National Institute of Technology Meghalaya
An Institute of National Importance

CURRICULUM

Programme	**Bachelor of Technology in Computer Science & Engineering**	Year of Regulation	**2019**
Department	**Computer Science & Engineering**	Semester	**VI**

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
CS 313	**Embedded Systems**	**3**	**1**	**0**	**4**	**50**	**50**	**100**	**200**

Course Objectives	**COB1:** To develop the student's ability to understand the concept of embedded system's characteristics, requirements and architecture.	Course Outcomes	CO1	Students should be able to Understand the computer architectural design principles and performance enhancement strategies that adopted in performance evolution of different components of computer, microprocessor / microcontroller and Digital signal processor architecture and distributed memory architecture and distributed systems.
	COB2: To develop the student's ability to understand the fundamentals of microprocessor and micro-controller families and their architecture with special emphasis on Digital Signal Processors.			
	COB3: To provide the students with some knowledge and analysis skills associated with the principles of memory organisation and bus structure of embedded system.		CO2	Students should be able to Solve the performance related problems of real time operating system.
	COB4: To develop the student's ability to understand the concepts of embedded system software with special emphasis on real time operating system and particularly real time job scheduling.			
	COB5: To provide the students with some basic knowledge of power aware architecture & hardware software co design.		CO3	Analyze the performance of embedded processing, memory, bus efficiencies, real time operating system performance h/w s/w codesign.

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	CO1	3	1	1	-	-	-	-	1	1	-	-	2	-	1	-
2	CO2	3	3	2	2	2	-	-	1	1	-	-	2	1	1	-
3	CO3	3	3	3	2	2	-	-	2	2	-	-	2	2	2	-

SYLLABUS

No.	Content	Hours	COs
Module 0: Basic 8085 programming & Interfacing	Introduction to 8-Bit 8085 Microprocessor Architecture, Operation, Memory Interfacing, Interfacing I/O Devices, Instruction Classification, Overview of 8085 Instruction Set Timings And Operations Of Instruction Cycle, Assembly Language Programming Using Different Programming Techniques Like Looping, Counting and Indexing, Time Delay Programs, Stack And Subroutines, Basic Interfacing Concepts, 8255 Programmable Peripheral Interface, Interfacing Display, Keyboards, 8279 Programmable Keyboard/Display Interface.	12	CO1
Module 1: Embedded systems	Introduction, Characteristics, Application dependent requirements, Architecture, Challenges, Development Process.	02	CO1 & 2
	Embedded System Hardware: Microprocessor, micro-controller, Von-Neumann and Harvard architecture, RISC, CISC.	03	CO1, 2 & 3
Module 2: PIC Microcontroller Family	PIC architecture, Clocking scheme, Instruction execution, Instruction pipeline. PIC Instruction set, Instruction format, Addressing modes, PIC peripherals on chip, Interrupts, PIC timers.	04	CO1 & 2
Module 3: Case Study	8051 micro-controller, ARM processor	02	CO1&2
Module 4: Digital Signal Processors	Features, Application, Memory, Addressing. System on Chip (SoC): Evolution, Design, Platforms, Multi Processor SOC.	03	CO1 & 2
Module 5: Memory	Basic organization, Embedded SRAM, Embedded DRAMS, Flash Memory, Virtual Memory, Memory Management Unit (MMU), Paging.	04	CO1 & 2
Module 6: Bus Structures, interrupt handling	Bus Structures, interrupt handling	04	CO1,2 &3
Module 7: Power Aware Architectures	Power Density, Power Dissipation, Power vs Speed, Power consumption of CMOS circuits, Gating, Dynamic Power Management.	04	CO1,2 &3
Module 8: Software for Embedded systems	Features, Memory Allocation, Heap Management.	02	CO1&2
Module 9: Fundamentals of Embedded Operating System	Real time operating system	07	CO2&3
Module 10: Hardware-Software Co-design	Introduction, methodology and concepts	03	CO1,2&3
	Total Hours	50	

Essential Readings

1. Wayne Wolf , "Computers as Components: Principles of Embedded Computing System Design", Second Edition, Morgan Kaufmann, 2006.
2. M. A. Mazidi , J. G. Mazidi and R. D. Mckinlay others, "The 8051 Microcontroller and Embedded Systems", Second Edition, Prentice Hall of India, 2008.
3.R. H. Barnett, L. O'Cull, S. Alison Cox, "Embedded C Programming and Microchip PIC", First Edition, Thomson Learning Inc., 2008.

Supplementary Readings
1. Andrew M Sloss, Dominic Symes, Chris Wright, "ARM System Developers Guide: Designing optimizing System Software" (Online resource)
2. http://eee.guc.edu.eg/Courses/Electronics/ELCT912%20Advanced%20Embedded%20Systems/Lectures/ARM%20System%20Developer%27s%20Guide.pdf
3. T. Wilmshurst , "An introduction to design of small scale embedded systems", First Edition, Palgrame Macmillan Publishers, 2001.
4. J. B. Peatman , "Design with PIC Microcontroller", Second Edition, Pearson Education, 2002.