PUNJAB TECHNICAL UNIVERSITY, JALANDHAR

Schedule of Teaching and Examination for
M.Tech. Microelectronics

Semester – I

Subject Code	Subject	Schedule of Teaching				Schedule of Examination		
		L	T	P	Credit	Theory Practical	Sessional	Total
ME-801	Micro and nano Sciences & Technology	3	1	0	4	100	50	150
ME-803	Electronics System Design	3	1	0	4	100	50	150
ME-805	VLSI Design	3	1	0	4	100	50	150
ME-807	Advanced mathematics for engineers	3	1	0	4	100	50	150
	Elective-I	3	1	0	4	100	50	150
ME-821	Lab-I	0	0	4	2	50	50	100
		15	5	4		550	300	850

Semester – II

Subject Code	Subject	Schedule of Teaching				Schedule of Examination		
		L	T	P	Total	Theory Practical	Sessional	Total
ME-802	MEMS and NEMS	3	1	0	4	100	50	150
ME-804	MOS Technology	3	1	0	4	100	50	150
ME-806	Measurement and Characterization Techniques	3	1	0	4	100	50	150
ME-808	Material Science & Engineering	3	1	0	4	100	50	150
	Elective-II	3	1	0	4	100	50	150
ME-822	Lab-II	0	0	4	2	50	50	100
		15	5	4		550	300	850

Semester – III

Subject Code	Subject	Schedule of Teaching				Schedule of Examination		
		L	T	P	Total	Theory Practical	Sessional	Total
ME-809	EDA & CAD tools	3	1	0	4	100	50	150
ME-811	Low Power Digital CMOS Design	3	1	0	4	100	50	150
ME-813	Project			8	8	50	50	100
		6	2	8	16	250	150	400

Semester – IV

	Thesis	Satisfactory/not satisfactory

ELECTIVE – I

ME-815 Advanced Microprocessor and Embedded System
ME-817 Opto Electronics
ME-819 Nano Electronics

ELECTIVE – II

ME-810 Analog and Mixed Signal Device Design
ME-812 RF & High Speed Digital Design
ME-814 Nanoscale Devices & Systems

ME-801 Micro & Nano Sciences & Technology

1. Introduction to semiconductor devices

Introduction- material conductivity - Quantum mechanics - energy bands - crystalline structures - Density of states - band structures - Fermi - Dirac function - material classification - Band structure - electrons and holes - doping - Scattering - mobility - Diffusion transport - Einstein relation - Carrier generation and recombination- continuity equation.

2**.Crystal Growth, Wafer Preparation, Epitaxy and Oxidation**

Review of Semiconductor theory - Electronic Grade Silicon - Czochralski Crystal Growing - Silicon Shaping Processing consideration - Vapor Phase Epitaxy - Molecular Beam Epitaxy - Silicon on Insulators – Epitaxial Evaluation – Growth Mechanism and Kinetics – Thin Oxides – Oxidation Techniques and Systems – Oxide Properties.

3.Lithography and Relative Plasma Etching

Optical Lithography – Electron Lithography – X-Ray Lithography - Ion Lithography Plasma -Properties – Feature Size - Control and Anisotropic Etch Mechanism – Relative Plasma Etching Techniques and Equipments.

4.Deposition , Diffusion, Lon Implementation And Metallization

Deposition Processes – Polysilicon – Plasma Assisted Deposition – Models of Diffusion in Solids – Fick's One Dimensional Diffusion Equation – Atomic Diffusion Mechanism – Measurement Techniques – Range Theory – Implantation Equipment. Annealing Shallow Junction – High Energy Implantation – Physical Vapor Deposition – Patterning.

5.**VLSI Process Integration, Analytical, Assembly Techniques And Packaging Of VLSI Devices** NMOS IC Technology – CMOS IC Technology – MOS Memory IC Technology – Bipolar IC Technology – IC Fabrication. Analytical Beams – Beams Specimen interaction – Chemical Methods – Package Types baking Design Considerations – VLSI Assembly Technology – Package Fabrication Technology.

References

1. S.M.Sze, "VLSI Technology ", McGraw-Hill, 2nd edition, 1988
2. Proceedings of NC of Nanotechnology held at BMSCE, Muktsar,2007
3. Duoglas A Pucknell and Kamaran Eshragian," Basic VLSI design", 3rd edition, PHI, 1994.
4. Wayne wolf, " Modern VLSI design", 2nd edition, Prentice Hall Ptr, 1998.
5. D. S. Grewal , "Nanotechnology", Orient Longman's, 2008

ME-803 Electronics System Design

Note: Eight questions of equal marks to be set covering the whole syllabus and any five to be attempted.

1. Review of Digital electronics concept

2. MSI and LSI Circuits And Their Applications

Arithmetic Circuits, Comparators, Multiplexers, Code Converters, XOR And AND OR INVERTER Gates, Wired Logic, Bus Oriented Structures, Tri-State Bus System, Propagation Delay.

3. Sequential Machines

The Concept Of Memory, The Binary Cell, The Cell And The Bouncing Switch, Set / Reset, D, Clocked T, Clocked JK Flip Flop, Design Of Clock F/F, Conversion,Clocking Aspects, Clock Skew, State Diagram Synchronous Analysis Process, Design Steps For Traditional Synchronous Sequential Circuits, State Reduction, Design Steps For Next State Decoders, Design Of Out Put Decoders, Counters, Shift Registers and Memory.

4. Multi Input System Controller Design

System Controllers, Design Phases And System Documentation, Defining The System, Timing And Frequency Considerations, Functional, Position And Detailed Flow Diagram Development, MDS Diagram, Generation, Synchronizing Two System And Choosing Controller, Architecture, State Assignment, Next State Decoders And Its Maps, Output Decoders, Clock And Power Supply Requirements, MSI Decoders,Multiplexers In System Controllers, Indirect Addressed Multiplexers Configurations, Programmable System Controllers, ROM, PLA And PAL Based Design.

5. Asynchronous Finite State Machines

Scope, Asynchronous Analysis, Design Of Asynchronous Machines, Cycle And Races, Plotting And Reading The Excitation Map, Hazards, Essential Hazards Map Entered Variable, MEV Approaches To Asynchronous Design, Hazards In Circuit Developed By MEV Method, Electromagnetic Interference And Electromagnetic Compatibility Grounding And Shielding of Digital Circuits. Interfacing digital system with different media like fiber cable, co-axial cable etc.

Books Recommended:

1. An Engineering Approach To Digital Design - by Fletcher PHI 1990
2. Designing With TTL Circuits - by Texas Instruments.
3. Related IEEE/IEE publications

ME-805 VLSI Design

Note: Eight questions of equal marks to be set covering the whole syllabus and any five to be attempted.

1. Overview
Overview of combinational and sequential circuits, timing analysis of combinational and sequential circuits, meta-stability, methods to eliminate meta-stability single synchronizer and double synchronizer, MTBF Clocking strategies.

2. Sequential Machine Design
State diagram, state minimization, state assignments, design of mealy and Moore machines, design of RAM, SDR, SRAM, DRAM, ROM. Charge Coupled Devices (CCD's).

3. Programmable logic Devices
Basic concepts, programmable logic array (PLA), Programmable Array Logic (PAL), Structure of standard PLD's Complex (PLD's), Complex PLD's (CPLD), Xilinx Xc-9500. Introduction to field programmable gate arrays-types of FPGA's, Configurable logic Block (CLB) Input/ Output Block (IOB). Introduction to Xilinx series. FPGA, XC4000 family, Implementation of Design in PLD's.

4. VHDL
Need for HDL's, Design flow, overview of VHDL, data types, Logic Operators, Data flow Modeling, Structural Modeling, Behavioral Modeling, Mixed Modeling, Modeling of combinational and sequential circuits.

5. Verilog
Verilog as HDL, HDL model abstraction-behavioral, RTL, structural, switch model, verification, Modeling of combinational logic, sequential logic, tasks and functions, Advanced Modeling concepts, User defined primitives.

Books Recommended:
1. Fundamentals of Digital Design - by Charles. H. Roth, Jr., Jaico Publishing House
2. Digital Design Principle & Practice – by John. F. Wakerly, PHI
3. VHDL Analysis & Modeling of Digital Systems – by Z Navabi, Mc. Graw Hill
4. An Engg. Approach to Digital Design - by William. I. Fletcher
5. Verilog HDL: Digital Design & Synthesis – by Samir Palnitker
6. Documents of Xilinx]
7. Related IEEE/IEE publications

ME-807 Advanced Mathematics for Engineers

Note: Eight questions of equal marks to be set covering the whole syllabus and any five to be attempted.

1. Fourier Transforms
Introduction, Fourier Integral Theorem, Fourier Sine and Cosine Integral, Complex form of Fourier Integrals, Fourier Transforms, Inverse Fourier Transform, Properties, Modulation Theorem, Convolution Theorem for Fourier Transforms, Parseval's Identity, Fourier Transforms of derivative of functions, Relation between Fourier and Laplace transform.

2. Z -Transforms
Introduction, Properties of Z- Transforms, Evaluation of inverse Z – Transforms.

3. Matrices And Linear System Of Equations
Solution of linear simultaneous equations by Gaussian elimination and its modification, Crout's triangularization method, Iterative methods-Jacobins method,Gauss-Seidal method, Determination of Eigen values by iteration.

4. Conformal Mapping
Conformal mapping, linear transformations, Bi-linear transformations, Schwarz's-Christoffel transformations.

5. Calculus Of Variations
Euler-Lagrange's differential equation, The Brachistochrone problems and other applications. Isoperi-metric problem, Hamilton's Principle and Lagrange's Equation.Rayleigh-Ritz method, Galerkin method.

Books Recommended:
1. Higher Engineering Mathematics - by Dr. B.S. Grewal; Khanna Publishers
2. Fourier Series and Boundary Values Problems - by Churchill; McGraw Hill.
3. Complex Variables & Applications - by Churchill; McGraw Hill.
4. Calculus of Variations - by Elsgole; Addison Wesley.
5. Calculus of Variations - by Galfand & Fomin; Prentice Hall.
6. The Use of Integral Transforms - by I.N. Sneddon., Tata McGraw Hill.

ME-821 **LAB – 1**

Hardware Description Language Lab using VHDL

1. Half adder, Full adder, Subtractor, 4bit comparator.
2. Code Convertor
3. Decoder and encoder
4. 8:1 multiplexer
5. Flip Flops- SR,D,JK,T
6. up/down counter with load able count
7. Johnson and Ring Counter
8. 8 bit shift register
9. UART
10. ALU Design

ME-802 MEMS & NEMS

Date Storage: Introduction to memories, DRAM, SRAM and their limitations, Problems in magnetic data storage, VLSI MEMS based storage devices, principles and operations, future development

Storage Memory in Nanotechnology: Principal of operation of Nano storage, Magneto Resistance Storage, MEMS storage, Optical Storage, Holographic Storage, Molecular Switches, Atomic Storage.

Effects of Nanotechnology on Storage Devices: Present Day Data Storage Technology, Future Data Storage Technology-Quantum Interference Spintronics

Design Issues for MEMS & NEMS: Introduction, Design Process, Design Tools, Design Procedure, Substrate Selection, Wafer pre cleaning for any oxides, Formation of required oxides, Spinning of Adhesive, Spinning of Photo resist, Prebaking Techniques, Masking of Pattern Using UV lights, Exposure to light to remove any solvent & check photo resist Uniformity, Development of resist, Post exposure & Post baking techniques, Etching of exposed oxide layers, stripping of Photo resist

Applications & Current Challenges of MEMS & NEMS: Applications of MEMS & NEMS in Biotechnology, Accelerometers, Communications, Medicines, Biology. Current challenges: Limited options, Packaging, Fabrication knowledge required.

References:

1. Microsystems Design by S.D. Senturia
2. NEMS & Nanosystem Design by Tai-Ran Hsu
3. D. S. Grewal , “Nanotechnology”, Orient Longman’s, 2008
4. Proceedings of NC of Nanotechnology held at BMSCE, Muktsar,2007

ME-804 MOS Technology

Note: Eight questions of equal marks to be set covering the whole syllabus and any five to be attempted.

1. Review of MOS technology
Basic MOS transistors, enhancement and depletion model transistors, N-MOS and CMOS processor, thermal aspects of processing, and production of masks.

2. Electrical properties of MOS circuit
Parameters of MOS transistors, pass transistor, N-MOS inverter, pull-up to pull down ratio for an N-MOS inverter, C-MOS inverters, MOS transistor circuit model, latch up on C-MOS circuits.

3. Design processes
MOS layers, stick diagram, design rules, AWA OX C-MOS process description,double metal single poly silicon C-MOS process.

4. Basic circuit concepts
Sheets resistance, area capacitance delay unit, inverter delay, super buffers,propagation delays.

5. Subsystem design & layout
Architectural issues, switch logic, gate logic, examples of combinational logic,clocked sequential circuits, and other system consideration.

6. Scaling of MOS circuits
Scaling factor, limitations, scaling of wires and inter connections

Books Recommended:
1. Basic VLSI design systems & circuits - by DA. And Eshrachian K (phi), 1988.
2. VLSI design techniques for analog & digital circuit - by Geigar BR, Allen PE & Strader ME (Mc graw hill 1990).
3. Related IEEE/IEE publications

ME-806 Measurement and Characterization Techniques

Measurement of Resistivity , Film thickness, reflelectivity, refractive-index , stress, line width, Doping profile

Compositional Surface Analysis: Ultraviolet (UV) and X-ray photoelectron spectroscopy (XPS), Secondary ion mass spectrometry (SIMS), Contact angles

Microscopes: Optical microscopy, fluorescence & confocal microscopy, Cathode Luminescence (CL) and Photo Luminescence (PL), TEM, SEM.

Probe Techniques: Atomic force microscopy (AFM), scanning tunneling microscopy STM),
scanning near field optical microscopy SNOM), Deep level transient spectroscopy DLTS)

Kelvin-Probe Measurements: Nano scale current-voltage I-V), capacitance-voltage C-V) Relationships

Synthesis: Nanoparticles, carbon nanotubes, Nano-phosphors, Nanocomposites, sensors (ceramics-AI203, Ti02, MgO and BaTi)

References:

1. Imperfection and Impurities in Semi conductor Silicon by K.V. Ravi, John Wiley and Sons.
2. Characterization of Semiconductor Materials by Philip F.Kare and Greydon B.Lauabee, MC-Graw Hill.
3. Semi Conductor measurement ad Instrumentation by W.R. Reunyan, Mcgraw Hill.
4 Nanotechnology: Nanostructures and Nanomaterials, By M Balakrishna Rao and K. Krishna Reddy, Campus Books, New delhi, ed.-2007
5. D. S. Grewal , “Nanotechnology”, Orient Longman’s, 2008
6. Nanostructures: Tsakalakos, Ovidko & Vasudevan
7. Proceedings of NC of Nanotechnology held at BMSCE, Muktsar,2007
8. Nanostructures & Nano Materials: Ghuzang Cao

ME-808 Material Science & Engineering

Material Science: Atomic Structure, Crystal Structure and Defects, Diffusion, Mechanical behavior, Thermal Behavior, Failure Analysis & Prevention .Phases & Phase Diagrams, Heat Treatment, Metals, Ceramics and Glasses, Polymers, Composites, Electrical Behavior, Optical Behavior, Corrosion & Oxidation Semiconductor Materials, Magnetic Materials, Environmental Degradation.

Advanced Semiconductor Materials. : Superconductivity Band structure, Carrier concentration, Electrical Mechanical and optical properties of Gallium Nitride, Aluminum Nitride, Indium Nitride, Boron Nitrade, Silicon Caride, Silicon-Germanium(Sil-xGex). Materials of special applications viz. cryogenic, high temperature, high frequency application

Books Recommended:

1. Properties of Advanced Semiconductor Materials : Gan, Aln, Inn by Michael E. Levinshtein , Springer. 2001

2. Introduction to Materials Science for Engineers, 6th Edition, James F.Shackelford, Prentice Hall 2001

3. Fundaments of Semi conductors: Physics and Materials Properties by Yu and M Cardona, Sprinder, 1996

4. Materials Science & Engineering: K.M.Gupta, Umesh Publications

ME-822 LAB –II

Simulation using FPGA and CPLDs

1. Half adder, Full adder, Subtractor, 4bit comparator.
2. Code Convertor
3. Decoder and encoder
4. 8:1 multiplexer
5. Flip Flops- SR,D,JK,T
6. up/down counter with load able count
7. Johnson and Ring Counter
8. 8 bit shift register
9. UART
10. ALU Design

ME-809 EDA & CAD Tools

An overview of OS commands. System settings and configuration. Introduction to Unix commands. Writing Shell scripts. VLSI design automation tools. , Leonardo spectrum, ISE 8.1i, Quartus II, VLSI backend tools.

Introduction to VLSI design methodologies and supporting CAD tool environment. Overview of C and Data structures, Graphics and CIF, concepts and structure and algorithm for some of the CAD tools, schematic editor, layout editor, Module generator, silicon compilers, placement and routing tools, Behavioral , functional , logic and circuit simulators , Aids for test vector generator and testing.

Synthesis and simulation using HDLs-Logic synthesis using verilog and VHDL. Memory and FSM synthesis. Performance driven synthesis, Simulation- Types of simulation. Static timing analysis. Formal verification. Switch level and transistor level simulation.

Circuit simulation using Spice - circuit description. AC, DC and transient analysis. Advanced spice commands and analysis. Models for diodes, transistors and opamp. Digital building blocks. A/D, D/A and sample and hold circuits. Design and analysis of mixed signal circuits.

References:

1. M.J.S.Smith, Application Specific Integrated Circuits,Pearson,2002
2. M.H.Rashid, Spice for Circuits and Electronics using Pspice. (2/e), PHI.
3. T. Grdtkeretal , System Design with SystemC, Kluwer, 2004.
4. P.J. Ashendenetal , The System Designer's Guide to VHDL-AMS, Elsevier, 2005

ME-811 LOW POWER DIGITAL CMOS DESIGN

Hierarchy of limits of power, Sources of power consumption, power estimation, Synthesis for low power,

Voltage scaling approaches, Design and test of low power circuits

Adiabatic switching ,Minimizing switched. Capacitance , low power static RAM architecture,

Low energy computing using energy recovery tecniques,

Low power programmable computation, Software design for low power.

References:

1. Low power CMOS VLSI Circuit Design, Kaushik Roy and Sharat Parsad, John wiley & Sons. 1998
2. Low power Digital CMOS Design , A.P. Chandrakasan and R.W. Broadersen , Kluwer Acedemic Publishers 1995
3. Low power Design Methologies, J.M. Rabaey and M.Pedram Kluwer Academic Publishers 2001
4. Designing CMOS Circuits for Low Power, Dimitrios Soudris, Christian Piguet and Costas Goutis, Kluwer Academic Publishers. 2000

ME-815 Advanced Microprocessor & Embedded Systems

Note: Eight questions of equal marks to be set covering the whole syllabus and any five to be attempted.

1. Microprocessor Architectural Concepts

Review of 16-bit Microprocessor Architecture, Word Lengths, Addressable Memory, Microprocessor Speed, Architecture Characteristics, Registers, Instructions, Memory Addressing Architecture, ALU, GPR's, Control Logic And Internal Data Bus, Introduction to Pentium Architecture.

2. Microprocessor Instructions And Communications

Instruction Set, Mnemonics, Basic Instruction Types, Addressing Modes, Interfacing I/O Microprocessor, Polling And Interrupts, Interrupts And DMA.

3. Microprocessor I/O

Data Communication, Parallel I/O Serial Communication, Serial Interface And UART, Modem, I/O Devices, D/A & A/D Interface, Interface, Special I/O Devices.

4. Embedded Controllers & Systems

Architecture of 80186 & 80188 CPU subsystems, Addressing Modes, Instruction set,Basic IO subsystems, Memory Subsystem, Example embedded controllers.

Books Recommended:

1. Intel Series Of Microprocessors: By Berry B. Bray, TMH.
2. 8086 microprocessor & Architecture by Liu, Gibson; PHI.
3. Embedded Microprocessor System Design by Kenneth L. Short, Pearson Education.
4. Embedded Controllers by Berry B. Bray Pearson Education.
5. Related IEEE/IEE publications

ME-817 Opto Electronics

Applied Optics: Holography, Fourier-Transform Optics, Spatial Filtering, Speckle Interferometer, Birefringence, Electro-optics, Magneto-optics and Acousto-optics, Kerr Effect

Optical Fiber Structures, Wave guiding and Fabrication: Fiber Optics, The optical fiber,comparison of optical fiber with other interconnections, concept of an optical waveguide, rays and modes, principle of light guidance in optical wave guides,

Optical Sources: Energy Bands, semiconductor Device Fabrications, Light Emitting Diodes, Laser Diodes, Light source linearity, Modal Partition and Reflection Noise,

Photo Detectors: Physical principles of photodiodes, photo detector noise, detector response time, avalanche multiplication noise, structures for InGaAs, APDs, comparisons of photo detectors

Optical Amplifiers: Basic applications and types of Optical Amplifiers, semiconductor optical Amplifiers, Erbium-doped fiber amplifier, amplifier noise, system application, Wave Length converters,

Measurements: Measurement standards and test procedures, test equipment, attenuation measurements, dispersion measurements, OTDR field applications, eye patterns, optical spectrum analyzer applications,

Application of fiber optics: nonlinear optics, nonlinear optical susceptibility, second and third order optical susceptibilities, harmonic generation, phase matching, optical mixing, parametric generation of light, self-focusing of light, optical bistability, optical phase conjugation.

References:

1. Optical Fiber Communication by Gerd Keiser McGRaw Hill, Third Ed.
2. Optical Electronics, by A. Ghatak & K. Thyagarajan
3. Quantum Electronics, by A. Yariv
4. An Introduction to Optical Fibers by A.H. Cherin

ME-819 Nanoelectronics

Note: Eight questions are to be set covering the complete syllabus. The students are required to attempt any five questions.

Technologies in Nanoelectronics: Fault Tolerant Techniques-Von Neumann's Multiplexing Techniques, N-tuple Modular Redundancy (NMR), Interwoven redundant logic and Quadded logic, Markov Chain Models,

Spintronics: Mechanism of Spintronics, Spin Waves & their advantages, Spin injection, spin valve effect, spin valves and MRAM devices Solid state devices: quantum dots, quantum wires, microwave induced transport osephson junctions, Spintronics Devices-Datta Das spin transistor, Jhonson spin Transistor, Spin Polarized Solar Battery, Magnetic Field Effect transistor, Spin based Quantum Computers.

Photonic Bandgap Materials: Nanoscale photonic devices, Special phenomena in 2D and 3D structures.

Single Electron Transistor: Limitations of MOSFET, theory of SET, operation of SET, electron Tunnel effect, coulomb staircase, Conductance as a function of gate voltage, applications of SET

Nano chip Development & Quantum Computers: Nano Scale, working at nanoscale, physical and chemical properties changes at nanoscale, constructing electrinc circuits from the top –down , constructing electronic circuits from the bottom-up, nanowafer level packaging program, Quantum Computers

Quantum Dots in Nano Electronics: Quantum phenomenon in nanostructures, quantum size effect

Nanoelectronic Devices-Technology and Application: Single Electron Tunneling (SET) Devices, Nano Flash Devices, Yano Memory, Resonant Tunneling Diodes (RTDs), Rapid single Flux Quantum Logic(RSFQ), Resonant Tunneling Transistor (RTTs), Intermolecular Nanoelectronics, Electric Field Controlled Molecular Electronics Switching Devices, Spin Devices

Electronic Displays: LCD Displays, The basic properties of liquid crystals and their display and non-display applications at the nanoscale

Books:

1. Beenaker and Van Houten, "Quantum Transport in Semiconductor Nanostructures in Solid State Physics" Ehemreich and Turnbell, A Cademic Press, 1991.
2. David Ferry "Transport in Nao Structures" Cambridge University Press 2000.
3. D. S. Grewal , "Nanotechnology", Orient Longman's, 2008

4. S Dutta “Electron Transport in Mesoscopic System” Cambridge University Press 1995.
5. H. Grabert and M Devoret “Single Charge Tunneling” Plenum Press 1992.
6. Y Imry “Introduction to Meroscopic Physics”, Oxford University Press 1997

ME-810 ANALOG AND MIXED SIGNAL DEVICE DESIGN

Basic concepts, Bi CMOS process and technology, current and voltage sources

Differential and operational amplifiers, multiplexing and modulators phase locked techniques.

D to A and A to D converters,

Microwave circuits ,

High Voltage circuits, Filter design.

Current mirror, differential amplifier, theory and design of operational amplifiers. Common mode range, Design considerations for rail to rail inputs and output. MOS operational amplifier timers,

function generators, Multipliers and PLL.

References:

1. Digital Bipolar Circuits by Mohammed I. Elmasy, John Wiley & Sons.
2. Analysis and Design of Analog Integrated circuits by Paul R.Gray and Robert G.Meyer, John Wiley & Sons. 1996

ME-812 RF AND HIGH SPEED DIGITAL DESIGN

High speed Design: Ideal transmission line fundamentals,
Crosstalk, Non Ideal interconnect issues, connectors packages and vias, Nonideal return paths
simultaneous switching noise , and power delivery, buffer modeling , digital timing analysis, timing specific design methodologies,

radiated emission compliance and system noise minimization, high speed measurement techniques.

RF Design: Introduction to RF Electronics, Basic concepts in RF design , Mos Review, Path Loss Small Signal Model, Receiver Design, RF Transreceivers, Low Noise RF amplifiers and Mixers, RF Power amplifiers , RF Oscillators.

Books Recommended.

1. High Speed Digital System Design by Stephen H.Hall. Springer 2001
2. Practical RF Circuit Design for Modern Wireless Systems, Volume I:
3. Passive Circuits and Systems by Les Besser, Rower Gilmore 2000

ME-814 NANOSCALE DEVIES AND SYSTEMS

Introduction, submicron scaling, ballistic effects in MOS Devices, Quantum transport phenomenon, nanoscale modeling.

Overview of Quantum Dots, Resonant tunneling devices (Diodes and transistors). Single electron effects and Coulomb Blockade,

Introduction to Molecular electronic devices. Self assembled monolayers (SAM), Diodes, Optoelectronic Devices, Switches, Nanowires, programmable logic arrays, digital gates, flip-flops , Shift registers, memories , rectifiers,

Overview of nano materials . Nano Fabrication Techniques (Lithography , Self-Assembly, Contact, imprinting and binding of organics and semiconductors).

References:

1. Transport in Nanostructure, Ferry, David K. and Goodnick, Stephen Marshall Cambridge University Press.
2. Nanotechnology: G.Timp, Bell Las Murry Hill , NJ (Ed.)
3. Molecular electronic devices , Part II , F.L. Carter Forrest . L, Publisher : Marcel and Dekker.
4. Nano Systems : Molecular machinery , manufacturing and computation : Eric Drexler Publisher: John wiley and sons.
5. Proceedings of NC of Nanotechnology held at BMSCE, Muktsar,2007