Course Description

M.E. Microelectronics
Core Courses:

**MEL G611 IC Fabrication Technology** [3 2 5]

Material properties; crystal growth and doping; diffusion; oxidation; epitaxy; ion implantation; deposition of films using CVD, LPCVD and sputtering techniques; wet and dry etching and cleaning; lithographic process; device and circuit fabrication; process modeling and simulation.

**MEL G621 VLSI Design** [3 2 5]

Introduction to NMOS and CMOS circuits; NMOS and CMOS processing technology; CMOS circuits and logic design; circuit characterization and performance estimation; structured design and testing; symbolic layout systems; CMOS subsystem design; system case studies.

**MEL G631 Physics and Modelling of Microelectronic Devices** [3 2 5]

Physics and properties of semiconductor - a review; pn junction diode; bipolar transistor; metal semiconductor contacts; JFET and MESFET; MOSFET and scaling; CCD and photonic devices.

**MEL G632 Analog IC Design** [3 2 5]

Basic concepts; BICMOS process and technology; current and voltage sources; differential and operational amplifiers; multipliers and modulators; phase-lock techniques; D-to-A and A-to-D converters; micropower circuits; high voltage circuits; radiation resistant circuits; filter design considerations.

**MEL G642 VLSI Architectures** [2 2 4]

Overview of CISC processor architectures; Instruction set architecture of CISC processor; hardware flow-charting methods; implementing microprocessor logic from hard-ware flowcharts; RISC instruction set architecture; Pipelined execution of RISC instructions; pipeline execution unit design; control hazards; design of memory hierarchy.

**BITS G540 Research Practice** [4]

This course is designed to train the students towards acquiring competence in research methodologies. The course will be conducted in terms of actual participation in Research and Development Work. Each student will be assigned to a faculty member to work on specified projects. The student will be required to present a number of seminars in his research area in a structured manner.

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Electives:

**CS G553 Reconfigurable Computing [5]**


**EEE F434 Digital Signal Processing [3]**

Introduction; design of analog filters; design of digital filters: (IIR and FIR); structures for the realization of digital filters; random signals and random processes; linear estimation and prediction; Wiener filters; DSP processor architecture; DSP algorithms for different applications.

**EEE G510 RF Microelectronics [5]**

Introduction; application of RF electronics in modern systems; basic concepts in RF circuit design, active RF components: various RF diodes and transistors and their circuit models, matching and biasing networks, RF amplifier design: low power, low noise and broadband amplifiers, RF oscillator design; negative resistance oscillator; dielectric resonator oscillators, phase noise. RF Mixers: Balanced mixers; low noise mixers; noise in RF circuits, microwave transmitters and receivers.

**EEE G512 Embedded System Design [3 1 4]**

Introduction to embedded systems; embedded architectures: Architectures and programming of microcontrollers and DSPs. Embedded applications and technologies; power issues in system design; introduction to software and hardware co-design.

**EEE G613 Advanced Digital Signal Processing [5]**

Review of stochastic processes, models and model classification, the identification problem, some field of applications, classical methods of identification of impulse response and transfer function models, model learning techniques, linear least square estimator, minimum variance algorithm, stochastic approximation method and maximum likelihood method, simultaneous state and parameter estimation of extended kalman-filter, non-linear identification, quasi linearization, numerical identification methods.

**EEE G626 Hardware Software Co-Design [4]**


**MEL G623 Advanced VLSI Design [5]**

Deep submicron device behavior and models, Interconnect modeling for parasitic estimation, Clock signals and system timing--Digital phase locked loop design, memory and array structures, Input/output circuits design, ASIC technology, FPGA technology, High speed arithmetic circuits design, Parallel prefix computation, Logical effort in circuit design, Low power VLSI circuits-Adiabatic logic circuits, Multi threshold circuits, Digital BICMOS circuits, Design of VLSI systems.
MEL G625 Advanced Analog and Mixed Signal Design [5]

Mixed signal blocks and design issues, Design of high speed comparators, opamps, Design of sample and hold circuits, Different architectures of analog to digital and digital to analog converters, Design of CMOS analog multipliers and dividers, Design of switched capacitor filters, Design of phase locked loop, Layout techniques for analog and mixed signal design, noise issues.

MEL G642 VLSI Architectures [2 2 4]

Overview of CISC processor architectures; Instruction set architecture of CISC processor; hardware flow-charting methods; implementing microprocessor logic from hard-ware flowcharts; RISC instruction set architecture; Pipelined execution of RISC instructions; pipeline execution unit design; control hazards; design of memory hierarchy.

EEE G572 Digital Signal Processing

Sampling process, representation of discrete time signals, use of transforms in signal spectrum analysis, fourier transform, fast fourier transform, Z transform, realization of filters, recursive and non recursive filters, effects of quantization and finite word length, hardware implementation