MEVD – 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, Elementary properties of FT, DFT, WFT, Wavelet transform, Haar transform.

UNIT II

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

UNIT III

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

UNIT IV

Operations of fuzzy sets, fuzzy arithmetic & relations, fuzzy relation equations, fuzzy logics. MATLAB introduction, programming in MATLAB scripts, functions and their application.

UNIT V

Introduction and definition of reliability, derivation of reliability functions, Failure rate, Hazard rate, mean time t future & their relations, concepts of fault tolerant analysis, Elementary idea about decision theory and goal programming.

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

MEVD – 102 CMOS VLSI Design

Unit I

VLSI design methodologies: VLSI Design flow, Design Hierarchy, Regularity, Modularity and Locality, VLSI design styles, Design quality, Packaging technology. MOS device design equations, Second order effects, the complementary CMOS Inverter DC characteristics.

Unit II

Circuit Characterization and Performance Estimation: Parasitic effect in Integrated Circuits, Resistance estimation, capacitance estimation, Inductance. Switching characteristics, CMOSGate transistor sizing, Power dissipation, CMOS Logic Structures, Clocking Strategies.

Unit III

CMOS Process Enhancement and Layout Considerations: Interconnect, circuit elements, Stick diagram, Layout design rules, Latchup, latchup triggering, latchup prevention, Technology
related CAD issues.

Unit IV

Subsystem Design: Structured design of combinational logic- parity generator, Multiplexer, code converters. Clocked sequential circuits- two phase clocking, charge storage, dynamic register element, dynamic shift register. Subsystem design process, Design of ALU subsystem, Adders, Multipliers. Commonly used storage/ memory elements.

Unit V

Field Programmable Devices: Definitions of Relevant Terminology, Evolution of Programmable Logic Devices, User- Programmable Switch Technologies, Computer Aided Design (CAD) Flow for FPDs, Programmable Logic, Programmable Logic Structures, Programmable Interconnect, Reprogrammable Gate Array, Commercially Available SPLDs, CPLDs and FPGAs, Gate Array Design, Sea-of-Gates.

Text/ References

1. D.A. Pucknell, K. Eshraghian, *Basic VLSI Design*, PHI, 3rd Ed.
2. John P. Uyemura, *Introduction to VLSI Circuits and Systems*, John Wiley & Sons.
3. Niel H.E. Weste, K. Eshraghian,, *Principles of CMOS VLSI Design*, Person, 2nd Ed.
4. Mead and L. Conway, *Introduction to VLSI Systems,* Addison-Wesley.
5. A. Mukherjee, *Introduction to nMOS and CMOS VLSI systems design*, Prentice Hall.

MEVD – 103 Advanced Logic Design

Unit I

Course overview; design concepts, introduction to logic circuit and Verilog. Implementation technology, CMOS logic gates, programmable logic devices. Optimized implementations of logic functions, canonical representations, Karnaugh maps, factoring, functional decomposition, NAND/NOR networks, bubble pushing.

Unit II

Verilog data types and operators, modules and ports, gate level modeling, time simulation/ scheduler. Circuit issues. Verilog behavioral models, number representation and arithmetic circuits, positional notation, signed numbers, arithmetic operations.

Unit III

Verilog specifications of combinational circuits, combinational logic building blocks, encoders/decoders, arithmetic comparison, etc. The basic latch, gated SR and D latch, master-slave and edge-triggered flip flops, counters, shift registers, Design examples, introduction to finite state machines; introduction to ModelSim.

Unit IV

Synchronous sequential circuits, design process, state assignment, hazards, glitches, asynchronous design, Metastability, Noise margins, Power, fan-out, skew Finite state machine design examples, Verilog representations.

Text/ Reference Books

1. John F. Wakerly, *Digital Design*, Pearson Education Asia, 3rd Ed.
2. M. M. Mano, *Digital Design,* Pearson Education, 3rd Ed.
3. C. H. Roth, Jr., *Fundamentals of Logic Design*, Jaico Publishing House.
4. Fletcher, *An Engineering Approach to Digital Design*, PHI.
5. J. M. Yarbrough, *Digital Logic*, Thomson Learning.
6. Stephen Brown and Zvonko Vranesic, *Fundamentals of Digital Logic with Verilog Design*, McGraw-Hill Higher Education, 2003, ISBN 0-07-283878-7.
7. Samir Palnitkar, *Verilog HDL,* Prentice Hall, 2nd Edition, 2003, ISBN 0-13-044911

MEVD – 104 Digital Signal Processing

UNIT I – Introduction to Discrete Time Signals
Sequences; representation of signals on orthogonal basis; Sampling and Reconstruction of signals.

UNIT II – Discrete Systems
Attributes; Z-Transform; Analysis of LSI systems; Frequency analysis; Inverse systems, Discrete Fourier Transform (DFT), Fast Fourier Transform algorithms, Implementation of discrete time systems.

UNIT III – Design of FIR Digital Filters
Window method, Park-McClellan's method; Effect of finite register length in FIR filter design.

UNIT IV – Design of IIR Digital Filters
Butterworth, Chebyshev and Elliptic Approximations; Lowpass, Bandpass, Bandstop and High pass filters.

UNIT V – Introduction to VLSI DSP
Transformations for high speed using pipelining, retiming, parallel processing, and folding techniques; Design of programmable DSPs.

Texts/References

1. A.V. Oppenheim and Schafer, *Discrete Time Signal Processing*, Prentice Hall, 1989.
2. John G. Proakis and D.G. Manolakis, *Digital Signal Processing: Principle, Algorithms and Applications*, Prentice Hall, 1997.
3. L.R. Rabiner and B. Gold, *Theory and Application of Digital Signal Processing*, Prentice Hall, 1992.
4. J.R. Johnson, *Introduction to Digital Signal Processing*, Prentice Hall, 1992.
5. D. J. DeFatta, J. G. Lucas and W. S. Hodgkiss, *Digital Signal Processing*, J Wiley and Sons, Singapore, 1988.
6. K.K. Parhi, *VLSI Digital Signal Processing Systems: Design and Implementation*, Wiley.

MEVD – 105 Embedded Microcontrollers Programming

Unit-I

Embedded System Overview : Embedded System definition.
Processor Technology : General purpose, Single Purpose, Application Specific, Super scalar, Pipelined, Very Long Instruction Word (VLIW) Processor, Microprocessors, Micro controllers and DSP Processors. Embedded Processors in VLSI circuit.

Unit-II

Architectural Issues : CISC, RISC, DSP and Harvard/Princeton Architectures.
Memory : ROM, EPROM, EEPROM, FLASH, RAM, SRAM, DRAM, SDRAM, NVRAM, EDORAM, DDRRAM, Memory Hierarchy and Cache.
Interfacing : Interfacing using Glue Logic, Interrupt, DMA, I/O Bus structure, I/O devices, Serial Communication Protocols, Parallel Communication Protocols, Wireless Protocols.

Unit-III

Introduction to 8-bit Microcontrollers e.g. 8051, 68HC11, 80196, Timers/Counters, USART. Detailed study of 8051 microcontroller, with its programming in assembly language and Interrupts, Serial Programming etc.

Unit-IV

Interfacing of Microcontroller such as SPI, PWM, WDT, Input Capture , Output Compare Modes, Interfacing LED, Switches, ADC, DAC, LCD , RTC. Idea about the C programming of Microcontroller. I2C, CAN bus architecture.

Unit-V

Introduction to 16/32-bit microcontrollers.
Introduction to ARM Architecture and Organization, Difference between ARM7 , ARM9 & ARM11 TDMI, ARM programming model, ARM Instruction set.

Text/References

1. David E. Simon, *An Embedded Software Primer*, Pearson Education.
2. Dr. RajKamal, *Embedded Systems*, TMH.
3. Vahid & Givargis, *Embedded System Design*,John Wiley & Sons.
4. K. J. Ayala , *8051 Microcontrollers*, Penram International, Second Edition
5. M. A. Mazidi & J. G. Mazidi, *8051 Microcontroller and Embedded System,* Pearson Education Asia
6. J. W. Valvano, *Embedded Microcomputer Systems - Real Time Interfacing*, Thomson Asia Pte. Ltd.
7. R. H. Barnett, *8051 family of Microcontrollers,* PHI.
8. Peter Spasov, *Microcontroller Technology: The 68HC11*, PHI, Fourth Edition
9. Dr. Rajkamal, *Microcontrollers (Architecture, Programming, Interfacing and System Design),* Pearson Education.