



MANIPAL

ACADEMY *of* HIGHER EDUCATION

(Deemed to be University under Section 3 of the UGC Act, 1956)

Master of Engineering - ME (Microelectronics and VLSI Technology)

Syllabus

July 2023 Onwards

**MANIPAL SCHOOL OF INFORMATION SCIENCES
MANIPAL ACADEMY OF HIGHER EDUCATION
MANIPAL - 576104.KARNATAKA. INDIA.**



MANIPAL SCHOOL OF INFORMATION SCIENCES

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SEMESTER I

High Level Digital Design

Introduction, Combinational Design, Arithmetic Circuits, Datapath Functional Units, Optimization, Sequential Design, FSM, Timing Analysis, Introduction to FPGA, Digital Design Application, AMBA Bus Specification.

VLSI Fabrication Technology

Introduction, Cleanroom Technology, Crystal Growth, Lithography, Oxidation, Diffusion and Ion Implantation, Thin film deposition, contacts, packaging and yield.

Digital VLSI Design

MOS transistor theory, CMOS circuit and layout design, Circuit characterization, CMOS Subsystem Design, CMOS Technologies, Layout Design Rules, and Manufacturing Issues.

Verification,

Introduction, Types of Verifications & Approaches, Verification Planning, Assertions, Test bench Infrastructure, Stimulus and Response, Coverage-Driven Verification, Assertions for Formal Tools, System-Level Verification, Processor Integration Verification, and Post-Silicon SoC Validation.

Electives

CAD for VLSI

Introduction to VLSI Design Methodologies, Review of VLSI Design Automation Tools, High Level Synthesis, High Level Synthesis Algorithms, Floor Planning and Placement, Routing, Layout Compaction.

System on Chip Design

Introduction to System Approach, Electronic System Level Flow, Specification and Modelling, Pre-Partitioning Analysis, Partitioning, Design Principles in SOC Architecture, Processors, Memory Design, Hardware Interconnects, Hardware/Software Interfaces, Application Studies.

MEMS Technology

Introduction, Microfabrication, Beam Mechanics, Electrostatic Sensing and Actuation, Thermal Sensing and Actuation, Piezo resistive Sensors and Piezoelectric Sensing and Actuation, Magnetic Actuation, Bulk Micromachining Surface Micromachining, Case Studies.



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Semiconductor Device Physics and Modelling

Introduction, Integrated Devices, MESFET and HEMTs, Advanced MOSFET Technology, Light Emitting Diodes and Lasers, Photodetectors and Solar Cells, Semi-classical Transport Theory, Drift-Diffusion (DD) model, Hydrodynamic Modelling, Quantum Transport models.

SEMESTER II

Advanced VLSI Design

CMOS passive elements, Analog MOSFET Models, High frequency MOSFET Model, Current Sources and Sinks, References, CMOS Single Stage Amplifiers, Differential Amplifiers, Frequency Response of Amplifiers, Noise, Operational Amplifiers, Nonlinear Analog Circuits, Dynamic Analog Circuits.

Low Power VLSI Design

Introduction to Low Power Design, Circuit techniques for leakage power reduction, Technology scaling for dynamic power reduction, Voltage scaling approaches, Glitch power, Clock gating, Adiabatic techniques for low power.

Physical Design

CMOS circuit and layout design, Floorplan, Placement, Clock tree synthesis, Routing, RC extraction, Back annotation, Testing.

Process and Device Characterization

Introduction, Resistivity and Carrier-Concentration Measurements, Carrier and Doping Density, Contact Resistance and Schottky Barriers, Defects, Microscopy and Photography, Chemical and Physical Characterization, Reliability and Failure Analysis.



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Electives

IC Packaging Technology

Chip Packaging, Packaging Options, Wire Assembly and Bonding, Flip Chip, High Density Interconnection, 3D Integration for IC Packaging, 3D IC Packaging.

Large Area Microelectronics

Introduction, Metal-Oxide Thin-Film Transistors for Flexible Electronics, Carbon Nanotube Thin-Film Transistors, Inorganic Semiconductor, Nanomaterials for Flexible Electronics, Dielectric Materials for Large-Area and Flexible Electronics, Latest Advances in Substrates for Flexible Electronics, Application Study.