R.K.D.F. UNIVERSITY, BHOPAL

B.E. (Electronics & Communication Engineering)

SECOND YEAR

Semester – III

Course Content & Grade

Branch	Subject Title	Subject Code
B.E. Common	**Engineering Mathematics-II**	**B.E.- 301**

Unit I

Second Order linear differential equation with variable coefficients : Methods one integral is known, removal of first derivative, changing of independent variable and variation of parameter, Solution by Series Method

Unit II

Vector Calculus: Differentiation of vectors, scalar and vector point function, geometrical meaning of Gradient, unit normal vector and directional derivative, physical interpretation of divergence and Curl. Line integral, surface integral and volume integral, Green's, Stoke's and Gauss divergence theorem

Unit III

Linear and Non Linear partial differential equation of first order: Formulation of partial differential equations, solution of equation by direct integration, Lagrange's Linear equation, charpit's method. Linear partial differential equation of second and higher order: Linear homogeneous and Non homogeneous partial diff. equation of nth order with constant coefficients. Separation of variable method for the solution of wave and heat equations

Unit IV

Fourier series: Introduction of Fourier series, Fourier series for Discontinuous functions, and Fourier series for even and odd function, Half range series Fourier Transform: Definition and properties of Fourier transform, Sine and Cosine transform.

Unit V

Laplace Transform: Introduction of Laplace Transform, Laplace Transform of elementary functions, properties of Laplace Transform, Change of scale property, second shifting property, Laplace transform of the derivative, Inverse Laplace transform & its properties, Convolution theorem, Applications of L.T. to solve the ordinary differential equations

References

(i) Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India
(ii) Higher Engineering Mathematics by BS Grewal, Khanna Publication
(iii) Advance Engineering Mathematics by D.G.Guffy
(iv) Mathematics for Engineers by S.Arumungam, SCITECH Publuication
(v) Engineering Mathematics by S S Sastri. P.H.I.

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SECOND YEAR

Semester – III

Course Content & Grade

Branch	Subject Title	Subject Code
EC	Electronic Device	EC - 302

PURPOSE

The purpose of this course is to provide a basis for understanding the characteristics, operation and limitations of semiconductor devices. This course brings together the quantum theory of solids, semiconductor material physics, and semiconductor device physics.

INSTRUCTIONAL OBJECTIVES

1. To understand the operational characteristics of a Semiconductor in Equilibrium and Non-Equilibrium conditions.
2. To understand the working of PN junction diodes and special purpose diodes.
3. To understand the basic working physics of BJT and FET both in ideal and non-ideal conditions.

UNIT-1

ENERGY BANDS AND EXCESS CARRIERS IN SEMICONDUCTORS

Energy bands and excess carriers in semiconductors: Bonding forces and Energy Bands in Solids – Charge Carriers in Semiconductors – Carrier concentrations – Drift of Carriers in Electric and Magnetic Fields – Invariance of the Fermi level at Equilibrium. **Excess carriers in semiconductors:** Optical Absorption – Luminescence – Carrier Lifetime and Photoconductivity – Diffusion of Carriers.

UNIT-II

SEMICONDUCTOR JUNCTIONS

Junctions : Equilibrium Conditions – Forward and Reverse Biased Junctions – Reverse Bias Breakdown – Transient and AC Conditions – Deviations from the Simple Theory – Metal-Semiconductor Junctions. **Field Effect transistors:** Transistor Operation – The junction FET – The Metal-Semiconductor FET – The Metal-Insulator-Semiconductor FET – The MOS FET

UNIT-III

SOLID STATE DEVICES-I

Bipolar Junction Transistors: Fundamentals of BJT Operation – Amplification with BJT's – Minority Carrier Distributions and Terminal Currents – Generalized Biasing – Switching – Other Important Effects – Frequency Limitations of Transistors – Hetero junction Bipolar Transistors **Opto-electronic devices:** Photodiodes – Light Emitting Diodes – Lasers and Semiconductor Lasers

UNIT-IV

SOLID STATE DEVICES-II

Charge transfer devices: Dynamic Effects in MOS Capacitors – The basic CCD – Improvements on the Basic Structure – Applications of CCD's. **High-frequency and high-power devices:** Tunnel Diodes – IMPATT Diode – Gunn Diode – PNPN Diode – SCR – IGBT – DIAC – TRIAC - UJT.

UNIT-V

POWER SUPPLIES

Half wave Rectification – Full wave Rectification – General filter consideration – Capacitor Filter – RC Filter – Discrete Transistor Voltage Regulation – IC Voltage Regulators – Practical Applications – SMPS. 33 EC – 07-08 – SRM – E&T

TEXT BOOKS

1. Ben G. Streetman and Sanjay Kumar Banerjee. "Solid State Electronic Devices", 6th Edition, Pearson Education
2. Robert L. Boylestad and Louis Nashelsky , "Electronic Devices and Circuit Theory" , 9th Edition Pearson Education , International Edition.
3. P.John Paul ,"Electronic Devices and Circuits", Edition- New Edge International Publishers
4. Millman & Halkias, "Integrated Electronics", Edition-Tata McGraw-Hill Education

REFERENCE BOOKS

1. Donald A. Neamen, "Semiconductor Physics and Devices, 2nd Edition, Irwin publishers.
2. S.M. Sze , "Physics of Semiconductor Devices", 2nd edition, Wiley Eastern
3. Stanley G. Burns and Paul R. Bond ," Principles of Electronic Circuits", Galgotia Publishers

Electronic Device Lab: -

INSTRUCTIONAL OBJECTIVES

1. To study experimentally the characteristics of diodes, BJT's and FET's.
2. To verify practically, the response of various special purpose electron devices.

LIST OF EXPERIMENTS

1. Characteristics of PN junction and Zener diode.
2. Input, Output and Transfer characteristics of CE and CC Amplifier.
3. Characteristics of LDR, Photo-diode and Photo transistor.
4. Transfer characteristics of JFET.
5. Transfer characteristics of MOSFET (with depletion and enchancement mode)
6. Characteristics of LED with three different wavelengths.
7. Half wave rectifier.
8. Full wave rectifier with 2 diodes.
9. Full wave rectifier with 4 diodes (Bridge rectifier).
10. Series voltage Regulator.
11. Shunt voltage Regulator.
12. Characteristics of Thermistor.

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SECOND YEAR

Semester – III

Course Content & Grade

Branch	Subject Title	Subject Code
EC	Digital System	EC - 303

PURPOSE

The purpose of this course is to develop a strong foundation in analysis and design of digital electronics.

INSTRUCTIONAL OBJECTIVES

At the end of the course students should be able to

1. Understand concepts of combinational and sequential circuits
2. Analyze the synchronous and asynchronous logic circuits
3. Understand concepts of memory, programmable logic and digital integrated circuits.

UNIT-I

NUMBER SYSTEMS - BOOLEAN ALGEBRA AND LOGIC GATES

Number Systems - Boolean algebra – Canonical and standard forms. Digital logic gates – Integrated circuits. Map method – four and five variable map methods –Products of Sums Simplification - Don't care conditions .Quine -McClucskey Method.

UNIT-II

GATE LEVEL MINIMIZATION & COMBINATIONAL LOGIC

Two level implementation – NAND & NOR Implementations – EXOR Functions. Combinational Circuits – Analysis and design procedure – Binary adder - Subtractor – Decimal Adder – Binary Multiplier – Magnitude Comparator – Decoders – Encoders – Multiplexers.

UNIT-III

SYNCHRONOUS SEQUENTIAL LOGIC

Sequential circuits - Latches – Flip-Flops - Analysis of Clocked Sequential Circuits – State Reduction and Assignment – Design Procedure.

Registers – Shift Registers – Ripple counters – Synchronous Counters – Other counters.

UNIT-IV

AYSYNCHRONUS SEQUENTIAL LOGIC AND MEMORY

Introduction – Analysis Procedure – Circuit with Latches – Design Procedure – Reduction of State and Flow Tables – Race-Free state Assignment. Memory – Introduction – Random-Access Memory – Memory Decoding – Read only memory.

UNIT-V

DIGITAL INTEGRATED CIRCUITS AND PROGRAMMABLE LOGIC

Introduction – Special Characteristics – Bipolar-Transistor Characteristics – RTL and DTL Circuits – TTL – ECL - MOS – CMOS – CMOS Transmission Gate Circuits – Programmable Logic Array – Programmable Array Logic - Sequential Programmable Devices.

TEXT BOOKS

1. Morris Mano. M, "Digital Design ", Pearson education, Third Edition 2002.
2. Ronald J. Tocci, "Digital System Principles and Applications" , PHI ,Sixth Edition, 1997.

REFERENCE BOOKS

1. Floyd, "Digital Fundamentals" , Universal Book Stall, New Delhi,1986.
2. Morris Mano. M, "Digital Design ", PHI, Second Edition.
3. Ronald J. Tocci, "Digital System Principles and Applications", Pearson education 9th edition.

Digital System Lab

INSTRUCTIONAL OBJECTIVES

1. To verify operation of logic gates and flip-flops.
2. To design and construct digital circuits

LIST OF EXPERIMENTS

1. Study of Gates & Flip-flops.
2. Half Adder and Full Adder.
3. Magnitude Comparator (2-Bit).
4. Encoders and Decoders.
5. Multiplexer and Demultiplexer.
6. Code Converter.
7. Synchronous Counters.
8. Ripple Counter.
9. Mod – N Counter.
10. Shift Register – SISO & SIPO.

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SECOND YEAR

Semester – III

Course Content & Grade

Branch	Subject Title	Subject Code
EC	Network Analysis	EC - 304

UNIT-I

Circuit Concepts: Introduction, Linearity, Time Invariance, Causality, Passive and active n-port Networks, Lumped and distributed Networks, Circuit Elements, Electric potential, Current, Sign conventions, Circuit diagrams, Voltage current relations, Star Delta transformation, Resistance, inductance and Capacitance, Signal waveforms, Average and effective values of various signal waveforms.

UNIT-II

DC Resistive Circuits and Network Theorems: Kirchoff's voltage law, Kirchoff's current law, Voltage division and current division, Series parallel Network reduction, Superposition theorem and its application, Thevenin's and Norton's theorem and its application, Maximum power transfer theorem, Tellegen's theorem, Conservation of power, Tellegen's quasi theorem, Application of Tellegen's theorem, Millman's theorem, Substitution theorem with proof, Compensation theorem

UNIT-III

DC Mesh and NODE Analysis: Loop and Mesh currents, Matrices and Mesh currents, Determinants and mesh current Input résistance, Node voltage method

Network Graph Theory: Concept of a network graph terminology used in network graph relation between twigs and links, Properties of a tree in a graph, Formation of incidence matrix, No. of trees in a graph, Cut set matrix and tie set matrix

UNIT-IV

The Laplace Transformation: Introduction, The Laplace transformation, Some basic theorems for the Laplace transformation, Partial fraction expansions, Initial and final value theorem, Heaviside's expansion theorem

Sinusoidal Steady state Analysis: Introduction, Sinusoidal voltage and current, Element responses, The sinusoidal steady state, The sinusoidal and ejwt, Solution using ejwt, Solution using Re ejwt or Im ejwt, Phasors and phasor diagrams.

UNIT-V

Two port Networks: Relationship of two port variables, Short circuit admittance parameters, open circuit impedance parameters, Transmission parameters, the hybrid parameters, Relationship between various parameters, Parallel connection of two part networks.

Frequency Response and Resonance: Introduction, Half power frequencies, RLC circuit series resonance, Quality factor, RLC parallel circuit parallel resonance, Practical LC parallel circuits, Series parallel conversions.

Books Recommended

1. Van-Valkenberg M E "Network Analysis", PHI, New Delhi, Third Edition (1999)
2. Van-Valkenberg M E, "Introduction to Modern Network Synthesis", John Wiley & Sons (1999)
3. Nahvi M, Edminister J, "Scaum's Outline of Electric Circuits (Theory and Problems)", TMH Publication, Fourth Edition, (2002)
4. Balabanian N, Bickert Theodare A, "Linear Network Theory: Analysis, Properties, Design and Synthesis", Matrix Publishers, First edition (1985)
5. DeCalro R A, Lin P M, "Linear Circuit Analysis", 2nd Ed. Oxford University Press, Indian Edition (2004).

Analysis and Synthesis of Networks Laboratory

1. Verification of Thevenin's theorem, Norton's theorem.
2. Verification of Maximum power transfer theorem, Superposition theorem.
3. Verification of Reciprocity theorem.
4. Design and implementation of T and Π passive filters.
5. Determination of h-parameters of a network.
6. Study of sinusoidal steady state response of a network.
7. Study of transient response of a network.
8. Study of passive integrator and differentiator.
9. Synthesis of RC-network for a given network function.
10. Verification of equivalence of star and delta transformation.

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SECOND YEAR

Semester – III

Course Content & Grade

Branch	Subject Title	Subject Code
EC	Value Education	EC - 305

Chapter 1

Value Education Concepts of Values-Definition and Types of values –The need for Education in values-Challenges for Value adoption-Character development-Vision of a better world

Chapter 2

Inculcation of values Classification of values- Personal Values-Family Values-Social Values-Spiritual values-Benefits of value adoption

Chapter3

Values for Professional excellence Definition-Purpose-implementation-situations to adopt-reflection questions quotable quotes of Active listening-Decision making-Determination-Perseverance-Discipline-Responsibility

Chapter 4

Business ethics

Ethics and Entrepreneurship- Professional Ethics –Ethical choices- Resolving Ethical Dilemmas-Leadership and Social Responsibility- Corporate Social Responsibility

Chapter 5

Quality of Life

Dealing with change-Trends, Organizations and the Individual-Self and the world-Quality from within-Relating to others-The dynamics of personal powers

Chapter 6

Exploring the self

True Identity-Anatomy of the self-The cyclic processes within the self-States of the awareness-Innate and Acquired qualities-Empowering the self

Chapter 7

Understanding Self-Esteem

Know self-esteem-Understanding the self-Components of self-esteem-**Association with self-esteem-Levels of self-esteem-Reflection exercises**

Chapter 8

Principles of living

Be introspective-Be an observer-Being optimistic-Appreciate differences-Don't compare yourself with others-Live at present

Chapter 9

Practical Meditation

Why meditate?-Soul consciousness-The supreme-Karma-Timeless dimension-The eight powers

Chapter 10

Exercises for Practice

Quiet reflection- Practice introversion-Being an observer-Stand back and observe -Self awareness (Soul consciousness)-Experiencing Body free stage-Reflect on original qualities-Visualize the Divine-Think attributes of the Supreme-Developing a living relationship-Surrender to God-Create Good wishes for all-Visualization in Meditation: Orbs of Light- The forest-The Balloon

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SECOND YEAR

Semester – III

Course Content & Grade

Branch	Subject Title	Subject Code
EC	Software Lab- I	EC - 306

CIRCUIT SIMULATION/ PCB DESIGNING SOFTWARE

Study of circuit simulation software (any one- TINA-PRO/ PSPICE/ CIRCUIT MAKER/ GPSIM/ SAPWIN etc).

Overview and Study of the key features and applications of the software. Application of the software in the field of Electronic Devices, Electronic Instrumentation and Network Analysis. Design, Optimization and simulation of

1. Basic Electronic circuits (examples rectifiers, clippers, clampers, diode, transistor characteristics etc).
2. Transient and steady state analysis of RL/ RC/ RLC circuits, realization of network theorems.
3. Use of virtual instruments built in the software.

Study of PCB layout software

Overview and use of the software in optimization, designing and fabrication of PCB pertaining to above circuits simulated using above simulation software or other available. Students should simulate and design the PCB for atleast two circuits they are learning in the current semester.

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SECOND YEAR

Semester – IV

Course Content & Grade

Branch	Subject Title	Subject Code
B.E. Common	**Mathematics-III**	**BE - 401**

Unit I

Difference Operators, Interpolation (Newton Forward & Backward Formulae, Central Interpolation Formulae, Lagrange's and divided difference formulae), Numerical Differentiation and Numerical Integration.

Unit II

Errors & Approximations, Solution of Algebraic & Trancedental Equations (Regula Falsi ,Newton-Raphson, Iterative, Secant Method), Solution of simultaneous linear equatins by Gauss Elimination, Gauss Jordan, Crout's methods , Jacobi's and Gauss-Siedel Iterative methods

Unit III

Functions of complex variables : Analytic functions, Harmonic Conjugate, Cauchy-Riemann Equations, Line Integral, Cauchy's Theorem, Cauchy's Integral Formula, Singular Points, Poles & Residues, Residue Theorem , Application of Residues theorem for evaluation of real integrals

Unit IV

Solution of Ordinary Differential Equations(Taylor's Series, Picard's Method, Modified Euler's Method, Runge-Kutta Method, Milne's Predictor & Corrector method), Correlation and Regression, Curve Fitting (Method of Least Square).

Unit V

Concept of Probability: Probability: Binomial, Poisson's, Continuous Distribution: Normal Distribution, Testing of Hypothesis |: Students t-test, Fisher's z-test, Chi-Square Method

Reference:

(i) Numerical Methods using Matlab by J.H.Mathews and K.D.Fink, P.H.I.
(ii) Numerical Methods for Scientific and Engg. Computation by MKJain, Iyengar and RK Jain, New Age International Publication
(iii) Mathematical Methods by KV Suryanarayan Rao, SCITECH Publuication
(iv) Numerical Methods using Matlab by Yang,Wiley India
(v) Pobability and Statistics by Ravichandran ,Wiley India
(vi) Mathematical Statistics by George R., Springer

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SECOND YEAR

Semester – IV

Course Content & Grade

Branch	Subject Title	Subject Code
EC	**Analog Communication**	**EC - 402**

Unit-I

Signal Analysis: Vectors and signals, orthogonal functions, Fourier series, Complex Fourier spectrum, Fourier Transform, Time domain and frequency domain representation of a signal, Existence of the FT, FT of some useful functions like exponential signal single sided & double sided, Gate function, singularity functions, FT of various functions, Properties of FT, Convolution, Convolution with Impulse Function.

Signal Energy and Power: Spectral Density of various types of signals, Spectra (Parseval's Theorem), Density Spectra of Periodic Gate and Impulse train.
Linear Time Invariant (LTI) Systems Casual and Non Causal System, Distortion less System, Impulse Response of Distortion less System, Ideal Filter and Practical Filter.

Unit-II

Modulation Techniques: Need and types of modulation techniques, Amplitude Modulation, Frequency Spectrum, Power Distribution, Modulation by Complex Signal, Low Level and High Level AM Modulators, Linear Integrated Circuit AM Modulators, Suppressed Carrier Generation (Balance/Chopper and Square Law Modulation), SSB Generator (Phase and Frequency Discrimination Method), VSB Transmission and Application. Detection of AM signals: Envelope Detector Circuit, RC Time Constant, Synchronous Detection Technique, Error in Synchronous Detection, SSB signal detection, PLL and its use in demodulation.

Unit-III

Angle Modulation: Frequency and Phase Modulation Frequency spectrum, bandwidth requirement, Frequency and Phase Deviation, Modulation Index, NBFM and WBFM, Multiple frequencies FM. FM Modulators: Direct (Parameter Variation Method) and Indirect (Armstrong) Method of frequency modulation. FM Detector: Slope Detector, Foster Seely Discriminator, Ratio Detector and PLL detectors.

Unit-IV

Transmitters: AM transmitter, block diagram and working of Low Level and High Level Transmitters, Trapezoidal Pattern and Carrier Shift, SSB Transmitters, FM transmitters - Frequency Multiplication Applied to FM Signals, FM transmitters.
Receivers: Block Diagram of Radio Receiver, Receiver Characteristics (Selectivity, Fidelity and Sensitivity), AM Receiver, RF Receiver, Super-heterodyne Receiver, RF Amplifier, Frequency Mixer, AVC and AFC, Image Signal, Intermediate Frequency Selection, Diversity Reception, FM Receiver.

Unit-V

Noise : Sources and types of noise and their power density, White Noise, Noise from Single and Multiple noise source for Linear Systems, Super Position of Power Spectrum, Equivalent Noise Bandwidth, Noise Figure, and Equivalent Noise Temperature, their Relationship, Calculation of Noise Figure and Noise Temperature for Cascade Systems,

References:

1. B.P. Lathi : Communication Systems, BS Publication
2. Taub and Schilling : Principles of communication Systems, TMH
3. Singh and Sapre : Communication Systems, TMH
4. S Haykin : Communication Systems, John Wiley and Sons Inc
5. B.P. Lathi : Signal, Systems and Communication Systems, BS Publication

List of Experiments:

1. Analysis of AM Modulation and Demodulation Techniques (Transmitter and Receiver), Calculation of Parameters
2. Analysis of FM Modulation and Demodulation (Transmitter and Receiver) and Calculation of Parameters
3. To Construct and Verify Pre-emphasis and De-emphasis and Plot the Waveforms.
4. Study of Super-heterodyne Receiver and Characteristics of Radio Receiver.
5. To Construct Frequency Multiplier Circuit and to Observe the Waveform
6. Study of AVC and AFC.
7. Study of PLL chip (566) and its use in various systems
8. Study of Sampling Process and Signal Reconstruction and Aliasing.
9. Study of PAM, PPM and PDM.
10. Study of PCM Transmitter and Receiver.
11. Time Division Multiplexing (TDM) and Demultiplexing.

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SECOND YEAR

Semester – IV

Course Content & Grade

Branch	Subject Title	Subject Code
EC	Electronic Instrument	EC - 403

Unit-I

Measurement and Error: Accuracy and Precision, Sensitivity, Linearity, Resolution, Hysterisis, Loading Effect. Measurements of Current, Voltage, Power and Impedance: DC and AC Ammeter, DC Voltmeter-Chopper type and solid-state, AC voltmeter using Rectifier, Average, RMS, Peak Responding voltmeters, Multi-meter, Power meter, Bolometer and Calorimeter.

Unit-II

Cathode Ray Oscilloscope (CRO): Different parts of CRO, Block diagram, Electrostatic focusing, Electrostatic deflection, Post deflection acceleration, Screen for CRTs, Graticules, Vertical and Horizontal deflection system, Time base circuit, Oscilloscope Probes, Applications of CRO, Special purpose CROs- Multi input, Dual trace, Dual beam, Sampling, Storage (Analog and Digital), Oscilloscope.

Unit-III

AC Bridges: Maxwell's bridge (Inductance and Inductance-Capacitance), Hay's bridge, Schering bridge (High voltage and Relative permittivity), Wein bridge, Wagner earth detector, Impedance measurement by Q-meter. **Non-Electrical Quantities (Transducer):** Classification of Transducers, Strain gauge, Displacement Transducer- Linear Variable Differential Transformer (LVDT) and Rotary Variable Differential Transformer (RVDT), Temperature Transducer- Resistance Temperature Detector (RTD), Thermistor, Thermocouple, Piezo-electric transducer, Optical Transducer- Photo emissive, Photo conductive, Photo voltaic, Photo-diode, Photo Transistor, Nuclear Radiation Detector.

Unit-IV

Signal generator & Display: Signal and Function Generators, Sweep Frequency Generator, Pulse and Square Wave Generator, Beat Frequency Oscillator, Digital display system and indicators, Classification of Displays, Display devices, Light Emitting diodes(LED), Liquid Crystal Display(LCD).

Unit-V

Digital Measurement and Instruments: Advantages of Digital Instrument over Analog Instrument, Digital-to-analog conversion (DAC) - Variable resistive type, R-2R ladder Type, Binary ladder, Weighted converter using Op-amp and transistor, Practical DAC. Analog-to-digital Conversion (ADC) –Ramp Technique, Dual Slope Integrating Type, Integrating Type (voltage to frequency), Successive Approximations, digital voltmeters and multi-meters, Resolution and sensitivity of digital meter, PLC structure, principle of operation, response time and application.

References:

1. H. S. Kalsi: Electronics Instrumentation, TMH.
2. K. Sawhney: Instrumentation and Measurements, Dhanpat Rai and Co.
3. Helfric and Cooper: Modern Electronic Instrumentation and Measurement Techniques; Pearson.

List of Experiments:

All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed/drafted on paper.

Step 2: The designed/drafted circuit should be simulated using Simulation Software

Step 3: The designed/drafted circuit should be tested on the bread board and compare the results with the simulated results.

Step 4: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1. Study of CRO and Function Generator.
2. Displacement measurement by LVDT.
3. Force measurement by strain gauge.
4. Measurement of Capacitor, Self-induction using Q-meter.
5. Temperature measurement by thermistor, RTD and thermocouple.
6. Optical Transducer- Photo conductive, Photo voltaic, Photo-diode, Photo-Transistor
7. Design of digital to analog converter.
8. PLC operation and applications (for example: relay, timer, level, traffic light etc.)

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SECOND YEAR

Semester – IV

Course Content & Grade

Branch	Subject Title	Subject Code
EC	Communication Network and Transmission Line	EC - 404

UNIT-I

TRANSMISSION LINE THEORY

General theory of Transmission lines - the transmission line – general solution - The infinite line – Wavelength, velocity of propagation – Waveform distortion – the distortionless line - Loading and different methods of loading – Line not terminated in Z0 – Reflection coefficient – calculation of current , voltage, power delivered and efficiency of transmission – Input and transfer impedance - Open and short circuited lines – reflection factor and reflection loss.

UNIT-II

HIGH FREQUENCY TRANSMISSION LINES

Transmission line equations at radio frequencies - Line of Zero dissipation – Voltage and current on the dissipationless line, Standing Waves, Nodes , Standing Wave Ratio – Input impedance of the dissipationless line - Open and short circuited lines - Power and impedance measurement on lines - Reflection losses – Measurement of VSWR and wavelength.

UNIT-III

IMPEDANCE MATCHING IN HIGH FREQUENCY LINES

Impedance matching: Quarter wave transformer – Impedance matching by stubs – Single stub and double stub matching – Smith chart – Solutions of problems using Smith chart – Single and double stub matching using Smith chart.

UNIT-IV

PASSIVE FILTERS

Characteristic impedance of symmetrical networks – filter fundamentals. **Design of filters:** Constant K, Low Pass, High Pass, Band Pass, Band Elimination, m-derived sections and composite.

UNIT-V

ATTENUATORS AND EQUALIZERS

Attenuators: T, □, Lattice Attenuators, Bridged – T attenuator, L-Type Attenuator. **Equalizers:** inverse network, series, full series, shunt, full shunt, constant resistance T, constant resistance □, constant resistance lattice and bridged T network.

REFERENCE BOOK

1. Umesh Sinha, “Transmission Lines and Networks”, Satya Prakashan Publishing Company, New Delhi, 2001.

List of Experiments:

1. To set up the standing waves formation on a transmission line and observe their maxima and minima using frequency domain method.
2. To measure the characteristic impedance of transmission lines using frequency domain method and to differentiate between the matched and unmatched lines.
3. To measure the VSWR, reflection coefficient and return loss in a transmission line.
4. To measure the dielectric constant of insulator in the transmission line.
5. To measure the velocity of propagation and wavelength in the given transmission line.
6. To study the attenuation characteristics of signal along a transmission line and observe its variation with frequency. Also calculate the phase constant and propagation constant.
7. To study the effect of reactive loads on transmission lines.
8. To study the difference between lossy and loss less line.
9. To study the physical dimensions of transmission line and estimation of characteristic impedance.
10. To study behavior of infinite and short lines.
11. To study the operation of Balun transformer.
12. To study the loading of transmission lines and estimate the cut off frequency of a loaded line.
13. To study the use of coaxial lines as tuned circuits and delay lines.
14. To study the input and output impedance of any RF circuits and match it to 50/75 ohms.
15. Simulation of various filters

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SECOND YEAR

Semester – IV

Course Content & Grade

Branch	Subject Title	Subject Code
EC	Analog Circuit	EC - 405

UNIT-I

Amplifier Basics, Transistor as an amplifier, load line, Q-point and its selection criteria, designing of fixed bias and self-bias, stability of biasing circuits, calculation of stability factor. **Transistor at low frequency**: frequency response, bandwidth, h-parameter analysis of CC, CB and CE configuration, simplified model, gain and impedance calculation of single stage amplifier.
Transistor at high frequency, high frequency model (hybrid-π), Parameters and their definition, Miller capacitance and its effect on voltage gain,

UNIT-II

Feedback amplifier: positive and negative feedback loop gain, effect of negative feedback on gain stability, distortion, bandwidth, input and output impedance of amplifier, types of feedback (voltage, current, series and shunt) and their analysis. **Oscillators**: condition of sustained oscillation, RC phase shift, LC (Hartley and Collpit) Oscillators, Wein Bridge, Negative resistance (Tunnel diode and UJT) oscillators, crystal oscillators.

UNIT-III

Power amplifier, classification, operation, analysis and design of Class A, Class B, Class-AB, Class C, transformer coupled, push pull and complementary symmetry amplifiers, power dissipation in transistors (Pdmax rating) and efficiency calculations. **Tuned amplifier** and its applications, Q factor, selectivity and bandwidth, effect of loading, double tuning (synchronous and stagger)

UNIT-IV

Cascade amplifiers, Calculation of gain, Input and output impedance, Effect of Cascading on bandwidth, Transformer, RC and direct-coupled amplifier and their performance. **Darlington connection**, equivalent circuit and Calculation of gain and impedances, Cascade amplifier: advantage, circuit diagram and analysis, feedback pair and applications of BIFET, Bootstrapping technique.

UNIT-V

Differential amplifier - configuration, transfer characteristics, DC analysis, h-parameter analysis, differential and common mode gain, CMRR, constant current source and current mirror, level shift.

References:

1. Millman and Halkias : Integrated electronics, TMH
2. Boylestad and Nashelsky : Electronic Devices and Circuit Theory, PHI
3. Sendra and Smith : Microelectronics, Oxford Press
4. Graham Bell : Electronic Devices and Circuits , PHI
5. Donald A Neamen : Electronic Circuits Analysis and Design, TMH

List of Experiments (Expandable):

All experiments (wherever applicable) should be performed through the following steps.

Step 1: Circuit should be designed/drafted on paper.

Step 2: The designed/drafted circuit should be tested on the bread board

Step 3: The bread board circuit should be fabricated on PCB by one batch using PCB machine.

1. Characteristics of Op-Amp (input offset voltage, slew rate, CMRR, BW, input bias current.
2. Linear application of Op-Amp (voltage follower, inverting and non-inverting amplifier and their frequency response, adder, substractor, differential amplifier, integrator and differential frequency response)
3. To design and construct a shunt and series regulator and find line and load regulation.
4. Design and performance evaluation of transistor amplifiers in CE, CB and CC configuration
5. Design and performance evaluation of FET amplifiers

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SECOND YEAR

Semester – IV

Course Content & Grade

Branch	Subject Title	Subject Code
EC	Software Lab- II	EC - 406

Course Contents

ADVANCED SIMULATION/ VERIFICATION SOFTWARE

Study of simulation/ verification software (any one- LAB-VIEW/KTECHLAB/ GNU CIRCUIT ANALYSIS PACKAGE/ LOGISIM/ MULTISIM/ SCILAB etc).

Overview and Study of the key features and applications of the software. Application of the software in the field of Electronic Circuits, Digital Electronics and Analog Communication. Design, Optimization, simulation and verification of

1. Electronic circuits (example amplifiers, oscillators etc).
2. Realization and verification of various digital electronic circuits (example logic gates, adders, subtractors etc)
3. Realization of various signals and communication link etc.

   Students should simulate and verify atleast six circuits they are learning in the current semester.

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THIRD YEAR

Semester – V

Course Content & Grade

Branch	Subject Title	Subject Code
EC	Control System	EC - 501

UNIT-I

Control system

Terminology and classification of control system, examples of control system, mathematical modeling of mechanical and electrical systems, differential equations, block diagram representation and reduction, signal flow graph techniques.

Feedback characteristics of control systems

Feedback and non-feedback systems, reduction of parameter variations by use of feedback, control over system dynamics and effects of disturbances by the use of feedback, linearization effect of feedback, regenerative feedback.

UNIT-II

Time response analysis

Standard test signals, time response of 1st order system, time response of 2nd order system, steady-state errors and error constants, effects of additions of poles and zeros to open loop and closed loop system.

Time domain stability analysis

Concept of stability of linear systems, effects of location of poles on stability, necessary conditions for stability, Routh-Hurwitz stability criteria, relative stability analysis, Root Locus concept, guidelines for sketching Root-Locus.

UNIT-III

Frequency response analysis

Correlation between time and frequency response, Polar plots, Bode Plots, all-pass and minimum-phase systems, log-magnitude versus Phase-Plots..

Frequency domain stability analysis

Nyquist stability criterion, assessment of relative stability using Nyquist Criterion (phase margin, gain margin and stability), closed-loop frequency response.

UNIT-IV

Approaches to system design

Design problem, types of compensation, design of phase-lag, phase lead and phase lead-lag compensators in time and frequency domain, proportional, derivative, integral and PID compensation.

UNIT-V

Digital control systems

System with digital controller, difference equations, the z-transform, pulse transfer function, inverse z-transform, the s and z domain relationship.

Concept of state, state variables and state model,

State space representation of systems, block diagram for state equation, transfer function decomposition, solution of state equation, transfer matrix, relationship between state equation and transfer function, controllability and observability.

References:

1. Nagrath and Gopal: Control System Engineering, New Age International Publishers.
2. Kuo: Automatic Control Systems, PHI Learning.
3. Varmah: Control Systems, TMH.
4. Distefano (Schaum series): Control Systems, TMH
5. Manke: Linear Control System, Khanna Publishers.
6. Stefani, Shahian: Design of feedback control systems, Oxford University Press.
7. Ogata: Modern Control Engineering, PHI Learning.

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THIRD YEAR

Semester – V

Course Content & Grade

Branch	Subject Title	Subject Code
EC	Electromagnetic Theory	EC - 502

PURPOSE

To enable the students, to have a fair knowledge about the theory and problems of electromagnetism and waveguides.

INSTRUCTIONAL OBJECTIVES

1. Understand the basic concepts of electric field and magnetic field
2. Compare between field and circuit theory
3. Need for impedance matching and different impedance matching techniques
4. Different types of waveguides

UNIT-I

STATIC ELECTRIC FIELDS

Introduction to co-ordinate system-**Coulomb's law**: Electric field intensity-Field due to different types of charges-Electric Flux density. **Gauss law**: It's applications to symmetrical charge distributions- Concept of divergence. **Electric potential**: Potential field due to different types of charges-Potential gradient-The dipole field due to dipole-Energy density in electrostatic field.

UNIT-II

STEADY MAGNETIC FIELDS

Biot Savart Law: Its applications**. Ampere's circuital law**: Its applications-Curl of magnetic field intensity-Magnetic flux and magnetic flux density-The scalar and vector magnetic potentials-Steady magnetic field laws.

UNIT-III

MAXWELLS EQUATIONS AND TIME VARYING FIELDS

Maxwell's Equations: For steady fields in point form and integral form-Faraday's law- displacement current-Maxwell's equations in point form and integral form for time-varying fields-Comparison of field and circuit theory. **Poynting Theorem:** Poynting vector

UNIT-IV

GUIDED WAVES

Waves between parallel planes: Transverse electric waves-Transverse magnetic waves-characteristic of TE and TM waves-TEM waves. Velocity of propagation-Attenuation in parallel plane guides-Wave impedance

UNIT-V

WAVEGUIDE THEORY

Rectangular wave guides: TE waves and TM waves in Rectangular waveguides-Dominant mode-cutoff frequency in wave guides-Impossibility of TEM waves in waveguides. **Circular waveguides**: Wave impedance and characteristic impedance-Power flow in wave guides-Attenuation factor and Q of wave guides-Transmission line analogy for waveguides

TEXT BOOKS

1. William H.Hayt,Jr and John A.Buck., "Engineering Electromagnetics", Tata McGraw-Hill Publishing Ltd, 7th edition 2006
2. G.S.N.Raju., "Electromagnetic Field Theory and Transmission Lines" Pearson Education, First Indian print 2005

REFERENCE BOOKS

1. Matthew N. O. Sadiku., "Elements of Electromagnetics", Oxford University Press,3rd edition, First Indian edition 2006
2. Gangadhar K.A , "Field Theory", Khanna Publications,2000
3. Muthusubramanian R and Senthil Kumar N, "Electromagnetic field theory",Anuradha publications,1999
4. Edward Jordan and KG Balmain, "Electromagnetic Waves and Radiationg Systems", Pearson education, 2nd edition.

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THIRD YEAR

Semester – V

Course Content & Grade

Branch	Subject Title	Subject Code
EC	Digital Communication	EC - 503

UNIT-I

Elements of Digital Communication and Information Theory: Model of a digital communication system; Mutual information and channel capacity of a discrete memory less channel, Calculation of channel capacity of a discrete memory less channel, of a BSC, of a
continuous AWGN Channel, Hartely- Shannon law, Bandwidth-S/N tradeoff.

Sampling Theory: Sampling theorem, Signal reconstruction in time domain, Practical and Flat Top Sampling, Sampling of Bandpass Signal.

UNIT-II

Waveform Coding Techniques: Discretization in time and amplitude, Linear quantizer, Quantization noise power calculation, Signal to Quantization noise ratio, Non-uniform quantizer, A law & Mu- law, companding; encoding and Pulse Code Modulation, Bandwidth of PCM, Differential pulse code modulation, Multiplexing PCM signals, Delta modulation, Idling noise and slope overload, Adaptive delta modulation, Adaptive DPCM, Comparison of PCM and DM,

UNIT-III

Digital Base Band Transmission: 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 signaling, ISI, Nyquist criterion for zero ISI & raised cosine spectrum, Matched filter receiver, Derivation of its impulse response and peak pulse signal to noise ratio, Correlation detector decision threshold and error probability for binary unipolar (on-off) signaling.

UNIT-IV

Digital Modulation Techniques: Types of digital modulation, Wave forms for Amplitude, Frequency and Phase Shift Keying, Method of generation and detection of coherent & noncoherent binary ASK, FSK & PSK, Differential phase shift keying, Quadrature modulation techniques, M-ary FSK, Minimum Shift Keying (MSK), Probability of error and comparison of various digital modulation techniques. A base band signal receiver, Probability of error, The Optimum filter, Matched Filter, Probability of error in Matched filter, Coherent reception, Coherent reception of ASK, PSK and FSK, Non- Coherent reception of ASK, FSK, PSK and QPSK, Calculation of error probability of BPSK and BFSK, Error probability for QPSK.

UNIT-V

Digital Multiplexing: Fundamentals of time division multiplexing, electronic commutator, bit, byte interleaving TTCarrier system, Synchronization and Signaling of T1, TDM, PCM hierarchy, North- America CCITT standards, T1 to T4 PCM TDM system (DS1 to DS4 signals), Signal format of M12 Mux for AT & T (Bell) system, bit rate calculation for DS1 to DS4 signals. Simulation of Digital Communication Systems like PCM, DPCM, ADM, DM, ASK, FSK, PSK, QPSK and Multiplexers using ComSim and Matlab.

Books Recommended

1. Haykin Simon, "Communication Systems", 4th Edition, Wiley publication.
2. Tomasi, "Electronic Communication Systems", 4th edition, Pearson Publications.
3. Miller Gary M, "Modern Electronic Communication", 6th edition, Prentice-Hall, (1999).
4. Nicolaos S Tzannes, "Communication and Radar Systems", Prentice-Hall Inc, (1985).
5. Proakis J J, "Digital Communications", 2nd Edition, Mc Graw -Hill.

Laboratory

1. Study of analog time division multiplexer.
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 NRZ formats.
5. Data decoding techniques for NRZ 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. Simple fiber optic link fabrication using discrete components with available digital data input.
10. Digital link simulation, error introduction & error estimation in a digital link using MATLAB (SIMULINK)/ComSim.

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THIRD YEAR

Semester – V

Course Content & Grade

Branch	Subject Title	Subject Code
EC	Industrial Electronics	EC - 504

UNIT-I

Semiconductor Switching Devices

Review of Thyristor, two transistor Model of SCR, classification and V-I characteristics, junction temperature, gate circuit ratings, triggering process, UJT and characteristics, UJT as a relaxation oscillator, turn off methods, fast recovery diodes,
schottky diodes, Series and parallel connections of SCR, DIAC, TRIAC, Power MOSFETS.

UNIT-II

Power Rectification

Classification of rectifiers, half, full, three-phase rectifier, semi converters, full converters, free wheeling diodes, circuits using SCR, voltage multiplying rectifier circuits, transformer utility factor.

Regulated Power Supplies

Classification of voltage regulators, short period and long period accuracy of voltage regulator, D.C. voltage regulators, complete series voltage regulator circuit with ICs, SMPS basic principles, step up and step down circuits.

UNIT-III

Inverters

Introduction, simple Inverters and Power Inverter using SCR, output voltage control in inverter waveform control, PWM inverters, reduction of harmonies with the help of PWM inverters.

Industrial Timing Circuits

Constituents of industrial timers, classifications, thermal timers, Electronic timers, SCR delay timer, I.C. electronic timers.

UNIT-IV

Electronic Control of D.C. Motors

Introduction, control of D.C. shunt motor, full wave D.C. shunt motor control overload projection, universal motor control, electronic control for reversing motor control using SCR, choppers, their classifications and applications.

UNIT-V

Electronic Control of A.C. Motors

Instability of D.C. motors, variable speed induction motor drives, T.N. characteristics of I.M. invertors for driving the motor, speed control of I.M. using various methods, cyclo-converters, their classifications and applications.

Books Recommended

1. Rashid M H, “Power electronics”, 2nd Ed., PHI, N.Delhi (1998).
2. Mithal G K, “Industrial electronics”, 18th Ed., Khanna Publishers, Delhi (1998).
3. Biswas S N, “Industrial electronics”, 3rd Ed., Dhanpat Rai and Company, Delhi (2000).
4. Bhimbra P S, “Power electronics”, 3rd Ed., Khanna Publishers, Delhi (2002).
5. Singh M D, Khanchandani K B, “Power electronics”, 6th reprint TMH, New Delhi (2001).

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THIRD YEAR

Semester – V

Course Content & Grade

Branch	Subject Title	Subject Code
EC	Microprocessor and Controller	EC - 505

UNIT-I

MICROPROCESSOR- 8086

Register Organization -Architecture-Signals-Memory Organization-Bus Operation-IO Addressing-Minimum Mode-Maximum Mode-Timing Diagram-Interrupts & Service Routines

UNIT-II

PROGRAMMING OF 8086

Addressing Modes-Instruction format-Instruction set-Assembly language programs in 8086

UNIT-III

INTERFACING DEVICES

IO and Memory Interfacing concepts–Programmable interval timer (8254)– Programmable Interrupt Controller (8259A) – Programmable DMA Controller (8257) –Programmable communication Interface (8251)-Stepper motor interfacing

UNIT-IV

MICROCONTROLLER-8051

Register Set-Architecture of 8051 microcontroller- IO and memory addressing-Interrupts-Instruction set-Addressing modes.

UNIT-V

PROGRAMMING OF 8051

Timer-Serial Communication-Interrupts Programming-Interfacing to External Memory-Interfacing to ADCs, Sensors.

TEXT BOOKS

1. A. K. Ray and K. M. Bhurchandi, “Advanced Microprocessors and Peripherals”,Tata McGrawHill, 2000.
2. Muhammad Ali Mazidi and Janice Gillispie Mazidi, “ The 8051 – Microcontroller and Embedded systems”,7th Edition, Pearson Education , 2004

REFERENCE BOOKS

1. Doughlas.V.Hall, Microprocessor and Interfacing : Programming and Hardware, 2nd edition, McGraw Hill, 1991
2. Kenneth.J.Ayala, 8051 Microcontroller Architecture,Programming and Applications.2nd edition, Thomson.

List of Experiments:

1. Assembly Language Programs of Microprocessor 8086.
2. Assembly Language Programs of Microcontroller 8051.
3. Assembly Language Programs for Interfacing Chips.

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THIRD YEAR

Semester – V

Course Content & Grade

Branch	Subject Title	Subject Code
EC	**Software Lab-III**	**EC - 506**

Study of simulation software (any one Scilab/ MatLab etc.)

Introduction to Scilab / Matab, Study of Scilab / Matlab programming environment, Modeling, Design and development of Programs.
Overview and Study of the key features and applications of the software.
Application of the software in the field of Control Systems, Data Communications and Communication Systems.

1. Programs Related to Control System- open-loop and closed loop control system, frequency response plots, determining transient response, specifications of second order system, effect of PID controller on control system, Bode plot, Nyquist plot and Root Locus plot, state space analysis.

2. Programs Related to Communication Systems--Simulation of a Communication System (Generation, addition of noise and Detection), AM, FM, PM, PAM, PCM, PSK, FSK etc.

3. Programs related to Data Communications- simulations of CRC, LRC, VRC, hamming codes, line encoding techniques.

References:

1. Rudra Pratap: Getting Started with MATLAB, Oxford University Press.
2. http://www.scilab.in
3. http://ekalavya.it.iitb.ac.in/contents.do?topic=Scilab
4. Vinu V. Das: Programming in Scilab, New Age Publisher.
5. Chapman Stephen J.: MATLAB Programming for Engineers, Thomson Cengage
6. Proakis: Contemporary Communication System Using MATLAB; Thomson Cengage.
7. Kuo: Automatic Control Systems, PHI Learning.
8. Singh and Chaudhari: Matlab Programming, PHI Learning

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THIRD YEAR

Semester – VI

Course Content & Grade

Branch	Subject Title	Subject Code
EC	Wireless Communication	EC - 601

UNIT-I

STANDARDS AND CELLULAR CONCEPT

Introduction - **Standards:** AMPS, GSM, CDMA (IS-95). Cellular Concept and Frequency Reuse, Overview of Multiple Access Schemes, Channel Assignment and Hand off, Interference and system capacity, Trunking and Erlang capacity calculations.

UNIT-II

MOBILE RADIO PROPAGATION

Radio wave propagation issues in Personal wireless systems, Elementary treatment of Propagation Models, Multipath fading and base band impulse response models, Parameters of mobile multipath channels

UNIT-III

MODULATION AND SIGNAL PROCESSING

Digital modulation techniques for mobile communications: BPSK, DPSK - □/4 QPSK - OQPSK - GMSK. Equalization, Diversity -Rake receiver concepts–Speech coding (LPC, CELP).

UNIT-IV

WIRELESS LAN STANDARD

IEEE 802.11 Architecture and Services - IEEE 802.11 Medium Access Control- IEEE 802.11 Physical layer

BLUETOOTH

Bluetooth:

UNIT-V

Overview-Radio specifications-Base band specifications-Link Manager Specification-Logical Link Control and Adaptation Protocol.

TEXT BOOKS

1. Rappaport T.S, “Wireless Communications: Principles and Practice”, 2nd edition, Pearson education.
2. William Stallings, “ Wireless Communication & Networking”, Pearson Education Asia, 2004

REFERENCE BOOKS

1. Feher K. “Wireless Digital Communications”, Pearson education.
2. Lee W.C.Y, “Mobile Communications Engineering: Theory & Applications”, McGraw Hill, New York 2nd Edition, 1998.
3. Schiller, “Mobile Communication”, Pearson Education Asia Ltd., 2000

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THIRD YEAR

Semester – VI

Course Content & Grade

Branch	Subject Title	Subject Code
EC	Antenna and Wave Propagation	EC - 602

UNIT-I

ANTENNA FUNDAMENTALS AND VECTOR POTENTIALS

Isotropic Radiation, Power density and Intensity, Gain, Directive gain, Directivity, Effective area, Reciprocity theorem, Antenna efficiency, Radiation resistance, Terminal impedance, Beam width and Bandwidth. Radiation from a small current element, Power radiated by a small current element and its radiation resistance, Half wave dipole, Radiation field of current distribution of center fed Dipole.

UNIT-II

ANTENNA ARRAYS

Various forms of antenna arrays – Broadside, End fire, Collinear, Parasitic arrays, Array of two point sources, Pattern Multiplication, Array of "N" sources – analysis of End fire and Broadside case, phased arrays, Binomial arrays.

UNIT-III

SPECIAL PURPOSE ANTENNAS

Traveling wave, Loop, Dipole and Folded dipole antennas, Horn antenna, Reflector antenna, Yagi- Uda antenna, Log periodic antenna, Helical and Micro strip antenna and applications of all types of antennas.

UNIT-IV

ANTENNA MEASUREMENTS

Impedance, Gain, Radiation pattern, Beam width, Radiation resistance, Antenna efficiency, Directivity, Polarization and phase Measurements.

UNIT-V

RADIO WAVE PROPAGATION

Modes of propagation, Structure of atmosphere, Ionosphere layers, Mechanism of bending of waves, Effect of earths Magnetic field on Radio wave propagation. Virtual height, MUF, Skip distance, OWF, Ionosphere abnormalities, Multi-hop propagations, Space wave
propagation, Super refraction.

TEXT BOOKS

1. Constantine A.Balanis**,** "Antenna Theory analysis and Design",II Edition,John wiley and Sons.
2. R.E.Collin, "Antennas and Radio Wave Propagation", McGraw Hill International Editions, 1985.

REFERENCE BOOKS

1. Robert S. Elliott, "Antenna Hand Book", Joseph J. Carr, Galgotia Publication, New Delhi, 1995.
2. K.D. Prasad, "Antenna and Wave Propagation", Tech India Publications, New Delhi, 1996.
3. John. D. Kraus, "Antennas", McGraw Hill International Editions, 1988

List of Experiments:

1. To Plot the Radiation Pattern of an Omni Directional Antenna.
2. To Plot the Radiation Pattern of a Directional Antenna.
3. To Plot the Radiation Pattern of a Parabolic Reflector Antenna.
4. To Plot the Radiation Pattern of a Log Periodic Antenna.
5. To Plot the Radiation Pattern of a Patch Antenna.
6. To Plot the Radiation Pattern of a Dipole/ Folded Dipole Antenna.
7. To Plot the Radiation Pattern of a Yagi (3-EL/4EL) Antenna.
8. To Plot the Radiation Pattern of a Monopole/ WHIP/ Collinear Antenna.
9. To Plot the Radiation Pattern of a Broad site Antenna.
10. To Plot the Radiation Pattern of a Square Loop Antenna.

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THIRD YEAR

Semester – VI

Course Content & Grade

Branch	Subject Title	Subject Code
EC	Digital Signal Processing	EC - 603

UNIT-I

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

UNIT-II

The Z Transform: Z-Transform, Region of convergence; Properties of the Z-transform; convolution theorem; Parseval's relation; Unilateral Z-transform and its application to difference equations with non-zero initial condition.

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

UNIT-III

REVIEW OF DISCRETE TIME SIGNALS AND SYSTEMS

Overview of signals and systems- DFT-FFT using DIT and DIF algorithms - Realization of structures for discrete time systems – Direct form I & II, Cascade, Parallel forms – MATLAB programs for DFT and FFT.

UNIT-IV

DESIGN AND IMPLEMENTATION OF IIR FILTERS

Design of analog filters using Butterworth and Chebyshev approximations – IIR digital filter design from analog filter using impulse invariance technique and bilinear transformations – Matlab programs IIR filters.

UNIT-V

DESIGN AND IMPLEMENTATION OF FIR FILTERS

Linear phase response- design techniques for FIR filters- Fourier series method and frequency sampling method –Design of Linear phase FIR filters using windows: Rectangular, Hanning and Hamming windows- Matlab programs FIR filters-FIR filter design using Decimation and Interpolation

.

TEXT BOOKS

1. Oppenheim A V & Sehafer R W, “Discrete Time Signal Processing”, Prentice Hall (1989).
2. Proakis J G & Manolakis D G, “Digital Signal Processing”, Pearson Education India.
3. Oppenheim A V, Willsky A S & Young I T, “Signal & Systems”, Prentice Hall, (1983).
4. Ifeachor and Jervis, “Digital Signal Processing”, Pearson Education India.
5. Mitra Sanjit, ” Digital Signal Processing – A Computer Based Approach,” TMH, (1998).
6. John .G. Proakis and Dimitris C. Manolakis , “Digital Signal Processing Principles , Algorithms and Applications , ” Pearson Education, Third edition 2006.
7. Sanjit Mitra, “Digital Signal Processing “– A Computer based approach”, Tata Mcgraw Hill, New Delhi, 2001

REFERENCE BOOKS

1. B.Venkataramani, M.Bhaskar, “Digital Signal Processors, Architecture, Programming and Application“, Tata McGraw Hill, New Delhi, 2003.
2. M.H.Hayes, “Digital Signal Processing”, Tata McGraw Hill, New Delhi, 2003.

List of Experiments:

1. Generation, analysis and plots of discrete-time signals.
2. Implementation of operations on sequences (addition, multiplication, scaling, shifting, folding etc).
3. Implementation of Linear time-invariant (LTI) systems and testing them for stability and causality.
4. Computation and plot of DTFT of sequences, verification of properties of DTFT.
5. Computation and plots of z-transforms, verification of properties of z-transforms.
6. Computation and plot of DFT of sequences, verification of properties of DFT.
7. Computation and plots of linear/circular convolution of two sequences.
8. Computation of radix-2 FFT- Decimation in time and Decimation in frequency.
9. Implementation of IIR and FIR filter structures (direct, cascade, parallel etc).
10. Implementation of various window design techniques (Rectangular, Bartlett, Hann, Hamming etc).

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THIRD YEAR

Semester – VI

Course Content & Grade

Branch	Subject Title	Subject Code
EC	**VLSI Fabrication and Technology**	**EC - 604**

Unit-I

Crystal Growth and Wafer preparation: Wafer terminology, Different crystalline orientations, CZ method, CMOS IC Design flow, Crystal Defects. Fabrication processes of FETs, MOSFETs, and BIMOS etc.

Unit-II

Layering: Epitaxial growth methods, Oxidation; Kinetics of oxidation, Thin film fabrication, Metallization; Physical Vapor Deposition, Sputtering.

Unit-III

Patterning: Lithography; Optical Lithography, Electron Lithography, X-ray Lithography, Ion Lithography. Photo masking steps, Resists. Doping: Diffusion; Diffusion Models, Ion Implantation; Implantation Equipment, Channeling.

Unit-IV

VLSI process techniques and Integration: Floor planning, layout, Design rules, stick diagrams, Test generation, Logic simulation, Introduction to EDA tools. Contamination Control; Clean rooms, HEPA, ULPA Filters and Class numbers.

Unit-V

Subsystem Design: Data-paths; adder, Shift registers ALU, Memory; NVRWM, Flash memories, 6-Transistor RAMs. Latch up in CMOS Circuits.

Text/ References:

1. S.K.Gandhi, VLSI Fabrication principles, Wiley.
2. S.M. Sze, VLSI Technology, II edition, McGraw Hill.
3. P.Van Zant, Microchip Fabrication, A Practical Guide to Semiconductor Processing, Third Edition, McGraw Hill.

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THIRD YEAR

Semester – VI

Course Content & Grade

Branch	Subject Title	Subject Code
EC	Optical Fiber and Communication	EC - 605

UNIT-I

Overview of Optical Fiber Communications (OFC): Motivation, optical spectral bands, key elements of optical fiber systems.
Optical fibers: basic optical laws and definitions, optical fiber modes and configurations, mode theory for circular waveguides, singlemode fibers, graded-index fiber structure, fiber materials, photonic crystal fibers, fiber fabrication, fiber optic cables.

UNIT-II

Optical sources: Light emitting diodes (LEDs): structures, materials, quantum efficiency, LED power, modulation of an LED. Laser diodes: modes, threshold conditions, laser diode rate equations, external quantum efficiency, resonant frequencies, structure and radiation patterns, single mode lasers, modulation of laser diodes.

UNIT-III

Power launching and coupling: source to fiber power launching, fiber to fiber joints, LED coupling to single mode fibers, fiber splicing, optical fiber connectors.
Photodetectors: pin photodetector, avalanche photodiodes, photodetector noise, detector response time, avalanche multiplication noise.

UNIT-IV

Signal degradation in optical fibers: Attenuation: units, absorption, scattering losses, bending losses, core and cladding losses. Signal distortion in fibers: overview of distortion origins, modal delay, factors contributing to delay, group delay, material dispersion, waveguide dispersion, polarization-mode dispersion. Characteristics of single mode fibers: refractive index profiles, cutoff wavelength, dispersion calculations, mode field diameter, bending loss calculation. Specialty fibers.

UNIT-V

Optical receivers: fundamental receiver operation, digital receiver performance, eye diagrams, coherent detection: homodyne and heterodyne, burst mode receiver, analog receivers.
Digital links: point to point links, link power budget, rise time budget, power penalties.
Analog links: overview of analog links, carrier to noise ratio, multichannel transmission techniques.
Optical technologies Wavelength division multiplexing (WDM) concepts: operational principles of WDM, passive optical star coupler, isolators,circulators, Active optical components: MEMS technology, variable optical attenuators, tunable optical filters, dynamic gain equalizers, polarization controller, chromatic dispersion compensators.

References:

1. G. Keiser: Optical Fiber Communications, 4th Edition, TMH New Delhi.
2. J. M. Senior: Optical Fiber Communication- Principles and Practices, 2nd Edition, Pearson Education.
3. G. P. Agarwal: Fiber Optic Communication Systems, 3rd Edition, Wiley India Pvt. Ltd.
4. J. C. Palais: Fiber Optics Communications,5th Edition, Pearson Education.
5. R.P. Khare: Fiber Optics and Optoelectronics, Oxford University Press.
6. A. Ghatak and K. Thyagrajan: Fiber Optics and Lasers, Macmillan India Ltd.
7. S. C. Gupta: Optoelectronic Devices and Systems, PHI Learning.
8. Sterling: Introduction to Fiber Optics, Cengage Learning.

List of Experiments:

1. Launching of light into the optical fiber and calculate the numerical aperture and V-number.
2. Observing Holograms and their study.
3. Measurement of attenuation loss in an optical fiber.
4. Diffraction using gratings.
5. Construction of Michelson interferometer.
6. Setting up a fiber optic analog link and study of PAM.
7. Setting up a fiber optic digital link and study of TDM and Manchester coding.
8. Measurement of various misalignment losses in an optical fiber.

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THIRD YEAR

Semester – VI

Course Content & Grade

Branch	**Subject Title**	**Subject Code**
EC	**Software Lab- IV**	**EC - 606**

VHDL

Hardware abstraction, Basic language elements: identifiers, data objects, data types, operators, behavioral modeling, data flow modeling, structural modeling, simulation and analysis.

VERILOG

Overview of digital design with Verilog, Hierarchical Modeling: basic concepts, models and ports, gate level modeling, data flow modeling, behavioral modeling, logic synthesis with Verilog HDL, simulation.

Experiments:

Design and simulation of following using Verilog/ VHDL .
Logic gates: NAND, NOR, XOR, XNOR.
Half adder, full adder, subtractor, latches, multiplexers- 2:1, 4:1, 8:1, comparators, decoders- 2:4, 3:8, 4:16.
4-bit ripple carry full adder,4-bit Ripple carry counter, parity generator, up/down counters.

References:

1. Samir palnitkar: Verilog HDL- A Guide to Digital Design and Synthesis, Pearson Education.
2. Bhasker: A Verilog HDL Primer –synthesis, Pearson Education
3. Pedroni: Circuit Design with VHDL, PHI Learning.
4. Perry: VHDL- Programming by example, TMH.

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FOURTH YEAR

Semester – VII

Course Content & Grade

Branch	Subject Title	Subject Code
EC	Satellite Communication	EC - 701

UNIT-I

SATELLITE ORBIT

Satellite orbits: Kepler's laws- Earth satellite orbiting satellite terms-Orbital elements – Orbital perturbations – Inclined Orbits- Sun synchronous orbit. **Constellation:** Geo stationary satellites- Non geostationary constellation- Launching of Geostationary satellites.

UNIT-II

LINK DESIGN

EIRP- Transmission Losses –Power Budget equation- System Noise Carrier to noise ratio –Uplink- Downlink – Effects of rain –Inter modulation Noise

UNIT-III

SPACE AND EARTH SEGMENT

Space Segment: Power Supply – Altitude control- Station keeping – Thermal Control- TT&C- Subsystems – Antenna subsystem –Transponders- Wideband Receiver. **Earth Segment:** receive only home TV system- Community antenna TV system.

UNIT-IV

SATELLITE ACCESS

Single Access- Pre assigned FDMA – Demand Assigned FDMA- SPADE system- TWT amplifier operation- Downlink analysis –TDMA- reference bursts-Preamble- Postamble- Carrier recovery-Network synchronization- Pre assigned TDMA –Assigned –CDMA introduction

UNIT-V

BROADCAST AND SERVICES

Broadcast: DBS - Orbital Spacings- Power ratings- Frequency and Polarization- Transponder Capacity- Bit rate-MPEG- Forward Error Correction. ODU-IDU-Downlink Analysis –Uplink –**Satellite Mobile services**: VSAT-GPS.

TEXT BOOKS

1. Dennis Roddy, "Satellite Communications", McGraw Hill Publications, 3rd Edition 2001.
2. M.Richaria, "Satellite Communication Systems Design Principles", Pearson Publications, 2nd Edition 1999.

REFERENCE BOOKS

1. Wilbur L.Prichard, Henry G. Suyerhood, Ropert A. Nelson , "Satellite Communication System Engineering", Pearson education ,2nd Edition,.
2. Pratt, Timothy, Charles W. Bostian, "Satellite Communication", John Wiley and Sons, New York, 1986.

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FOURTH YEAR

Semester – VII

Course Content & Grade

Branch	Subject Title	Subject Code
EC	CMOS Circuit	EC - 702

UNIT-I

Introduction

Introduction to CMOS circuit, Circuit & System representation Behavioral representation, structural representation. Physical representation MOS transistor theory. NMOS and PMOS enhancement transistor. Threshold voltage, body effect. MOS device design equation. Basic DC equation, second order effects, MOS models. The complementary CMOS inverter-DC character, Static load MOS inverters. The differential inverter. Tristate inverter. Bipolar devices, diodes, transistors, BICMOS inverters.

UNIT-II

Design Technology

Review of silicon semiconductor technology and basic CMOS technology-n-well and p-well process. Interconnect and circuit Twin-tub process layout design rules and latch-up, latch-up triggering and prevention. CMOS design methods. Design strategies. Programmable logic, programmable logic structure,

UNIT-III

Specification of sequential systems

Characterizing equation & definition of synchronous sequential machines. Realization of state diagram and state table from verbal description, Mealy and Moore model machines state table and transition diagram. Minimization of the state table of completely and incompletely specified sequential machines.

UNIT-IV

Asynchronous Sequential Machine

Introduction to asynchronous sequential machine, Fundamental mode and Pulse mode asynchronous sequential machine, Secondary state assignments in asynchronous sequential machine, races and hazards.

UNIT-V

State Machine

Algorithmic state machine and fundamental concept of hardware/ firmware algorithms. Controllers and data system designing.

Fault Detection in combinational circuit

Types of faults, Fault detection using Boolean Difference and path sensitization method. Concept of PROM, PLA, PAL, CPLD and FPGA, PALASM software applications.

Text Books

1. Neil Weste: Principle of CMOS VLSI Design, TMH

2. Neil, H.E. Wasdte, Kamran Eshraghian, Principles of CMOS VLSI design, Pearson Education.

3. Wyne Wolf, Modern VLSI Design-system on silicon, PHI.

4. Phillip E. Allen and Douglas R holding, CMOS Analog Circuit Design, 2nd edition, Oxford University press.

REFERENCE BOOKS

1. Wolf Wayne, “FPGA Based System Design”, Pearson Education, 2005.
2. Design manuals of Altera, Xilinx and Actel
3. Jan M. Rabaey, Anantha Chandrakasan and Borivoje Nikolic, “Digital Integrated Circuits”, Second Edition

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FOURTH YEAR

Semester – VIII

Course Content & Grade

Branch	Subject Title	Subject Code
EC	TV and RADAR	EC - 801

UNIT-I

MONOCHROME TELEVISION TRANSMITTER AND RECEIVER

TV transmitter – TV signal propagation – Interference – TV transmission Antennas – Monochrome TV receiver – RF tuner – UHF, VHF tuner- Digital tuning techniques- AFT-IF subsystems - AGC – Noise cancellation- Video and sound inter carrier detection- vision IF subsystem- video amplifiers requirements and configurations - DC re-insertion - Video amplifier circuits- Sync separation – typical sync processing circuits- Deflection current waveform – Deflection Oscillators – Frame deflection circuits – requirements- Line Deflection circuits – EHT generation – Receiver Antennas.

UNIT-II

ESSENTIALS OF COLOUR TELEVISION

Compatibility – colour perception- Three colour theory- luminance, hue and saturation-colour television cameras- values of luminance and colour difference signals- colour television display tubes- delta – gun62 precision – in-line and Trinitron colour picture tubes- purity and convergence- purity and static and dynamic convergence adjustments- pincushion correction techniques- automatic degaussing circuit- grey scale tracking – colour signal transmission- bandwidth- modulation of colour difference signals – weighting factors- Formation of chrominance signal.

UNIT-III

COLOUR TELEVISION SYSTEMS:

NTSC colour TV system- NTSC colour receiver- limitations of NTSC system – PAL colour TV system – cancellation of phase errors- PAL –D colour system- PAL coder – Pal-Decolour receiver- chromo signal amplifier- separation of U and V signals- colour burst separation – Burst phase Discriminator – ACC amplifier- Reference Oscillator- Ident and colour killer circuits- U and V demodulators- Colour signal matrixing – merits and demerits of the PAL system – SECAM system – merits and demerits of SECAM system.

UNIT-IV

RADAR EQUATIONS

RADAR Block Diagram & operation- RADAR Frequencies- RADAR Equation- Detection of signals in Noise- RADAR cross section of targets- RADAR cross section fluctuations- transmitter power- pulse repetition frequency- system losses and propagation effects.

MTI AND PULSE DOPPLER RADAR

Introduction to Doppler & MTI RADAR- Delay Line canceller- Moving Target Detector- Pulse Doppler RADAR- Non-Coherent MTE- CW RADAR- FMCW RADAR- Tracking RADAR- Monopulse Tracking – Conical Scan and Sequential Lobing.

UNIT-V

RADAR TRANSMITTER AND RECEIVER

Linear beam power tubes- Solid state RF power sources- solid state devices used in RADAR- Magnetroncrossed field amplifiers- other aspects of radar transmitter- RADAR Receiver- Receiver noise figure- super heterodyne receiver- dynamic range- RADAR Displays.

TEXT BOOKS

1. R.R.Gulati, " Monochrome Television Practice, Principles, Technology and servicing ", Second edition, New age International Publishes, 2004
2. R.R.Gulati "Monochrome and colour television ", New age International Publisher, 2003
3. M.I. Skolnik, "Introduction to RADAR systems", 3rd edition, McGraw Hill.
4. N.S. Nagaraja "Elements of Electronic Navigation", Tata McGraw Hill, 1993.

REFERENCES

1. A.M Dhake, "Television and Video Engineering", Second edition, TMH, 2003.
2. S.P.Bali, "Colour Television, Theory and Practice", TMH, 1994
3. Nadav Levanon, "RADAR Principles", John Wiley and Sons, 1989.
4. Brookner, " RADAR Technology", Artech Hons, 1986

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FOURTH YEAR

Semester – VIII

Course Content & Grade

Branch	Subject Title	Subject Code
EC	Human Resources and Management	EC - 802

UNIT-I

Introduction

Nature of Human Resource Management (HRM), Importance of Human Resource Management, Functions of Human Resource Management, The changing environment of HRM and Role of HRM in changing business scenario.

UNIT-II

Procurement

Job, Job Analysis, Job Description and Job Specifications, Manpower planning, demand and supply forecasting, recruitment, methods of recruitment, Employees testing and selection, types of psychological tests and interviews, placement and induction.

UNIT-III

Development

Operative Training and Management Development, methods of training and development, Performance Appraisal: Traditional and Modern methods, Career development: career anchors, career development programme and the modern career problems.

Compensation

Factors affecting compensation policy, Job evaluation, methods of job evaluation, Variable compensation: Individual & Group, Supplementary compensation-Fringe benefits and Current trends in compensation

UNIT-IV

Integration

Human relations, industrial relations, importance of Industrial relations, Causes and effects of Industrial disputes, Machinery for settlement of industrial disputes in India, Role of trade unions in maintaining relations, Collective Bargaining: concept, features, process and advantages.

Maintenance and separation

Employee safety, health and welfare, Provisions under Factory Act, 1948, Turnover, Retirement and Layoff

UNIT-V

International HRM

The growth of International business, HR and the international business challenge, effect of inter country difference on HRM, International staffing, International compensation and appraisal, International labour relations and Information Technology and HR

Text Books

1. Flippo Edwin B, “Personnel Management” , 6th Ed., McGraw Hills (2000)
2. Memoria C B, ”Personnel Management (Management of HRM)”, Himalaya Publication New Delhi (1999)
3. Dresler Garry, “Human Resource Management” 8th Ed. Pearson Education, New Delhi (2002)
4. Becanzo David A and Robbins S P, “Personnel/Human Resource Management”, 3rd Ed. Prentice Hall of India, New Delhi (2000)
5. Milkovich George T and Bourdean John W, “Personnel Human Resource Management – Diagnostic Approach”, AITBS, Delhi (2000)

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FOURTH YEAR

Elective-I

Semester – VIII

Course Content & Grade

Branch	Subject Title	Subject Code
EC	Operation Research	EC - 8031

UNIT-I

RESOURCE SCHEDULING AND NETWORK ANALYSIS

Problem of sequencing – Sequencing n jobs through 2 machines and 3 machines, 2 jobs through m machines. PERT and CPM –Critical path calculation – Probability and cost consideration.

UNIT-II

REPLACEMENT AND GAME THEORY

Replacement Models – Replacement of items that deteriorate with time – Equipment that fails suddenly. Two person zero sum games – Pure strategies and saddle point – Mixed strategies – 2 x n and m x 2 games – Method of dominance – Numerical and graphical solutions.

UNIT-III

INVENTORY CONTROL

Inventory models – Deterministic models – Economic ordering quantity, Reorder level, optimum cost – Instantaneous and Non-instantaneous receipt of goods with or without shortages.

UNIT-IV

LINEAR PROGRAMMING

Introduction to Linear Programming – Formulation of the problem – Graphical method – Simplex method – Artificial variable techniques - Primal-dual problems – Dual Simplex method.

UNIT-V

ADVANCED LINEAR PROGRAMMING PROBLEMS

Integer programming problem - Cutting plane algorithm – Transportation models - Vogel's Approximation method – MODI method – Unbalanced transportation problem – Degeneracy in transportation models – Assignment models – Traveling salesman problem-Dynamic Programming problem.

TEXT BOOK

1. Kanti Swarup, Gupta P.K., and Man Mohan, "Operations Research" Sultan Chand & Sons, 1994.

REFERENCE BOOKS

1. Gupta P.K., and Hira D.S., "Operations Research", S.Chand & Sons, 2000.
2. Sundaresan.V, Ganapathy Subramanian.K.S. and Ganesan.K, "Resource Management Techniques", A.R. Publications,2002

3. Taha H.A., “Operations Research – An introduction”, 7th edition, PHI, 2002.
4. Sharma S.D., “Operations Research”, Kedarnath Ramnath & Co., Meerut,1994.
5. Billy B. Gillet, “Introduction to Operations Research “– TMH Publishing Co.
6. Gupta P.K., and Manmohan, “Operations Research and Quantitative Analysis” – S.Chand & Co., New Delhi.
7. Hamblin S., and Stevens Jr., “Operations Research”, Mc Graw Hill Co.
8. Taha H.A., “Operations Research – An introduction”, 8th edition, Taha H.A., “Operations Research – An introduction”, 7th edition, PHI, 2002.

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FOURTH YEAR

Semester – VIII

Course Content & Grade

Branch	Subject Title	Subject Code
EC	Neural Network and Fuzzy Logic	EC - 8032

UNIT-I

INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS

Neuro-physiology - General Processing Element - ADALINE - LMS learning rule – MADALINE – XOR Problem – MLP - Back Propagation Network - updation of output and hidden layer weights - application of BPN

UNIT-II

ASSOCIATIVE MEMORY & CPN

Associative memory - Bi-directional Associative Memory – Hopfield memory - traveling sales man problem Annealing, Boltzmann machine - learning – application - Counter Propagation network –architecture – training – Applications.

UNIT-III

SELF ORGANIZING MAP & ART

Self-organizing map - learning algorithm - feature map classifier – applications - architecture of Adaptive Resonance Theory - pattern matching in ART network.

UNIT-IV

CRISP SETS AND FUZZY SETS

Introduction – crisp sets an overview – the notion of fuzzy sets –Basic concepts of fuzzy sets – classical logic an overview – Fuzzy logic- Operations on fuzzy sets - fuzzy complement – fuzzy union – fuzzy intersection – combinations of operations – general aggregation operations

UNIT-V

FUZZY RELATIONS

Crisp and fuzzy relations – binary relations – binary relations on a single set– equivalence and similarity relations – Compatibility or tolerance relations– orderings – morphisms-fuzzy relation equations.

TEXT BOOKS

1. Freeman J.A. and Skapura B.M., “Neural Networks, Algorithms Applications and Programming Techniques”, Addison-Wesely, 1990.
2. George J Klir and Tina A Folger, ” Fuzzy sets, uncertainty and information”, Prentice Hall of India

REFERENCE BOOKS

1. **Timothy J. Ross**, “Fuzzy Logic with Engineering Applications”, John Wiley & Sons, 01-Dec-2009 Technology & Engineering
2. **Laurene Fausett**, “Fundamentals of Neural Networks: Architecture, Algorithms and Applications”, Pearson Education, 1994.
3. **H.J. Zimmerman**, “Fuzzy set theory and its Applications”, Allied Publishers Ltd.
4. **Ra´ul Rojas,** “Neural Networks A Systematic Introduction”, Springer

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FOURTH YEAR

Semester – VIII

Course Content & Grade

Branch	Subject Title	Subject Code
EC	Spread Spectrum Technology	EC - 8033

UNIT-I

INTRODUCTION

Introduction-Application and advantages of spread spectrum (SS)-Classification of SS Pseudo noise sequences-Direct Sequence(DS) spread spectrum-Frequency hopping-Chirp-Hybrid Spectrum methods.

UNIT-II

SPREAD SPECTRUM TECHNIQUES-TYPES

Frequency hopped (FH) spread spectrum signals. Performance of FH Spread spectrum-Fast hopping versus slow hopping- DS versus FH. CDMA system based on FH spread spectrum signals-Other types of spread spectrum signals. Time hopping SS system.

UNIT-III

SPREAD SPECTRUM TECHNIQUES-ANALYSIS

Synchronization of SS systems - Acquisition. Tracking, Jamming consideration- Broad band –Partial- multiple tone-pulse-repeat band jamming blades system

UNIT-IV

CRYPTOGRAPHY

Fundamental concepts of cryptosystems – authentication, digital signature. Key schedule – Encipherment , Decipherment , Stream cipher system. Public key –cryptosystem. Public key distribution system. RSA cryptosystem and authentication scheme. Protocols, Internetworking security mechanisms, Private and public key encryption.

UNIT-V

APPLICATIONS

Commercial application of SS – CDMA – Multi path channels – The FCC part 15 rules – Direct sequence CDMA – IS-95 CDMA digital cellular systems. SS applications in cellular. PCS and mobile communication

TEXT BOOKS

1. Bernard Sklar , “Digital Communication – Fundamentals and Application”, Pearson Edition, 2001.
2. M.K.Simon,J.K Scholtz and B.K Levitt, “Spread Spectrum Communications Vol-1,Vol-2,Vol-3 “, Computer Science press inc, 1985.

REFERENCE BOOKS

1. John G. Prokias , “Digital Communications”, McGraw Hill Inc,2001
2. Feher. K., “Wireless Digital Communications”, Pearson education.