III Year II Semester   **L   T   P   C**

Code: 20IO6734   **4   0   0   4**

INTRODUCTION OF EMBEDDED SYSTEMS (Minors)

Course Objectives:
1. The basic concepts of an embedded system are introduced.
2. The various elements of embedded hardware and their design principles are explained
3. Different steps involved in the design and development of firmware for embedded systems are elaborated.
4. Internals of Real Time operating system and the fundamentals of RTOS based embedded firm ware design is discussed. And Fundamental issues in hardware software co-design were presented and explained.
5. Familiarise with the different IDEs for firmware development for different family of processors / controllers and embedded operating systems. An embedded system implementation and testing tools are introduced and discussed.

Course Outcomes:
At the end of this course the student can able to:
1. Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specific function.
2. Analyze the hardware components required for an embedded system and the design approach of an embedded hardware
3. Distinguish the various embedded firmware design approaches on embedded environment.
4. Understand how to integrate hardware and firmware of an embedded system using real time operating system.
5. Understand how to embedded system development and its testing

UNIT-I:
INTRODUCTION: Embedded system Definition, history Of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, the typical embedded system-core of the embedded system, Memory, Sensors and Actuators, Communication Interface ,Embedded firmware, Characteristics of an embedded system, Quality attributes of embedded systems, Application specific and Domain-Specific examples of an embedded system

UNIT-II:
EMBEDDED HARDWARE DESIGN: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

UNIT-III:
EMBEDDED FIRMWARE DESIGN:
Embedded Firmware design approaches, Embedded Firmware development languages, ISR Concept, Interrupt sources, Interrupt servicing mechanism, multiple interrupts, DMA, Device Driver programming, Concepts of C versus Embedded C and Compiler versus Cross compiler

UNIT-IV:
REAL TIME OPERATING SYSTEM: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronization, Device Drivers .
HARDWARE SOFTWARE CO-DESIGN: Fundamental Issues in Hardware Software Co Design Computational models in embedded design, Hardware software Trade-offs, Integration of Hardware and Firmware, ICE.

UNIT-V
EMBEDDED SYSTEM DEVELOPMENT AND TESTING: The integrated development environment, Types of files generated on cross compilation, De assembler/ De compiler, Simulators, Emulators and Debugging, Target hardware debugging, Boundary Scan, Embedded Software development process and tools, The main software utility tool, Debugging tools, Quality assurance and testing of the design, Testing on host machine.

Text Books:
1. Embedded Systems Architecture-By Tammy Noergaard, Elsevier Publications, 2013
2. Embedded Systems-By Shibu. K.V-Tata McGraw Hill Education Private Limited, 2013.

Reference Books:
1. Embedded System Design, Frank Vahid, Tony Givargis, John WileyPublications,2013.
2. Embedded Systems-Lyla B. Das-Pearson Publications, 2013.