

Branch Name:	Information and Communication Technology
Semester/Year:	Semester VII / Fourth Year
Subject Title:	Embedded System Design(Elective-III)
Subject Code:	1ET1070707
Pre-requisite:	Students should have Basic knowledge of Computer hardware and C language, basic knowledge of assembly language and digital electronics with ability of Programming.

Course Objective:

To introduce the students to various optical fiber modes, configurations and various signal degradation factors associated with optical fiber and to study about various optical sources and optical detectors and their use in the optical communication system, optical amplifiers, fiber network elements, basic optical components, and techniques of fiber optic measurement.

Teaching and Examination Scheme:

Teaching Scheme (Hours Per Week)				Examination Scheme (Marks)				Total
L	T	P	Credit	Theory		Practical		
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Topic	Total Hrs.	% Weightage
1	Introduction: Embedded Systems, Processor Embedded into a System, Embedded Hardware Units and Devices In a System, Embedded Software in a system, Examples of Embedded Systems, Embedded System-on-chip (SOC) and Use of VLSI Circuit Design Technology, Complex Systems Design and Processors, Design Process in Embedded System, Formulation of System Design, Design Process and Design Examples, Classification of Embedded Systems, Skills Required for an Embedded System Designer	05	14
2	Devices for Network Embedded Systems: IO Types and examples, Serial communication devices, Parallel Device ports, Sophisticated Interfacing Feature in Devices Ports, Wireless Devices, Timer and Counting Devices, Watch dog timer, Real time clock, Network Embedded	03	10
3	ARM PROCESSOR FOR EMBEDDED SYSTEMS: Design philosophy, ARM features, Core dataflow model, Operating modes, Memory architecture, register sets, ARM instructions, Jazelle mode, Thumb mode, Programming of ARM processor.	14	25
4	REAL TIME OPERATING SYSTEM: Operating system basics, Processes vs. threads, Multi-tasking, Need for real time operating 14 systems, RTOS kernel functions, Scheduling policies, Critical section issue and semaphore, Types of RTOS.	14	25
5	Introduction to Embedded Hardware & Software: MSP430 RISC CPU architecture, Compiler-friendly features, Instruction set, Clock	05	12

	system, Memory subsystem. Understanding of different MSP430 families. Introduction to Code Composer Studio (CCS) and use CCS for Embedded C.		
6	Programming and Interfacing: Digital I/O –I/O ports programming using C, Understanding the muxing scheme of the MSP430 pins, interrupt programming On-chip peripherals -Watchdog Timer, Basic Timer, Real Time Clock (RTC),ADC, Universal Serial Communication Interface (USCI).Interfacing LED, LCD, Seven segment LED modules interfacing. Example on Real	08	14

Course Outcome: After learning the course the students will be able

	CO Statement
CO-1	Understand the properties of microprocessor, memory, peripheral components and buses in an embedded system.
CO-2	Design of an embedded system using an ARM processor.
CO-3	Understand concepts of architecture and code for embedded systems.
CO-4	Understand the basic properties of a real-time operating system
CO-5	role of the compiler in the embedded system design process

List of Reference Books:

1. Embedded System Architecture, Programming and Design By Rajkamal, TMH Publication
2. Embedded System Design By Frank Vahid and Tony Givargis, John Wiley Publication.
3. Embedded Microcomputer System: Real Time Interfacing By J.W. Valvano, Brooks/Cole Publication
4. The Art of Designing Embedded Systems By Jack Ganssle, Newnes Publication.
5. An Embedded Software Primer By David Simon, Addison Wesley Publication

List of Suggested titles of Experiments:

1. Introduction to MSP430 Kit and Programming Environment with program to workwith ports
2. Configure timer block with capture/compare channel 0 & 1 to generate 4.096 KHz & 1.024KHz signal.
3. Configure watchdog timer in watchdog & interval mode.
4. Test various Power Down modes in MSP430.
5. Read Temperature of MSP430 with the help of ADC.
6. Use Timer to trigger ADC for reading analog signal in most efficient manner to reduce power consumption.
7. Configure DAC to generate positive ramp signal.
8. Use Comparator to compare the signal threshold level.
9. Implement Hardware Multiplier to multiply two arrays to perform MAC operation.
10. Implement DMA controller for basic convolution algorithm.
11. Use I2C protocol for communication between more than two MSP430 connected on I2C bus.
12. Use SPI protocol for communication between two MSP430.