MTH – 301
COMPUTATIONAL TECHNIQUES

UNIT I MATRICES

Eigenvalues and Eigenvectors of a real matrix , Characteristic equation , Properties of Eigenvalues and eigenvectors , Cayley-Hamilton Theorem , Diagonalization of matrices , Reduction of a quadratic form to canonical form by orthogonal transformation

UNIT II INFINITE SERIES

Sequences , Convergence of series , General properties , Series of positive terms , Tests of convergence (Comparison test, Integral test, Comparison of ratios and D'Alembert's ratio test) , Alternating series , Series of positive and negative terms , Absolute and conditional convergence , Power Series , Convergence of exponential, logarithmic and Binomial Series.

UNIT III FUNCTIONS OF SEVERAL VARIABLES

Limits and Continuity , Partial derivatives , Homogeneous functions and Euler's theorem ,Total derivative ,Differentiation of implicit functions , Change of variables , Partial differentiation of implicit functions , Taylor's series for functions of two variables .
Errors and approximations , Maxima and minima of functions of two variables

UNIT IV IMPROPER INTEGRALS

Improper integrals of the first and second kind and their convergence , Evaluation of integrals involving a parameter by Leibnitz rule – Beta and Gamma functions , Properties , Evaluation of integrals using Beta and Gamma functions , Error functions.

UNIT V MULTIPLE INTEGRALS

Double integrals , Change of order of integration ,Area enclosed by plane curves , Triple integrals , Volume of Solids , Change of variables in double and triple integrals , Area of a curved surface.

TEXT BOOKS :

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 40th Edition, 2007.
2. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill Co. Ltd.,

EEC-302- Electronics Devices & Circuits

Unit I-Semiconductor: Intrinsic and extrinsic, p-type and n-type, energy band diagrams, majority and minority carrier, charge density in semiconductor, generation and recombination of charges, process of diffusion, diffusion and drift currents, hall effects and its applications. p-n junction, depletion layer, potential barrier, electric field, forward and reverse biased junction, current components in p-n diode, current equation, V-I characteristics, cut in voltages of si and ge diode, transition and diffusion capacitance, power dissipation.

Unit II-Semiconductor Diode: Semiconductor diodes, ideal & practical diode equivalent circuit & frequency response, graphical analysis of diode circuits, signal diodes, power diode, zener diode, varactor diode, schottky diode, pin diode, tunnel diode, photo diode. direct tunneling equivalent circuit, tunnel diode oscillator; solar cell, specification, colours & geometry of LEDs, diffusion and transition capacitance of P-N junction diode, zener regulators.

Unit II- Diode Applications: P-N junction diode as rectifier, clipper and clamper, the diode as a circuit element,the load line concept, Pieceswise linear diode modal, clipping circuits, clipping at two independent levels, comparators, sampling gate, rectifiers, other full wave circuits, capacitor filter additional diodes circuits.

Unit IV- Bipolar junction transistor: Construction, basic operation, current components and equations, CB, CE & CC-configuration, input and output characteristics, early effect, region of operation, active, cutoff and saturation region Ebers-Moll model, power dissipation in transistor, Photo transistor, Uni-junction transistor, principle of operation, characteristics.

Unit V- FET construction: Construction, n channel, p channel, characteristics, parameters, equivalent model, voltage gain, enhancement and depletion MOSFET, its Characteristics, analysis of FET in various configuration.

References:

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

List of Experiments:

1. V-I characteristics of various Diodes (p-n, Zener, Varactor, Schottky, Tunnel, Photodiode.
2. Characteristics of Transistors (BJT and FET)
3. Design of various clipping and clamping circuits
4. Design of half & full wave rectifier
5. Design & analysis of transistor amplifier in CE, CB & CC configuration.
6. Design & analysis of JFET Amplifier.
7. Design & analysis of MOSFET Amplifier.

EEC- 303 Digital Circuits

Unit I- State Machines & Sequential Systems: Need for state machines, its basic concepts, characterizing equation, synchronous sequential machines, realization of state diagram and state table from verbal description, Mealy and Moore model, machines state table , transition diagram, minimization of the state table of completely and incompletely specified sequential machines.

Unit II Asynchronous Sequential Machine: Fundamental-Mode Model, problems of asynchronous circuits, design principles, analysis and design of asynchronous sequential circuits, reduction of state and flow tables, race-free state assignment, hazards, asynchronous design example.

Unit III Synchronous State Machine Design: Sequential counters, state changes referenced to clock, number of state flip-flops, input forming logic, output forming logic, generation of state diagram from a timing chart, redundant states, general state machine architecture, asynchronous design example.

Unit IV Fault Detection: Fault, reason of fault, types of faults, fault detection using Boolean difference, path sensitization method.

Unit V Designing with Verilog HDL: Basic concepts, design modeling, modeling style, data types, tasks and functions, timing and delays, user-defined primitives, PLI, simulation and synthesis tools.

References:

1. Kohavi: Switching & Finite Automata Theory, TMH.
2. Lee: Digital Circuits and Logic Design, PHI Learning..
3. Roth Jr.: Fundamentals of Logic Design, Jaico Publishing House.
4. Parag K. Lala: Fault Tolerant and Fault Testable Hardware Design, BS Publication.
5. Verilog HDL A Guide To Digital Design And Synthesis, Edition: 2 by Samir Palnitkar.
6. A Verilog HDL Primer, Third Edition, by J. Bhasker

List of Experiments:

1. Designing and Simulation of Logic Gates with Verilog HDL
2. Designing and Simulation of Adders with Verilog HDL
3. Designing and Simulation of Subtractors with Verilog HDL
4. Designing and Simulation of Multiplexers with Verilog HDL
5. Designing and Simulation of Demultiplexers with Verilog HDL
6. Designing and Simulation of Decoders with Verilog HDL
7. Designing and Simulation of encoders & Priority encoder with Verilog HDL

EEC 304-Network Analysis and Synthesis

Unit I- Graph Theory : Graph of a network, definitions, tree, co tree, link, basic loop and basic cut set, incidence matrix, cut set matrix, tie set matrix duality, loop and node methods of analysis.

Unit II - Network Theorems: Super-position theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem. Millman's theorem, Compensation theorem, Tellegen's theorem.

Unit II- Circuit Analysis : Natural response and forced response, transient response and steady state response for arbitrary inputs (DC and AC), evaluation of time response both through classical and laplace methods.

Unit IV - Network function & Two port networks : Concept of complex frequency, network & transfer functions for one port & two ports, poles and zeros, necessary condition for driving point & transfer function. two port parameters – Z, Y, ABCD, hybrid parameters, their inverse & image parameters, relationship between parameters, interconnection of two ports networks, terminated two port.

Unit V - Network Synthesis: Positive real function, definition and properties, properties of LC, RC and RL driving point functions, synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms.

References:

1. 1 M.E. Van Valkenburg, "Network Analysis", Prentice Hall of India
2. 2 A.Chakrabarti, "Circuit Theory" Dhanpat Rai & Co.
3. 3 C.L Wadhwa, "Network Analysis and Synthesis" New Age International Publishers, 2007.
4. 4 D.Roy Choudhary, "Networks and Systems" Wiley Eastern Ltd.
5. 5 Donald E. Scott: "An Introduction to Circuit analysis: A System Approach" McGraw Hill

List of Experiments:

1. Study of various commands of PSPICE.
2. To determine node voltages and branch currents in a resistive network.
3. To obtain Thevenin's equivalent circuit of a resistive network.
4. To obtain transient response of a series R-L-C circuit for step voltage input.
5. To verify Thevenin Theorem.
6. To verify Superposition Theorem.
7. To verify Reciprocity Theorem.
8. To verify Maximum Power Transfer Theorem.
9. To verify Millman's Theorem.
10. To determine Open Circuit parameters of a Two Port Network.

EEC- 305 Signals & Systems

Unit I- Introduction to Signal & Systems: Signals, classification of signals, basic continuous time and discrete time signals, continuous LTI, discrete LTI systems , impulse and step functions, impulse response stability, linearity, stability, time invariance, eigen values, eigen functions, discrete convolution, properties of discrete and continuous LTI system, systems described by difference and differential equations.

Unit II- Fourier Analysis of Continuous Time Signals and Systems: Fourier series, fourier series representation of continuous periodic signal & its properties, fourier transform and its properties, parseval's theorem, frequency response of LTI systems.

Unit III- Fourier Analysis of Discrete Time Signals & Systems: Discrete-time fourier series, discrete-time fourier transform (including DFT) and properties, frequency response of discrete time LTI systems, continuous time fourier transform for periodic and non-periodic signals, properties of CTFT.

Unit IV- Laplace & Z-Transform Transform: Laplace transform and its inverse, existence conditions, region of convergence and properties, application of laplace transform for the analysis of continuous time LTI system, Z-Transform, properties of Z-transform, inversion of Z-transform, two dimensional Z-transform, convergence of Z-transform, region of convergence and properties, application of Z-transform for the analysis of discrete time LTI systems, Z transform problems.

Unit V- State Space Analysis: Concept of state, state space representation, discrete time LTI systems, state space representation of continuous time LTI systems, solutions of state equation for discrete time LTI systems, solutions of state equation for continuous time LTI systems.
Sampling: Sampling theorem, ideal & real sampling, reconstruction of signal from its samples, aliasing sampling in frequency domain, sampling of discrete-time signals.

References:

1. Alan V. Oppenheim, Alan S. Willsky and H. Nawab, Signals and Systems, Prentice Hall, 1997
2. Simon Haykin, Communication Systems, 3rd Edition, John Wiley, 1995.
3. Signals & Systems, 2nd Edition, by Alan Oppenheim, Alan Wilsky, S. Nawab. Prentice Hall, 1997.
4. Signals and Systems, by Simon Haykin and Barry Van Veen. Wiley, 1999.

List of Experiments (Extendable):

1. Demonstration of diff. Signals and their properties.
2. Demonstration of sampling /reconstruction of signals and spectral analysis using dft.
3. Analysis of Fourier properties of signals.
4. Convolution and correlation of signals.
5. Demonstration of salient properties of signals.

EE-306 Instrumentation and Measurement

Unit I-Philosophy of Measurement: Methods of measurement, measurement system, classification of instrument systems, characteristics of instruments & measurement systems, Accuracy and precision, sensitivity resolution, errors in measurement & its analysis, standards, operating force, types of supports, damping, controlling.
Analog Measurement of Electrical Quantities: PMMC, MI, electrodynamic, thermocouple, electrostatic & rectifier type ammeters & voltmeters, electrodynamic type wattmeter, three phase wattmeter, power in three phase systems, low power factor & UPF wattmeter, errors & remedies in wattmeter, energy meter, D'arsonal galvanometer.

Unit II- Instrument Transformers: CT and PT; their errors, applications of CT and PT in the extension of instrument range, measurement of speed, frequency and power factor.

Unit III- Measurement of Parameters: Different methods of measuring low, medium and high resistances, measurement of inductance & capacitance with the help of AC Bridges, Q meter, Megger.

Unit IV- AC Potentiometers: Polar type & Co-ordinate type AC potentiometers, application of AC Potentiometers in electrical measurement.
Magnetic Measurement- Ballistic galvanometer, flux meter, determination of hysteresis loop, measurement of iron losses, Lloyd Fischer square for measurement of power loss.

Unit V- Digital Measurement of Electrical Quantities: Concept of digital measurement, block diagram, analog & digital instruments, digital voltmeter, frequency meter, spectrum analyzer, electronic multimeter.
Cathode Ray Oscilloscope: CRO block diagram, Cathode Ray Tube & its components, applications of CRO, lissajous pattern, dual trace & dual beam oscilloscopes.

References:

1. E. W. Golding & F. C. Widdis, "Electrical Measurement &Measuring Instrument", A. W. Wheeler & Co. Pvt. Ltd. India
2. A. K. Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons, India
3. Purkait, "Electrical & Electronics Measurement & Instrumentation", TMH
4. Forest K. Harris, "Electrical Measurement", Willey Eastern Pvt. Ltd. India
5. M. B. Stout , "Basic Electrical Measurement", Prentice Hall of India
6. W. D. Cooper, "Electronic Instrument & Measurement Technique", Prentice Hall International
7. J. B. Gupta, "Electrical Measurement & Measuring Instrument", S. K. Kataria & Sons

List of Experiments:

1. Measurement of low resistance using Kelvin's Double bridge.
2. Measurement of medium resistance using Wheatstone's bridge.
3. Measurement of high resistance by loss of charge method.
4. Measurement of Insulation resistance using Megger.
5. Measurement of power in a single phase ac circuit by 3 voltmeter/ 3 Ammeter method
6. Calibration of a induction type single phase energy meter
7. Calibration of a dynamometer type of wattmeter by Phantom Loading method.
8. Measurements using Instrument Transformers.
9. Study of various types of Indicating Instruments.
10. Measurement of Power in three phase circuit by one, two & three wattmeters.