## Department of Electronics and Communication Engineering

**AU College of Engineering (Autonomous)**

**Scheme of Instruction, Examination and Syllabus**

**B.E. (Electronics and Communication) – 4 Year Degree Course**

**Common Scheme of Instruction & Examination**

I/IV B.E./B.Tech (Four Year Course) – Semester System

(with effect from 2006 – 2007 admitted batch onwards)

### First Year

**I & II Semesters**

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| **Total** | **39** | **22** | **17** | **440** | **760** | **1200** |
## B.E. 3rd Semester

### B.E. 2nd Year 1st Semester

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B.E. 3rd Year 1st Semester

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Core Elective – I

1. Computer Architecture and Organization
2. Image Processing and Pattern Recognition
3. Information Networks

Free Elective – I

1. Civil : Traffic Engineering and Management
2. Mechanical : Statistical Quality Control
3. ECE : Basic electronic Devices & Applications
4. EEE : Non-conventional Energy Sources
6. CSSE : Data Structures
7. Chemical : Corrosion Engineering
8. Marine : Power Plant Engineering
9. Instrument Tech : Electronic Instrumentation
10. Geo-Engg : Spatial Information Technology
11. Architecture : Interior Design
### B.E. 6th Semester

#### B.E. 3rd Year 2nd Semester

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**Core Elective – II**

1. EMI / EMC
2. Micro Electronics
3. Electronic Measurements and Instrumentation
4. Software Engineering
### B.E. 7th Semester
#### B.E. 4th Year 1st Semester

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**Core Elective – III**

1. Cellular and Mobile Communications
2. VLSI Design and Embedded Systems
3. Advanced Microprocessors
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#### B.E. 4th Year 2nd Semester

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**Core Elective – IV**

1. Data Communications
2. Bio-Medical Signal Processing
3. Microwave Networks

**Free Elective – II**

1. Fundamentals of Mobile Communications
2. Basics of GPS

**NOTE:**

EHM indicates that the course is drafted by the Department of Humanities.
EME indicates that the course is drafted by the Department of Mechanical Engineering.
ECE indicates that the course is drafted by the Department of Electronics and Communication Engineering.
EEE indicates that the courses is drafted by Department of Electrical Engineering.
EEM indicates that the courses is drafted by Engineering Mathematics Department.
EEP indicates that the course is drafted by Engineering Physics Department

ECE 320 Soft Skills is common for all Branches
The emphasis on English Language is enormously increasing as an effective medium of communication in all sectors the World over. As a consequence of this, the acquisition of effective communication skills in English has become most important to the students to flourish in their careers. In this connection there is a need to train the students to equip themselves with the necessary skills required for effective communication in English thereby enabling them to get a good placement immediately after the completion of their under-graduate courses. To meet the objectives of developing proficiency in English communication the following curriculum is designed for favorable consideration.

CURRICULUM: THEORY AND PRACTICE (LANGUAGE LAB)

1. A textbook with focus on skills approach.
   - Intended to develop the language skills of Listening, Speaking, Reading & Writing.

2. Vocabulary
   a) One – Word Substitution
   b) Words often Confused – Pairs of Words
   c) Synonyms and Antonyms
   d) Foreign Phrases
   e) Phrasal verbs derived from the following dynamic verbs
      - Go, Get, Run, Take, Look, Hold, Put, Stand, Etc.
   f) Idioms and Phrases

3. Grammar
   a) Error Analysis
   b) Tense
   c) Voice
   d) Concord
   e) Articles and Prepositions

4. Writing Skills
   a) Précis Writing
   b) Note Making
   c) Letter Writing – (Letters of Enquiry, Invitation, Regret, Congratulations, Condolences, Complaint, Breaking the ice.)
d) Reading Comprehension

e) Content Writing : Paragraph Writing and Essay Writing

Practice (Language Lab)

1. Spoken English : Varieties
2. Speech Mechanism
3. The consonant and vowel sounds of English
4. Word Accent
5. Accent in Connected Speech
6. Rhythm and Intonation
7. Conversation

Textbook Prescribed:


Reference Books:

2. Margaret M Maison, Examine your English, Macmillan
3. Krishnaswami, N. and Sriram, T., Current English for Colleges, Macmillan
Partial Differentiation and its Applications
Functions of two or more variables, partial derivatives, homogenous functions – Eular’s Theorem, Total Derivative, Differentiation of implicit functions, Geometrical interpretation – Tangent plane and normal to a surface. Change of variables, Jacobians, Taylor’s theorem for functions of two variables, Jacobians, Taylor’s theorem for functions of two variables, Errors and approximations, Total differential, Maxima and minima of functions two variables, Lagrange’s method of undetermined multiples, Differentiation under the integral sign – Leibnitz Rule, Involutes and evolutes.

Multiple Integrals and their Applications
Double integrals, Change of order of integration, Double integrals in polar coordinates, Areas enclosed by plane curves, Triple integrals, Volume of solids, Change of variables, Area of a curve of a curved surface, Calculation of mass, center of gravity, center pressure, Moment of inertia, Product of inertia, Principle axes, Beta function, Gamma function, Relation between Beta and Gamma functions, Error function or probability integral.

Solid Geometry (Vector Treatment)
Equation of a plane, Equation of straight line, Condition for a line to lie in a plane, Coplanar lines, Shortest distance between two lines, Interaction of three planes, Equation of sphere, Tangent plane to a sphere, Cone, Cylinder, Quadric surfaces.

Infinite Series
Definitions, Convergence, Divergence and oscillation of a series, General properties, Series of positive terms, comparison tests, Integral test, D’Alembert’s ratio test, Raabe’s test, Logarithmic test, Cauchy’s root test, Alternating series – Leibnitz’s rule, Series of positive or negative terms, Power series, Convergence of exponential, Logarithmic and binomial series, Uniform convergence, Weirstrass M-test, Properties of uniformly convergent series.

Fourier Series
Eular’s formulae, Conditions for a Fourier expansion, Functions having point of discontinuity, Change of interval, Odd and even functions – Expansions of odd or even periodic function, Half range series, Parseval formula, Practical harmonic analysis.

Textbooks:
Higher Engineering mathematics by B.S. Grewal
Mathematics for Engineering by Chandrica Prasad

Reference Books:
Higher Engineering Mathematics by M.K. Venkatraman
Advanced Engineering Mathematics by Erwin Krezyg
## ENG 1003 MATHEMATICS – II

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### Linear Algebra

Rank of a matrix, Eigen values, Eigen vectors of a Matrix, Cayley Hamilton theorem, Consistency of equations, Matrix inversion, Gaussian elimination scheme, Cholesky factorization, Jacobi and Gauss-Seidal iterative methods for solving simultaneous equations, Eigen value solution using forward iteration, Inverse iteration, Hermitian and skew Hermitian forms, Unitary Matrix, Functions of a Matrix, Quadratic forms and conical forms.

### Differential Equations of First Order and its Applications

Formation of differential equation, Solution of a differential equation, Geometrical meaning, Equations of the first order and first degree, Variables separable, Homogeneous equations, Linear equations, Bernoulli’s equation, Exact equations, Equation reducible to exact equations, Equations of the first order and higher degree, Calirut’s equation, Geometric applications, Orthogonal trajectories, Physical applications, Simple electric circuits, Heat flow, Chemical applications, Newton’s law of cooling.

### Linear Differential Equations

Higher order linear differential equations with constant coefficients, Deflection of beams, Simple harmonic motion, Oscillatory electric circuits.

### Series Solution of Differential Equations

Frobenis method, Special function as solution from series, Bessel equation, Bessel functions of first and second kind, Equation reducible to Bessel’s equations, Legender’s equations, Legender polynomial, Rodrigues formula, Generating functions, Recurrence relation, Orthonogolity relation for Bessel functions and Legendre polynomial.

### Laplace Transforms

Textbooks:

Theory of Matrices by Shantinarayanan
Higher Engineering Mathematics by B.S. Grewal
Advanced Mathematics for Engineering Students, Vol. 2 by Narayana, Manieavachgon Pillay, Ramanaiah

Reference Books:

Higher Engineering Mathematics by M.K. Venkataraman
Advanced Engineering Mathematics by Erwin Kreyszig
Engineering Mathematics by P.P. Gupta
A textbook on Engineering Mathematics by N.P. Bali
Thermodynamics


Electromagnetism

Concept of electric field – Point charge in electric field, Dipole in an electric field, Gauss law, Some applications, Electric potential and field strength, Potential due to a point charge and dipole.

Magnetic field – Magnetic force on current, Torque on current loop, Hall effect, Ampere’s law, B near a long wire, B for a solenoid and toroid, The Biot-Savart’s law, B for a circular current loop.

Faraday’s law of induction, Lenz’s law, Calculation of inductance, L-R circuit, Energy stored in magnetic field, Induced magnetic fields, Displacement current, Energy density in electric and magnetic fields, Poynting vector S.

Maxwell’s equations and electromagnetic waves (both differential and integral forms), Magnetic properties of materials, Paramagnetism, Diamagnetism, Ferromagnetism, Ferrite and its applications.

Optics

Interference – Principles and superposition – Young’s experiment – Coherence – Interference of thin films, Wedge shaped film, Newton’s rings, Michelson interferometer and its applications.

Diffraction – Single slit (Qualitative and quantitative treatment).

Polarisation – Polarisation by reflection, Refraction and double refraction in uniaxial crystals, Nicol prism, Quarter and half wave plate, circular and elliptical polarization and detection.

Lasers and Fibre Optics

Spontaneous and stimulated emissions, population inversions, Ruby laser, Gas laser, Semiconductor laser, Applications of lasers.

Fibre optics, Optical fibre and total internal reflection, Acceptance angle and cone of a fibre, Fibre optics in communications, Optical parts in fibre, Fibre optic sensors.
Ultrasonics

Production of ultrasonics by magnetostriction and piezoelectric effects – Ultrasonics and diffraction pattern, Applications of Ultrasonics.

Modern Physics

The quantization of energy, Photoelectric effect, De Broglie concept of matter waves, uncertainty principle, Schrodinger wave equation, application to a particle in a box.

Elementary concepts of Maxwell-Boltzman, Bose-Einstein’s and Fermi dirac statics, Fermi dirac distribution function (no derivations), Free electron theory of metals, Band theory of solids, Kronig penny model, Metals, Insulators and Semiconductors, Ferroelectrics and their applications.

Super conductivity, Meisner effect, Types of superconductors and applications of superconductors.

Nanophase materials – Synthesis, Characterization of nanostructured materials, properties and applications.


Books Recommended:

2. Physics by David Halliday and Robert Resnick – Part I and Part II
3. Modern Engineering Physics by A.S. Vadudeva
4. University Physics by Young and Freedman
5. Materials Science by V. Rajendra and A. Marikani
6. Nonconventional Energy by Ashoke V. Desai
1. Water Chemistry and Pollution


**Water Pollution**: Source - BOD-COD-Sewage treatment - preliminary, primary, secondary and tertiary.

**Air Pollution**: Source - Air pollutants - CO, Sox, NOx, Hydrocarbons and particulates, Acid rain - Green house effect - Control of air pollution (General)

2. Solid state Chemistry:


3. Energy Sources

**Thermal Energy**: Coal - Ranking of coal - analysis (proximate and ultimate) Calorific value and determination (Bomb calorimeter method) - COKE-Manufacture- Otto Hoffmann’s process - Applications

**Chemical Energy**: Electrode potential - Calomel electrode - Galvanic cells - Primary secondary - Acid and alkaline cells - Fuel cells.

**Nuclear Energy**: Fission and fusion - Power reactors - Atomic pile applications.

**Solar Energy**: Methods of utilization - Thermal conversion - Liquid Flat - Plate collector - Photovoltaic conversion - Solar Cell - Applications.

4. Corrosion Chemistry

Origin and theories of corrosion - Types of corrosion - Factors affecting corrosion - Corrosion control methods, Protective coatings - Metallic coatings - Chemical conversion coatings - Phosphate, Chromate, Anodized, Organic coating - Paints - Special paints - Varnishes and lacquers.
5. Fuels and Lubricants


6. Polymers and Plastics


7. Building Materials


Refractories : Classifications – Properties – Engineering applications

Ceramics : Classification – Properties – Uses

Prescribed Textbooks:

4. A textbook of Engineering Chemistry, Balasubramanian et al. – Allied Publishers
5. Material Science and Engineering V. Raghavan – Prentice-Hall India Ltd.
1. Historical Perspective

The nature of science and technology, Roots of science and technology in India, Science and society, Scientists and society, Science and Faith and the rise of applied sciences.

2. Policies and Plans after Independence

Nehru’s vision of science for independent independent India, Science and technology developments in the new era science and technology developments during the Five Year Plan Periods and science and technology policy resolutions.

3. Research and Development (R&D) in India

Expenditure in R&D, Science and Technology Education, Research activities and promotion of technology development, Technology mission, Programs aimed at technological self reliance, activities of council of scientific and industrial research (CSIR).

4. Science and Technological Developments in Major Areas

Space – Objectives of space programs, Geostationary Satellite Services – INSAT system and INSAT services remote sensing applications, Launch Vehicle Technology

Ocean Development – Objectives of ocean development, Biological and mineral resources, Marine research and capacity building

Defence Research – Spin-off technologies for civilian use,

Biotechnology – Applications of biotechnology in medicine, Biocatalysts, Agriculture, Food, Fuel and Fodder, Development of biosensors and animal husbandry

Energy – Research and development in conservation of energy, India’s nuclear energy program, technology spin-offs.
5. Nexus between Technology Transfer and Development

Transfer of Technology – Types, Methods, Mechanisms, Process, Channels and Techniques, Appropriate technology, Technology assessment, Technological forecasting, Technological innovations and barriers of technological change.

Textbooks:

1. Kalpana Rajaram, Science and Technology in India, Published and Distributed by Spectrum Books (P) Ltd., New Delhi – 58.


Reference Books:


2. Kohili, G.R., The Role and Impact of Science and Technology in the Development of India, Surjeet Publications.


Objectives

To make the student familiar with programming in C and enable the student to implement the numerical methods described in this course using C as programming language.

Section A

Computer programming in C

Basics

Variables – Constants – Expressions – Operators and their precedence and associativity.

Basic input and output statements, Control structures, Simple programs in C using all the operators and control structure.

Functions

Concept of a function – Parameters and how they are passed – Automatic Variables – Recursion – Scope and extent of variables, Writing programs using recursive and non-recursive functions.

Arrays and Strings

Single and multidimensional arrays – Character array as a string – Functions on strings, Writing C programs using arrays and for string manipulation.

Structures

Declaring and using structures – Operations on structures – Arrays of structures – User defined data types – Pointers to using files.

Files

Section B

Computer oriented numerical methods

1. Basic Concepts

Preliminary concepts of algorithms – Flow charts and their execution traces – A simplified model of a computer.

2. Representation for Characters and Numbers

Representation for integer and real numbers, Effect of finite representation on arithmetic operations for example overflow, underflow, associativity and normalization, Some elementary methods for overcoming these limitations.

3. Numerical Methods

Notation of round-off and truncation errors, numerical methods of finding roots of an algebraic equation of one variable, Successive bisection method, False position method, Newton Raphson method and secant method.

4. Solutions of Simultaneous Algebraic Equations

Gauss elimination method and Gauss Seidal methods.

5. Interpolation

Lagrange’s Interpolation and difference table methods.

6. Numerical Integration

Simpson’s Rule, Gaussian quadrature for formula.

7. Numerical Solution of Differential Equation

Eular’s method, Taylor’s series method and runge-Kutta method.

Books

Section A : Programming with C by K.R. Venugopal & Sudeep R Prasad
Section B : Introduction to Numerical Methods by S.S. Sastry
Elementary Numerical Methods by S.D. Conte

Reference

C Programming Language by Kerningham & Ritchie
Introduction

Drawing instruments and uses, Lettering scales in common use.

Curves

Curves used in Engineering Practice, Conic sections, Construction of conics by different methods, Rectangular-hyperbola, Cycloidal curves, Trochoids, Ep and hypo-cycloids, Involute and Archemedian spiral.

Orthographic Projections

Projection of points, Projection of straight lines, Traces of a line, Projection of planes and projection on auxiliary planes.

Solids and Developments

Projection of solids in simple positions, Projection of solids with axis inclined to one of the reference planes and parallel to the other, projection of solids with axis inclined to both the reference planes, Projection of spheres, Development of surfaces of solids, Development of transition piece connecting a square and circular pipe Helices and screw treads.

Sections and Intersections

Sections of different solids and true shape of sections, Intersection of surfaces-simple problems with cylinders, Prisms and cones.

Isometric and Perspective Projections

Isometric projection and conversion of orthographic projection into isometric projection, Perspective projection, Theory of visual ray method and vanishing point method, Simple problems involving regular geometrical solids.

Textbook

Elements of Engineering Drawing by N.D. Bhatt

Reference

Engineering Graphics by K.L. Narayana and P. Kanniah
### ENG 1009  PHYSICS LABORATORY

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12 of the following experiments must be completed

2. Melde’s Experiment – Determination of the frequency of an electrically maintained tuning fork.
5. Determination of Cauchy’s constants using Spectrometer and mercury light.
8. Determination of $\mu$ using calcite crystal.
9. Optical Bench – a) Young’s double slit b) Lloyd’s mirror c) Biprism d) Diffraction at an edge e) Thickness of wire
11. Variation of magnetic field along the axis of current carrying circular coil – Stewart and Gee’s apparatus
13. Carey Foster’s bridge a) laws of resistance b) temperature coefficient of resistance.
15. Calendar and Barnes method – Determination of specific heat of water.
17. Photoelectric Effect – a) Characteristics of photoelectric cell b) Determination of Planck’s constant.
18. Determination of Rydberg constant using hydrogen discharge tube.
19. Determination of $e/m$ of an electron – Thomson’s method.
List of Experiments

1. Determination of sodium carbonate.
2. Determination of sulfuric acid using a strong base.
3. Estimation of iron (II) using potassium permanganate.
7. Estimation of chromium (VI) using Ferrous Ammonium Sulphate.
8. Estimation of copper (II) using sodium thiosulphate.
9. Analysis of Bleaching power for chlorine content.
11. Determination of hardness of a water sample (EDTA method).
12. Determination of alkalinity of a water sample.

Demonstration Experiments

14. Preparation of copper pigment.
15. Preparation of Phenol-Formaldehyde resin.
17. digital potentiometer
18. D.O. analyzer
1. Carpentry

Bench work, tools used in carpentry, jobs for class work – half lap joint mortise and tenon joint, half-lap dovetail joint, corner dovetail joint, bridle joint.

2. Sheet Metal

Tools used in sheet metal work, Laying developments of sheet metal jobs, soldering, Jobs for class work – square tray, taper side tray, funnel, elbow pipe.

3. Fitting

Tools used in fitting work, Different files, Chisels, Hammers and bench vice, Jobs for class work – Hexagon, Rectangular, Circular, and triangular fits, External and internal threads with dies and taps.

Reference

Elements of workshop technology, vol. 1 by S.K. and H.K. Hajra Choudary
1. Write a program to read \( x, y \) coordinates for 3 points and then calculate the area of a triangle formed by them and print the coordinates of the three points and the area of the triangle. What will be the output from your program if the three given points are in a straight line?

2. Write a program, which generates 100 random integers in the range of 1 to 100. Store them in an array and then print the arrays. Write 3 versions of the program using different loop constructs. (eg. For, while, and do while).

3. Write a set of string manipulation functions e.g. for getting a sub-string from a given position. Copying one string to another, reversing a string, adding one string to another.

4. Write a program which determines the largest and the smallest number that can be stored in different data types of like short, int., long, float and double. What happens when you add 1 to the largest possible integer number that can be stored.

5. Write a program, which generates 100 random real numbers in the range of 10.0 to 20.0, and sort them in descending order.

6. Write a function for transposing a square matrix in place (in place means that you are not allowed to have full temporary matrix).

7. First use an editor to create a file with some integer numbers. Now write a program, which reads these numbers and determines their means and standard deviation.

8. Given two points on the surface of the sphere, write a program to determine the smallest arc length between them.

9. Implement bisection method to find the square root of a given number to a given accuracy.

10. Implement Newton Raphson method to determine a root of polynomial equation.

11. Given a table of \( x \) and corresponding \( f(x) \) values, write a program which will determine \( f(x) \) value at an intermediate \( x \) value using Lagrange’s interpolation.
1. **Vector Calculus**
Differentiation of vectors, curves in space, Velocity and acceleration, Relative velocity and acceleration, Scalar and Vector point functions, Vector operator $\nabla$, $\nabla$ applied to scalar point functions, Gradient, $\nabla$ applied to vector point functions, Divergence and curl, Physical interpretations of $\nabla$, $F$, and $\nabla \times F$, $\nabla$ applied twice to point functions, $\nabla$ applied to products of point functions, integration of vectors, Line integral, Circulation, Work, Surface integral-flux, Green’s theorem in the plane, Stoke’s theorem, Volume integral, Divergence theorem, Irrotational and solenoidal fields, Green’s theorem, Introduction of orthogonal curvilinear coordinates: Cylindrical, Spherical and polar coordinates.

2. **Introduction of Partial Differential Equations**
Formation of partial differential equations, Solutions of PDEs, Equations solvable by direct integration, Linear equations of first order, Homogeneous linear equations with constant coefficients, Rules for finding the complimentary function, Rules of finding the particular integral, Working procedure top solve homogeneous linear equations of any order, Non-homogeneous linear equations.

3. **Applications of Partial Differential Equations**
Method of separation of variables, Vibrations of a stretched string-wave equations, One-dimensional and two-dimensional heat flow equations, Solution of Laplace’s equation, Laplace’s equation in polar coordinates.

4. **Integral Transforms**

**Text Book**:

**Reference Books**:
EME 212  ENGINEERING MECHANICS AND STRENGTH OF MATERIALS

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**Engineering Mechanics**

Concurrent Forces in a Plane and its Equilibrium, Centroids of Composite Plane Figures, General Case of Forces in a Plane.


Rotation of a Rigid Body about a Fixed Axis Kinematics, Equation of Motion of a Rigid Body about a Fixed axis, Rotation and Constant Moment, Torsional Vibration.

**Strength of Materials:**

Simple Stress and Strain, Stresses on Inclined Plane, Two-dimensional Stress Systems, Principal Stress and Principal Planes, Mhor’s Circle.

Shearing Force and Bending Moment, Types of Loads, Types of Supports, S.F. and D.M. Diagrams for Cantilever and Simply Supported Beams under Concentrated Loads and under U.D.L.

Flexure formula, Bending Stresses on the above types of Beams with Rectangular and Circular Sections.

Torsion of Circular Shafts, Determination of Shear Stress.

**Text Books**

1. Engineering Mechanics, S. Timoshenko (relevant sections only).
2. Elements of Strength of Materials, S. Timoshenko (relevant sections only).
1. **Analysis of DC Circuits:**

   Active Elements, passive Element, Reference Directions for current and voltage, Kirchhoff’s Laws, Voltage and Current Division Nodal Analysis, MESH Analysis, Linearity and superposition, Thevinin’s and Norton’s Theorem, Source Transformation.

2. **DC Transients:**


3. **Sinusoidal Steady State Analysis:**

   The Sinusoidal Forcing Function, Phasor Concept, Average and Effective values of Voltage and Current, Instantaneous and Average Power, Complex Power, Steady State Analysis Using Mesh and Nodal Analysis, Application of Network Theorems to AC Circuits, Balanced 3-phase circuits, Resonance, Concept of Duality.

4. **Coupled Circuits:**

   Magnetically Coupled Circuits, Dot Convention, Y, Z, H, T – Parameters of Two – Port Networks, Reprocity Theorem.

5. **Laplace Transform Techniques:**

   Transforms of Typical Signals, Response of Simple Circuits to Unit – Step, Ramp and Impulse Functions, Initial and Final Value Theorem, Convolution Integral, Time Shift and Periodic Functions, Transfer Function.

**Text Books**

1. **Electric Energy System**
Basic Structure, Generation, Transmission, Distribution and Utilization of Electric Power, Non-Conventional Energy Sources (Elementary treatment only).

2. **DC Machines**
Constructional Features, Function of Commutator, Induced EMF and Torque Expressions, Relationship Between Terminal Voltage and Induced EMF for Generator and Motoring Action, Different Types of Excitation and Performance Characteristics of Different Types of DC Machines, Starting and Speed Control of DC Motors, Losses and Efficiency, Efficiency by Direct Loading, Swinburne’s Test and Hopkin’s Test, Applications of DC Machines.

3. **Transformers**
Constructional Details, EMF Equation, Equivalent Circuit, Voltage Regulation, Losses and Efficiency, Auto-Transformers, Instrument Transformers, Open/Short-Circuit Tests and Determination of Efficiency and Regulation.

4. **Three-Phase Induction Machines**

5. **Three-Phase Synchronous Machines**
Generation of EMF, Constructional Details, Induced EMF, Synchronous Generator on No-Load and Load, Synchronous Impedance and Voltage Regulation.

6. **V-Curves and Inverted V-Curves**
Synchronous Condenser, Starting of Synchronous Motors, Applications of Synchronous Machines.

7. **Single-Phase Motors**
Double Revolving Field Theory, Methods of Starting Single Phase Induction Motors, Universal Motor, Stepper Motor.

**Text Books:**
1. Energy Band Theory of Solids
Intrinsic and Extrinsic Semiconductors Doping, Doping Materials, Carrier Mobility, Conductivity, Diffusion and continuity equation, Hall – Effect and its Application.

2. Semiconductor Diodes

3. Diode Rectifiers
Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Ripple Factor and Regulation Characteristics.

4. Bipolar Junction Transistor
NPN and PNP junction Transistor, Characteristics of Current Flow across the Base Regions, Minority and Majority Carrier Profiles, CB, CE and CC Configurations and their Input and Output Characteristics. Comparison of CE, CB and CC Configurations. Junction Biasing for Saturation, Cutoff and Active Region, $\alpha$ and $\beta$ Parameters and the relation between them.

5. JFET
JFET and its characteristics, Pinch off Voltage, Drain Saturation Current, MOSFET – Enhancement and Depletion Modes, Small signal models of FET.

6. Transistor Biasing Circuits
Various Biasing Circuits and Stabilization, Thermal Runaway, Thermal Stability, Biasing of FETs.

7. Small Signal – Low Frequency Transistor Biasing Circuits

Text Books :
1. **Conducting Materials**


2. **Dielectric Materials**


3. **Magnetic Materials**


4. **Super Conducting Materials**

Types of Super Conductors, High Tc Super Conductors and High Frequency Applications.

5. **Integrated Circuits – Fabrication**

Crystal Growth, Epitaxial Process, Masked Diffusion, Fabrication of Thin Films, Principles of IC Packaging.

**Text Books :**

### ECE 217 NETWORK LABORATORY

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Ten Experiments based on Networks Theory.
1. Study of CRO and Applications
2. V-I Characteristics of PN Junction Diode
3. V-I Characteristics of Zener Diode and Zener regulator characteristics.
4. V-I Characteristics of LED
5. V-I characteristics of Photo diode
6. Half-wave and full-wave rectifiers
7. Half-wave and full-wave rectifiers with capacitor filter
8. CE characteristics of BJT, h-parameters
9. CB characteristics of BJT, h-parameters
10. Voltage gain, input impedance and output impedance of emitter follower
11. Drain and transfer characteristics of JFET
12. Frequency response of CE amplifier

Textbook
Electronic devices and circuits (Chapter 14), G.S.N. Raju, IK International Publishers, New Delhi, 2006.
B.E. 2nd Year 2nd Semester

EEM 221  MATHEMATICS – IV

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1. **Functions of a Complex Variables**
   Continuity concept of \( f(z) \), Derivative of \( f(z) \), Cauchy - Riemann Equations, Analytic Functions, Harmonic Functions, Orthogonal Systems, Applications to Flow Problems, Integration of Complex Functions, Cauchy’s Theorem, Cauchy’s Integral Formula, Statements of Taylor’s and Laurent’s Series without Proofs, Singular Points, Residues and Residue Theorem, Calculations of Residues, Evaluation of Real Definite Integrals, Geometric Representation of \( f(z) \), Conformal Transformation, Some Standard Transformations:- (1) \( w = z+c \), (2) \( w = 1/z \), (3) \( w = (az+b) \) (4) \( w = z^2 \), (6) \( w = e^2 \).

2. **Statistical Methods**
   Review of Probability theory (not be examined), Addition law of probability, Independent events, Multiplication law of probability, Bay’s theorem, Random variable, Discrete probability distribution, Expectation, Moment generation function, repeated trails, Binomial distribution, Poisson distribution, Normal distribution, Prabable error, Normal approximation to binomial distribution.

   Sampling Theory: Sampling Distribution, Standard Error, Testing of Hypothesis, Level of Significance, Confidence Limits, Simple Sampling of Attributes, Sampling of Variables - Large Samples and Small Samples, Student’s T-distribution, \( x^2 \) - Distribution, F - Distribution, Fisher’s Z - Distribution.

3. **Difference Equations and Z-Transforms**

**Text Books :**

**Reference Books :**
Electrostatics

Introduction, Applications of electrostatic fields, Different types of charge distributions, Coulomb’s law, Applications of coulomb’s law, Limitation of coulomb’s law, Electric field strength due to point charge, Salient features of electric intensity, Electric field due to line charge density, Electric field strength due to an infinite line charge, Field due to surface charge density, Field due to volume charge density, Potential, Potential at a point, Potential difference, Salient features of potential difference, Potential gradient, Salient features of potential gradient, Equipotential surface, Potential due to electric dipole, Electric field due to dipole, Electric flux, Salient features of electric flux, Faradays experiment to define flux, Electric flux density, Salient features of electric flux density, Gauss’s law and applications, Proof of Gauss’s law, Gauss’s law in point form, Divergence of a vector, Applications of Gauss’s law, Limitations of Gauss’s law, Salient features of Gauss’s law, Poisson’s and Laplace’s equations, Applications of Poisson’s and Laplace’s equations, Uniqueness theorem, Boundary conditions on E and D, Proof of boundary conditions, Conductors in electric field, Properties of conductors, Electric current, Current densities, Equation of continuity, Relaxation time, Relation between current density and volume charge density, Dielectric materials in electric field, Properties of dielectric materials, Dipole movement, Polarization, Capacitance of different configurations, Energy stored in an electric field, Energy in a capacitor.

Steady Magnetic Fields

Introduction, Applications of magnetic fields, Fundamentals of steady magnetic fields, Faradays law of induction, Magnetic flux density, Ampere’s law of current, Element or Biot-Savart law, Field due to infinitely long current element, Field due to a finite current element, Ampere’s work law or Ampere’s circuit law, Differential form of Ampere’s circuit law, Stock’s theorem, Force on a moving charge due to electric and magnetic charge, Applications of Lorentz force equation, Force on a current element in a magnetic field, Ampere’s force law, Boundary conditions on H and B, Scalar magnetic potentials, Vector magnetic potentials, Force and torque on a loop or coil, Materials in magnetic fields, Magnetization in materials, Inductance, Standard inductance configurations, Energy density in a magnetic field, Energy stored in inductor, Expression for inductance, L in terms of fundamental parameters, Mutual inductance, Comparison between electric and magnetic fields / circuits / parameters.
Maxwell’s Equations

Introduction, Equation of continuity for the varying fields, Maxwell’s equations for time varying fields, Meaning of Maxwell’s equations, Conversion of differential form of Maxwell’s equations to integral form, Maxwell’s equations for static fields, Characteristics of free space, Maxwell’s equations for free space, The Maxwell’s equations for static fields in free space, Proof of Maxwell’s equations, Sinusoidal time varying fields, Maxwell’s equations in phasor form, Influence of medium on the fields, Types of media, Summary of Maxwell’s equations for different cases, Boundary conditions, Proof of boundary conditions on E, D, H and B, Complete boundary conditions in scalar form, Boundary conditions in vector form, Time varying potentials, Retarded potentials, Maxwell’s equations approach to relate potentials, Fields and their sources, Helmoltz theorem, Lorentz gauge condition.

Electromagnetic Waves

Introduction, Applications of EM waves, Wave equations in free space, Wave equations for a conducting medium, Uniform plane equation, General solutions of uniform plane wave equations, Relation between E and H in a uniform plane wave, Proof of E and H wave are perpendicular to each other, Wave equations in phasor form, Wave propagation in a lossless medium, Propagation characteristics of EM waves in free space, Propagation characteristics of EM waves in a conducting medium, Summary of propagation, Characteristics of EM waves in conducting medium, Conductors and dielectrics, Wave propagation characteristics in good dielectrics, Summary of the propagation characteristics in good dielectrics, Wave propagation characteristics in good conductors, Summary of characteristics of wave propagation in good conductors, Depth of penetration, Polarization of a wave, Sources of different polarized EM waves, Direct cosines of vector field, Waves on a perfect conductor – Normal incidence, Waves on dielectric –Normal incidence, Oblique incidence of a plane wave on a boundary plane, Oblique incidence of a wave on perfect conductor, Oblique incidence of a plane wave on dielectric, Brewster angle, Total internal reflection, Surface impedance, Poynting vector and flow of power, Complex poynting vector.

Guided Waves

Induction, Waves between parallel plates, Derivation of field equations between parallel plates and propagation parameters, Field components for TE waves (E_z = 0), Field components of TM waves (H_z = 0), Propagation parameters of TE and TM waves, Guide wavelength, Transverse electromagnetic waves (TEM wave), Velocities of propagation, Attenuation in parallel plane guides, Wave impedances, Waves in rectangular waveguides, Derivation of field equations in rectangular hallow waveguides, Propagation parameters of TE and TM waves in rectangular waveguides, TEM does not exist in waveguides, Excitation methods for different TM and TM modes, Evanescent wave or mode, Wave impedance in waveguide, Power transmitted in a lossless waveguide, Waveguide resonators, Salient features of cavity resonators, Circular waveguides, Salient features of circular waveguides.
Transmission Lines

Types of transmission lines, Applications of transmission lines, Equivalent circuit of pair of transmission lines, Primary constants, Transmission line equations, Secondary constants, lossless transmission lines, Distortionless line, Phase and group velocities, Loading of lines, Input impedance of transmission lines, RF lines, Relation between reflection coefficient, Load and characteristic impedance, Relation between reflection coefficient and voltage standing wave ratio (VSWR), Lines of different lengths - $\frac{\lambda}{8}, \frac{\lambda}{4}, \frac{\lambda}{2}$ lines, Losses in transmission lines, Smith chart and applications, Stubs, Double stubs.

Textbook


References:

ECE 223 ANALOG ELECTRONIC CIRCUITS

<table>
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Multistage Amplifiers

Feedback Amplifiers

Sinusoidal Oscillators

Power Amplifiers

Tuned Voltage Amplifiers
Single Tuned and Stagger Tuned Amplifiers – Analysis – Double Tuned Amplifier – Bandwidth Calculation.

Operational Amplifiers

Books :
2. Integrated Electronics – Millman and Halkias
4. Electronic Devices and Circuits – Mottershead
Probability Theory


Random Variables


Statistical Averages


Random Processes


Textbook:


References:

ECE 225 SIGNALS AND SYSTEMS

<table>
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</tbody>
</table>


**Linear Time – Invariant (LTI) Systems**


**Concept of Z**


**Textbook :**

2. Signals and Systems, Alan V. Oppenheim, Alan S. Willsky and Ian T. Young, PHI.

**References :**

1. Communication Systems, B. P. Lathi
2. Signals Systems and Communication, B. P. Lathi, BS Publication
Fourier Transforms


Network Functions

Network Functions for Single Port and Two Port, Calculation of Network Functions for Ladder and General Networks, Poles and Zeroes, Restriction of Poles and Zeroes for Driving point and Transfer Functions, Time Domain Behavior from Pole Zero Plot, Transfer Functions in terms of Y and Z functions, Scaling Network Functions.

Positive Real Function and Other Properties, Herwitz Polynomials, Computation of Residues, Even and Odd Functions, Test for Positive Real Functions.

Network Synthesis


RLC Networks

Minimum Positive Real Functions, Brune’s Method of RLC Synthesis, Realization Difficulties.

Textbooks:


Reference:

Module 1: Introduction

Definition, Score and importance, Measuring and defining environmental development: Indicators

Module 2: Ecosystems

Introduction, Types, Characteristic features, Structure and functions of ecosystems, Forest, Grassland, Desert, Aquatic (lakes, rivers and estuaries).

Module 3: Environment and Natural Resources Management

Land Resources: Land as a resource, Common property resources, land degradation, Soil erosion and desertification, Effects of modern agriculture, fertilizer-pesticide problems, Forest Resources: Use and over-exploitation, Mining and dams – their effects on forest and tribal people, Water resources: Use and over-utilization of surface and ground water, Floods, Droughts, Water logging and salinity, Dams – benefits and costs, Conflicts over water, Energy Resources: Energy needs, Renewable and non-renewable energy sources, Use of alternate energy resources, Impact of energy use on environment.

Module 4: Bio-Diversity and its Conservation

Value of bio-diversity – Consumptive and productive use, Social, Ethical, Aesthetic and option values, Bio-geographical classification of India – India as a mega diversity habitat, Threats to biodiversity – Hot-sports, habitat loss, poaching of wildlife, loss of species, seeds etc., Conservation of biodiversity – in-situ and ex-situ conservation.

Module 5: Environmental Pollution – Local and Global Issues

Causes, Effects and control measures of: Air pollution, Indoor air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Solid waste management, Composting, Vermiculture, Urban and industrial wastes, Recycling and re-use, Nature of thermal pollution and nuclear hazards, Global warming, Acid rain, Ozone depletion.

Module 6: Environmental Problems in India

Drinking water, Sanitation and public health, Effect of activities of the quality of environment: Urbanization, Transportation, Industrialization, Green revolution, Water scarcity and ground water depletion, Controversies on major dams –
Resettlement and rehabilitation of people problems and concerns, Rain water harvesting, Cloud seeding and watershed management.

**Module 7 : Economy and Environment**

The economy and environment interaction, Economics of development, Preservation and conservation, Sustainability : Theory and practice, Limits to growth, Equitable use of resources for sustainable lifestyles, Environmental impact assessment.

**Module 8 : Social Issues and the Environment**

Population growth and environment, Environmental education, Environmental movements, Environment Vs development.

**Module 9 : Institutions and Governance**

Regulation by Government, Monitoring and enforcement of environmental regulation, Environmental acts : Water (Prevention and control of pollution) act, air (Prevention and control of pollution) act, Environmental Protection Act, Wild life protection act, Forest conservation act, Costal zone regulations, Institutions and policies relating to India, Environmental Governance.

**Module 10 : International Conventions**


**Module 11 : Case Studies**

Chipko movement, Narmada bachao andolan, Silent valley project, Madhura refinery and Taj Majal, Industrialization of pattancheru, Nuclear reactor at Nagarjuna Sager, Tehri Dam, Ralegaon Siddhi (Anna Hazare), Kolleru lake – Acquaculture, Florosis in Andhra Pradesh.

**Module 12 : Field Work**

Visit to a local area to document and mapping environmental assets – River / forest / grassland / hill / mountain, Study of local environment – Common plants, Insects, Birds, Study of simple ecosystems – Pond, river, hill, slopes etc. Visits to industries, Water treatment plants, Affluent treatment plants.

**Textbooks** : Kaushik – Kaushik, Anubha

Ten Experiments based on Electrical Machines Theory.
2. Current series feedback amplifier
3. Voltage series feedback amplifier
4. Colpitt’s Oscillator
5. RC Phase - Shift Oscillator
6. Wein - Bridge Oscillator
7. Class B Push - Pull Power Amplifier
8. Operational Amplifier - as an Inverting and Non-inverting Amplifier and Frequency Response Characteristics
10. Multistage Amplifier
11. Tuned Voltage Amplifier
12. Class A Transformer - Coupled Amplifier

**Textbooks**

B.E. 3rd Year 1st Semester (Credit Based Grading System)  
With effect from the admitted batch of 2006 - 2007

ECE 311 PULSE AND DIGITAL CIRCUITS

<table>
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</table>

1. **Linear Wave Shaping:**

2. **Non-Linear Wave Shaping:**

3. **Multivibrators:**

4. **Sweep Circuits:**
   Voltage sweep – Simple Exponential sweep Generator. Errors that define Deviation from linearity, UJT Relaxation Oscillator – Methods of linearising a Voltage Sweep – Bootstrap and Miller Circuits – Current Sweep – Linearising a current Sweep by Adjusting the driving Waveform.

5. **Synchronization and Frequency Division:**
   Principles of Synchronization – Synchronization of Astable Multivibrators. Synchronization of Sweep Circuits with Symmetrical Signals.

6. **Logic Gates:**
   IC Families, TTL, CMOS, ECL, FFs and Circuits.

7. **Blocking Oscillator:**

**Books:**
1. Pulse, Digital and Switching Waveforms – Millman and Taub.
1. **Operational Amplifiers:**
   Design Aspects of Monolithic Op-Amps, Ideal Characteristics, Specifications, Offset Voltages and Currents, Frequency Compensation Techniques, Measurement of Op-Amp Parameters,

2. **Applications of Op-Amps**, Inverting and Non-inverting Amplifiers, Integrators, Function Generators, Logarithmic Amplifiers, Instrumentation Amplifiers,


4. **555 Timers, 556 Function Generator ICs and their Applications. Three Terminal IC Regulators,**

5. **IC 1496 (Balanced Modulator), IC 565 PLL and its Applications.**

6. **Active Filters – LPF, HPF, BPF, BEF, All-pass Filters, Higher Order Filters and their Comparison.**

7. **Op-Amp Phase Shift, Wein-bridge and Quadrature Oscillator, Voltage Controlled Oscillators, Voltage to Frequency and Frequency to Voltage Converters, Voltage to Current and Current to Voltage Converters. Switched Capacitance Filters, Analog Multiplexers, Sample and Hold Circuits.**

**Books:**

1. Microelectronics, Jacob Millman
2. Op-Amps and Linear ICs, Ramakanth Gayakwad.
3. Integrated Circuits, Botkar, Khanna Publications.
4. Applications of Linear ICs, Clayton.
1. **Linear Modulation Systems:**

2. **Angle Modulation Systems:**
   Angle Modulation, Phase and Frequency Modulation and their Relationship, Phase and Frequency Deviation, Spectrum of an FM Signal, Bandwidth of Sinusoidally Modulated FM Signal, Effect of the Modulation Index on Bandwidth, Spectrum of Constant Bandwidth FM, Phasor Diagram for FM Signals,

3. **FM Generation:**
   Parameter variation method, Indirect method of Frequency Modulation (Armstrong Method), Frequency Multiplication, PLL FM Demodulator, Pre-emphasis and De-emphasis, Comparison of FM and AM.

4. **Noise In AM and FM Systems:**
   Sources of Noise, Resistor Noise, Shot Noise, Calculation of Noise in a Linear System, Noise in AM Systems, Noise in Angle Modulation Systems, Comparison between AM and FM with respect to Noise, Threshold Improvement in Discriminators, Comparisons between AM and FM.

5. **Radio Transmitters:**
   Classification of Radio Transmitters, AM and FM Transmitters, Radio Telegraph and Telephone Transmitters, SSB Transmitters.

6. **Radio Receivers:**
   Radio receiver Types, AM Receivers – RF Section, Frequency Changing and Tracking, Intermediate Frequency and IF Amplifiers, Automatic Gain Control (AGC); FM Receivers – Amplitude Limiting, FM Demodulators, Ratio Detectors, ISB Receiver, Comparison with AM Receivers.

7. **Communication Receivers:**
   Extensions of the Super-heterodyne Principles, Additional Circuits.
Text Books:

References:
## ECE 314  COMPUTER ARCHITECTURE AND ORGANIZATION

<table>
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<tr>
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1. **Register Transfer and Micro operations:**
   Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit.

2. **Basic Computer Organization:**
   Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory Reference Instructions, Input - Output and Interrupt, Complete Computer Description.

3. **CPU Organization:**
   Introduction, General Register Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC), Stack Organization.

4. **Micro programmed Control:**
   Control Memory, Address Sequencing, Microinstruction Formats, Microprogram Example, Design of Control Unit.

5. **Memory Organization:**
   Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

6. **Input - Output Organization:**
   Peripheral Devices, Input - Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA),

7. **Introduction to Multiprocessor System.**

**Text Book:**

**References:**

ECE 315  SWITCHING THEORY AND LOGIC CIRCUITS

<table>
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1. **Introductory Concepts:**
   Number Systems, Base Conversion Methods, Complements of Numbers, Codes, Error detecting and Error Correcting Codes.

2. **Minimization of Boolean Functions:**
   Standard forms of Boolean Functions, Simplification of Functions – Karnaugh map and Quine McClusky methods, multiple output functions.

3. **Logic Gates:**
   Symbols and Truth Tables of Gates – AND, OR, NOT, NAND, NOR, XOR, Multiplexers, Demultiplexers, Encoders, Decoders, Flip-flops, Counters and Registers.

4. **Combinational Logic:**
   Logic Design of Combinational circuits – Binary addition, Subtraction, Code Conversion, Priority Encoders, Decoders, Seven-segment Displays, Comparators, PLAs.

5. **Sequential Machine Fundamentals:**
   The Flip-flop – RS, JK and D Flip-flops, the Design of Clocked Flip-flop, Flip-flop conversion from one type to another.

6. **Traditional Approaches to Sequential Analysis and Design:**
   Analysis and Design of Finite State Machines, State Reduction, Design of Flip-flops, Counters and Shift Registers.

7. **Asynchronous Finite State Machines:**
   Analysis and Design of Asynchronous Machines, Cycles, Races and Hazards.

**Books:**

   (For syllabus items 1, 3, and 4)

   (For syllabus item 2)

   (For syllabus items 5, 6, and 7)
1. Radiation and Antennas
Antenna definition, Functions of antennas, Network theorems, Properties of antennas, Antenna parameters, Polarization, Basic antenna elements, Radiation mechanism, Radiation fields of alternating current element, Radiated power and radiation resistance of current element, Radiation, induction and electrostatic fields, Hertzian dipole, Different current distributions in linear antennas, Radiation from half-wave dipole, Radiation from quarter wave monopole, Radiation characteristics of dipoles.

2. Analysis of Linear Arrays

3. Array Synthesis

4. HF, VHF and UHF Antennas
5. Microwave Antennas
Introduction, Rod reflector, Plane reflector, Corner reflector, Parabolic reflector, Types of parabolic reflectors, Feed systems for parabolic reflectors, Shaped beam antennas, Horn antennas, Corrugated horns, Slot antennas, Impedance of a few typical dipoles, Slots in the walls of rectangular waveguides, Babinet’s principle, Lens antennas, Microstrip antennas.

6. Antenna Measurements

7. Wave Propagation
Propagation characteristics of EM Waves, Factors involved in the propagation of radio waves, Ground wave propagation, Ground wave field strength by Maxwell’s equations, Reflection of radio waves by the surface of the earth, Roughness of earth, Reflection factors of earth, Wave tilt of the ground wave, Tropospheric wave propagation, Atmospheric effects in space wave propagation, Duct propagation, Radio horizon, Troposcatter, Fading of EM waves in Troposphere, Line of sight (LOS), Ionospheric propagation, Characteristics of ionosphere, Refractive index of ionosphere, Phase and group velocities, Mechanism of Ionospheric propagation, reflection and refraction, Characteristic parameters of Ionospheric propagation, Sky wave field strength, Fading and diversity techniques, Faraday’s rotation, Effect of earth’s magnetic field.

Text Book :

References:
I. Electrodynamics and CRO
Cathode ray tube, Cathode ray oscilloscope (CRO), Applications of CRO, Types of CROs

Diode Characteristics and Applications
Basic applications of PN diode, Characteristics of a PN diode, Diode equivalent circuits, Diode specifications, Volt-ampere characteristics of PN diode, Diode testing, Varactor diode, Applications of varactor diode, Salient features of varactor diode, Zener diode, Applications of zener diode, Salient features of zener diode, Light Emitting Diode, Salient features of LED, Applications of LED, Varistor diode, Photo diode, Applications of photo diode

II. Rectifiers and DC Power Supplies
Introduction, Half-wave rectifier, Full-wave rectifier, Bridge rectifier, Comparative characteristics of rectifier circuits, Filter circuits, Inductor filter in half-wave rectifier, Inductor filter with full-wave rectifier, Half-wave rectifier with capacitor filter, Full-wave rectifier with capacitor filter.

III. Transistor characteristics and applications
Introduction, Operation of the transistor, Transistor configurations, Current amplification factor, $\alpha$, Relation between $\alpha$ and $\beta$, Differences among the parameters of CE, CB and CC transistor configurations, Switching times in transistors, Applications of transistors, Testing of transistors, Transistor terminal identification

Field Effect Transistors
Classification of field effect transistors, Junction field effect transistors (JFET), The salient features of JFET, Comparative characteristics of JFET and BJT, Merits of JFET, JFET characteristics, Drain characteristics, Comparison of CS, CD and CG JFET amplifier, Applications of JFETs, Metal oxide semiconductor field effect transistor (MOSFET), Enhancement type MOSFET, Depletion type MOSFET, Salient features of enhancement and depletion type of MOSFET, Comparison between JFET and MOSFET.
IV. Feedback Amplifiers

Introduction, Expression of gain with feedback, First classification of feedback amplifiers, Negative feedback amplifier, Positive feedback, Second classification of feedback amplifiers, Characteristics of negative feedback amplifier, Characteristics of positive feedback, Effect of negative feedback on gain stability, Effect of negative feedback on bandwidth, Effect of negative feedback on distortion, Effect of negative feedback on non-linear distortion, Effect of negative feedback on noise, The net effects of feedback circuits, Comparative characteristics of feedback and non-feedback amplifiers, Applications of negative feedback, Typical feedback circuits, Comparison between the parameters of voltage and current feedback circuits.

V. Power Amplifiers

Introduction, Classification of power amplifiers, Class A amplifier, Class B amplifier, Class AB amplifier, Class C amplifier, Class D amplifier, Class A large signal power amplifier, Efficiency of class A power amplifier, Transformer coupled class A power amplifier, Efficiency of transformer coupled class A power amplifier, Class B power amplifier, Push-pull amplifier, Merits of push-pull amplifier, Demerits, Class B push-pull amplifier, Operation of class B push-pull amplifier, Class AB push-pull amplifier, Performance of power amplifiers, Characteristics of power amplifier, Complementary symmetry push-pull class B power amplifier, Heat sinks, Definition of derating factor

Power Devices


VI. Oscillators

Definition of oscillator, Definition of generator, Conditions for oscillators, Bharkhausen criteria, The characteristics of oscillators, Classification of oscillators, Sinusoidal oscillators, Relaxation oscillators, RC phase shift oscillator, Salient features of RC phase oscillator, Wein bridge oscillator, Expression for frequency of oscillation, Salient features of wein bridge oscillator, Colpitts oscillator, Expression for the frequency of oscillation, Salient features of colpitts oscillator, Hartley oscillator, Expression for frequency, The crystal oscillator, Differences between rectifiers, amplifiers and oscillators
VII. Operational Amplifiers and Applications

Introduction to integrated circuits (ICs), Salient features of op-amps, Symbol of op-amp, Classification of integrated circuits, Differences between linear and digital ICs, Characteristics of an ideal op-amp, Applications of operational amplifiers, The equivalent circuit of op-amp, Definitions of op-amp parameters, Frequency sensitive parameters of op-amp, Temperature sensitive parameters, Applications of linear ICs, Typical op-amps, Salient features of op-amp series, Specifications of μA 741, Virtual ground concept, Applications of op-amp, Typical pin designations of op-amp.

Textbooks


6. ELECTRONIC DEVICES AND CIRCUITS THEORY, BOYLSTED, PRENTICE HALL PUBLICATIONS.

REFERENCES

1. INTEGRATED ELECTRONICS ANALOG DIGITAL CIRCUITS, JACOB MILLMAN AND D. HALKIAS, McGRAW HILL.
1. Applications of Op-Amps.
2. 555 Timer as Monostable and Astable Multivibrator.
3. Three terminal IC Voltage Regulator.
4. Linear Wave Shaping – RC Circuits.
6. Fixed – Bias Binary.
7. Self – Bias Binary.
9. UJT Sweep Generator.
10. Miller and Bootstrap Sweep Circuits.
1. Minimization and Realization of a given Function using Basic Gates (AND, OR, NOR, NAND, EXOR).
2. Function Generation using Decoders and Multiplexers.
4. Application of Multiplexers.
5. Seven – segment Display experiments.
6. Four bit and eight bit adders and subtractors.
7. Experiments using 74LS181 and 74LS182 ICs (ALU and Carry Look Ahead Adders).
9. Design and testing of Ripple Counters using ICs.
10. Design and testing of Mod-K Synchronous Counters.
11. Design and testing of Shift Registers.
12. Experiments using ROMs.
14. PLAs to realize SOP function using IC828100.
15. To realize Binary – Select Multiplexer using PAL 16L8.

### ECE 320 Soft Skills
B.E. 3rd Year 2nd Semester (Credit Based Grading System)  
with effect from the admitted batch of 2006 - 2007

EEE 321  CONTROL SYSTEMS

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<th>Credits</th>
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Pages (65 – 100)


Pages (127 – 150)


Pages (296 – 350)


Pages (355 – 428)


Pages (552 – 624)

Text Book:

Reference Books:
1. Modern Control Engineering, Ogata, PHI.
1. Internal Architecture and Functional Description of INTEL 8085, Microprocessor Interrupt Structure of 8085, Instruction Set and Timing Diagrams.

2. Programming The 8085:
   Introduction to 8085 Assembly Language Programming, Sample Programs - Stack and Subroutines.

3. Interfacing Semiconductor Memory Devices To 8085:
   Classification and Internal Organization of Semiconductor Memory Devices, Interfacing of SRAMs, DRAMs and EPROMs.

4. Interfacing I/O Devices to 8085:
   Parallel I/O (8255A), Timer/Counter (8253), Serial I/O (8251A), Keyboard/Display Interface.

5. Data Converters:
   ADC, DAC, and their Interfacing to 8085.


Text Book:

References:


1. Revision of C Language Overview only (no questions to be set on this).

2. Arrays and Functions:
   Organization and use of One Dimensional, Two Dimensional and Multi Dimensional Arrays, Handling of Character Strings, String Operation, Concept of Function, Parameter Passing, Recursion.

3. Structures, Pointers and Files:
   Definition of Structure and Union, Programming examples; Pointers, Pointer Expressions, Programming examples; File Operations, Preprocessor.

4. Linear Data Structures:

5. Non-Linear Data Structures:
   Trees, Binary Tree Representation, Tree Transversals, Conversion of a General Tree to Binary Tree, Representation of Graphs.

6. Searching Techniques:
   Basic Search Techniques, Tree Searching Graphics, Linked Representation of Graphics, Graph Transversal and Spanning Trees.

Text Books:
   1. Programming In ANSI C, by E. Balaguruswamy.

Reference Books:
   1. An Introduction To Data Structures With Applications, Trembly and Sorenson.
   2. The C – Programming Language, Kerningham and others.
# ECE 324  COMPUTER NETWORKS ENGINEERING

<table>
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<td>Tutorial 1</td>
<td>Lab -</td>
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1. **Introduction:**

2. **Physical layer:**
   - Theoretical Basis for Data Communication, Transmission Media, Analog and Digital Transmission, Transmission and Switching ISDN.

3. **Medium Access Sub-layer:**

4. **Data Link layer:**

5. **Network layers:**
   - Design Considerations, Difference between Gateway, Ethernet Switch, Router, Hub, Repeater, Functions of Router, Congestion Control Internetworking and Examples, Details of IP addressing schemes, TCP/IP Protocol details.

**Books:**


**References:**


2. Binary Phase-Shift Keying, Differential Phase-Shift Keying, Differentially-Encoded PSK (DEPSK), Quadrature Phase-Shift Keying (QPSK), M-ary PSK, Quadrature Amplitude Shift Keying (QASK), Binary Frequency Shift-Keying, Similarity of BFSK and BPSK, M-ary FSK, Minimum Shift Keying (MSK), Duo-binary Encoding.


Text Books:


2. Principles of Communications By Taub and Schilling
1. Introduction to EMI/EMC:
2. Grounding Techniques, Shielding Techniques, Cabling Techniques.
3. Conducted EMI/EMC:
4. Choice of Passive Components:
   EMC Design Components
5. EMI Measurement Technology:

**Text Books:**
1. IMPACT Learning Material Series Modules 1 – 9, IIT New Delhi, Published by RSTE.
2. Electromagnetic Compatibility, R. C. Paul.
1. Integrated- Circuit Fabrication:

2. Basic Digital circuits:
   MOS Technology - NMOS, CMOS, Inverters, Logic gates - ECL circuits.

3. Combinational Circuits:
   Arithmetic functions - Comparators - Multiplexers - Demultiplexers - Memory - Memory applications - PAL - PLAs.

4. Sequential Circuits:

Text Book:
   Microelectronic by Jocob Milliman, Arbin Grabel second edition, TMH.

References:
1. Measurement of Physical Systems:

2. Transducers:

3. Data Indication and Recording:

4. Signal Transmission and Processing:

References:
2. Electronic Instrumentation, H. S. Kalsi, TMH.
5. Transducers and Instrumentation, D.V.S. Murthy, PHI.
<table>
<thead>
<tr>
<th>Credits</th>
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Generation of AM Signal and measurement of Modulation Index.
Diode Detector for AM Signals.
Generation of FM Signal.
FM Detector.
Receiver Measurements.
Balanced Modulator.
Passive Filters (LPF, HPF, BPF).
Active Filters.
Attenuator.
Equalizer and Twin-T-Network.
Frequency Multiplier/Limiter.
SSB Generation and Detection.
Pre-emphasis and De-emphasis.
PLL.
IF Amplifier.
1) Write a program, which loads Registers, A, B, C, and D with the same constant. Try to optimize the program in such a way that the smallest numbers of program bytes are used. Test the program in single step mode. After each step, test the register of interest.

Assume that 4 bytes of data are stored at consecutive locations of the data-memory starting at (x). Write a program, which loads Registers E with (x), D with (x+1), C with (1+2) and A with (x+3).

   a. Assume that 1 byte of data is stored at data memory location (x). Write a program which tests bit 5 of (X). Write ‘FF’ in (x+1), if bit 5=0 and write ‘00’ at the same location if bit 5=1.

   b. Write a program which tests the zero-condition of a data byte specified at data memory location (x). If it is zero ‘00’ should be stored at (x+1) location, if non-zero ‘FF’ should be stored at the same location.

   c. A binary number is stored at data-memory location (x) Compute the number of its logical 1’s and store the result at y.

   d. Comment on the instructions used in the above three programs and write about the effect of flags with the instructions used.

2) Two unsigned binary numbers are stored at data-memory locations (x) and (x+1).

   a) Compute the sum of the two numbers and store the result at y, ignoring the possible overflow.

   b) Write a program to compute (x+1) - (x). The magnitude of the result should be stored at (y) and the sign (00 if positive, 01 if negative) at (y+1). Understand the 2’s compliment Arithmetic.

3) A double precision number is stored at (x) and (x+1) (lower order byte at (x)). Add another double precision number stored at (y) and (y+1) (lower order byte at (y)]. Store the result at (w) and (w+1).

   b) Same as above: subtract the number (y+1) (y) from (x+1) (x) and store the result at (w) and (w+1).

4) Two 2-digit BCD numbers are stored at consecutive memory locations (x) and (x+1). Write a program for computing the sum and store the result at loc. (y)

5) Implement a time-delay loop for the generation of milli seconds. Determine the exact time-delay by adding the states of the instructions executed in the program.

6) Write a program for a decimal counter (00-99) with programmable clock frequency [Eg. Frequency specified at data memory locations (x)] and display the count in the data field using the corresponding monitor subroutine.

   b) Reset the decimal counter at a predefined number and start the count again.

7) N binary numbers stored at consecutive data memory locations starting at (x) where N is defined at data memory location ‘NUMBER’.

   a) Find the largest number and display it in the data field and arrange them in ascending order.
b) Find the smallest number and display it in the data field and arrange them in descending order.

8) Two 8-bit binary numbers are stored at data memory locations (x) and (x+1) compute the product of the two numbers using, a). Successive addition method. b). Shifting and adding method store the result in (y) and (y+1).

9) Divide the 16-bit unsigned number in memory location (x) and (x+1) [Most significant byte in (x+1)] by the 8-bit unsigned number in memory location (x+2). Store the quotient in memory location (x+3) and remainder in memory location (x+4). [Choose the data such that the quotient must be contained in 8 bits].

10) a) A 2-digit BCD number is stored at data-memory location (x). Convert the number into binary and display the result in data field.

b) Convert a binary number in memory location (x) to two BCD digits in memory locations (x+1) and (x+2) [most significant digit in (x+1)]. The number in memory location (x) is unsigned and less than (64)H+1.

11) Write a program to do the operation specified at a data memory location (x). The operations are specified as follows:

00-Test the parity of the data at (x+1) and store DD for odd parity, EE for even parity at (y).

01-To operate a staircase lamp, 02-Test the zero condition of the data and store 00 if zero and FF if not, 03-Test if the data is positive or negative.

12) Hardware experiments:

   a) A/D and D/A Converters.
   b) DPSK Modulator and Demodulator.
   c) Seven Segment Display interface.
   d) Keyboard interface.
ECE 411 DIGITAL SIGNAL PROCESSING

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1. Discrete - Time Signals and Systems:

2. Applications of Z – Transforms:

3. Discrete Fourier Transform (DFT):
   Properties of the DFS, DFS Representation of Periodic Sequences, Properties of DFT, Convolution of Sequences.

4. Fast – Fourier Transforms (FFT):
   Radix – 2 Decimation – In – Time (DIT) and Decimation – In – Frequency (DIF), FFT Algorithms, Inverse FFT.

5. IIR Digital Filter Design Techniques:
   Design of IIR Filters from Analog Filters, Analog Filters Approximations (Butterworth and Chebyshev Approximations), Frequency Transformations, General Considerations in Digital Filter Design, Bilinear Transformation Method, Step and Impulse Invariance Technique.

6. Design of FIR Filters:
   Fourier Series Method, Window Function Techniques, Comparison of IIR and FIR Filters.

7. Applications:

Text Book:
Alan V. Oppenheim and Ronald W. Schafer: Digital Signal Processing, PHI.

References:
1. Information measure and source coding, Information measure, Entropy and Information rate, Coding for a discrete memory less source, Predictive coding for sources with memory, Information transmission on discrete channels, Mutual information.

Discrete channel capacity, coding for the binary symmetric channel, Continuous channels and system comparisons, continuous information, continuous channel capacity, Ideal communication system, system comparisons.

2. Rationale for coding, and types of codes, Discrete memory less channels, linear block codes, cyclic codes, convolution codes, Maximum likely hood Decoding of Convolution codes, Distance properties of convolution codes.

Sequential Decoding of Convolution codes, Trellis codes, Applications, Algebraic codes, Burst error correcting, Parity check bit coding for error detection, comparison of error rates in coded and uncoded transmission, Automatic repeat request.

Text Books:
2) Digital Communications by Simon Haykin, John Wiley & Sons (for topic 2)

References:
1) Principles of Digital Communications, Signal representation, Detection, Estimation & Information
3) Principles of Communication Systems, Taub & Schilling, 2/e, TMH Publishers
ECE 413   TV AND SATELLITE COMMUNICATION

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Television

Basic Television System:

Sound and Picture Transmission, the Scanning Process, Interlaced Scanning, Number of Scanning Lines, Vertical and Horizontal Resolution, Bandwidth of the Baseband Picture Signal.

Television Cameras:

Principle of working and constructional details of Image Orthicon, Vidicon, Plumbicon and Silicon diode array Vidicon and Solidstate Image Scanners.

Composite - Video Signal:

Video signal levels, Need for Synchronization, Details of Horizontal and Vertical Sync Pulses, Equalizing Pulses.

Signal Transmission and Channel Bandwidth:

AM and FM Channel Bandwidth, VSB Transmission, Complete Channel Bandwidth, Reception of Vestigial Sideband Transmission, Television Standards, Block Schematic study of a typical TV Transmitter.

The TV Picture Tube:

Monochrome Picture Tube, Picture Tube Characteristics and Picture Tube Control Circuits, Gamma Correction.

Television Receiver:

Block Schematic and Functional Requirements, VSB Correction, Vertical and Horizontal Deflection Circuits, E.H.T. Generation, Study of Video IF Amplifier Video Detector, Sound Channel Separation, Sync Separation Circuits.

Colour Television:


Satellite Communication

Text Books:


References:

1. Microwave Components:

2. Microwave Signal Generators and Amplifiers:
   Vacuum Tube Triodes, Resonant Cavity Devices, Reflex Klystron, Two - Cavity Klystron, Multi - Cavity Klystron, Slow - Wave Devices, TWT, Crossed Field Devices, Magnetrons, Semiconductor Devices, Microwave BJTs, FETs, Tunnel Diodes, Gunn Diode, IMPATT, TRAPATT Diodes.

3. Microwave Circuits:
   Scattering Matrix and its Properties, Scattering Matrix of directional coupler, circulator, E Plane Tee, H plane Tee and Magic Tee.

4. Microwave Integrated Circuits:
   Materials, Substrate, Conductor, Dielectric and Resistive Materials, MMIC Growth, Fabrication Techniques, MOSFET Fabrication, NMOS Growth and CMOS Development, Thin Film Formation.

5. Microwave Measurements:
   VSWR, Frequency, Guide Wavelength, Coupling and Directivity measurements.

Text Books:
1. Microwave Engineering, G.S.N. Raju, IK International Publishers,
3. Microwave Devices and Circuits, S. Y. Liao, PHI.

References:
4. ECE 415 Elective - II (1) : CELLULAR AND MOBILE COMMUNICATIONS

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Introduction to Cellular Mobile Systems:


Elements of Cellular Radio System Design:

General description of the problem, Concept of Frequency reuse Channels, Co-channel interference Reduction factor, Desired C/I from a normal case in an Omni-directional Antenna system, Cell splitting, consideration of the components of Cellular Systems.

Interference:

Introduction to Co-channel interference, Real time Co-channel interference, Co-channel measurement, Design of Antenna system, Antenna parameters and their effects, Diversity Receiver, Non Co-channel interference - different types.

Cell Coverage for Signal and Traffic:

General introduction, Obtaining the Mobile Point - to - Point model, Propagation over water or flat open area, Foliage loss, Propagation in near in distance, Long distance Propagation, Point - to - Point predication model - characteristics, Cell site, Antenna heights and signal coverage cells, Mobile - to - Mobile Propagation.

Cell Size Antennas and Mobile Antennas:

Characteristics, Antennas at Cell site, Mobile Antennas.

Frequency Management and Channel Assignment:

Frequency management, Fixed Channels assignment, Non Fixed Channel assignment, Traffic and Channel Assignment

Hand Off, Dropped Calls:

Why Hand-Off, Types of Hand-Off and their characteristics, dropped call rates and their evaluation.

Operational Techniques:

Parameters, Coverage hole filter, Leaky feeders, Cell Splitting and small cells, Narrow Beam concept.

Text Books:


Reference Books:

1. Wireless Digital Communication by Dr. Kamilo Feher, PHI.
1. Review of microelectronics and an introduction to MOS technology:
   Introduction to IC technology, MOS and related VLSI technology, NMOS,
   CMOS, BiCMOS Technologies, Thermal aspects of processing, Production of
   E beam marks.
2. MOS and BiCMOS circuit design processes:
   MOS layers, Stick diagrams, Design rules, and layout, 2 & 1.2 micro meter
   CMOS rules, Layout diagrams, Symbolic diagram.
3. Basic Circuit concepts:
   Sheet resistance, Area capacitances of layers, Delay unit, Wiring Capacitances,
   Choice of layers.
4. Scaling of MOS Circuits:
   Scaling models, Scaling function for device parameters, Limitations of scaling.
5. Sub system design and Layout:
   Architectural issues, Switch logic, Examples of Structural
design(Combinational logic).
6. Sub system design process:
   Design of ALU subsystem, Some commonly used storage elements, Aspects
   of design tools, Design for testability, Practical design for test guidelines, Built
   in self test, CMOS project-an incremen ter / decremen ter, a comparator for
   two n-bit numbers.
   Ultra fast systems, Technology development, MOSFET based design.
7. Introduction to Embedded Systems
   Embedded Systems, Processor Embedded into a System, Embedded
   Hardware Units and Devices in a System, Embedded Software in a System,
   Examples of Embedded Systems, Embedded Systems on Chip, Complex
   Systems Design and Processors, Design Process in Embedded System,
   Formalization of System Design, Design Process and Design Examples,
   Classification of Embedded Systems, Skills required for an Embedded System
   Designer.
8. Embedded Software Development Process and Tools
   Introduction to Embedded Software Development Process and Tools, Host
   and Target Machines, Linking and Locating Software, Getting Embedded
   Software into the Target System, Issues in Hardware-Software Design and
   Co-design

Text books:
1. Basic VLSI Design by Douglas A, Pucknell, Kamran Eshraghian, Prentice-
   by Raj Kamal, Tata McGraw Hill Publication (Chapter 1, Chapter 13)

References:

ECE 415 Elective – II(3) : ADVANCED MICROPROCESSORS

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8086 / 8088 microprocessor, architecture and addressing modes.

Instructions and assembly language programming.

Macroassembler MASM and advanced programming.

Interrupts of 8086 / 8088 and DOS Interrupt 21h functions.

Interfacing A/D converters to the PC and data acquisition. Interfacing D/A converters and waveform generation.

80286, 80386, 80486 and Pentium microprocessors.

Motorola 68000, 68020 and 68030 microprocessors.

Text Books:


Reference Books:

Assembly Language Programming the IBM PC by Alan R. Miller, Sybex INC, 1987.
1. Information and Communication:
   Measure for Information, sources, source models and source encoding, coding for memory
   less sources, coding for analog sources, channel model and channel capacity.
2. Communication Networks:
   Existing Communications Networks, outlines of the associated hardware facilities,
   Modules of the interfacing facilities, brief outlines of the characteristics of the networks.
3. Communication Methodologies.
4. Information based services:
   Communication services, data analysis services, systems oriented services.
5. Information based forecasting MIS Establishing the Frame work, Information Research management, Data Base

Books:
Introduction:

Digital Image Fundamentals:
Elements of Visual perception – A simple Image Model – Sampling and Quantization – Some Basic Relationship between Pixels.

Image Transforms:

Image Enhancement:

Image Restoration and Compression:
Image observation models – Inverse and Wiener Filtering – Pixel Coding – Predictive techniques – Transform Coding of Images.

Statistical and Non–Parametric Decision Making:

Clustering:
Introduction – Hierarchical Clustering – Partitional Clustering.

Artificial Neural Networks:

Text Books:
Fundamentals of Digital Image Processing, Anil K. Jain, PHI.
Pattern Recognition and Image Analysis, Earl Gose and Richard Johnsonbaugh Steve Jost, PHI.
1. Sample the given input signal for different sampling rates and recover the signal by means of appropriate low – pass filter.

2. Study the Pulse – Width Modulation for both AC and DC Modulating Signals and obtain the corresponding waveforms.

3. Study the Pulse – Position Modulation for both AC and DC Modulating Signals and obtain the corresponding waveforms.

4. Study the functioning of a given Analog to Digital Converter.

5. Study the functioning of a given Digital to Analog Converter.

6. Encode the given 4-Bit Data Word into 16-Bit Orthogonal Encoded Word using Hadamard Code.

7. Decode the 16-Bit Orthogonal Encoded Word to 4-Bit Data Word.

8. Study the performance of the given Continuously Variable Slope Delta Modulation (CVSD).

9. Obtain the characteristics of the Phase Shift Keying (PSK) Modulator.

10. Obtain the characteristics of the Frequency Shift Keying (FSK) Modulator.
Cycle – I: Signal Processing with MATLAB

1. Generation of Discrete-Time Sequences
2. Implementation of Discrete-Time Systems
3. Frequency Analysis of Discrete Time Sequences
4. Frequency Analysis of Discrete Time Systems
5. Infinite Impulse Response Filter Design
6. Finite Impulse Response Filter Design

Cycle – II: VHDL Experiments

1. Logic Gates
2. Full Adder
3. SR Latch and D Latch
4. 8 x 1 Multiplexer and Demultiplexer
5. Up/Down Counter, Universal Shift Register
6. Mealy & Moore Counters
   Basic Elements of Supply and Demand – Law of Demand – Elasticity of Demand.
   Recent Trends in Contemporary Business Environment.

References:

5. Production and Operation Management – B. S. Goel.
ECE 422  RADAR ENGINEERING AND NAVIGATIONAL AIDS

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2. MTI and Pulse Doppler Radar: Introduction, Delay line Cancellers, Moving target Detector, Limitation to MTI performance, MTI from moving platform, Pulse Doppler Radar

3. Tracking Radar, Sequential Lobing, Conical Scan, Monopulse tracking Radar, Low angle tracking, Pulse compression,
   Block Diagrams of Synthetic Aperture Radar (SAR), Phased array Radars, MST Radar, ECM, ECCM


Text Book:


References

Data Communication Concepts and Terminology:

Data Representation, Data Transmission, Modes of Data Transmission, Signal Encoding, Frequency Spectrum, Transmission Channel, Data Communication

Transmission Media:


Modems and Data Multiplexers:

Digital Modulation Methods, Multilevel Modulation, Differential PSK, Standard Modems, Limited Distance Modems and Line Drivers, Group Band Modems, Data Multiplexers, Statistical Time Division Multiplexers

Error Control:

Transmission Errors, Coding for Error Detection and Correction, Error Detection Methods, Forward Error Correction Methods, Reverse Error Correction

The Physical Layer, The Data Link Layer:

Need for Data Link Control, The Data Link Layer 196, Frame Design Considerations, Flow Control, Data Link Error Control, Data Link Management, HDLC-HIGH-LEVEL DATA LINK CONTROL

The Network Layer:

The Sub network Connections, Circuit Switched Sub networks, Store and Forward Data Sub networks, Routing of Data Packets, Internetworking, Purpose of the Network Layer, Title of X.25 Interface, Location of X.25 Interface, Addressing in X.25, Packet Assembler and Disassembler (PAD), Asynchronous Character Mode Terminal PAD

Local Area Networks:


Text Book:

Praksh C. Gupta ‘DATA COMMUNICATIONS’ Prentice Hall of India 1996.
1. Propagation: in Fibers:
   - Elementary discussion of propagation in fibers
   - Attenuation in Optical Fibers
   - EM wave propagation in step-Index Fibers
   - EM wave propagation in graded-Index Fibers.

2. Optical Fibers and Associated Components:
   - Fiber Properties
   - Splices, connectors, Couplers, and GRATings.

3. Transmitting and Receiving Devices:
   - Injection laser Characteristics
   - LED structures, Characteristics and modulation

4. Optical Transmitters, Receivers and Fiber-optic Link Design:

5. Concepts of Fiber-Optic Networks and wavelength – Division Multiplexing:

Books:
- For syllabus items 2,4 and 5
- For syllabus item 1
  - Optical Communication Systems by John Gowar, PHI 1994
- For syllabus item 3
ECE425 Free Elective –II (1) FUNDAMENTALS OF MOBILE COMMUNICATIONS

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INTRODUCTION:

WIRELESS TRANSMISSION TECHNIQUES:

THE CELLULAR CONCEPT:

MOBILE RADIO PROPAGATION:
Introduction, Free space propagation model, The three basic propagation models-Reflection, Diffraction and Scattering, Two-ray model, Outdoor propagation models, Indoor propagation models, Signal Penetration into building, Small scale multipath Propagation, Parameters of Mobile multipath channels, Types of small scale fading.

TELECOMMUNICATION SYSTEMS:

Textbooks:

References:
Introduction to Global Navigation Satellite Systems (GNSSs)

The History of GPS, The Evolution of GPS, Development of NAVSTAR GPS, Block I, Block II satellites, Block IIA, Block IIR and Block II R-M satellites.

GPS working principle, Trilateration, Determination of where the satellites are, Determination of how far the satellites are, Determining the receiver position in 2D or X-Y Plane, Determining the receiver position in 3D or X-Y-Z Plane.

Other Global Navigation Satellite Systems, GLONASS, GALILEO, Comparison of 3 GNSS (GPS, GALILEO, GLONASS) in terms of constellation and services provided.

GPS Satellite constellation and Signals

GPS system segments, Space segment, Control segment, User segment, GPS Signals, Pseudorandom noise (PRN) code, C/A code, P code, Navigation data, Signal structure of GPS.

Coordinate Systems:

Geoid, Ellipsoid, Coordinate Systems, Geodetic and Geocentric coordinate systems, ECEF coordinates, Datums, world geodetic 1984 (WGS 84), Conversion between Cartesian and geodetic coordinate frame.

Textbook:

Reference Books:
### ECE 426  MICROWAVE ENGINEERING AND ANTENNAS LABORATORY

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1) Measurement of VSWR  
2) V-I Characteristics of GUNN Diode  
3) Measurement of Coupling Factor and Directivity of a 4-Port directional coupler  
4) Measurement of Microwave frequency  
5) Reflex Klystron Characteristics  
6) Radiation Pattern of Horn Antenna  
7) Fiber Optic Analog Link  
8) Fiber Optic Digital Link  

Other four experiments from the choice either from Microwave Engineering or from Antenna Theory

### ECE 427  PROJECT – II

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