COURSE STRUCTURE FOR M.TECH IN ELECTRONICS AND COMMUNICATION (VLSI & MICROELECTRONICS)
Techno India

Semester I

Sl.No.	Code	Subject Name	Contacts Periods/Week				Credits
			L		P	Total	
1.	MVM101	Microelectronics Technology	4		0	4	4
2.	MVM102	Advanced Analog Integrated Circuit Design	4		0 0	4	4
3.	MVM103	Advanced Digital Integrated Circuit Design	4		0 0	4	4
4	MVM104	Elective I	4			4	4
5	MVM105	Elective II	4			4	4
6	MVM191	Microelectronics Lab.			3	3	2
7.	MVM192	VLSI Design Lab.			6	6	4
	Total of Semester		Total:			29	26

ElectiveI		(Any One)					
Sl.No.	Code	Subject Name	Contacts Periods/Week				Credits
			L		P	Total	
A.	MVM104A	Semiconductor Devices: Physics & Modelling.	4		0	4	4
B	MVM104B	VLSI CAD					

ElectiveII		(Any One)					
Sl.No.	Code	Subject Name	Contacts Periods/Week				Credits
			L	T	P	Total	

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A.	MVM105A	Advanced Digital Signal Processing	4	0	0	4	4
B.	MVM105B	Optoelectronic & Display Devices.	4	0	0	4	4

Semester II

Sl.No.	Code	Subject Name	Contacts Periods/Week				Credits
			L	T	P	Total	
1.	MVM201	Architectural Design of VLSI system. VLSI Circuits and System	4	0 0	0 0	4	4
2.	MVM202	Elective III	4	0	0	4	4
3.	MVM203	Elective IV	4	0	0	4	4
4.	MVM204	VLSI System Design Lab	4	0	6	4	4
5.	MVM291	Seminar	0	0	4	6	4
6.	MVM292	Viva- Voce.	--	--	--	4	2
7.	MVM293					--	3
			Total:		26		25

Elective III (Any One)							
Sl.No.	Code	Subject Name	Contacts Periods/Week				Credits
			L	T	P	Total	
A.	MVM203A	Design Verification and Testing	4	0	0	4	4
B.	MVM203B	Bioelectronics Systems	4	0	0	4	4

Elective IV (Any One)

Sl.No.	Code	Subject Name	Contacts Periods/Week				Credits
			L	T	P	Total	
A.	MVM204A	Quantum & Nanoelectronics	4	0	0	4	4
B.	MVM204B	MEMS & Application	4	0	0	4	4

Semester III

Sl.No.	Code	Subject Name	Contacts Periods/Week				Credits
			L	T	P	Total	
1.	MVM301	Embedded and Real time system	4	0	0	4	4
2.	MVM391	Embedded Systems Lab		0	4	4	2
				Total:		8	6

Semester III

Sl.No.	Code	Subject	Credits
1.	MVM392	Project Work (Thesis) Part I	5

Semester IV

Sl.No.	Code	Subject	Credits
1.	MVM491	Project Work (Thesis) Part II	10

COURSE STRUCTURE FOR M.TECH IN ELECTRONICS AND COMMUNICATION (VLSI & MICROELECTRONICS)
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DETAILED SYLLABI

Semester I

Code: MVM101
Paper: Microelectronics Technology

Clean room concept, Growth of single crystal Si, Cleaning and etching,
Physical vapour diposition, Chemical vapour deposition;
Epitaxial growth Oxidation, Diffusion, Ion implantation, Lithography,
Plasma deposition and etching, Metallization, VLSI Process Integration.

Code: MVM102
Paper: Advanced Analog Integrated Circuit Design

Basic MOS device & model, Basic CMOS device, MOS resistor, MOS current source, current Sink, Current Mirror circuits, operational amplifier design (OPAMP), differential amplifier, level shifter, Source follower, Compensation techniques, BiCMOS device and technology, pass transistor logic. Analog Filter: Switched capacitor (SC) fundamentals, first order and second order SC circuits. VLSI interconnects: Physics of interconnects in VLSI, distributed RC model, Future interconnect technology.

Code: MVM103
Paper: Advanced Digital Integrated Circuit Design

Review of MOSFET characteristics, Scaling and small-geometry effects, MOSFET capacitances, MOS Inverter, CMOS Inverters, Combinational MOS Logic Circuits (including CMOS logic domino logic, Pseudo-NMOS)
Sequential MOS Logic Circuits, Dynamic Logic Circuits, Low-Power CMOS Logic Circuits, BiCMOS Logic Circuits, Input-Output Circuits.
Testing and Verification.

Elective I
Code: MVM104A
Paper: Semiconductor Devices: Physics and Modelling

Semiconductor fundamentals, carrier transport, excess carriers, Junction theory, Basic theory of FETs and MOSFETs, Advanced theory of MOSFETs, Models for basic semiconductor devices, Introduction to device simulation programs.

Code: MVM104B
Paper: VLSI CAD

Hierarchical view of VLSI design; Architectural design; High level synthesis; Scheduling; data path synthesis; logic synthesis, minimization techniques, circuit design and simulation; layout synthesis; placement and routing; DRC; Silicon compiler; Array processors.

Elective II
Code: MVM105A
Paper: Optoelectronics and Display Devices

Optical processes in semiconductors; Light –emitting diodes; Laser operating principles; Semiconductor laser structures; Solid- state and gas lasers, Photo detectors, Receiver noise considerations, Special

detection systems; Solar cells; Optoelectronic modulation and switching devices; Liquid crystal devices; porous silicon optical devices; Optical integrated circuits and its processing and applications.

Code: MVM105B
Paper: Advanced Digital Signal Processing and Application

Discrete time signals and systems: Convolution and frequency response. Discrete time Fourier and Z-transforms: Properties, analysis of discrete time systems. The DFT: Definition and properties, circular convolution calculation, FFT and Chirp transform.
Relationship between continuous and discrete time systems; sampling time and frequency normalization, discrete time processing of continuous time signals. Difference equation for digital filters: Definition and properties. FIR filters, IIR filters. Digital filter design techniques: Impulse invariance. Bilinear transformation, finite difference, window design methods, frequency sampling optimization algorithms. Parametric Signal modeling: Auto regressive signal modeling based on linear prediction, pole zero modelling. Time varying auto regressive models. Paramatric signal modeling in the presence of noise, application, spectral analysis. Power spectral analysis using DFT, Maximum entropy spectral estimation (MEN). Adaptive signal processing, Time adaptive systems. LMS algorithm. 2-D signal processing: Filter design and implementation. 2-D spectral factorization and analysis. Applications of DSP.

Semester II

Code: MVM201

Paper: Architectural Design of VLSI System.

The Impact of VLSI on Computer Architecture;
VLSI Technology Overview and Trends: VLSI design methodologies, Multi- Processor Arrays and Interconnect Topologies, Timing Design of VLSI systems, FPGA Architecture, Low power VLSI design, Applications.

Code: MVM202
Paper: VLSI Circuits and Systems.
Introduction, Overview of CMOS VLSI fabrication, Concept of Mask Design, Mask Layout, Stick Diagram, Interconnects; CMOS combinational logic Design (review): static vs. dynamic CMOS,R-C calculation-delay analysis, Driving large fan-outs, Speed and power dissipation; and Elements of sequential logic circuits: timing matrics,Static and dynamic latches and registers, Timing issues in digital circuits, Asynchronous Design, Input-Output Circuits, Advanced A/D converters; Filter design; Semiconductor Memories,

Elective III

Code: MVM203A
Paper: Design Verification and Testing

Concept of verification and validation – Test –bench-black-box, white-box –grey-box
Testing-Verification tools-simulators-code coverage and functional coverage.
Verification of plans-design for verification
What is testing? – Physical faults and their modeling- fault simulation.
Test generation for combinational circuits –D-algorithm etc.
Test pattern generation for sequential circuits-boundary scan(JTAG)
Built in self-test techniques
Non-intrusive automated testing
Functional testing

Load Testing
Inter-operability and conformance Testing
Regression Testing
Hardware-Software integrated Testing

Code: MVM203B
Paper: Bioelectronics Systems

General instrumentation concept, Origin of biomedical signals : acquisition and processing, sensors and transducers. Heart anatomy and ECG. Brain and EEG. Medical image processing: Ultrasound, X-Rays ,CT, MRI; VLSI in signal processing/ image processing. Analysis of Biomedical signals using advanced techniques(e.g.Artificial intelligence, neural network, orthogonal transforms etc.) , Medical informatics ,Examples of nanotechnology in modern medicine, Examples of embedded (using hardware- software codesign) biomedical instruments.

Elective IV

Code: MVM204A
Paper: Quantam & Nanoelectronics

Introduction and foundation, Electrons and phonons in crystal,Heterostructures,Quantum wells and low dimensional system, Electronic & optical properties in low dimension, Quantum effect nano electronic devices, Recent advancement.

Code: MVM204B
Paper: MEMS and Application

An Introduction to Micro sensors and MEMS, Evolution of Micro sensors & MEMS, Micro sensors & MEMS applications, Microelectronic technologies for MEMS , Micromachining Technology Surface and Bulk Micromachining, Micro machined Micro sensors; Mechanical, Inertial, Biological, Chemical ,Acoustic, Microsystems Technology, Integrated Smart Sensors and MEMS, Interface Electronics for MEMS, MEMS Simulators, MEMS for RF Applications, Bonding & Packaging of MEMS, Conclusions & Future Trends.

Semester III

Code: MVM301
Paper: Embedded and Real-Time System.

Methodologies and technologies for behavioral synthesis, system synthesis and real-time issues in embedded systems, Topics include behavioral synthesis, hardware/ software code sign, interface synthesis, scheduling, real-time constraints, real-time specification and modeling, transformation and estimations during synthesis and design optimization, concurrency, real time OS and embedded processors, Design for low power, verification and debugging.