

3rd Semester

TESTING OF VLSI CIRCUITS

VED 601

Introduction – VLSI testing process and test equipment – test economics and product quality – fault modeling – logic and fault simulation.

Testability Measures – combinational circuit test generation – sequential circuit test generation.

Memory test – analog and mixed signal test – delay test – IDDQ Test.

DFT fundamentals – ATPQ fundamental – scan architecture and technique.

System test – embedded core – test – future testing.

Books:

1. Viswani D. Agrawal Michael L. Bushnell, “Essentials of Electronic Testing for digital memory and mixed signal VLSI circuit”, Kluwer Academic Publications, 1999.
2. Alfred L. Crouch “Design for test for digital ICs and embedded core systems” – PHI 1999.

NANO TECHNOLOGY

VED 602

Introduction

Introduction to nanoscale systems. Length energy and time scales. Top down approach to Nano lithography. Spatial resolution of optical, deep ultraviolet, X-ray, electron beam and ion beam lithography. Single electron transistors, coulomb blockade effects in ultra small metallic tunnel junctions.

Quantum Mechanics

Quantum confinement of electrons in semiconductor nano structures. Two dimensional confinement (Quantum wells), Band gap engineering, Epitaxy, Landauer, - Buttiker Formulism for conduction in confined geometries, one dimensional confinement, quantum point context, quantum dots and bottom of approach, introduction to quantum methods for information processing.

Molecular Techniques

Molecular Electronics, Chemical self assembly, carbon nano tubes, self assembled mono layers , Electomechanical techniques, Applications in biological and chemical detection, Atomic scales characterization techniques, scanning, tunneling microscopy, atomic force microscopy.

Books:

1. Beenaker and van Houten “Quantum Transport in Semiconductor Nanostructures in solid state Physics” Eherneich and Turnbull, Academic press, 1991

2. David Ferry "Transport in Nano structures" Cambridge University press 2000
3. Y. Imry "Introduction to Mesoscopic Physics, Oxford University press 1997
4. S. Dutta "electron Transport in Mesoscopic system" Cambridge University press 1995
5. H. Grabert and M. Devoret "single charge Tunneling" Plenum press 1992

**Elective – III: (i) NEURAL NETWORKS
VED 611**

Introduction to Artificial Neural Networks

Neuro-physiology – general processing element – ADALINE – LMS learning rule – MADLINE – MR2 training algorithm.

BPN and BAM

Back propagation network – updating of output and hidden layer weights – application of BPN – associated memory – Bi-directional associative memory – Hopfield memory – traveling sales man problem.

Simulated Annealing and CPN

Annealing, Boltzmann machine – learning – application – counter propagation network – architecture – training – applications.

SOM and ART

Self organizing map – learning algorithm – featuring map classifier – applications – architecture of adaptive resonance theory – pattern matching in ART network.

Neocognitron

Architecture of Neocognitron – Data processing and performance of architecture of spatio – temporal networks for speech recognition.

Books :

1. J.A. Freeman and B.M. Skapura, "Neural Networks, Algorithms Applications and programming Techniques", Addison – Wesley, 1990
2. Laurence Fausett, "Fundamental of Neural Networks: Architecture, algorithms and application", Prentice Hall, 1994.

Elective – III: (ii) COMPUTER ARCHITECTURE AND PARALLEL PROCESSING

VED 612

THEORY OF PARALLELISM

Parallel computer models-the state of computing. Multiprocessors and Multicomputers and Multivectors and SIMD computers, PRAM and VLSI models, Architectural development tracks. Programs and network properties-Conditions of parallelism, Program partitioning and scheduling , Program flow mechanisms, System interconnect architectures. Principles of scalable performance matrices and measures, Parallel processing applications, speed up performance laws, scalability analysis and approaches.

HARWARE TECHNOLOGIES

Processor and memory hierarchy advanced processor technology, superscalar and vector processors, memory hierarchy technology, virtual memory technology , bus cache and shared memory – backplane bus systems, cache memory organizations, shared memory organizations, sequential and weak consistency models.

PIPELINING AND SUPER SCALAR TECHNOLOGIES

Parallel and scalable architectures, Multiprocessor and multicomputers , Multivector and SIMD computers, Scalable, Multithreaded and data flow architectures.

SOFTWARE AND PARALLEL PROGRAMMING

Parallel models, Languages and compilers , Parallel program development and environments , UNIX,MACH and OSF/1 for parallel computers.

Books

1. Kai hwang . “ Advanced Computer Architecture” , McGraw Hill International ,1993.
2. William Stalling ,”Computer Organization and Architecture”, Macmillan Publishing Company ,1990.
3. M .J. Quinn,” Designing Efficient Algorithms for Parallel Computers” , McGraw Hill International ,1994.

Elective – III: (iii) ADVANCED DIGITAL SIGNAL PROCESSING
VED 613

Discrete Random Signal Processing

Discrete Random Process, Expectations, Variance, Co-Variance, Scalar Product, Energy of Discrete Signals-Parseval's Theorem, Wiener Khintchine Relation – Power Spectral Density – Periodogram-Sample Auto-correlation-Sum Decomposition Theorem, Spectral Factorization Theorem – Discrete Random Signal Processing by Linear Systems – Simulation of White Noise – Low Pass filtering of White Noise.

Spectrum Estimation

Non-Parametric Methods-correlation Method – Co-Variance Estimator – Performance Analysis of Estimators Unbiased, Consistent Estimators – Periodogram Estimator-Barlett Spectrum Estimation Welch Estimation – Model based Approach – AR, MA, ARMA Signal Modelling – Parameter Estimation using Yule – Walker Method.

Linear Estimation and Prediction

Maximum likelihood criterion efficiency of estimator-least mean squared error criterion-Wiener filter-Discrete Wiener Hoff equations Recursive estimators – Kalman filter – linear prediction, prediction error-whitening filter, inverse filter – Levinson recursion, lattice realization, and Levinson recursion algorithm for solving Toeplitz system of equations.

Adaptive Filters

FIR adaptive filters-Newton's steepest descent method-adaptive filter based on steepest descent method Widrow Hoff LMS adaptive algorithm-adaptive channel equalization – adaptive echo canceller-adaptive noise cancellation RLS adaptive filters-exponentially weighted RLS-sliding window RLS simplified IIR LMS adaptive filter.

Multirate Digital Signal Processing

Mathematical description of change of sampling rate – interpolation and decimation continuous time model-Direct digital domain approach-decimation by an integer factor-interpolation by an integer factor-single and multistage realization – poly phase realization – application to sub band coding- wavelet transform and filter bank implementation of wavelet expansion of signals.

Books

1. Monson H. Hayes, "Statistical Digital Signal Processing and Modeling", John Wiley and Sons. Inc. New York, 1996.

Reference:

1. Spocles J. Orfanidis, "Optimum signal processing", McGraw Hill 1990
2. John G. Proakis, Dimitris G. Manolakis, "Digital Signal Processing", Prentice Hall of India 1996.

Elective – III: (iv) REAL TIME SYSTEMS

VED 614

Introduction, Real-time Versus Conventional Software, Computer Hardware for Monitoring and Control, Software Engineering Issues.Process and State-based Systems model, Periodic and Sporadic Process, Cyclic Executives, CE definitions and Properties, Foreground-Background Organizations, Standard OS and Concurrency – Architectures, Systems Objects and Object-

Oriented Structures, Abstract Data Types, General Object Classes Requirements and Design Specifications: Classification of Notations, Data Flow Diagrams, Tabular Languages, State Machine, Communicating Real Time State Machine- Basic features, Timing and clocks, Semantics Tools and Extensions, Statecharts-Concepts and Graphical Syntax, Semantics and Tools

Declarative Specifications: Regular Expressions and Extensions, Traditional Logics-Propositional Logic, Predicates, Temporal logic, Real time Logic Deterministic Scheduling : Assumptions and Candidate Algorithms, Basic RM and EDF Results, Process Interactions-Priority Inversion and Inheritance Execution Time Prediction: Measurement of Software by software, Program Analysis with Timing Schema, Schema Concepts, Basic Blocks, Statements and Control, Schema Practice, Prediction by optimisation, System Interference and Architectural Complexities Timer Application, Properties of Real and ideal clocks, Clock Servers – Lamport’s Logical clocks, Monotonic Clock service, A software Clock server, Clock Synchronization- Centralized Synchronization, Distributed Synchronization Programming Languages: Real Time Language Features, Ada-Core Language, Annex Mechanism for Real Time Programming, Ada and Software Fault Tolerance, Java and Real-time Extensions, CSP and Occam

Operating Systems: Real Time Functions and Services, OS Architectures-Real Time UNIX and POSIX, Issues in Task management- Processes and Threads, Scheduling, Synchronization and communication.

Book:

1. Real – Time Systems and software by Alan C. Shaw ; John Wiley & Sons Inc