M.E. Microelectronics

Semester wise Pattern for Students Admitted to Higher Degree Programmes in the First Semester							
First Semester			U	Second Semester			U
M.E. Microelectronics							
MEL	G611	IC Fabrication Technology	5	BITS	G540	Research Practice	4
MEL	G621	VLSI Design	5	MEL	G632	Analog IC Design	5
MEL	G631	Physics & Modeling of Microelectronic Devices	5	MEL	G641	CAD for IC Design	5
		Elective	*			Elective	*
			19				18
		Elective	*	BITS	G629T	Dissertation	16
		Elective	*			or	Or
		Elective	*	BITS	G639	Practice School	20
		Elective	*				
			13				16/20

List of Core Courses

MEL G611	IC Fabrication Technology
MEL G621	VLSI Design
MEL G631	Physics & Modeling of Microelectronic Devices
MEL G632	Analog IC Design
MEL G641	CAD for IC Design

List of Elective Courses (Any Six)

BITS F415	Introduction to MEMS
CS G553	Reconfigurable Computing
CS G562	Advanced Architecture and Performance Evaluation
CS G612	Fault-Tolerant System Design
EEE F434	Digital Signal Processing
EEE G510	RF Microelectronics
EEE G512	Embedded System Design
EEE G522	Advanced Satellite Communication
EEE G594	Advanced VLSI Devices
EEE G595	Nanoelectronics and Nanophotonics
EEE G613	Advanced Digital Signal Processing
EEE G626	Hardware-Software Co-Design
MEL G512	Optoelectronic devises Circuits and Systems
MEL G531	Testable Design and Fault-Tolerant Computing
MEL G612	Integrated Electronics Design
MEL G622	Introduction to Artificial Neural networks
MEL G623	Advanced VLSI Design
MEL G624	Advanced VLSI Architectures
MEL G625	Advanced Analog and Mixed-Signal Design
MEL G626	VLSI Test and Testability
MEL G642	VLSI Architectures

Course Descriptions

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 hardware 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 some seminars in his research area in a structured manner.

CS G553 Reconfigurable Computing [5]

Overview of Programmable Logics. FPGA fabric architectures. Logic Elements and Switch Networks. Design and Synthesis of Combinational and Sequential Elements. Placement and Routing. Pipelining and other Design Methodologies. Fine-grained and Coarse-Grained FPGAs. Static and Dynamic Reconfiguration. Partitioning. Hardware/Software Portioning and Partial Evaluation. Systolic Architectures.

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]

FPGA and ASIC based design, Low-Power Techniques in RT Embedded Systems On-chip networking. Hardware Software partitioning and scheduling, Co-simulation, synthesis and verifications, Architecture mapping, HW-SW Interfaces, and Re-configurable computing.

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.

EEE G572 Digital Signal Processing **[3 0 3]**

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