EC-409B	EMBEDDED SYSTEMS	L T P C
	(ELECTIVE - V)	4 - - 3

COURSE OBJECTIVES:

1. To understand the concept of an embedded system, to get the clarity of various design metrics for a system, understand the concept of improving productivity by presenting a unified view of software & hardware.
2. To understand general purpose processors and standard single purpose processors.
3. To grasp the advanced techniques for programming embedded systems including state machine models & concurrent process models.
4. To learn the details of task scheduling algorithms. Understand the commonalties and differences of the operating systems available off the shelf and to grasp the knowledge regarding various abstraction levels (syntheses) to be involved in the designing of an embedded system.

COURSE OUTCOMES:
After successful completion of the course, the students are able to

1. outline the knowledge on Processor, IC and Design Technologies, State machines and Models Memories, Communication interfaces and RTOs, Design process models
2. discover problems in optimization of custom single purpose processor and synchronization among processes and scheduling algorithms.
3. distinguish; Models, Memories, S.P.P and G.P.P, Priority Inversion and inheritance protocols, Embedded and real time and hand held operating systems
4. design embedded system to suit a particular application.
5. decide suitable hardware and software components of a system that work together to solve engineering problems to show a specific behavior.

UNIT I   *Text Book - 1* **(12)**

Introduction to embedded systems overview, design challenge, processor technology, IC technology, design technology, tradeoffs. Custom single-Purpose processors: Hardware, Introduction: Combinational Logic, Sequential Logic, Custom Single-Purpose Processor Design, RT-Level Custom Single-Purpose Processor Design, Optimizing the Custom Single-purpose processors.

UNIT II   *Text Book - 1* **(12)**

General purpose processors : Software, Introduction, Basic Architecture, Operation, programmer's View. Development Environment, Application-Specific Instruction-Set Processors (ASIPs), Selecting a Microprocessor, General-Purpose Processor Design, Standard Single-Purpose Processors: Peripherals, Introduction: Timers, Counters and Watchdog Timers, UART, Pulse Width Modulators, LCD Controllers, Keypad Controllers, Steeper Motor Controllers, Analog-to-Digital Converters, Real-Time Clocks.

UNIT III   *Text Book - 1* **(12)**

Memory : Introduction, Memory Write Ability and Storage Permanence, Common memory types, Composing Memory, Memory Hierarchy and Cache, Advanced RAM. **Interfacing:** Introduction, Communication Basics, Microprocessor Interfacing: Input / Output Addressing port and bus based I/O, Arbitration, Multilevel Bus Architectures, Advanced Communication Principles, Serial Protocols, Parallel Protocols, Wireless Protocols.

UNIT IV   *Text Book - 1* **(10)**

State machine and concurrent process models : Introduction, models vs. languages, Text versus Graphics, An Introductory Example, FSM, FSMD, using state machines, HCFSM and the state charts language PSM,The role of an appropriate Model and Language concurrent process model, concurrent processes, communication and synchronization among processes, Implementation, data flow model and real time systems.

UNIT V   *Text Book - 1,2* **(10)**

Embedded system and RTOS concepts : priority inversion problem, priority inheritance protocol, embedded OS and real time OS, RT Linux, and Handheld OS. Design technology: Introduction, automation, synthesis, Verification: Hardware / Software Co-Simulation, Reuse: Intellectual Property Cores. Design Process Models.

LEARNING RESOURCES:

TEXT BOOK(s):

1. Frank Vahid, Tony D Givargis - Embedded system design - A unified HW/ SW Introduction, John Wily & sons 2002.
2. KVKK Prasad - Embedded and real time systems, Dreemtech Press, 2005.

REFERENCE BOOK(s):

1. Raj Kamal, Embedded system architecture, programming and design, TMH edition.
2. Jonathan W Valvano, Embedded Microcomputer Systems, Brooks/cole, Thompson Learning.
3. David E. Simon, An Embedded Software Primer, Pearson edition

WEB RESOURCES:

http://nptel.iitm.ac.in/courses/