

1st Semester

COMPUTATIONAL METHODS FOR ELECTROMAGNETICS MMW 501

Solution of linear simultaneous and transcendental equation, Eigen values problems, Iterative method, Jacobi's method, and solution of electromagnetic problem.

Analytical method separation of variables orthogonal functions, series expansion, boundary value problems some practical application of electromagnetic.

Numerical integration, Euler's rule, Trapezoidal rule, Simpson rule, Newton Cote's method, Newton – Raphson method and Gaussian Quadrature method, Finite Element method solution of poisson and wave equation and other electromagnetics problems.

Basic MATLAB function and application. Fuzzy Set Theory and Application to Microwave problems, fuzzy MATLAB tools.

Finite element, Effective dielectric constant, mode matching other analytical tools for solving field problems.

Books:

1. Numerical methods in science & engineering , Dr. M.K Venkataraman, The National Pub. Co. 1991.
2. Computer Oriented statistical and numerical methods, B Balaguru Swamy, Macmillan India Ltd. 1998
3. Numerical methods for scientific and engineering computation , M.K Jain, S.R.K Iyengar and R,K Jain , Wiley Eastern Ltd, 1987
4. Communication Systems , S Haykins, John Wiley and Sons

DIGITAL COMMUNICATION AND CODING MMW 502

Sampling Theorem, PAM , TDM, PCM, DM, ADM, DPCM, Systems.

Digital Modulation, ASK, FSK, PSK, BPSK, QPSK, Mary PSK Systems.

Entropy, Information Rate, Mutual Information, Channel Capacity, Shannon's Theorem, Shannon Hartley Theorem.

Source coding, Shannon – Fano code, Huffman code, Channel Coding, Hamming's SEC Block code, Convolutional Code, Cyclic Code.

Books:

1. Digital & Analog Comm. Systems. K.Sam , Shanmugham , John wiley
2. Communication Systems : R.P.Singh & S.D.Sapre, TMH, 1995.

3. Principles of Comm. Systems : Taub & Schilling , Mc Gram Hill.

MICROWAVE THEORY AND TECHNIQUES **MMW 503**

Characteristics features of microwaves, applications of microwaves, Maxwell's equations, plane wave in dielectric and conducting media, waveguide analysis, VSWR, and impedance, waveguide discontinuities.

Microwave Network Representations: S-matrix representations, matrices of some typical microwave components such as attenuator, matched load, powerdivider, directional coupler, magic tee etc.

Ferrite devices, wave propagation in ferrite medium, faradayrotation, isolator, circulator etc.

Books:

1. S.Y. Liao, "Microwave devices & Circuits", Prentice Hall of India, 3rd Ed.. 1995.
2. K.C.Gupta, "Microwaves", Wiley Eastern LTd. 1979.
3. B.R. Vishvakarma, "Electromagnetic fields & applications", NBC international 1998.

MICROWAVE AND MILLIMETER WAVE INTEGRATED CKTS

MMW 504

Analysis of strip lines, microstrip lines, other microstrip like planer transmission lines etc. analysis of slot lines and coplanar guides quasi- static approach and fullwave discontinuities .

Microstrip line charectcuization of bends & junction. Lumped element in MICs, Technology of hybrid MICs.

Design of MIC components- transitions, couplers, filters Power dividers, oscillators, modulators, phase shifters & amplifiers.

Analysis of basic transmission lines for millimeter wave frequencies-Integrated fin line , insulated image guide, trapped guide, non-radiative guide, groove guide.

Transitions, bends and discontinuities at MM waves. Measurement techniques. Design of millimeter wave components, couplers, power dividers, filters, oscillators, switches, phase shifters and amplifiers.

Books:

1. K.C. Gupta, "Microstripline & Slot lines" Artech House.
2. S.K.Kaul, "Optical & Dielectric waveguide", John Wiley International, 2001.

**ELECTIVE – I: 1. MICROWAVE MEASUREMENTS
MMW 511**

Microwave power measurements. Measurement of low, medium and high microwave powers.

Slotted line techniques for VSWR Measurement. Measurement of high VSWR using double minima method. VSWR Measurement using reflectometer techniques. Impedance Measurement.

Measurement of scattering parameters using network analyzer. Frequency Measurements. Slotted line method and frequency meter.

Measurement of Q for transmission type cavity . Antenna Measurement (gain, radiation pattern, impedance) etc.

Dielectric Measurement. swept frequency Measurements,. Measurement using spectrum analyzer.

Books:

1. E.L. Giunzton, "Microwave Measurements", Mc Graw Hill Book Co. Inc. 1957.
2. SR Adams, "Microwave theory and applications", Prentice Hall Inc. 1969.

**ELECTIVE – I: 2. VLSI DESIGN
MMW 512**

Introduction to VLSI design – motivation for IC design, IC design process, design abstraction levels, CAD tools, elements of system specification and design.

Combinational logic design, logic minimization, synchronous sequential logic design. Finite state machines, Mealy and Moore models, Designing with programmable logic devices ROM, PLA, PAL, PLD.

A synchronous sequential logic- analysis procedure, state minimization, state assignment, static and dynamic hazards.

Introduction to VHDL – basic concepts in VHDL, language features, types of VHDL description – structural, data flow and behavioral descriptions of hardware, combinational and sequential design examples using VHDL.

Features and internal structure of CPLDs, FPGAs, designing with CPLDs and FPGAs. Introduction to IC floor planning and testing, design for testability, combinational logic testing, sequential logic testing, ATPG, boundary scan, built in self test.

Design examples and case studies

Books:

1. VHDL: Analysis and Modeling of digital Systems – Zainalabedin Navabi, Mc Graw Hill, 1993.
2. VHDL Primer – Bhaskar, PHI, 3rd Edition, 1999.
3. Digital Principles and Design- Donald D. Givone, Tata McGraw Hill, 2002.
4. Digital Design – M.M. Mano, Third Edition, Pearson Education 2001.
5. Digital Design – Principles and Practice – John.F.Wekerly, third edition, Pearson Education 2001.
6. Modern VLSI design – Wayne wolf, Pearson Education, 1997.
7. Specification and Design of Embedded Systems – daniel D. Gajski, Frank Vahid, Sanjiv Narayan, Jie Gong, Prentice Hall 1994.

**ELECTIVE – I: 3. DETECTION AND ESTIMATION THEORY
MMW 513**

Classical Detection and Estimation Theory.

Signal Representation

Detection of signal in Gaussian noise

Waveform estimation

Linear estimation problems

Wiener filtering

Kalman filtering

Books:

1. Principles of Digital Communication: J. Das, S.K Mullick, P.K Chatterjee, New age International (P) Ltd publisher , New Delhi
2. Modern Digital and Analog Communication Systems , B.P Lathi, Oxford publishers.