



**MAR ATHANASIOUS COLLEGE OF ENGINEERING**  
**KOTHAMANGALAM**

ELECTRONICS & COMMUNICATION ENGINEERING DEPARTMENT

LIST OF COURSE OUTCOMES

M.TECH- VLSI & EMBEDDED SYSTEMS

SEMESTER	SUBJECT CODE	SUBJECT NAME	CO NO:	CO DESCRIPTION
S1	05EC 6001	CMOS ANALOG DESIGN	1	To analyze MOSFET and its characteristics in detail.
			2	To design MOS sub circuits like current mirrors and references.
			3	To analyze and design MOS single stage amplifiers and differential amplifiers.
			4	To provide knowledge about MOS operational amplifier.
			5	To study the frequency response of MOS Single-Stage Amplifiers, Differential Pairs and Operational Amplifiers.
			6	To do the frequency compensation of various amplifier circuits.
S1	05EC 6003	CMOS DIGITAL DESIGN	1	Able to design basic CMOS digital circuits and model the circuits.
			2	Able to analyze the delay, area and power consumption of CMOS Digital circuits.
			3	Able to design static and dynamic CMOS Digital circuits.
			4	Able to design arithmetic and logic.
			5	Able to design memory systems.
			6	Able to design the layout of simple CMOS digital circuits using any VLSI tool.
S1	05EC 6005	ADVANCED DIGITAL DESIGN	1	Ability to design and implement various optimized

				combinational and sequential digital circuits.
			2	An ability to understand the different switching algebra theorems, apply them for logic functions and describe the operation and timing constraints for latches and registers
			3	Learn methods to design clocked sequential circuits using state diagrams and tables, state reduction and state assignment methods
			4	Students should be able to learn the benefits and drawbacks of the various design methods for solving a problem.
			5	Students should be able to design a Register Transfer level circuit
			6	Students will understand the design optimization and trade-off considerations.
S1	05EC 6007	EMBEDDED PROCESSORS	1	Students will be able to study DSP processor and interfaces
			2	Students will be able to study ARM processor and interfaces
			3	The students will be able to select hardware and software components for optimized performance.
			4	The students will have knowledge regarding the embedded networking, sensors and transducers along with their applications.
			5	The students will be acquainted with usage of advanced development tools
			6	Students will be able to develop embedded systems using advanced embedded processors
S1	05EC 6011	FPGA BASED SYSTEM DESIGN (ELECTIVE 1)	1	Understand the basic concepts of verilog HDL
			2	Design and optimize complex combinational circuits

			3	Design and model digital circuits with verilog HDL at behavioral, structural and RTL levels
			4	Develop testbenches to simulate combinational and sequential circuits
			5	Design a universal asynchronous receiver and transmitter
			6	Design graphic mode and text mode VGA controller
S1	05EC 6013	MODELLING OF EMBEDDED SYSTEMS (ELECTIVE 1)	1	The students will have systematic approach towards the embedded system design.
			2	Standard system design methodologies.
			3	Modelling of hardware and software components.
			4	Software and hardware synthesis, functional connectivity and sharing.
			5	System startup methods, boot up codes.
			6	Tools for design of software and hardware, simulation and verification.
S1	05EC 6015	SEMICONDUCTOR DEVICE PHYSICS AND MODELLING (ELECTIVE 1)	1	Will be able to apply concepts of semiconductor device physics and principles to the microelectronics industry.
			2	
			3	
			4	Understand how devices and integrated circuits are fabricated.
			5	Advanced concepts of semiconductor device modelling.
			6	Modern trends in the microelectronics industry.
S1	05EC 6077	RESEARCH METHODOLOGY	1	Students are able to develop a basic framework of research process.
			2	Students will be able to understand the basic concepts

				of research and its methodologies.
			3	Students will have knowledge on the technical aspects of executing a research study.
			4	Students are able to understand different statistical tests and parameters.
			5	Students are able to define appropriate research problem and write a research report.
			6	Students get an idea about descriptive and inferential statistics.
S1	05EC 6091	HDL LAB	1	Understand the procedure involved in the realization of digital systems
			2	Design and model digital circuits with Verilog HDL at behavioral, structural and RTL levels.
			3	Design and optimize combinational and sequential circuits.
			4	Develop test benches to simulate combinational and sequential circuits.
			5	Understand the usage of FPGA board for digital system development.
			6	Design and implement advanced systems like ADC, DAC, UART, VGA monitor interfacing etc. In FPGA board
S2	05EC 6002	MIXED SIGNAL VLSI DESIGN	1	Understand and design various types of filters using active components
			2	Analyse different switched capacitor circuits
			3	Design different continuous time and digital filters
			4	Design different data converter circuits
			5	Understand the concept of modulators and noise impact
			6	Design signal delta convertors and modulators

S2	05EC 6004	SENSOR TECHNOLOGIES AND MEMS	1	Able to choose suitable sensor/transducer for a given physical variable.
			2	Able to understand its principle and characteristics.
			3	Able to design suitable signal conditioning circuits for sensor/transducers.
			4	Able to design a complete measurement system.
			5	Able to implement a practical measurement system using a commercial sensor.
			6	Able to analyze the results obtained from such a system
S2	05EC 6006	EMBEDDED REAL TIME SYSTEMS	1	To present the mathematical model of the system.
			2	To develop real-time algorithm for task scheduling.
			3	To understand the working of real-time operating systems and real-time database.
			4	To work on design and development of protocols related to real-time communication.
			5	To install and initialize $\mu$ C/OS-II
			6	To embed $\mu$ C/OS-II in a real time embedded system.
S2	05EC 6022	DESIGN OF POWER CONVERTERS (ELECTIVE 2)	1	Understand design techniques of switching regulators
			2	Perform a complete design of a switching regulator
			3	Understand inverter system
			4	Understand different PWM control techniques
			5	Optimize the performance of DC to DC converters
			6	Design driver circuit for regulators
S2	05EC 6024	SYSTEM IDENTIFICATION AND SYSTEM SIMULATION (ELECTIVE 2)	1	Can identify and simulate static and dynamic systems. The response of the systems can also be analysed.
			2	Understand static system identification methods.

			3	Understand dynamic system identification methods.
			4	Will get an idea about simulation of static and dynamic systems.
S2	05EC 6026	VLSI PROCESS TECHNOLOGY (ELECTIVE 2)	1	Will get an overall idea about the different process steps involved in the fabrication of a VLSI chip. This will enable them to work in fabrication industry.
			2	Understand the students about the various fabrication steps involved in VLSI chip process technology.
			3	Idea about the precise lithographic development techniques and corrective measures as per the design of the chip.
			4	Idea about the industrial fabrication process steps such as diffusion, deposition and finishing process of VLSI chip.

S2	05EC 6034	LOW POWER VLSI DESIGN (ELECTIVE 3)	1	Students will be able to design chips used for battery powered systems and high performance circuits not exceeding power limits
			2	Students will learn the need for low power VLSI in detail
			3	Students will be able to design and test low voltage CMOS
			4	Students will be able to design deep submicron devices having low leakage current
			5	Students will be able to design low power memories
			6	Students will be able to design adiabatic circuits
S2	05EC 6036	NANOMATERIALS, STRUCTURES AND DEVICES (ELECTIVE 3)	1	Students will have a good understanding on structure-property relationships in nanomaterials.

			2	The students will have broader concepts of a technology, applicable to smaller length scales.
			3	The students will be able to evaluate the relevance of nanotechnology devices in the current scenario.
S2	05EC 6066	SEMINAR 1	1	The students will be able to analyze and present technological and research topics more effectively.
			2	The students will be able to identify , understand and discuss current and real world issues.
			3	The students will be able to develop an audience centered presentation meeting concrete professional objectives and integrating visual aids
			4	Enable students to deliver well-rehearsed and polished presentation meeting time ,content and interactive requirement.
			5	Students will determine when information is needed and find it efficiently using a variety of reference sources
			6	Students will be able to demonstrate an ability to follow discussion, oral arguments and able to challenge and offer substantive replies to others arguments and queries.
S2	05EC 6088	MINI PROJECT	1	Understand the hardware component of an embedded system
			2	Design and fabricate single layer board for simple circuit
			3	Design and fabricate four layer microcontroller development board
			4	Write code and debug for microcontroller

			5	Able to do real time testing of embedded systems using processors
			6	Implement an embedded system
S2	05EC 6092	EMBEDDED SYSTEMS LAB	1	Understand ARM microcontroller and its features using manufacturer datasheet.
			2	Develop knowledge about schematics and layout of ARM development board.
			3	Familiarize LPC Xpresso software for coding.
			4	Configuration and testing GPIO as both input and output pins.
			5	Configuration and testing of GPIO, ADC, DAC, RTC of ARM microcontroller.
			6	Configuration and testing of peripherals like SPI, UART, PWM of ARM microcontroller.
S3	05EC 7041	ELECTROMAGNETIC COMPATIBILITY (ELECTIVE 4)	1	The students would gain enough knowledge to understand the concept of EMI / EMC related to product design & development.
			2	Students shall be able to analyze the different EM coupling principles and its impact on performance of electronic system.
			3	Students would know how to bring down the electromagnetic interference highlighting the concepts of both susceptibility and immunity
			4	The students will be able to analyze various EM compatibility issues with regard to the design of pcbs and ways to improve the overall system performance.
			5	The students will be able design bypassing and decoupling for power and ground planes, components,



			and internal power connection in high-frequency systems.
			6 Students will be able to analyze Real-world EMC design constraints and make appropriate tradeoffs to achieve the most cost-effective design that meets EMI standards.
S3	05EC 7045	VLSI SIGNAL PROCESSING (ELECTIVE 4)	1 Students will be able to apply VLSI design methodology for signal processing systems.
			2 Students will be familiar with VLSI algorithms and architectures for DSP.
			3 Hands on experience on VLSI algorithm transforms including retiming, pipelining and parallel processing, folding/unfolding, algebraic transforms, relaxed look-ahead transforms, and dynamic algorithm transforms.
			4 Be familiar with fault-tolerant signal processing.
			5 Be familiar with outer receiver VLSI design techniques.
			6 The students will be familiar with systolic architectures for DSP.
			7 The students will be familiar with asynchronous and wave pipelines, scaling and roundoff noise issues and their impact on performance.
S3	05EC 7055	EMBEDDED NETWORKING (ELECTIVE 5)	1 Understand basics of various protocols involved in embedded networking
			2 Understand CAN protocol
			3 Understand the basics of SPI protocol
			4 Aware of I2C protocol
			5 Analyse the TCP/IP protocol
			6 Analyze the working of zigbee protocol

S3	05EC 7067	SEMINAR 2	1	Improve professional competency, research aptitude and team work skills.
			2	Identify real world issues and develop innovative solutions
			3	Motivate and energize talents
			4	Deliver commitments and manage time and stress pressures.
			5	Acquire technical skills on emerging software and hardware tools
			6	Write reports on emerging solutions
S3	05EC 7087	PROJECT (PHASE 1)	1	Improve professional competency, research aptitude and team work skills.
			2	Identify real world issues and develop innovative solutions
			3	Motivate and energize talents
			4	Deliver commitments and manage time and stress pressures.
			5	Acquire technical skills on emerging software and hardware tools
			6	Write reports on emerging solutions
S4	05EC 7088	PROJECT (PHASE 2)	1	Improve professional competency, research aptitude and team work skills.
			2	Identify real world issues and develop innovative solutions
			3	Motivate and energize talents
			4	Deliver commitments and manage time and stress pressures.
			5	Acquire technical skills on emerging software and hardware tools
			6	Write reports on emerging solutions