MTDE - 101 ADVANCED MATHEMATICS

UNIT I

Solution of Partial Differential Equation (PDE) by separation of variable method, numerical solution of PDE (Laplace, Poisson's, Parabola) using finite difference methods.

UNIT II

FT, DFT, Wavelet transform, Haar transform, their properties and applications.

UNIT III

Probability, compound probability and discrete random variable. Binomial, Normal and Poisson's distributions, Sampling distribution, elementary concept of estimation and theory of hypothesis, recurrence relations.

UNIT IV

Stochastic process, Markov process transition probability transition probability matrix, just and higher order Markov process, Markov chain.

UNIT V

Queuing system, transient and steady state, traffic intensity, distribution queuing system, concepts of queuing models (M/M/1: Infinity/ Infinity/ FC FS), (M/M/1: N/ Infinity/ FC FS), (M/M/S: Infinity/ Infinity/ FC FS)

Reference Books:

1. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Hill.
2. Advance Engineering Mathematics by Ervin Kreszig, Wiley Easten Edd.
3. Applied Numerical Methods with MATLAB by Steven C Chapra, TMH.
4. Introductory Methods of Numerical Analysis by S.S. Shastry,
5. Introduction of Numerical Analysis by Forberg
6. Numerical Solution of Differential Equation by M. K. Jain
7. Numerical Mathematical Analysis By James B. Scarborogh
8. Fourier Transforms by J. N. Sheddon
9. Fuzzy Logic in Engineering by T. J. Ross
10. Fuzzy Sets Theory & its Applications by H. J. Zimmersoms

MTDE - 102 ADVANCE CONTROL SYSTEM

UNIT I

Review of basic control systems; Modelling of dynamics in state space; Eigen-values and eigen-vectors; Modal transformation; State transition matrix and its computation; Solution of closed loop dynamics in state space.

UNIT II

State feedback; Response due to step reference input; State solution with examples; Stabilisability and pole placement; Stabilisability of higher order systems.

UNIT III

Controllability and observability; Minimal polynomial; Stability in the sense of Lyapunov, Routh-Hurwitz stability analysis; Nyquist stability analysis; Jury's stability test.

UNIT IV

Types of nonlinear elements – ideal relay, saturation, ideal relay with dead zone, saturation with dead zone, hysteresis; Describing function; Determination of describing functions of these nonlinear elements; Stability analysis of closed loop systems having nonlinear element and a linear transfer function block in the forward block, by using Nyquist method; Limit cycles; Phase plane trajectory of linear second order systems; Concepts; Phase plane trajectory of the closed loop systems having nonlinear element and a linear transfer function block in the forward block.

UNIT V

Discretisation of continuous-time state dynamics, pole placement via state feedback, stabilisability of discrete-time state dynamics, multi-rate sampling and corresponding response of closed loop state dynamics.

References:

1. Digital Control Systems – B. C. Kuo, Oxford University Press, 1992.
2. Discrete-time Control Systems – K. Ogata, Prentice-Hall, 1987.
3. Analysis and Design of Nonlinear Feedback Control Systems – George J. Thaler and Marvin P. Pastel, McGraw-Hill, New York, 1962.
4. State Functions and Linear Systems – Donald G. Schultz and James L. Melsa, McGraw-Hill Education, 1967.
5. Linear System Theory and Design – Chi-Tsong Chen, Oxford University Press, New York, 1999.

MTDE - 103 ADVANCE ELECTRONIC SYSTEM

UNIT – I

Introduction to Processor Design: Abstraction in Hardware Design, MUO a simple processor, Processor design trade off, Design for low power consumption. ARM Processor as System-on-Chip: Acorn RISC Machine – Architecture inheritance –ARM programming model – ARM development tools – 3 and 5 stage pipeline ARM organization – ARM instruction execution and implementation – ARM Coprocessor interface

UNIT – II

ARM Assembly Language Programming: ARM instruction types – data transfer, data processing and control flow instructions – ARM instruction set – Coprocessor instructions. Architectural Support for High Level Language: Data types – abstraction in Software design – Expressions – Loops – Functions and Procedures – Conditional Statements – Use of Memory.

UNIT – III

Memory Hierarchy: Memory size and speed – On-chip memory – Caches – Cache design-an example – memory management

UNIT – IV

Architectural Support for System Development: Advanced Microcontroller bus architecture – ARM memory interface – ARM reference peripheral specification –Hardware system rototyping tools – Armulator – Debug architecture

UNIT – V

Architectural Support for Operating System: An introduction to Operating Systems – ARM system control coprocessor – CP15 protection unit registers – ARM protection unit – CP15 MMU registers – ARM MMU Architecture –Synchronization – Context Switching input and output

Books:

1. Steve Furber, ARM System on Chip Architecture, 2nd ed., Addison Wesley Professional, 2000.
2. Ricardo Reis, Design of System on a Chip: Devices and Components, 1st ed., Springer, 2004.
3. Jason Andrews, Newnes, Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) , BK and CDROM
4. Prakash Rashinkar, System on Chip Verification – Methodologies and Techniques, Peter Paterson and Leena Singh L ,Kluwer Academic Publishers, 2001.

MTDE - 104 VLSI DESIGN

Building blocks of VLSI: Overview of VLSI, Complexities and Design, VLSI Simulation Steps and Tools

MOS Transistor Theory: A review of MOS structure and operation, MOS I-V characteristics, MOSFET model for Circuit Simulation, Scaling and Small Geometry effects

CMOS Process Flow: Basic steps, CMOS n-well process, Twin-Tub process, layout design rules.

MOS Inverter: Static and Dynamic Characteristic, Performance Estimation

Combinational MOS logic circuits: Transmission gate, Dynamic logic, Timing issues in CMOS Digital Circuits, Semiconductor Memories, SRAM, DRAM, ROM analysis and design

HDL based design: Language Fundamentals, Behavioral and RTL style of modeling, Data Flow style of description, Structural style, Test-Bench

VLSI Testing: Hazards and Fault Analysis

References:

1. S. M. Kang, Y. Leblebici, CMOS Digital Integrated Circuits: Analysis and Design, 3rd Edition Tata McGraw-Hill Publication, 2003.
2. J. M. Rabaey, A. Chandrakasan, B. Nikolic, Digital Integrated Circuit: A design perspective, 2nd Edition Pearson Education, 2005.
3. S. Sjoholm, L.Lindh, VHDL for Designers, Pearson Education Ltd., England, 1997.
4. N. Weste, David Harris, CMOS VLSI Design: A Circuits and Systems Perspective, 3rd Edition Addison Wesley, 2004.

MTDE - 105 ACTIVE & PASSIVE NETWORK SYNTHESIS

Unit - I

Introduction to circuit elements

R,L,C and their characteristics in terms of linearity & time dependant nature, voltage & current sources controlled & uncontrolled sources KCL and KVL analysis, Nodal & mesh analysis, analysis of magnetically coupled circuits, Transient analysis :- Transients in RL, RC & RLC Circuits, initial conditions, time constants.

Unit- II

Driving point synthesis, Camer & Foster methods. Transfer function synthesis (Bolt Duffion method)

Unit – III Filter approximations

Filter characteristics- Butterworth, Chebyshev & Bessel filters

Unit-IV Active filter classifications

Realisation using VCVS, NIC, INIC & impedance converter & inverter network using op-amps & discrete components, Tunabale filters. Sensitivity analysis for op-amp based filters using R-C networks

Unit-V Computer Techniques

Design of active and passive filters using Spice, Microcap EDA tools.

Recommended Text:

RC Network Synthesis – Huelsman - S. K. Mitra
Network Synthesis – Van Valkenberg
Passive and Active Network Analysis and Synthesis, Budak, Aram, Waveland
Lindquist: Active Network Design: Steward and Sons 1977