MICROCONTROLLERS FOR EMBEDDED SYSTEM DESIGN

II Semester: ES

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BESB16	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

This course outlines the design and implementation of embedded systems using suitable hardware and software tools. It covers 8051 microcontroller architecture, PIC controller, Embedded RISC processor architecture, Interrupts and device drivers and network protocals. The knowledge acquired from this course will enable the students to develop embedded hardware projects and prototype models for engineering and scientific applications.

II. COURSE OBJECTIVES:

The students will try to learn:

I. The hardware units and devices for design of embedded systems.
II. Use architectures of embedded RISC processors and system on chip processor design of embedded systems.
III. How to analyze interrupt latency, context switching time, for development of device drives for timing devices.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO1	Summarize the concepts of Embedded Systems for system design with examples.	Understand
CO2	Compare the architecture and operation of RISC and ARM for designing embedded system	Analyze
CO3	Demonstrate 8051 microcontroller functionality using registers, memory and Hardware/Software interfacing	Understand
CO4	Construct programmable system on chip architecture using configurable analog and digital blocks	Create
CO5	Analyze interrupt latency, context switching time for development of device drivers	Analyze
CO6	Determine network protocols such as serial, ethernet, SDMA, IDMA for high-performance network communication	Evaluate

IV. SYLLABUS:

UNIT-I	INTRODUCTION TO EMBEDDED SYSTEMS	Classes: 09

Overview of embedded systems, processor embedded into a system, embedded hardware units and devices in system, embedded software, complex system design, design process in embedded system, formalization of system design, classification of embedded systems.

UNIT-II	MICROCONTROLLERS	Classes: 09
8051 architecture, input/output ports and circuits, external memory, counters and timers, PIC controllers; Interfacing processor 8051, PIC, memory interfacing, I/O devices, memory controller and memory arbitration schemes.		
UNIT-III	**EMBEDDED RISC PROCESSORS**	**Classes: 09**
programmable system on chip architectures, continuous timer blocks, switched capacitor blocks, I/O blocks, digital blocks, programming of PSOC. Embedded RISC processor architecture, ARM processor architecture, registers set, modes of operation and overview of Instructions.		
UNIT-IV	**INTERRUPTS AND DEVICE DRIVERS**	**Classes: 09**
Exceptions and Interrupt handling Schemes, Context and periods for context switching, deadline and interrupt latency; Device driver using interrupt service routine, serial port device driver and device drivers for internal programmable timing devices.		
UNIT-V	**NETWORK PROTOCOLS**	**Classes: 09**
Serial communication protocols, Ethernet protocol, SDMA, Channel and IDMA, external bus interface.		

Text Books:

1. Raj Kamal, "Embedded Systems, Architecture Programming and Design", Tata Mc Graw Hill, 2nd Edition, 2008.
2. Muhammad Ali Mazidi, Rolin D. Mckinaly, Danny Causy, "PIC Microcontroller and Embedded Systems", Pearson Education, 1st Edition, 2008.
3. Robert Ashpy, "Designers Guide to the Cypress PSOC", Elsevier, 1st Edition, 2005.

Reference Books:

1. Jonathan W. Valvano – Brookes / Cole, "Embedded Microcomputer Systems, Real Time Interfacing", Thomas Learning, 1st Edition, 1998.
2. Andrew N. Sloss, Dominic Symes, Chris Wright, "ARM Systems Developers Guides, Design & Optimizing System Software", Elsevier, 1st Edition, 2004.
3. John B. Peatman, "Designing with PIC Microcontrollers", PH Inc, 1st Edition, 1998.

Web References:

1. http://nptel.ac.in/syllabus/108102045/

E-Text Books:

1. http://microcontrollershop.com/default.php?cPath=239
2. http://www.sciencedirect.com/science/book/9780750667555
3. https://books.google.co.in/books/about/Embedded_Systems_Design_with_8051_Microc.html?id=YiTa,HChn0UC&redir_esc=y
4. https://books.google.co.in/books/about/Microcontroller_And_Embedded_Systems.html?id=4GrXJeC6HFkC