, Properties, Evaluation of integrals by Laplace Transform, Inverse Laplace Transform and its Properties, Convolution theorem (statement only), Laplace Transform of Periodic Functions (statement only), Unit Step Function and Unit Impulse Function, Applications of Laplace Transform to solve Ordinary Differential Equations, Simultaneous Differential Equations, Integral Equations & Integral-Differential Equations.

2. FOURIER SERIES & FOURIER TRANSFORM: Periodic functions and their Fourier Expansions, Even and Odd functions, Change of interval, Half Range Expansions. Fourier Transform: Definition and Properties (excluding FFT), Fourier Integral Theorem, Relation with Laplace Transform, Applications of Fourier Transform to Solve Integral Equation.

3. CALCULUS OF VARIATIONS: Functionals, Maxima and minima of functionals, Euler‟s equation(statement only), Functionals dependent on First & Second order derivatives, Isoperimetric Problems, Solution of Boundary Value problems by Rayleigh-Ritz method.

4. FUNCTIONS OF COMPLEX VARIABLE: Analytic function, Cauchy- Riemann Conditions, Harmonic Functions (excluding orthogonal system), Milne-Thomson Method, Cauchy Integral Theorem & Integral Formula (Statement only), Taylor's & Laurent's series (Statement only), Zeros and Singularities of Analytic function, Residue Theorem (Statement only), Contour integration (Evaluation of real definite integral around unit circle and semi-circle).

Books:-

1. Higher Engineering Mathematics by B.S. Grewal, 40th Edition, Khanna Publication.

2. Advanced Engineering Mathematics by Erwin Kreysizig, 8th Edition, Wiley India.

3. Applied Mathematics for Engineers & Physicist by L.R. Pipes and Harville.

4. Calculus of variation by Forrey.

5. A Text Book of applied Mathematics, Volume II, by P.N. Wartikar & J.N. Wartikar, Poona Vidyarthi Griha Prakashan.

6. A text book of Engineering Mathematics by N. P. Bali & M. Goyal, Laxmi Publication.

3.2 ANALOG ELECTRONICS

1. Low Frequency Transistor Amplifier

Equivalent circuit of BJT using h-parameter for CB, CE and CC & configuration, calculation of transistor parameter for CB, CE & CC using h-parameters, comparison of transistor amplifier configuration.

2. Multistage Amplifier

General cascaded system, RC coupled amplifier and its frequency response, merits and demerits, cascade amplifier, Darlington compound configuration, multistage frequency effect.

3. High Frequency Response of Transistor

Amplifier High frequency model for CE configuration, approximate CE high frequency model with resistive load, CE short circuit current gain, HF current gain with resistive load.

4. Large Signal Amplifier

Analysis and design of class A, B, AB, C amplifiers, push pull amplifiers, transformer less output stages, distortion calculations.

5. Tuned Amplifier

General behaviour of tuned amplifiers, resonance-series and parallel resonant circuit, calculations of circuit impedance at resonance. Variation of impedance with frequency, Q-factor of a circuit & coil, Band width of series & parallel resonant circuit, advantages and disadvantages of tuned amplifiers. Single tuned amplifiers, voltage gain & frequency response of single tuned amplifiers, double tuned amplifiers. Analysis & design of class C amplifiers.

6. Feedback Amplifier

Feedback concept, characteristics of negative and positive feedback. Effect of negative and positive feedback on input impedance, output impedance, gain, and noise and frequency response.

7. Oscillators

Classification of Oscillators, frequency and frequency stability of oscillatory circuits, Tuned based Oscillators, Hartley Oscillator, Colpitts Oscillators Clapp Oscillator, Crystal Oscillator, Phase Shift Oscillator, Wein Bridge Oscillator.

Books:

1. Integrated devices & circuits by Millman & Halkias.

2. Electronic Devices & circuit theory by R. Boylestad.

3.3 DIGITAL ELECTRONICS

1. Fundamentals Of Digital and Number System: Digital signal, logic gates: AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR, Boolean algebra. Review of Number systems. Binary codes: BCD, Excess-3, Gray, EBCDIC, ASCII, Error detection and correction codes.

2. Combinational Design Using Gates and MSI Devices: Design using gates like Half & full adder, Half & full subtract , parallel adder, binary adder, Magnitude comparator, Encoder and Decoders, Multiplexers and Demultiplexers, Code converters ,parity generator/checker, Drivers for display devices, Karnaugh map and Quine Mcluskey methods of simplification.

3. Synchronous and Asynchronous Sequential Circuits: Flip Flops : S-R, J-K, T, D, master-slave, Edge triggered and clocked flip-flop, timing and waveforms, Shift Registers, Counters, Design of Synchronous and Asynchronous sequential circuits, Up-down counter, BCD Counter , Modulus counters , Ring counters and Johnson Counter.

4. A/D and D/A Converters: Sample and hold circuit, weighted resistor and R -2 R ladder D/A Converters, specifications for D/A converters. A/D converters : Quantization, parallel -comparator, successive approximation, counting type, dual-slope ADC, specifications of ADCs.

5. Digital Logic Families: Bipolar and Unipolar logic families: RTL, DTL, DCTL, HTL, TTL, ECL, MOS, and CMOS logic families. Tristate logic, Interfacing of CMOS and TTL families, Comparison of logic families.

6. Semiconductor memories and Programmable Logic Devices: Introduction, Memory organisation, Classification and characteristics of memories, Sequential memories, ROMs, R/W memories. Content addressable memories, PLA, PAL, FPGA and CPLDs. Charged-Coupled device memory.

Books:-

1. Taub & Schilling, Digital Integrated Electronics : MGH
2. Jain , R. P, Modern Digital Electronics; TMH
3. Morris Mano; Digital Design : PHI.
4. Floyd, “Digital Fundamentals”, Universal Book Stall.
5. Albert Paul Malvino and Donald P Leach, “Digital principles and applications”,TMH

3.4 ELECTRONICS MEASUREMENT AND INSTRUMENTATION

1. Basic Measurement Concept: Classification of Instruments (Based upon mode of measurement); Absolute and Secondary Instruments, Based upon Principle of Operation, Based upon function –Indicating, Recording and Integrating Instruments); Generalized Instrument (Block diagram and description of various blocks). The three forces in an Electromechanical indicating instrument (Deflecting controlling, deflecting and damping). Measurement systems – Static and dynamic characteristics – units and standards of measurements – error analysis – moving coil, moving iron meters – multimeters – True RMS meters

2. Measurement Of Resistance, Capacitance And Inductance: DC BRIDGES - Limitations of Whetstone bridge; Kelvin's double bridge method AC BRIDGES - General Balance Equation; Circuit diagram; Phasor diagram and Advantages as well as Disadvantages and Applications of Maxwell's inductance; Maxwells Inducance - Capacitance bridge; Hays, Anderson, Ownens; De-Sauty's Schering and Weins bridges.

3. Electronic Measurement : Electronic multimeters – Cathode ray oscilloscopes – block schematic – applications – special oscilloscopes – Q meters – Vector meters – RF voltage and power measurements.

4. Signal Generators And Analyzers : Function generators – RF signal generators – Sweep generators – Frequency synthesizer – wave analyzer – Harmonic distortion analyzer – spectrum analyzer.

5. Digital Instruments : Comparison of analog and digital techniques – digital voltmeter – multimeters – frequency counters – measurement of frequency and time interval – extension of frequency range – measurement errors.

6. Instrumentation : Transducers, classification & selection of transducers, strain gauges, inductive & capacitive transducers, piezoelectric and Hall-effect transducers, thermisters, thermocouples, photo-diodes & photo-transistors, encoder type digital transducers, signal conditioning and telemetry, basic concepts of smart sensors and application. Data Acquisition Systems.

Books:-

1. *Sawhney, A .K., Electrical and Electronic Measurement & Instrumentation: Dhanpat Rai*
2. *Golding , E. D., Electrical Measurements*
3. *Gupta, J.B, Electronic & Electrical Measurement & Instrumentation;, Kataria & Sons*
4. *Cooper , W.D. & A.D. Helfrict , Electronic Instrumentation & Measurement Technique.*

3.5 MICRO-PROCESSOR AND IT'S PERIPHERALS

1. Introduction To Microprocessor: Basic block diagram of microprocessor, Architecture trends of microprocessor, Classification of computers, Evolution of microprocessors, Programming Development Tools (Editor, Debugger, Assembler, etc.).

2. 8-Bit Microprocessor (Intel 8085): Internal Architecture of Intel 8085, Block Diagram, Registers, Internal Bus Organization, Pin Description, Control Signals. Instruction set, classification of instructions, Addressing Modes, Timing Diagrams of 8085. Programs based on Data Transfer, Arithmetic & Logical operations, Code Conversion, Stack & Subroutines, Delay subroutines (with a register and register pair), Interrupt structure.

3. Peripherals And Interfacing With 8085: 8255 Programmable Peripheral Interface, 8253 Programmable Interval Timer, 8257 DMA Controller, 8259 Programmable Interrupt Controller, 8279 Programmable Display Keyboard Controller.8251 LED, 7 – segment display, relay, keyboard, stepper motor, ADC & DAC, Memory interfacing.

4. 16-Bit Microprocessor (Intel 8086): Architecture, Memory addresses space & data organization; Segment Registers & Memory Segmentation, I/O Address space; Addressing Modes. Comparison of 8086 & 8088. Basic 8086/8088 configuration; Minimum mode & Maximum Mode.

Books:-

1. Microprocessor Architecture, Programming and Applications—Gaonkar, WE
2. Microprocessor and Programmed Logic--K.L.Short, PE
3. Fundamentals of Microprocessor & Microprocomputers-- B. Ram, TMH.
4. Microprocessor and Digital System – Dougles Hall- TMH.
5. Intel's Data Manuals.
6. Microprocessor H/W Interfacing and Application – Bray – CBS
7. Microprocessors and Peripherals—B. Venkatramani, TMH.
8. The 8086/8088 family: Design, Programming, and Interfacing by – John Uffenbeck.
9. Ajoy Kumar Ray & Kishor M.Bhurchandi, "Advance Microprocessors & Peripherals" (Architecture, Programming & Interfacing), TMH

3.6 NETWORK ANALYSIS & SYNTHESIS

1. Network Concept And Circuit Element:

Network Graph: Matrices associated with Graphs; Incidence, fundamental cut set and fundamental circuit matrices-Independent and dependent Sources-Signal and Waveforms, Periodic and Singularity voltages , Step , Ramp, Impulse, Doublet,-Nodal and Mesh Analysis-Network Theorems: Superposition theorem, Norton Theorem, Maximum Power Transfer, Reciprocity.

2. Time And Frequency Domain Analysis:

Time and Frequency Domain Analysis of simple RLC circuits (Transient and steady state analysis), Laplace Transform of shifted functions, Time Domain behavior from Pole and Zero, Convolution Theorem and Circular Convolution.

3. Network Synthesis:

Network Functions-Impedance and Admittance function, Driving point and Transfer Function, Relationship b/w Transfer function and Impulse function, Restriction of Poles and Zero location of network functions, Network Function for two terminal pair network-Driving point and Transfer function-State equality for networks- 2 port network parameters, Foster and Cauer Form-Solution of network equation using laplace transform.

4. Filter Synthesis:

Classification of filters-Characteristic Impedance and Propagation constant of pure reactive network – Ladder Network-T section- Pie section, Terminating Half section- Pass Band and Stop Band, Design of constant K, m-derived filter-Composite filter.

Books:-

1. Van Valkenberg, Network Analysis and Synthesis
2. Sudhakar Sham Mohan, Network Analysis and Synthesis
3. Chakarborty, Circuit Theory
4. Franklin F.Kuo , Network Analysis and Synthesis ; JW

3.7 ANALOG ELECTRONICS LABORATORY

1. Study of Half wave, full wave & Bridge rectifiers.
2. Study of simple capacitive, T & π filters
3. Study of Zener regulator.
4. To plot the input and output characteristics of CE configuration.
5. To plot the input and output characteristics of CB configuration.
6. Determination of h- parameters of a transistors using output characteristics.
7. Design of transistor biasing circuits.
8. Study of frequency response of RC coupled amplifier.
9. Study of an emitter follower circuit.
10. To plot JFET characteristics in CS configuration.
11. Study of frequency response of CS- FET amplifier

3.8 DIGITAL ELECTRONICS LABORATORY

LABORATORY EXPERIMENTS:

1. Verification of the truth tables of TTL gates, e.g., 7400, 7402,7404, 7408, 7432, 7486.
2. Design and verification of the truth tables of half adder and full adder circuits using gates 7483.
3. (a) Verification of the truth table of the Multiplexer 74150

   (b) Verification of the truth table of the De-Multiplexer 74154
4. (a) Design and test of an S-R flip-flop using NOR/NAND gates.

   (b) Verify the truth table of a J-K flip-flop (7476)

   (c) Verify the truth table of a D flip-flop (7474) and study its operation in the toggle and asynchronous modes.
5. To design and Verification of the operation of bi-directional shift register.
6. To design and Verification of the operation of 3-bit synchronous counter.
7. To design and Verification of the operation of synchronous UP/DOWN decade counter using J K flip-flops.
8. (a) Verify the truth table of decoder driver 7447 / 7448. Hence operate a 7 segment LED display through a counter using a low frequency clock.

   (b) Repeat the above with the BCD to Decimal decoder 7442 and an array of LEDs,
9. (a) Verify the truth table of converters Gray to BCD.

   (b) Verify the truth table of converters BCD to Gray.
10. Design a 4-bit shift-register and verify its operation. Verify the operation of a ring counter and a Johnson counter.

3.9 ELECTRONIC MEASUREMENT & INSTRUMENTATION LABORATORY

LIST OF EXPERIMENTS

1. To convert & calibrate a D' Arsonnal type galvanometer into a voltmeter & an ammeter.
2. To measure low resistance by Kelvin's double bridge.
3. To measure capacitance by De Sauty's bridge.
4. To measure inductance by maxwell's bridge.
5. To measure frequency by Wien's bridge.
6. To measure frequency, time period of a signal using CRO.
7. To analyze lissegious patterns on CRO.
8. To measure quality of coil using Q-meter.
9. To measure strain factor using strain gauge.
10. Study of LVDT for measurement of displacement.

3.10 MICROPROCESSOR LABORATORY

LABORATORY EXPERIMENTS:

Software Based (Using 8085 And 8086 Instruction Sets)

1. Arithmetic operation on two 8 bit numbers
2. Addition and subtraction of two 16-bit numbers.
3. Operation on two 16-bit BCD numbers.
4. Searching of the smallest and largest element in a block of data.
5. Sorting the elements of a block of data in ascending and descending order.
6. Converting 2 digit numbers to their equivalents. a) BCD to HEX and b) HEX to BCD

Hardware Based (Interfacing With 8085)

1. Program controlled data transfer using 8255 PPI.
2. Interfacing 7 segment LED display using 8255A – in static and dynamic mode.
3. Interfacing keyboard-using 8279.
4. Interfacing display-using 8279.
5. Interfacing ADC 0808/0809.
6. Interfacing DAC 0808.
7. Interfacing stepper motor with microprocessor using 8255.
8. Interfacing of 8253 / 8254.
9. Interfacing of 8251.

D. FOURTH SEMESTER

4.1 ANALOG COMMUNICATION SYSTEM

Base Band Signals and Systems: Introduction, Elements of communication system, Modulation & Demodulation, Mixing; Linear & Nonlinear, need of modulation, types of modulation systems, basic transmission signals.

Analog Modulation Techniques: Introduction, theory of amplitude modulation; AM power calculations, AM current calculations, AM modulation with a complex wave, theory of frequency modulation; mathematical analysis of FM, spectra of FM signals, narrow band of FM, Wide band FM, Theory of phase modulation, phase modulation obtained from frequency modulation, comparison of AM & FM, Comparison of PM & FM.

AM Transmission: Introduction, generation of Amplitude Modulation, Low level and high level modulation, basic principle of AM generation; square law modulation, Amplitude modulation in amplifier circuits, suppressed carrier AM generation (Balanced Modulator) ring Modulator, Product modulator/balanced Modulator.

AM Reception: Receiver Parameters; Selectivity, Sensitivity, Fidelity, Tuned Ratio Frequency (TRF) Receiver, Super heterodyne Receiver; Basic elements of AM superheterodyne Receiver; RF Amplifier, Neutralization of RF Amplifiers, Class of operation of RF Amplifiers, High power RF Amplifiers, Image Frequency Rejection, Cascade RF Amplifier, methods of increasing Bandwidth, frequency Conversion and Mixers; Additive Mixing, multiplicative mixing, Tracking & Alignment, IF Amplifier, AM detector; square law detector, Envelope or Diode detector, AM detector with AGC, Distortion in diode detectors, AM detector Circuit using Transistor, Double hetro-dyne receiver, AM receiver using a phase locked loop (PLL), AM receiver characteristics.

FM Transmission: FM allocation standards, generation of FM by direct method, varactor diode Modulator, Cross by Direct FM Transmitter, Phase-Locked-Loop Direct FM Transmitter, Indirect generation of FM; Armstrong method, RC phase shift method, Frequency stabilized reactance FM transmitter.

FM Reception: Frequency demodulators, Tuned circuit frequency discriminators; Slope Detector, Balance Slope Detector, Foster Seeley discriminator, Ratio Detector, FM detection using PLL, Zero crossing detector as a Frequency Demodulator, quadrature FM demodulator, pre emphasis and de-emphasis, limiter circuits, FM Capture effect, FM receiver, FM stereo transmission and reception, Two way FM Radio Transmitter and Receiver.

SSB Transmission: Introduction, Single Side band systems, AM-SSB; Full carrier, Suppressed carrier , reduced carrier, Independent side band, and Vestigial side band, Comparison of SSB Transmission to conventional AM, Generation of SSB; Filt-r method, Phase Shift Method, Third Method.

SSB Reception: SSB Product Demodulator, Balanced Modulator as SSB Demodulator, Single Side band receivers; Single side band BFO Receivers, Coherent Single side band BFO Receivers, Single Side band Envelop detection receiver, Multi-Channel Pilot Carrier SSB Receiver.

Pulse Modulation Transmissions and Reception: Introduction, Sampling Theorem Pulse Amplitude Modulation (PAM), Natural PAM Frequency Spectra for PAM , Flat-top PAM, Sample and hold circuits, Time division Multiplexing, PAM Modulator Circuit, Demodulation of PAM Signals, Pulse Time Modulation (PTM); Pulse Width Modulation(PWM), Pulse Position Modulation (PPM), PPM Demodulator.

Books:

1. Wayne Tomasi, "Electronic Communication System Fundamentals through Advance" PE
2. Symon Hykens "Analog Communication Systems" John Wiley & Sons .
3. Taub & Schilling "Principles of Communication System" TMH
4. Roody Coolean "Electronic Communication Systems" PHI

4.2 ENVIRONMENTAL SCIENCE

ENVIRONMENTAL MANAGEMENT, RESOURCES AND LEGISLATION:

Environmental disturbances, quantification of environmental issues, soil resources and their classification, equitable use of resources, natural resource management, food chain and trophic levels, environmental impacts of energy development, legislation.

GLOBAL ATMOSPHERIC CHANGE:

The atmosphere of earth, global temperature, greenhouse effect, radiative forcing of climate change, global warming potential, carbon cycle, carbon emissions from fossil fuels, regional impacts of temperature change, global initiatives.

PHYSICAL, CHEMICAL AND BIOLOGICAL PROCESSES: Particle dispersion, methods of expressing particle concentrations, stoichiometry, chemical equilibria, solubility of gases in water, carbonate system, organic chemistry, nuclear chemistry, nuclear fission and fusion, basic atmospheric properties, fundamentals of microbiology.

POPULATION AND ECONOMIC GROWTH: The nature of human population growth, population parameters, industrialization, urbanization, sustainable development, sustainable consumption, resettlement and rehabilitation issues, health and the environmental impacts.

SOLID AND HAZARDOUS WASTE MANAGEMENT: Integrated solid waste management, hazardous waste management, biomedical waste treatment technologies and disposal options, e-waste management, waste minimization for sustainability, waste management – Indian scenario.

POLLUTION AND MONITORING: Water resources, characteristics of water, water pollutants, oxygen demanding wastes, surface water quality, groundwater quality, water and wastewater treatment systems. Air quality standards, emission standards, criteria pollutants, air pollution and meteorology, atmospheric dispersion, emission controls. Effect of noise on people, rating systems, community noise sources and criteria, traffic noise prediction, noise control.

Books:

1. Mackenzie L. Davis and David A. Cornwell.2010. Introduction to Environmental Engineering, 4e. Tata McGraw-Hill Education Private Limited New Delhi.

2. Gilbert M. Masters.2007. Introduction to Environmental Engineering and Science, 2e. Pearson Education. Dorling Kindersley (India) Pvt. Ltd. Delhi.

3. J. Glynn Henry and Gary W. Heinke.2004. Environmental Science and Engineering, 2e. Pearson Education (Singapore) Pte. Ltd.

4.3 ELECTROMAGNETIC FIELD THEORY

Introduction: Coordinate systems and transformation: Cartesian coordinates, circular cylindrical coordinates, spherical coordinates Vector Analysis: 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.

Static Electric Fields: Coulomb's Law, Gauss's Law, potential function, field due to a continuous distribution of charge, electric flux density, equi-potential surfaces, Gauss's law, electric potential, potential gradient, Gauss's Theorem, Poison's and Laplace's equation, capacitance, boundary conditions, conduction current, Displacement current ,Equation of continuity, Uniqueness theorem.

Steady Magnetic Fields and Time Varying Fields: Magnetostatic fields, Biot-Savart's Law, Forces due to magnetic field, magnetic torque and moment, a magnetic dipole, magnetic boundary conditions,.Faraday Induction law, magnetic flux density, Ampere's circuit law, Inconsistency of Ampere's law , Maxwell's field equations and their interpretation, solution for free space conditions, in point and integral forms , surface impedance ,Poynting's theorem

Electromagnetic waves: EM Waves equations in various forms, EM Waves in a homogeneous medium, propagation of uniform plane-wave, relation between E & H, wave equations for propagation in a lossless medium, conducting medium, good dielectric, good conductor, Depth of penetration, phase and group velocity, skin depth, Polarization. Reflection and refraction of plane waves at the surface of a perfect conductor & perfect dielectric (both normal incidence as well as oblique incidence), Brewester's angle and total internal reflection, reflection at the surfaces of a conductive medium.

Guided Waves and wave Guides: Waves between parallel planes. TE and TM waves and their characteristics.

TEM waves, velocities of propagation, Attenuation in parallel plane guides, wave impedance. Rectangular Wave Guides: Introduction, TE and TM waves in rectangular waveguide, Dominant mode, Impossibility of TEM waves in wave guides, Wave impedance and characteristic impedance, Excitation methods for various modes. Circular Wave Guides: TE and TM waves in circular waveguide-,Wave impedance, Attenuation factor and Q of wave guides, Excitation modes in circular wave guides.

Transmission Line Theory: Transmission line parameters, line equations, input impedance, travelling ,standing waves , characteristic impedance, Reflection coefficient, SVR, VSWR and power, The Smith chart, Impedance matching, Applications of transmission lines.

Books:-

1. Edward C.Jordan and Keith G.Balaman,"Electromagnetic waves and radiating systems", PHI
2. Krauss J.DF , Electro-Magnetics :; MH
3. David.K.Cheng, "Field and wave Electromagnetics",PE
4. W. H. Hayt and J. A. Buck, "Electromagnetic field theory", TMH
5. G.S.N. Raju, "Electromagnetic field theory and transmission lines", PE

4.4 LINEAR INTEGRATED CIRCUITS

Differential Amplifiers:

Introduction, Differential Amplifier and their Circuit Configuration, Dual Input-Balanced output & Unbalanced output Differential Amplifier, Single Input-Balanced output & unbalanced output Differential Amplifier with their DC and AC analysis, Differential Amplifier with swamping resistors, Constant current bias, Current Mirror, Cascaded differential Amplifier , Level Translator, CE-CB configuration.

Operational Amplifiers:

Block diagram of Op-Amp, Schematic symbol, integrated circuits and IC package their types, Pin diagram, Overview of data sheets, Ideal Op-Amp, Equivalent circuit of an Op-Amp, Ideal voltage transfer curve, Open loop configurations: Differential, Inverting & Non Inverting. Close loop configuration: Inverting, non- inverting differential amplifier, unity gain amplifier (voltage follower), sign changer.

Practical Characteristics And Parameters Of Op-Amp:

Input offset voltage, Input offset current, Input bias current, differential input resistance, Input capacitance, Input voltage range, offset voltage adjustment, SVRR, large signal voltage gain, supply voltages, supply current, output voltage swing, output resistance, slew rate, gain bandwidth product, output short circuit current, Temperature and supply voltage sensitive parameters, Noise, Common Mode configuration and CMRR.

Feedback Configurations And Frequency Response In Op-Amps:

Block diagram of feedback configurations, Voltage-series and voltage shunt feedback amplifier, Differential amplifiers with one two and three op-amps. Frequency response, Compensating Networks, Frequency response of Internally compensated and Non compensated Op-amps, Closed loop frequency response, causes of slew rate and its effect on applications

Applications Of Op-Amp:

DC and AC amplifiers, Peaking Amp, Summing, Scaling and Averaging Amp, Instrumentation Amplifier, Log and Antilog Amp, Integrator, Differentiator, Peak Detector, Comparator, Zero crossing detector, Schmitt trigger, window detector, Sample and Hold Circuit.

AS FILTERS:

First order , Second order Low Pass Butterworth filter, First order, Second order High Pass Butterworth filter, Band pass filter, Band reject filters, All pass filter, Phase shift oscillator, Wein bridge oscillator, Quadrature oscillator, Square wave, Triangular wave, Saw tooth wave generator, Voltage controlled oscillator.

As Converters:

Voltage to current and Current to voltage converter, Voltage to Frequency and Frequency to Voltage converters, ADC and DAC converters,

Special Function Ic's And Their Applications:

Introduction to timer IC 555, Pin configuration, Block diagram, Application of 555 as Monostable and Astable Multivibrator, Block diagram of Phase Lock Loops IC565 , Application of PLL as frequency multiplier, FM demodulator, Fixed voltage regulators, Adjustable voltage regulators, Switching Regulators.

Books:-

1.Gayakwad. Ramakant , Op Amps & Linear Integrated circuits
2. Coughlin,Op Amps & Linear Integrated circuits
3. Dudeja , Op Amps & Linear Integrated circuits

4.5 SIGNAL AND SYSTEM

System and Signal Analysis: Classification of signals and systems, definition and properties of linear transform, signal representation using fourier series, complex exponential fourier series, fourier series representation of periodic signals, periodic signal representation using fourier transform, fourier transform of periodic power signals, power spectral density, system response impulse, step and time domain response analysis, transfer function and frequency Domain analysis effect of Transfer function on spectral densities, Stationary of non-Transients, Linear time invariant (LTI) systems, Signal transmission through LTI systems, Discrete Fourier Transform, Fast Fourier transform (FFT),

Laplace transform: Basic theory of Laplace transforms ,Inverse Laplace transform. application of Laplace transform to solve the initial value problem. Translation theorems. Laplace transform of direct –δ Function and more properties of L-transform, Convolution theorem, Laplace transform of periodic function, Laplace Transform method for the solution of some partial differential equation,

Z transform: Introduction, Basic theory of Z transform, Solution of difference equation using Z transform.

Random Signal Theory: Introduction to probabilities Definition, probability of Random events, Joint and conditional probability, probability Mass function statistical averages, Probability density functions and statistical averages, Examples of P.D. function, transformation of random variables random processes, stationary, true averages and ergodic, Convolution theorem, its graphical interpretation, Relationship between transfer and impulse response, poles and zeros, parallel and cascade structure, frequency response, group delay and phase delay.

Signal Transmission Through Linear Networks: The sampling theorem, Noises: Introduction to thermal noise, shot noise, partial noise, low frequency or flicker, Gaussian Noise, burst noise, avalanche noise bipolar transistor noise, F.E.T. noise, signal to noise ratio, noise factor, Noise temperature, Noise equivalent Bandwidth, Noise figure.

Books:-

1. Simon Haykin ,Communication Signal and Systems
2. Oppenheim and Willsky , Signal and Systems, PE
3. Network Analysis and Synthesis by Sudhakar Sham Mohan
4. Chakarborty, Circuit Theory
5. Robert , M.J Signals and Systems , TMH

4.6 NUMERICAL & STATISTICAL METHOD

Solution of Algebraic and Transcendental Equations

Bisection method, Secant method, Fixed-point iteration method, Newton raphson method and generalized newton's method.

Matrices and Linear System of Equations

Solution of linear equations: Gauss elimination method, Gauss- seidel iterative method, Computation of eigen values and eigen vectors of matrices by using iterative methods.

Interpolation

Forward and backward differences, Symbolic relation, Differences of a polynomial, Newton' forward and backward interpolation formulas, Divided differences, Lagrange's interpolation formula.

Random Variables

Definitions of distribution function, discrete and continuous random variables, Probability functions, Cumulative distributions functions, Mathematical expectation, Probability Distributions: Binomial, Poisson, Normal distribution.

Sampling Distributions

Sampling distribution of mean and variance, Chi-square distribution, t-distribution and F-distribution. Linear Correlation and Regression: Karl pearson's correlation coefficient, Rank correlation, Linear regression, Least square principal and lines of regression (two variables only).

Books:

1. Introductory Methods of Numerical Analysis, S.S. Sastry, PHI Learning Private Limited.
2. Numerical Mathematical Analysis, James D. Scarborough, Oxford and IBH Publishing.
3. Elementary Numerical Analysis, Kendall E. Atkinson, Wiley.
4. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Narosa Publication.
5. Higher Engineering Mathematics, B. S. Grewal, Khanna Publication.
6. Higher Engineering Mathematics, N. P. Bali, Laxmi Publication.

4.7 ANALOG COMMUNICATION LABORATORY

LIST OF EXPERIMENTS:

1. To obtain Amplitude modulated Envelop and determine depth of modulation
2. To study envelop detector for demodulation of AM signal and observe diagonal peak clipping effect.
3. Frequency modulation using voltage controlled oscillator.
4. Generation of DSB-SC signal using balanced modulator.
5. Generation of single side band signal
6. To generate a FM Signal and measure Depth of modulation.
7. Detection of FM Signal using PLL.
8. To Study Super heterodyne AM receiver and measurement of receiver parameters viz. sensitivity, selectivity & fidelity.
9. Familiarisation of PLL, measurement of lock and capture range, frequency demodulation, frequency multiplier using PLL.
10. Sampling Theorem & Reconstruction of Signal from its lsamples using Natural Sampling, Flat Top Sampling & Sample & Hold Circuits.
11. To study the circuit of PAM modulator & Demodulator
12. To study the circuit of PWM modulator & Demodulator
13. To study the circuit of PPM modulator & Demodulator

4.8 LINEAR INTEGRATED CIRCUIT LABORATORY

LABORATORY EXPERIMENTS:

1. Measurement of parameters of IC 741 (such as CMRR, SVRR, offset adjustment)
2. To assemble inverting and non inverting amplifier and draw input output waveforms.
3. To assemble addition and subtraction of analog signal using OPAMP
4. Observe output of active integrator for different types of input (sine and square)
5. Observe output of active differentiator for different types of input (sine and square)
6. Plot the graph of input and output for V to I converter and I to V converter
7. To assemble logarithmic and antilogarithmic amplifier and verify its output.
8. To assemble zero crossing detector and active peak detector.
9. To assemble and plot the output waveform for a stable multivibrator, voltage control oscillator using IC 555.
10. To assemble and plot the output waveform for bistable multivibrator and schmitttrigger using IC 555.
11. Design monostable multivibrator using IC 555 and troublshoot.
12. Plot the frequency response of second order butterworth low pass filter.
13. Plot the frequency response of first order butterworth band pass filter/ band reject filter.

4.9 ANALOG ELECTRONICS LABORATORY

LABORATORY EXPERIMENTS:

The objective shall be to study

1. various coupling techniques for transistor amplifiers.
2. characteristics of a Class- A amplifier.
3. characteristics of Class- B amplifier.
4. characteristics of Class-C amplifier.
5. characteristics of Class- AB amplifier.
6. characteristics of Class- B push-pull amplifier.
7. characteristics of complementary symmetry amplifier.
8. response of RC phase shift oscillator and determine frequency of oscillation.
9. response of Hartley oscillator and determine frequency of oscillation.
10. response of Colpitt's oscillator and determine frequency of oscillation.
11. response of Wien Bridge oscillator and determine frequency of oscillation.

E. FIFTH SEMESTER

5.1 LINEAR CONTROL SYSTEMS

Introductory Concepts : Plant, Systems, Servomechanism, regulating systems, disturbances, Open loop control systems, closed loop control systems, linear and non- linear systems, time variant & invariant, continuous and sampled data control systems, illustrative examples.

Modelling : Formulation of equation of linear electrical, mechanical, thermal, pneumatic and hydraulic systems, electrical and mechanical analogies. Use of Laplace transform, Transfer function, concepts of state variable modelling. Block diagram representation, signal flow graphs and associated algebra, characteristics equation.

Time Domain Analysis: Typical test -input signals, Transient response of the first and second order systems. Time domain specifications, Dominant closed loop poles of higher order systems. Steady state error and co-efficient, pole-zero location and stability, Routh-Hurwitz Criterion.

Root Locus Technique: The extreme points of the root loci for positive gain. Asymptotes to the loci, Breakaway points, intersection with imaginary axis, location of roots with given gain & sketch of the root locus plot.

Frequency Domain Analysis: Closed loop frequency response, Bode plots, stability and loop transfer function. Frequency response specification, Relative stability, Relation between time and frequency response for second order systems. A and N- circles, log. Magnitude versus Phase angle Plot, Nyquist criterion.

Compensation : Necessity of compensation, series and parallel compensators, compensating network, application of lag and lead compensation.

Control Components: Error detectors- potentiometers and synchros, servo motors, A.C. and D.C. techogenerators, Magnetic amplifiers.

Books:

1. Modern Control Engineering by K. Ogata, Prentice Hall, N. Delhi, 1974
2. Control System components by J.F. Gibsen, McGraw Hill, 1963
3. Automatic Control System by B. C. Kuo. Prentice Hall 3rd Ed, 1978
4. Control System Engineering by I.J. Nagrath & Gopal, Wiley Eastern Ltd. N. Delhi, 1975

5.2 OBJECT ORIENTED PROGRAMMINH USING C++

1.Basics of C & C++: Introduction, Basics, Data Type, Bit Field integer, Operations, Control Structures, Storage Classes, User Defined Data Type, Reserved Words and Standard 110 Statements in C & C++.

2. Object Orient Programming With C++: Introduction ,Object Oriented Programming Concept, Objective of OPP, Programming Structure in C++, Data Abstraction

3. Overloading and Information Hiding: Introduction, Function Overloading, Information Hiding

4. Memory Management in C++ : Introduction ,Constructor-Automatic Initialization of Objects, Dynamic Memory Management , Default Constructor, Copy Constructor, Constructor and Information Hiding, Destructor- Automatic Clear up of an Object.

5. Inheritance: Introduction, Inheritance-Data and Code Sharing , Class Derivation ,Ambiguity in Class Member Access ,Virtual Base Class-A Remedy , Class Initialization in Inheritance ,Arguments for the Base Class.

6. Bindings and Polymorphism: Introduction , Bindings in C++, Polymorphism

7. Generic Facility: Introduction, Concept of Generic Facility, Generic Function ,Overloading a Generic Function, Generic Classes.

7. **File Handling in C++:** Introduction , Concept of Stream in C++, File Positioning Functions , Error Handling During File Operation
8.

Books:

1. The C++ Programming Language by B.Stroustrup, Pearson Education
2. Thinking in C++ by Bruce Eckel, Pearson Education
3. Object Oriented programming in C++ by N.Barkakati, PHI
4. Mastering C++ by Venugopal and et all, Tata McGraw Hill
5. C++ How to program by Detail and Detail, Pearson education

5.3 ANTENNA AND WAVE PROPAGATION

1. **Introduction**: Physical concept of Radiation in single wire, two wire, and dipole, Current Distribution on a thin wire antenna.

2. **Fundamental Parameters of Antenna**: Radiation Pattern, Radiation Power Density, Radiation intensity, Directivity, Gain, Antenna efficiency, Beamwidth, Bandwidth, Polarisation, Antenna Input Impedance, Elementary idea about self and mutual impedance, Radiation efficiency, Effective aperture, Antenna Temperature.

3. **Linear Wire Antennas:** Retarded potential, Infinitesimal dipole, Current distribution of short dipole and half wave dipole, Far-field, Radiating near-field and reactive near-field region, Monopole and Half wave dipole.

4. **Antenna Arrays:** Array of two point sources, Array factor, n-element linear array with uniform amplitude and spacing, Analysis of Broadside array, Ordinary end-fire array, Hansen-woodyard end fire array, n-element linear array with non-uniform spacing, , Analysis of Binomial and Dolph-Tschebyscheff array, Scanning Array, Superdirective array.

5. **Aperture Antennas:** Field Equivalence principle, Rectangular and circular aperture antennas, Horn antenna, Babinet's Principle, Slot Antenna, Reflector antenna.

6. **Ground wave Propagation:** Friis Free space equation, ,Reflection from earth's surface, Surface and Space wave propagation for vertical and horizontal dipole, Field strength of Space wave, Range of space wave propagation, Effective earth's radius, Effect of earth imperfections and atmosphere on space wave propagation, Modified refractive index, Duct propagation, Tropospheric propagation.

7. **Ionospheric Propagation:** Structure of ionosphere, propagation of radio waves through ionosphere, Refractive index of ionosphere, Reflection and refraction of waves by ionosphere, Critical frequency, Maximum usable frequency, Optimum working frequency, Lowest usable high frequency, virtual height, Skip Distance, Effect of earth's magnetic field.

Books:

1. Antenna Theory , Balanis C.A ,John Wiley & sons.
2. Electromagnetics and radiating systems, Jordan E.C.,PHI.
3. Antenna and radio wave propagation, Collins R.E., McGraw Hill.
4. Antenna Theory , Krauss J.D.,McGraw Hill.

5.4 PULSE, DIGITAL & SWITCHING CIRCUITS

Linear Wave Shaping:

High Pass circuits, Response to Standard waveforms, Differentiator, Double differentiation, Low pass circuits, response to standard waveforms, Integrator, Attenuator, RLC circuits, Ringing circuits.

Wide band Amplifiers:

Frequency response of an amplifier, Short circuit current gain, Gain & Band width consideration, Compensation, Shunt compensation, Low frequency compensation, Distributed amplifiers.

Switching Characteristics of devices:

Steady state and transient behaviors of electronic (Diode & transistor) Switches, Dynamic analysis of switches, Charge storage phenomena, Switching characteristics, Delay time, Rise time, Storage time and fall time, Use of Schottkey diode for reducing storage time. Behavior of MOS transistor as switch.

Non- Linear Wave shaping:

Realization of clipping circuits (diode & transistor), comparators, champing circuits and sweep generators.

Multivibrators:

Realization of astable, monostable, bistable, multivibrators using transistors, unsymmetrical, symmetrical triggering, Schmitt trigger circuits.

Books:-

1. Milliman, Taub, Pulse and Digital Switching Circuits
2. G. K. Mithal, Pulse and Digital Switching Circuits

5.5 DIGITAL COMMUNICATION SYSTEM

Digital Transmission: Introduction, Advantages of Digital Transmission, Pulse Code Modulation; PCM Sampling, Sampling Rate, Aliasing, quantization error, Uniform and Non uniform quantization, Dynamic Range, Coding efficiency, A law & μ law companding, Bandwidth of PCM, Block diagram of PCM system, Delta Modulation, Continuously variable Slope Delta Modulator (CVSDM) or Adaptive Delta Modulation, Differential Pulse Code Modulation, Intersymbol Interference, Eye Patterns, Signal power in binary digital signals.

Digital Carrier Line Encoding & Multiplexing Techniques: Line Coding & its properties. NRZ & RZ types, signaling format for unipolar, Polar, bipolar (AMI) & Manchester coding and their power spectra (No derivation), HDB and B8ZS signalling, Fundamentals of time division multiplexing, T1 Digital Carrier system, Synchronization and Signaling of T1, TDM, PCM hierarchy, North-American Digital Hierarchy; T1 to T4 PCM TDM system (DS1 to DS4 signals), Bit versus word interleaving, Statistical TDM, Codecs & Combo Chips

Digital Carrier Modulation & Demodulation Techniques: Introduction, Information capacity, Shannon Limit for Information capacity, Bit Rate, Baud & M-Ary Encoding, Amplitude Shift Keying (ASK), ASK Spectrum, ASK Modulator, Coherent ASK Detector, Noncoherent ASK Detector, Frequency Shift Keying (FSK), FSK Bit Rate and Baud, Bandwidth and Frequency Spectrum of FSK, FSK Transmitter, Non-coherent FSK Detector, Coherent FSK Detector, FSK Detection Using PLL, Binary Phase Shift Keying, Binary PSK Spectrum, BPSK Transmitter, Coherent PSK Detection, Quadrature Phase Shift Keying (QPSK), QPSK Demodulator, Offset QPSK, p/4 QPSK, Comparison of conventional QPSK, Offset QPSK and p/4 QPSK, M-Ary BPSK e.g. 8 PSK & 16 PSK, Quadrature Amplitude Modulation (QAM); 8 QAM & 16 QAM transmitters and receivers, Band Width efficiency, Carrier Recovery; Squaring Loop & Costas Loop, Differential PSK, DBPSK transmitter and receiver, Constant Envelop Modulation; Minimum Shift Keying (MSK) & Gaussian Minimum Shift Keying (GMSK).

Books:

1. Communication Systems, Fourth Edition, Simon Haykin, Wiley publication.
2. Electronic Communication Systems, Tomasi, 4th edition, Pearson Publications.
3. Modern Electronic Communication, (6th edition), by Gary M. Miller, published by Prentice-Hall, 1999
4. Introduction to Communication Systems, third edition, by F. G. Stremler Addison-Wesley, 1990.
5. Digital Communication, E.A. Lee and D.G. Messerschmitt, , Kluwer Academic Publishers,1994
6. Digital Communication Receivers, H. Meyr, M. Moeneclaey, S.A. Fechtel, Wiley, 1998
7. Digital Communications/Mc Graw Hill 2nd Ed, ProakisJ.J.

Elective I

1. BIO MEDICAL ENGINEERING

Transducers and Electrodes: Different type of transducer and their selection for Biomedical applications; Inductive, capacitive, piezoelectric transducers, Thermistors: Radiation & Chemical thermometry; Electrode theory and Different types of Electrodes. Polarization, Electrode behaviour, Electrode-skin interface.

Origin of Bio-potentials: Electric activity of excitable cells, Neuron resting potential, Nerst equation : ECG, EEG, EMG, source of these potentials, generation of signals, recording.

Cardio Vascular Measurement: Measurement of blood pressure, balloon flow, cardiac output and cardiac rate.

Respiratory System Measurements: Respiratory mechanism; Measurement of gas volume, flow rate, carbon dioxide and oxygen concentration in exhaled air, respiration controller.

Medical Imaging Systems: Radiography, CAT scan, Ultrasonic scanning and nuclear medicine, principles and applications, Angio graphy, flour scopy.

Bio-effects of Microwaves: Interaction of microwaves with biological systems. Diathermy, Biological Hazards of microwaves as well as low

Therapeutic and Prosthetic Devices: Cardiac pacemakers, electrical stimulators,Defibrill'ors and cardioverters Heamodialysis, Ventilators.

Electrical Safety: Physiological effects of electricity, Micro shock and Macro shock hazards; Electrical safety standards Basic approaches to shock protection.

Books:

1. Medical Instrumentation : Application & Design - John G. Webster, Houghton Miffin & Co., Boston, 1978.

2. Biomedical Instrumentation - Marvin D. Wwirs, Chilton Book Co., London, 1973.

2. IMAGE PROCESSING

1 Introduction to Electronic Image Processing: historical background, visual perception, image formation, sampling & Quantization & application of image Processing.

2. **Transforms used in Electronic Image Processing**: Review of 1-D & 2-D Fourier Transforms, Discrete Fourier transforms & other image transforms.

3. **Image Enhancement by Point operation**: An overview of point Processing, constant & non-linear operations between image & histogram techniques.

4. **Spatial Filtering & Fourier frequency Method**: Noise in image, Spatial & Special frequency filtering, image restoration.

5. **Non-Linear image processing techniques**: Non-linear Spatial/Mean/Adaptive & Homomorphic Filters.

6. **Color Image Processing**: Color Models, examples of color image processing, Pseudocoloring & color displays.

7. **Image segmentation & Representation**: Image Thresh-holding, Edge/Line &Point direction, Region based segmentation & Image representation.

8. Introduction to Morphological filters & Image Compression

Books:

1. Fundamentals of electronic image processing by Arthur R. Weeks, Jr., Eastern Economy Edition 2003, SPIE Press, Prentice hall of India New Delhi.
2. Digital Image Processing by Rafael C. Gonzale & Richard E. Woods, Pearson Education Asia(2nd edition 2002)
3. Fundamentals of digital image processing by A.K.Jain, 1989, Prentice Hall Englewood Cliffs, N.J.

3. SATELLITE COMMUNICATION

Introduction: Origin of Satellite Communication, Current state of Satellite Communication, Advantages of Satellite Communication, Active & Passive satellite, Orbital aspects of Satellite Communication, System Performance. Communication Satellite Link Design - Introduction, general link design equation, system noise temperature, C/N & G/T ratio, atmospheric & econospheric effects on link design, complete link design, interference effects on complete link design, earth station parameters.

Satellite analog & digital communication: Baseband analog(voice) signal, FDMA techniques, S/N ration, SCPC & CSSB systems, digital baseband signals & modulation techniques.

Multiple Access Techniques: TDMA frame structure, burst structure, frame efficiency, superframe, frame acquisition & synchronization, TDMA vs FDMA, burst time plan, beam hopping, satellite switched, Erlang call congestion formula, demand assignment ctrl, DA-FDMA system, DATDMA.

Laser & Satellite Communication Link analysis, optical satellite link Tx & Rx, Satellite, beam acquisition, tracking & pointing, cable channel frequency, head end equation, distribution of signal, n/w specifications and architecture, optical fiber CATV system.

Satellite Applications Satellite TV, telephone services via satellite, data Communication services, satellites for earth observation, weather forecast, military appliances, scientific studies.

Books:

1. Timothy Pratt "Satellite Communication "
2. D.C Aggarwal "Satellite Communication"

5.7 LINEAR CONTROL SYSTEMS LABORATORY

To perform exercises related to the following using Control System Toolbox by writing computer programs and functions in MATLAB:

• Time and Frequency response of control systems

• Plotting of Bode, Nyquist and Root Loci diagrams.

• Design of Control Systems using MATLAB and SIMULINK

5.8 OBJECT ORIENTED PROGRAMMING USING C++ LABORATORY

List of experiments:

To write following programs in C / C++ :

1. Using basic statements like control statements, looping statements, various I/O statements and various data structures.
2. Creating classes in C++ for understanding of basic OOPS features.
3. Representing concepts of data hiding, function overloading and operator overloading.
4. Using memory management features and various constructors and destructors.
5. Representing Inheritance, virtual classes and polymorphism.
6. Writing generic functions.
7. File handling programs.

5.9 DIGITAL COMMUNICATION SYSTEM LABORATORY

LIST OF EXPERIMENTS:

1. Study of Time Division Multiplexing system.
2. Study of pulse code modulation and demodulation.
3. Study of delta modulation and demodulation and observe effect of slope overload.
4. Study pulse data coding techniques for various formats.
5. Data decoding techniques for various formats.
6. Study of amplitude shift keying modulator and demodulator.
7. Study of frequency shift keying modulator and demodulator.
8. Study of phase shift keying modulator and demodulator.
9. Error Detection & Correction using Hamming Code
10. Digital link simulation; error introduction & error estimation in a digital link using MATLAB (SIMULINK)/ComSim.

F. SIXTH SEMESTER

6.1 MICROELECTRONICS

1. Miniaturization of Electronic Systems & its impact on characterization: Introduction, Trends & Projections in microelectronics. Semiconductor materials and their merits, demerits. Monolithic chips trends, Advantages, limitations & classification of ICs.

2. Monolithic Fabrication Techniques: Crystal growth: Source of silicon, Single crystalline and Poly crystalline, Requirement of purity for electronics industry, Electronics grade silicon production, Crystal growth techniques: Bridgeman method, float zone method, Czocharalski method, Wafer Preparation & Crystal Defects. **Epitaxial Process:** Need of epitaxial layer, vapors phase epitaxy -reactor design, chemistry of epitaxial process, transport mechanism doping & auto doping, selective epitaxy, epitaxial process induced defects, molecular beam epitaxy, merits and demerits among epitaxial processes, recent trends in Epitaxy. **Oxidation:** Importance of oxidation, types of oxidation techniques, growth mechanism & kinetics, factors affecting the growth mechanisms, silicon oxidation model, dry & wet oxidation, oxidation induced faults, recent trends in oxidation. **Lithography:** Basic steps in lithography, lithography techniques-optical lithography, electron beam lithography, x-ray lithography, ion beam lithography, resists and mask preparation of respective lithographies, printing techniques-contact, proximity printing and projection printing, merits and demerits of lithographies, recent trends in lithography at nano regime. **Etching:** Performance metrics of etching, types of etching- wet and dry etching, dry etching techniques-ion beam or ion-milling, sputter ion plasma etching and reactive ion etching (RIE), merits and demerits of etching, etching induced defects. **Diffusion and Ion Implantation:** Diffusion mechanisms, diffusion reactor, diffusion profile, diffusion kinetics, parameters affecting diffusion profile, Dopants and their behavior, choice of dopants, Ion Implantation- reactor design, impurity distribution profile, properties of ion Implantation, low energy and high energy ion implantation. **Metallization:** Desired properties of metallization for VLSI, metallization choices, metallization techniques –vacuum evaporation, sputtering.

3. Monolithic Components & their Isolation: Diodes and Transistors, MOSFETs (Enhancement and depletion mode), Resistors, Capacitors, MOS, CMOS. Various isolation techniques.

4. Assembly Techniques & Packaging of VLSI chip: Introduction to packaging, packaging process, package design considerations, various package types.

5. Fundamentals of MEMS/NEMS Design & Fabrication: Needs for MEMS, MEMS material, MEMS Features, MEMS design limits and safety factors, MEMS processing techniques: Lithography, Galvanik Abforming (LIGA), Lift-off, Chemical Mechanical Polishing, Surface micromachining, Bulk micromachining, Deep Reactive Ion Etching, Application of MEMS, Recent trends in MEMS/NEMS. Challenges and opportunities associated with bringing MEMS to market, Basic MEMS operating principles.

Books:

1. S.M. Sze, "VLSI Technology", TMH
2. S.K. Gandhi, "VLSI Fabrication Principles", John Willey & Sons
3. S.D Senturia, "Microsystems design". Kluwer Academic Publishers,2001
4. N.P. Mahalik, " MEMS", Tata McGraw Hills Publishers.
5. G.T.A. Kovacs, "Micromachined transducer", McGraw Hill, 1998.
6. Botkar, "Integrated Circuits", Khanna Publishers
7. D. Nagchoudhuri, "Principles of Microelectronics Technology" PHI

6.2 DIGITAL SIGNAL PROCESSING

Introduction

Limitations of analog signal processing, Basic elements of DSP system, Advantages of digital signal processing, Application of Digital signal processing.

Discrete Time System Analysis

Elementary discrete time signals, Manipulation of discrete time signals, Classification of discrete time LTI system using convolution sum method, Properties of LTI system, Analysis of LTI system using Difference equation.

Z-Transform

Direct Z-Transform and importance of ROC, properties of Z-Transform, Inverse Z-transform methods, Rational Z-transform function representation, system function of LTI systems in Z-domain, one sided Z –Transform.

Discrete Fourier Transform

Frequency domain sampling and reconstruction of discrete time signal, DFT as linear transformation, properties of DFT, use of DFT in linear filtering, Fast Fourier transform(FFT), decimation in time, decimation in frequency algorithm, Goertzel algorithm.

Implementation of Discrete Time System

Structures for realisation of discrete time system, Direct form, cascade form, parallel form and lattice form structures for FIR and IIR systems, Representation of numbers, Quantisation of filter coefficients.

Design of Digital Filters

Fundamentals of filter design, Design of FIR filter using Window method, Design of IIR filter by Impulse invariance, bilinear transformation and matched Z transform technique, Analog and digital domain frequency transformation.

DSP Processor Architecture Fundamentals

Study of ADSP and TMS series of processor architectures.

Books:

1. Digital Signal Processing - J. G. Proakis & D.G. Manolakis, prentice Hall, 1992.
2. Digital signal processing – ifeachor, Pearson education.
3. Digital signal processing - Salivahanan, vallavaraj, and gananpriya; TMH
4. Discrete Time Signal Processing - A. V. Oppenheim & R W. Schafer, Prentice Hall, 89.
5. Digital Signal Processing - A Computer-based Approach, Mitra, Tata McGraw Hill, 98.

6.3 MICROCONTROLLER & EMBEDDED SYSTEM

Introduction:

8051 Micro controller: Comparison of Microprocessor and Micro controller, micro controller and embedded processors, overview of 8085 families.8051 Assembly Language Programming: Introduction to 8051 Assembly programming, Assembling and running an 8051 program. Data Types and directives.8051 flag bits and PSW register. Register banks and stack.

Jump loop and call instructions, I/O Port programming: Addressing modes and accessing memory using various addressing modes. Arithmetic instructions and programs, Logic instructions and programs, Single bit instructions and programming, Timer/counter programming in the 8051.

Serial Communication: 8051 connection to RS 232, 8051 serial communication programming.

Real World Interfacing: LCD, ADC and sensors, Stepper motor, keyboard, DAC and external memory.

Introduction to an embedded system and its design:

Introduction to ES& its applications, design parameters of an ES and its significance (With respect to all parameter), present trends in ES, Embedded System design life cycle, product specifications and hardware, software partitioning, Codesign.

Introduction to latest micro controllers such as ARM processors and its applications.

Books:

1. Ali Mazidi, The 8051 Microocntroller and embedded Systems

2. David e Simon, Am embedded software primer, PE

3. Frank vahid and Tony Givargus, Embedded system design

6.4 ANALOG AND DIGITAL VLSI DESIGN

1. MOSFETS:

Fundamentals of Enhancement Mode MOSFETs, Depletion Mode MOSFETs, Weak & strong Inversion Conditions, Threshold Voltage Concept in MOSFETs, Current-Voltage (IV) Characteristics of a MOSFET, Limitations in IV Model and MOSFET Parasitics. Trends & Projections in VLSI Design & Technology, Flow of VLSI Circuit Design. Scaling in MOS devices.

2. VLSI Design Styles:

NMOS, CMOS Process flow, Noise Margin, Inverter Threshold Voltage, NMOS Inverter design and characteristics, CMOS Inverter Design and Properties, Delay and Power Dissipation. Parallel & Series Equivalent circuits, Static CMOS Circuit Design and Precharge-Evaluate logic, Dynamic CMOS logic circuits.

3. VLSI Physical Design:

Stick Diagrams, Physical Design Rules, Layout Designing, Euler‟s Rule for Physical Design. Reliability issues in CMOS VLSI, Latching.

4. Memory Design:

ROM Design, SRAM Design.

5. CMOS Amplifier:

Single stage CS amplifier, CG amplifier, CD amplifer 6. CMOS Differential amplifier Single Stage MOS Amplifier, Differential Amplifier and their analysis.

BOOKS:

1. B.G. Streetman & S. Banerjee, “Solid State Electronic Devices”, PHI.

2. S.M. Kang & Y. Leblebici, “CMOS Digital Integrated Circuits-Analysis & Design”.

3. B. Razavi, “Design of Analog CMOS Integrated Circuits”, TMH.

4. K. Eshraghian & Pucknell, “Introduction to VLSI”, PHI.

6.5 COMPUTER NETWORKS

Data communication concepts: Digital & Analog, Parallel & serial Synchronous & Asynchronous, Simplex, Half duplex & Full duplex.

Computer Networks: Introduction, N/W Topology, Wired N/W Vs wireless N/W. Classification of computer N/W's- LAN, MAN, WAN. Internet,Intranet & Extranet.

Protocols & Protocol suits (eg TCP/IP, IPX/SPX), Need of Protocols & their significance in Networking.

N/W Reference Models:- OSI reference Model, TCP/IP reference Model, comparison of OSI & TCP/IP Ref Models.

Networking H/W: Ethernet cabling, The NIC, Repeater, Router, Bridges, Switches, Transcievers, hubs, Cable Modems. **Comminication Switching Techniques:** Circuit Switching, Packet Switching & Message switching.

LAN standards (IEEE 802 PROJECT): Ethernet, CSMA/CD, Token Ring, Token Bus, & theircframe formats, FDDI.

Data link & N/W layer Services provided to N/W layer, Framing, Data link control: Flow control, Error Detection, HDLC & SDLC, concept of Routing & congesition control.

Transport layer Transport layer Protocols like TCP, UDP, connection Oriented Transport Protocol, TCP services.

N/W Protocols: Low level Protocols. SLIP, PPP NETBEUI, High level Protocols:- IP & IP Addresses, ARP,RARP

Traditional Application: Terminal Acess:Telnet, File transfer: FTP, Email: SMTP & MIME & POP3

Modern Applications: Web Applications :- HTTP. Internet and its Applications

Unix Networking concepts: Introduction to sockets.

Books:

1. William Stallings "Computer Networking with Internet Protocols And Technology", Pearson Education.
2. Keneth C. Mansfield, Jr. James L. Antonakos "An Introduction to Computer Networking", PHI.

6.6 INDUSTRIAL ELECTRONICS

Characteristics of Selected Devices: Fast recovery diodes, Schottky diode, SCR, gate trigger and commutation circuits, series and parallel connection of SCRs, Diac, Triac, UJT, Power MOSFETs.

Controlled Rectifier: Half wave and full wave with resistive & R-L-E and resistive-inductive loads. Free-wheeling diode, three phase rectifiers, Bridge rectifiers -half controlled and fully controlled.

Inverter, Chopper And Cycloconverter : Voltage driven, current driven, bridge, parallel, SCR versions, control of output voltage-PWM schemes, harmonic reduction Motor Control: D.C. and A.C. motor control, reversible drives, closed loop control, commutatorless d.c. motor control.

A.C. Voltage Controllers: Types of AC Voltage Controllers, Integral cycle control, single phase voltage controller, Sequence control of AC voltage (Transformer tap changers)

Books:

1. Power Electronics - P.C. Sen, Tata McGraw Hill Publishing Co., Ltd., 1987.
2. Power Electronics and Control - S.K. Dutta, Prentice Hall of India Pvt. Ltd., 1986.

6.7 DIGITAL SIGNAL PROCESSING USING MAT LAB

Perform the following exercises using MATLAB

1. To develop elementary signal function modules (m-files) for unit sample, unit step, Exponential and unit ramp sequences.

2. To develop program modules based on operation on sequences like signal shifting, signal folding, signal addition and signal multiplication.

3. To develop program for discrete convolution and correlation.

4. To develop program for finding response of the LTI system described by the difference equation.

5. To develop program for computing inverse Z-transform.

6. To develop program for finding magnitude and phase response of LTI system described by system function H(z).

7. To develop program for computing DFT and IDFT .

8. To develop program for computing circular convolution.

9. To develop program for conversion of direct form realisation to cascade form realisation.

10. To develop program for cascade realisation of IIR and FIR filters.

11. To develop program for designing FIR filter.

12. To develop program for designing IIR filter.

6.8 MICROCONTROLLER & EMBEDDED SYSTEM LABORATORY

1. Study of 8051/8031 Micro controller kits.
2. Write a program to add two numbers lying at two memory locations and display the result.
3. Write a program for multiplication of two numbers lying at memory location and display the result.
4. Write a program to check a number for being ODD or EVEN and show the result on display.
5. Write a program to split a byte in two nibbles and show the two nibbles on display.
6. Write a Program to arrange 10 numbers stored in memory location in Ascending and Descending order.
7. Write a program to find a factorial of a given number.
8. Study of Interrupt structure of 8051/8031 micro controllers.
9. Write a program to show the use of INT0 and INT1.
10. Write a program of Flashing LED connected to port 1 of the Micro Controller
11. Write a program to generate a Ramp waveform using DAC with micro controller.
12. Write a program to interface the ADC.
13. Write a program to control a stepper motor in direction, speed and number of steps.
14. Write a program to control the speed of DC motor.
15. Interfacing of high power devices to Micro-controller port-lines, LED, relays and LCD display.

6.9 INDUSTRIAL ELECTRONICS LABORATORY

1. To draw the characteristics of SCR.
2. To draw the characteristics of DIAC.
3. To draw the characteristics of TRIAC.
4. To vary the speed of a dc motor with the help of an SCR.
5. To determine the ripple factor of a full wave rectifier using SCR for various firing angles.
6. To control the firing angle of thyristor by varying

i) dc bias alone

ii) dc bias with superimposed ac.

7. To vary the firing angle of an SCR using a phase shift circuit and a peaking transformer.
8. To vary the frequency of an inverter circuit
9. To determine frequency of a relaxation oscillator for various values of C.
10. To obtain the average current of an SCR as a function of resistance.

G. SEVENTH SEMESTER

7.1 VHDL

Introduction:

Introduction to Computer-aided design tools for digital systems, Hardware description languages, Introduction to VHDL, Data objects, Classes and data types, Operators, Overloading, Logical operators. Types of delays, Entity and Architecture declaration. Introduction to behavioural, dataflow and structural models.

VHDL Statements:

Assignment statements, sequential Statements and process, Conditional statements, Case statements, Array and loops, Resolution functions, Packages & Libraries, Concurrent statements.

Combinational Circuit Design:

VHDL models and simulation of combinational circuits such as Multiplexers, Encoders, Decoders, Code converters, Comparators, Implementation of Boolean functions etc.

Sequential Circuit Design:

VHDL Models and simulation of sequential circuits, Shift registers, Counters etc.

Design of Microcomputer:

Basic components of a computer, Specifications, Architecture of a simple Microcomputer system, Implementation of a simple microcomputer system using VHDL.

Design with CPLDs and FPGAs:

Programmable logic devices : ROM, PLAs, GAL, PEEL, CPLDs and FPGA. Design and implementation using CPLDs and FPGAs.

Books:

1. IEEE Standard VHDL Language reference Manual(1993)
2. Digital Design & Modelling with VHDL & Synthesis : KC Chang; IEEE Computer Society Press.
3."A VHDL Primmer": Bhasker; Prentice Hall 1995
4."Digital System Design using VHDL":Charles. H. Roth; PWS(1998)
5. "VDHL-Analysis & Modelling of Digital Systems": Navabi Z; McGraw Hill

7.2 OPTICAL FIBER COMMUNICATIONS

1. Introduction: Need of Fiber Optic Communications, Evolution of Light wave Systems, Basic Concepts; Analog & Digital Signals, Channel Multiplexing, Modulation Formats, Optical Communication Systems, Light wave System Components; Optical Fibers as a Communication Channel, Optical Transmitters, Optical Receivers.

2. Optical Fibers: Geometrical-Optics Description; Step-Index Fibers, Graded Index Fibers, Wave Propagation; Maxwell's Equations, Fiber Modes, Single-Mode-Fibers, Dispersion in Single-Mode Fibers; Group Velocity Dispersion, Material Dispersion, Wave guide Dispersion, Higher-order Dispersion, Polarization-Mode Dispersion, Dispersion-Induced Limitations; Basic Propagation Equation, Chirped Gaussian Pulses, Limitations on the Bit Rate, Fiber Bandwidth , Fiber Losses; Attenuation Coefficient, Material Absorption, Rayleigh Scattering, wave guide Imperfections, Nonlinear Optical effects; Stimulated Light Scattering, Nonlinear Phase Modulation, Four Wave Mixing, Fiber Manufacturing; Design Issues, Fabrication Methods, Cables and Connectors.

3.Optical Transmitters: Basic Concepts; Emission and Absorption Rates, p-n Junctions, Non radiative Recombination, Semi conductor Materials, Light Emitting Diodes; Power-current Characteristics, LED spectrum, Modulation Response, LED Structures, Semi Conductor Lasers; DFB Lasers, Coupled Cavity semiconductor Lasers, Tunable Semiconductor Lasers, Vertical Cavity Semiconductor Lasers, Laser Characteristics, Small & Large Signal Modulation, Spectral Line width, Source Fiber Coupling.

4.Optical Receivers: Basic concepts, p-n Photo Diodes, p-i-n Photo Diodes, Avalanche Photo Diode, MSM Photo detector, Receiver Design, Receiver Noise; Noise mechanism, Receiver sensitivity; Bit error rate, Minimum Receiver Power, Sensitivity Degradation, Receiver Performance.

5.Light Wave Systems: System Architecture, Loss limited Light wave systems, Dispersion limited Light wave systems, Power Budget, Long Haul systems, Sources of Power Penalty; Model Noise, Dispersive Pulse Broadening, Mode Partition Noise, Frequency Chirping, Reflection Feedback Noise.

6. Multi-channel Systems: WDM Light wave systems, Optical TDM Systems, Subscriber Multiplexing, Code Division Multiplexing.

Books:

1. Govind P. Agrawal, Fiber Optics Communication Systems John Wiley & Sons (Asia) Pte Ltd.
2. Senior J. Optical Fiber Communications, Principles & Practice, PHI.
3. Keiser G., Optical Fiber Communication Mc graw-hill.

7.3 MICROWAVE AND RADAR ENGINEERING

Microwave Tubes: Limitations of conventional tubes, construction, operation and properties of Klystron Amplifier, reflex Klystron, Magnetron, TWT, BWO, Crossed field amplifiers.

Microwave Solid State Devices: Limitation of conventional solid state devices at MW, Transistors(Bipolar, FET) , Diodes(Tunnel, Varactor, PIN), Transferred Electron Devices(Gunn diode), Avalanche transit time effect (IMPATT, TRAPATT, SBD)

Microwave Components: Analysis of MW components using s-parameters, Junctions (E,H, Hybrid), Directional coupler, Bends and Corners, MW posts, S.S. tuners, Attenuaters, Phase shifter, Ferrite devices(Isolator, Circulator, Gyrator), Cavity resonator, Matched termination.

Microwave Measurements: Power measurements using calorimeters and bolometers, Measurement of SWR, Frequency and wavelength, Microwave bridges.

Introduction to Radar Systems: Basic Principle*:* Block diagram and operation of Radar,Radar range Equation, PRFs and Range Ambiguities, Applications of Radar.

Doppler Radars: Doppler determination of velocity, CW radar and its limitations, FMCW radar, Basic principle and operation of MTI radar, Delay line cancellers, Blind speeds and staggered PRFs.

Scanning and Tracking Techniques: Various scanning techniques(Horizontal, vertical, spiral, palmer, raster, nodding), Angle tracking systems(Lobe switching, conical scan, monopulse), Range tracking systems, Doppler(velocity)tracking systems.

Books:

1. Microwave devices and circuits: Samuel Liao;PHI
2. Microwave devices and radar engg: M.Kulkarni;Umesh Publications
3. Introduction to radar systems: Merill I. Skolnik
4. Foundation of Microwave Engg : R.E.Collin;McGraw Hill
5. Microwave Engg: K.C Gupta

7.4 Elective II

1. Television Engineering

General Introduction Sound and picture transmission, Sound and picture reception, picture elements, frame and field frequencies, scanning process, interlaced scanning ,resolution- vertical resolution, horizontal resolution ,video bandwidth, receiver controls.

Composite video signals and TV standards Construction of composite signal, Horizontal & vertical sync details, scanning sequence details, functions of composite video signal.

Picture carrier signal transmission Negative transmission, vestigial side-band channel allocations, T.V. studio / control room.

Television Camera and Picture Tube Camera lenses, T. V. camera tubes- Image orthicon, vidicon, plumbicon, comparison of various T.V. camera tubes, monochrome picture tube-principle of operation and characteristics.

Broadcast Television receivers Design specifications for T.V. receiver in India, R. F. tuner, Block diagram of V.H.F tuner, types of tuners, transistor tuners, video I.F. amplifier, synchronisation and staggered tuning, inter stage coupling methods, types of trap circuits, transistor video I.F. amplifier circuits , video detector, D.C. component restoration, sound I.F. take off, video amplifier requirements, low frequency compensation, H. F. compensation ,A G.C- its types, and E.H.T. generation, synchronising circuits and control oscillators, horizontal deflection circuits, vertical deflection circuits, alignment of monochrome and colour T.V. receivers.

Colour Television Colour fundamentals, mixing of colours and colour reception, chromaticity diagram, colour picture tubes and its types, colour T.V. transmission and reception-frequency interleaving, modulation of colour difference signals, colour burst signal, weighting factors.

Text Books:

1. Television Engg. - By Dhake Arvind, M. Tata McGraw hill
2. Television simplified - Milton S. Kilver
3. Basic Television Principles and servicing - Bernard Grob. McGraw Hill
4. Principles of Television Engg. - Fink. McGraw Hill
5. Principles of Monochrome of colour television - R. R. Gula

2. WIRLESS COMMUNICATION SYSTEM

Introduction: Mobile Radio Systems around the world, Examples of Wireless Communication Systems; Paging Systems, Cordless Telephone Systems, Cellular Telephone Systems, Comparison of common Wireless Communication systems.

Digital Communication through fading multipath channels: Fading channel and their characterstics- Channel modelling, Digital signalling over a frequency non selective slowly fading channel- frequency selective slowly fading channel- Calculation of error probabilities- Tapped Delay line model- The RAKE demodulator- performance-Concept of diversity branches and signal paths- Combining methods- Selective diversity combining-pre-detection and post-detection combining- Switched combining- maximal ratio combining- Equal gain combining.

Multiple Access Techniques for Wireless Communications: Introduction, Frequency Division Multiple Access (FDMA), Time Division Multiple Access (TDMA), Spread Spectrum Multiple Access, Space Division Multiple Access, Packet Radio Protocols; Pure ALOHA, Slotted ALLOHA, Capacity of Cellular Systems.

Wireless Networking: Introduction, Difference between Wireless & Fixed Telephone Networks, Development of Wireless Networks, Traffic Routing in Wireless Networks, Wireless Data Services, Common Channel signaling, Broad band ISDN & ATM, Signaling System No. 7(SS-7), Personal Communication Services/ Networks, Protocols for Network Access, Network Databases.

Wireless Systems & Standards: AMPS and ETACS, United states digital cellular (IS-54 & IS 136), Global system for Mobile (GSM); Services, Features, System Architecture, and Channel Types, Frame Structure for GSM, Speech Processing in GSM, CDMA Digital standard (IS 95); Frquency and Channel specifications, Forward CDMA Channel, Reverse CDMA Channel, CT2 Standard for Cordless Telephones, Personal Access Communication System, Pacific Digital Cellular, Personal Handyphone Systems, PCS and ISM Bands, Wireless Cable Television.

Wireless Local Area Networks (WLAN): Components and working of WLAN, transmission media for WLAN, Modulation techniques for WLAN (DSSS, FHSS), IEEE 802.11 standards and protocols for WLAN (MACA, MACAW). Mobile Network and Transport layer: Mobile IP, Mobile TCP, traffic routing in wireless networks, wireless ATM. Wireless Local Loop(WLL) : WLL Architecture, WLL Technologies and frequency spectrum.

Future trends: Blue Tooth technology, 4G mobile techniques, Wi-Fi Technology.

Books:

1. Theodore S.Rappaport, "Wireless communications:Principles and practice", third Indian reprint Pearson Education Asia 2003.
2. Raj Pandya, "Mobile and Personal Communication systems and services", Prentice Hall of India, 2001.

3.DATABASE MANAGEMENT SYSTEM

Part – 1 Basic Concepts

Databases And Database Users: -

Introduction, Characteristics of Database Approach, Advantages And isadvantages of Using DBMS.

Database System Concepts And Architecture:-

Data Models, Schemas And Instances, DBMS Architecture And Data Independence, Database Language And Interfaces, Classification of Database Management Systems.

Data Modeling Using The Entity Relationship Model:-

Entity Types, Entity Sets, Attributes And Keys, Relationships, Relationship Types, Roles, And Structural Constrains, Weak Entity Types, ER Diagrams, Naming Conventions And Design Issues.

Part – 2 Relational Model, Language And Systems

The Relational Data Model, Relational Constrains, The Relational Algebra and Relational Calculus:-

Relational Model Concepts, Relational Constraints And Relational Database Schema, Update Operations And Dealing With Constraint Violations, Basic Relational Algebra Operations, Example of Queries in Relational Algebra, The Tupple Relational Calculus, The Domain Relational Calculus.

SQL Relational Database Standard:-

Basic queries in SQL, More Complex SQL Queries, Insert, Delete and Update Statements in SQL, Views in SQL, Additional Features of SQL.

Part – 3 Database Design Theory and Methodology

Functional Dependencies and Normalization for elational

Databases:-

Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms.

Part – 4 System Implementation Techniques Transaction Processing Concepts:-

Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Schedules and Recoverability, Serializability of Schedules.

Concurrency Control Techniques:-

Locking Techniques for Concurrency Control, Concurrency Control Based on Timestamp Ordering, Validation Concurrency Control Techniques, Granularity of Data Items and Multiple Granularity Locking.

Database Recovery Techniques:-

Recovery Concepts, Recovery Techniques Based on Deferred Update, Recovery Techniques Based on Immediate Update, Shadow Paging

Database Security and Authorization:-

Introduction to Database Security Issues, Discretionary Access Control Based on Granting/Revoking of Privileges, Introduction to Statistical Database Security.

Books :

1. Fundamentals of Database Systems, Third Edition, by Elmasri/Navathe
2. Korth and Silberschatz Abraham, Database Concepts, McGraw Hall,1991
3. An introduction to Database Systems by C.J.Date.
4. An introduction to Database Systems by Bipin C. Desai.
5. SQL,PL/SQL ,The programming language of oracle, Ivan Bayross BPB Publication

4. Neural Network and Fuzzy Logic

Neural Networks characteristics: History of development in neural Networks Principles, Artificial Neural Net terminology, Model of a neuron, topology, learning types of learning supervised unsupervised, re-inforcement learning.

Basic Hopfield Model: the perceptron, linear separability, Basic learning laws : Hebb's rule, Delta rule, Widrow & Hoff LMS learning rule, correlation learning rule, instar and outstar learning rules.

Unsupervised learning: competitive learning, K-means clustering algorithm, Kohonen's feature maps.

Radial Basis: Function neural networks, basic learning Laws in RBF nets, Recurrent networks, recurrent back propagation, Real Time Recurrent learning algorithm. Introduction to counter Propagation networks, CMAC networks, ART networks.

Applications of neural nets such as pattern recoginition: optimization, associative memories, vector quantization, control, Applications in speech and decision making.

Fuzzy Logic : Basic concepts of Fuzzy Logic, Fuzzy vs Crisp set, Linguistic variables, membership functions, operations of fuzzy sets, fuzzy IF-THEN rules, variable inference, techniques, defuzzication techniques, basic fuzzy inference algorithm, Applications of fuzzy logic, Fuzzy system design, Implementation of fuzzy system, Useful tools supporting design.

Books:

1. Fuzzy Systems Design Principles, Building Fuzzy IF-THEN Rule Bases By Riza C. Berkin & Trubatch, JeeeBcss
2. Vegna Narayanan - Artificial Neural Networks
3. Bart Kosko - Neural Networks & Fuzzy Logic
4. Simon Haykin - Neural Networks

7.5 PRINCIPLE OF BUSINESS, ECONOMICS AND MANAGEMENT

MODULE-I: Economics: Definitions, Nature & scope of Economics, Economics Systems-meaning of Capitalism, Socialism & mixed economy. Demand And Supplies Analysis: Law of demand and supply, exception to the law of demand, Elasticity of demand and supply and their types, Methods of measuring elasticity of demand and supply. **Theory Of Production :** Scales of production, Law of returns, Break even analysis. Monetary System: Monetary Policy – Meaning, objectives, methods, Fiscal policy – Meaning & objectives of fiscal policy in a developing country like India, Functions of Reserve Bank of India and commercial banks.

MODULE-II: Economics & Business Environment: Privatization –Growth of private capitalism in India, Business/Trade Cycles – Meaning, Characteristics & classification, Foreign capital & economic development. **Management Principles:** Meaning & types of Management, Concept of Scientific Management, Management by Objectives, System Approach to Management. Financial Management: Meaning, functional areas of financial management, Sources of Finance, Meaning of financial accounting, accounting principles-concepts & conventions, Importance of final accounts – profit & loss a/c and balance sheet, Need and importance of capital budgeting.

MODULE-III: Marketing Management: Introduction to marketing management, Market segmentation, Developing & managing advertising programs, Deciding on media & measuring effectiveness. Production Management: Procedure for production planning & Control, Plant Location & Layout, Routing, Scheduling, CPM & PERT Quality Management: Statistical Quality Control, introduction Control Charts, X Charts, R Charts, Control Charts for C (N. of defects per unit), Control chart for P(Fraction defective), Advantages & Limitations of SQC, Quality Circles:- Structure, functions & Limitations.

Books:-

1. Dewett , K.K., Modern Economic Theory , S.Chand & Co
2. Singh,B. P. and Chabra, T. N., Business Organisation & Management, Dhanpat Rai & Sons
3. Kotler, Philip, Marketing Management, PHI
4. I.M. Pandey., Financial Management, Vikas Publishing House Pvt. Ltd.
5. Ruddar Dutt, K.P.M.Sundaram., Indian Economy, S.Chand & Co.
6. Ahuja, H.L, Advanced Economic Theory, S.Chand & Co.
7. Grant, Leaven worth, Statistical Quality Control ,TMH

7 .6 VHDL LABORATORY

Combinational Design Exercises

1. Design of Gates
    a. Design of AND gate
    b. Design of OR gate
    c. Design of XOR gate
2. Design of XOR gate using other basic gates
3. Design of 2:1 Mux using other basic gates
4. Design of 2 to 4 Decoder
5. Design of Half-Adder, Full Adder, Half Subtractor, Full Subtractor
6. Design of 3:8 Decoder
7. Design of 8:3 Priority Encoder
8. Design of 4 Bit Binary to Grey code Converter
9. Design of 4 Bit Binary to BCD Converter using sequential statement
10. Design an 8 Bit parity generator (with for loop and Generic statements)
11. Design of 2,s Complement for 8-bit Binary number using Generate statements

Sequential Design Exercises

12. Design of all type of Flip-Flops using (if-then-else) Sequential Constructs
13. Design of 8-Bit Shift Register with shift Right, shift Left, Load and Synchronous reset.
14. Design of Synchronous 8-bit Johnson Counter.
15. Design of Synchronous 8-Bit universal shift register (parallel-in, parallel-out) with 3- state output (IC 74299)
16. Design of 4 Bit Binary to BCD Converter using sequential statement.
17. Design
    a. Mod 3 Counter b. Mod 5 Counter c. Mod 7 Counter d. Mod 8 Counter e. Mod 16 counter
    f. 4 Bit Johnson counter
18. Design a decimal up/down counter that counts up from 00 to 99 or down from 99 to 00.
19. Design 3-line to 8-line decoder with address latch
20. Design of ALU

7.7 MICROWAVE AND RADAR ENGINEERING LABORATORY

1. Study of microwave components and instruments.

2. Measurement of crystal characteristics and proof of the square law characteristics of the diode.

3. Measurement of klystron characteristics. 4. Measurement of VSWR and standing wave ratio.

4. Measurement of Dielectric constants.

5. Measurement of Directivity and coupling coefficient of a directional coupler.

6. Measurement of Q of a cavity.

7. Calibration of the attenuation constant of an attenuator.

8. Determination of the radiation characteristics and gain of an antenna.

9. Determination of the phase-shift of a phase shifter.

10. Determination of the standing wave pattern on a transmission line and finding the length and position of the short circuited stub.

SEMESTER 8

8 .1 Major Project

Major Project is meant for solving live problems faced by the current industries by applying the knowledge and skills gained by students in the 3 years. Students may be asked to identify the problem of project in consultation with a teacher in the second year(well in advance). Each project should be taken by 4 to 5 students. While the students are executing the projects teacher will monitor the progress of students by paying regular visit to the industries. The students will submit comprehensive project report with a fabricated model / instruments/ circuits for evaluation by the teacher guide, experts from industry and external examiner. Some of the suggested projects are :

1. Projects related to design, fabrication, testing and trouble shooting of medical, electronic equipment
2. Software projects related to electronic field. \projects related to microprocessor based circuits of the instruments.
3. Projects related to design, fabrication, testing and application of simple digital circuit and component
4. Projects related to design of small oscillators and amplifiers circuits.
5. Projects related to suggesting substitute of electronics components being used.
6. Projects related to design of PCBS.
7. Projects connected with repair and maintenance of instrument , plant and equipment
8. Projects related to estimation and economics.
9. Projects related to quality insurance
10. Projects related increasing productivity
11. Projects related to designing small electronic equipment/ instrument
12. Any other project student may like to undertake, which is of desired standard and related to his field of interest.

5. SUGGESTIONS FOR EFFECTIVE IMPLEMENTATION OF CURRICULUM

Curricula for degree programmes in engineering and technology have been designed by SSU Palampur faculty with close cooperation of SSE Badhani and Amritsar They have understood the systematic approach of curriculum development and implementation. While designing the curriculum they have taken in to account employment scenario, equivalence with PTU curriculum and experience of implementing existing curriculum.

Some of the suggestions for effective implementation of curriculum are:

-1.Vision and mission of institute, Philosophy objective and outcome of curriculum of programmes should be understood by all teachers and students. These should be displayed in the Department so that expectation of all stake holders are clear to everyone.

2.Principal with Head of Departments should analyze the curriculum to find out the requirement of resources for its implementation and prepare an action plan for their availability in time. Institute should network with other organizations for sharing resources and adopt innovative approaches for managing whole courses.

3.HOD's and teachers are managers of whole programme and subject teaching respectively. Their success in achieving objectives depends on preparing academic plan and its judicious execution.

4.Teachers should prepare rationale and objective of their respective subjects, structure of content, method and media and table of specification for evaluation. This should be given to student so that they are aware of the outcome of the course.

5.Set up a group of teachers and final year students for sharing experiences of curriculum implementation and suggest further improvement.

6.Teachers are required to plan as follows for carrying out teaching learning process effectively:
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(a) Prepare profile of students for knowing their background and strengths so as to facilitate them in fulfilling their dreams of jobs and life.
(b) Analyze programme and develop teaching plan.

(c) Plan for guided self-study exercises for student and available learning resources like journals, web site, educational video programming etc in addition to visit to industries and organizing industrial training, arranging expert lecture by alumni and experts from industry/ field.

(d) The co-curricular activities like organizing different camp, social gathering study tour, hobby club etc may be used to develop generic skills like communication skills, task

Management, problems solving, managing self, stress Management, Time Management and collaborating with others etc.

1. A project bank may be developed by the concerned department of the university in consultation with industry, research and other relevant field organizations.

2. Student may be given practical assignment and project to develop practical skills. This will help them in developing creativity and confidence for their gainful employment, (wage and self).

3. (a). Teachers and students should be aware of objectives and outcomes of whole programme and the role played by each subjects in achieving them as part of the curriculum.

   (b). Identification of project and their details should be prepared by all teachers in consultation with students at the beginning of the year. The projects should relate to state of art technology and require use of theoretical and advance planning practical knowledge.

   ©. Self learning and learning beyond syllabus should be encouraged by including optional subjects with scope of learning.

   (d). Department should develop a feedback Mechanism for teaching performance and a reward system for doing excellence work.

   (e) Academic calendar should include remedial classes and additional make up test to help academically weaker students. Students involved in mentoring junior students should be rewarded, who are actively doing mentoring.

6. APPENDIX

A. STUDENT CENTERED ACTIVITIES

Student centered activity play an imported role in the development of students of independent learning and self confident among students. Consulting library and visit to market or industry for gathering search information. This information will be presented by students during seminars. Expert lectures by eminent person from technical education, industry, culture areas; and alumni of the institute will also be arranged. Students will also undertake activities like mentoring students poor in academics, community service in respect of technology transfer entrepreneurship development and environmental awareness for fulfilling the outcome of programme.

B. MAJOR PROJECT WORK

(Industry/field oriented-practice based)

As far as possible students shall be assigned live project problem with a view to:

1 Develop understanding regarding the size and scale of operation and nature of field work in which Students are going to plan their role after completing the programme of study.

2 Develop understanding of subject based knowledge given in the classroom in the control of its application at work place.

3 Provide first hand experience to develop confidence amongst the students to enable them to use and apply classroom based knowledge skills to solve practical problem of the world of work.

4 Develop social skills and abilities like interpersonal skills, communication skills, attitude and values.

For the fulfillment of above objective, SSU University will establish close linkages with 20-25 relevant organizations and provide such experience to students. It is necessary that each organization is visited well in advance by respective teachers and projects activities to be performed by students are well defined. Efforts should be made to identify actual field problems to be given as project work to the students. Project selected should be challenging. Such chosen projects assignment should be entrusted to students which are of professional value to industrial/field organization. Each teacher would supervise and guide 10-15 students.

The placement of students for such a practical cum project work should match with the competency profile and interest of students. Students are to be assessed both by industry and engineering college faculty.

The suggested performance criterion is given below:

a) Punctuality and regularity 10
b) Initiative in learning/ working at site 10
c) Level/processing of practical skills acquired 10
d) Sense of responsibility 10
e) Self expression/ communication skills 10
f) Interpersonal skills 10
g) Reports writing skills 20
h) Viva voce 20

Note :The above is a guideline only. Ssu palampur may devise its own criteria in consultation with industry.

C. ENTREPRENEURSHIP DEVELOPMENT CAMP AND SETTING SELF BUSINESS CLUB IN INSTITUTE

A large population of degree holders has to think of setting up their own enterprises or businesses due to lack of opportunities in organized sector. They have to be motivated and trained to search for new opportunities and avail these for becoming an entrepreneur. For this they must be acquainted with entrepreneurship development, scope of setting up self enterprise, existing business opportunities, financial support available and various aspects of managing business. In this context an entrepreneurship awareness camp is suggested. During the camp, experts from various organizations such as banks, financial corporations, service institutes etc. Should be invited to deliver expert lectures. Successful entrepreneurs should also be invited to interact with the students. Students may be encouraged to read papers or give seminar during the camp, on entrepreneurship development related topics.

1. The camp is to be organized for two to three days at a stretch during fifth semester. Lectures will be delivered on the following broad topics. There will be no examination for this subject.

- Who is an entrepreneur?
- Need for entrepreneurship, entrepreneurial career and self employment.
- Scenario of development of small scale industries/service organization in India and other countries.
- Entrepreneurial history in India, Indian values and entrepreneurship.
- Consideration for product/business selection.
- Opportunities for business, seminar and industrial ventures.
- Learning from Indian experiences in entrepreneurship (Interaction with successful entrepreneurs).
- Managerial aspects of small business.
- Legal aspects of small business.

2. Assistance from District Industries Centers, Commercial banks, and state Financial Corporation's Small industries service Institutes, Research and developments laboratories and other financial and Development Corporation.

3.In order to arrange successful entrepreneurship awareness camp, a group of interested students for setting up their self business may be identified and given responsibility of undertaking the above .A follow up mechanisms should be evolved at the institute in order to enable student to set up and manage their enterprise. This group should regularly meet after a month to see the progress of their project and get inputs from mentors.

D. Ecology and environmental awareness camp

A degree holder must have knowledge of different types of pollution caused due to public, Industries and construction activities. So that he may help in balancing the eco system and controlling pollution by pollution control measures. He should also be aware of environmental laws related to the control of pollution.

This can be done by organizing a camp at a stretch for 3-4 days. Lectures will be delivered on following broad topics. There will be no examination for this subject. Students interested to contribute in improving ecology and environment of the institute or community through various projects, may be allotted marks out of 20 (a part of final year project)

1. Sources of pollution natural and manmade, their effects on living and non living organisms.
2. Solid waste management; classification of refuse material, types, sources and properties of solid wastes, abatement methods, methods of vermin composting.
3. Pollution of air-causes and effects of man, animal, vegetation and non living organisms.

4. Pollution of water causes, effects of domestic waste and industrial effluent on living and non-living organisms.
5. Legislation to control pollution and protect environment.
6. Recycling for taking advantage of waste and reducing pollution.

It is suggested that, at the institution level, a voluntary group be formed for taking care of ecological balance by undertaking waste management projects- which would result in additional revenue to the institute, besides presenting a friendlier environment.

E. INDUSTRIAL TRAINING

Industrial Training shall be accomplished through attachment with an industry/ service sector organization. Teachers in consultation with industry/ service sector will identify the problem/ project for students. A Group of students placed in city will be monitored by the faculty or expert appointed for the purpose. During the 6 month training, the students will be required to maintain a training diary which will be required to be duly authenticated by his supervisor in the industry.