M.E. Embedded Systems

Semester wise Pattern for Students Admitted to Higher Degree Programmes in the First Semester							
Year	First Semester			U	Second Semester		U
M.E. Embedded Systems							
I	BITS	G553	Real-Time Systems	5	BITS G540	Research Practice	4
	EEE	G512	Embedded System Design	4	CS G523	Software for Embedded Systems	5
			Elective	*	MEL G642	VLSI Architecture	5
			Elective	*		Elective	*
				17			18
II	EEE	G626	Hardware-Software Co-Design	5	BITS G629T	Dissertation	16
			Elective	*		or	Or
			Elective	*	BITS G639	Practice School	20
			Elective	*			
				17			16/20

List of Core Courses

BITS G553	Real-Time Systems
CS G523	Software for Embedded Systems
EEE G512	Embedded System Design
EEE G626	Hardware-Software Co-Design
MEL G642	VLSI Architecture

List of Elective Courses (Any Six)

BITS F415	Introduction to MEMS
CS G541	Pervasive Computing
CS G553	Reconfigurable Computing
CS G611	Distributed Processing Systems
CS G612	Fault-Tolerant System Design
EEE F434	Digital Signal Processing
EEE G547	Device Drivers
EEE G594	Advanced VLSI Devices
EEE G595	Nanoelectronics and Nanophotonics
EEE G613	Advanced Digital Signal Processing
EEE G625	Safety-Critical Embedded System Design
EEE G627	Network Embedded Application #
MEL G531	Testable Design and Fault-Tolerant Computing
MEL G621	VLSI Design
MEL G622	Introduction to Artificial Neural networks
MEL G623	Advanced VLSI Design
MEL G624	Advanced VLSI Architectures
MEL G626	VLSI Test and Testability
MSE G511	Mechatronics

Course Descriptions

BITS G553 Real Time Systems [5]

Real-time software, Real-time operating systems scheduling, virtual memory issues, and file systems, real-time databases, fault tolerance, and exception handling techniques, reliability evaluation, data structures, and algorithms for real-time/embedded systems, programming languages, compilers, and run time environment for real-time/embedded systems, real-time system design, real-time communication and security, real-time constraints and multiprocessing and distributed systems.

CS G523 Software for Embedded Systems [3 2 5]

Real-time and embedded systems; software issues in the embedded system; software development process; requirement analysis: use cases, identification, and analysis of use cases, use case diagrams; design: architectural design, design patterns, and detailed design; implementation: languages, compilers, runtime environments, and operating systems for embedded software; testing: methodologies, test cases. The course will also consist of laboratory practices and the development of software for embedded systems.

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 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 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 many seminars in his research area in a structured manner.

CS G541 Pervasive Computing [4]

Select application architectures; hardware aspects; human-machine interfacing; device technology: hardware, operating system issues; software aspects, java; device connectivity issues and protocols; security issues; device management issues and mechanisms; the role of the web; wap devices and architectures; voice-enabling techniques; PDAs and their operating systems; web application architectures; architectural issues and choices; smart card-based authentication mechanisms; applications; issues and mechanisms in WAP-enabling; access architectures; wearable computing architectures.

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.

EA C415 Introduction to MEMS [4]

Overview, history and industry perspective; working principles; mechanics and dynamics, thermofluid engineering; scaling law; microactuators, microsensors and microelectromechanical systems; microsystem design, modeling and simulation; materials; packaging; microfabrication: bulk, surface, LIGA, etc; micromanufacturing; microfluidics; micro-robotics; case studies.

EEE C434 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 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 G627 Network Embedded Applications [4]

This course deals with the three main application areas of Network Embedded Systems – Wireless Sensor Networks, Automotive Networks, and Industrial Networks– Network Architecture, Deployment Issues, Network Protocol stack: Modular and Cross-Layer Design. Network Node: Architectures, Operating Systems, and Applications. Middleware Issues and Design. Security and Encryption

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 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 G624 Advanced VLSI Architectures [5]

Instruction set design and architecture of programmable DSP architectures; dedicated DSP architectures for filters and FFTs; DSP transformation and their use in DSP architecture design; Application Specific Instruction set Processor; superscalar and VLIW architectures.

MSE G511 Mechatronics [3 2 5]

Concepts of measurement of electrical and nonelectrical parameters; displacement, force, pressure, etc. and related signal conditioning techniques, drives and actuators, concepts of microprocessors/microcontrollers architecture and programming, memory, and I/O interfacing. System design concepts through case studies.

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