III B.Tech – II Semester
(17EC633) EMBEDDED SYSTEMS

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	1	-	3

Pre-Requisites: Micro Processors & Micro Controllers

Course Objectives:

- The basic concepts of an embedded system are introduced.
- The various elements of embedded hardware and their design principles are explained.
- Different steps involved in the design and development of firmware for embedded systems is elaborated.
- Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design is discussed.
- Familiarize with the different IDEs for firmware development for different family of Processors/controllers and embedded operating systems.
- Embedded system implementation and testing tools introduced and discussed.

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, General purpose and Domain specific Processors, RISC Vs CISC Processors, Harvard and Von- Neumann Processors, Big Endian Vs Little Endian Processors, Memory – ROM,RAM. Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system.

UNIT-II: EMBEDDED HARDWARE DESIGN:

Sensors and Actuators, I/O types and examples- LED, 7 segment, optocoupler, stepper Motor, Relay, Piezo Buzzer, Push button switch, Keypad; Communication Interface- I2C, SPI, 1- wire Interface, Parallel Interface, External communication interfaces – RS232, RS485, Wireless- IrDA, Bluetooth, Wifi, Zigbee; Other System Components - Reset Circuit, Brownout Protection, Oscillator circuit, Real time clock, Watchdog timer.

UNIT-III: EMBEDDED FIRMWARE DESIGN:

Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, 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.

UNIT-V: EMBEDDED SYSTEM DEVELOPMENT:

The integrated development environment, Types of files generated on cross-compilation, Disassembler/Decompiler, Simulators, Emulators and Debugging, Target hardware debugging, Boundary Scan, Embedded Software development process and tools.

UNIT-VI: EMBEDDED SYSTEM IMPLEMENTATION AND TESTING:
The main software utility tool, CAD and the hardware, Translation tools-Pre-processors, Interpreters, Compilers and Linkers, Debugging tools, Quality assurance and testing of the design, Testing on host machine, Simulators, Laboratory Tools.

Course Outcomes:
After successful completion of the course, the students can be able to:

S. No	Course Outcome	BTL
1.	Understand basic concept of embedded systems, hardware and software issues and applications	L1
2.	Understand and apply the various types of sensors and applications, memory interface, and communication interface with respect to embedded systems	L1
3.	Analyze and develop embedded hardware and software development approaches and methods.	L2
4.	Understand the operating system concepts and fundaments of real time operating systems for Embedded Systems.	L1
5.	Know the fundamental issues in embedded hardware and software integration.	L2
6.	Know and apply the familiarity with tools for development and testing the embedded systems	L2

Correlation of COs with POs & PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	1	-	-	-	-	-	1	1	1	1	3	2
CO 2	2	2	3	-	-	-	-	-	1	1	1	1	2	2
CO 3	2	2	2	-	-	-	-	-	1	1	1	1	2	2
CO 4	3	2	2	-	-	-	-	-	1	1	1	1	3	2
CO 5	1	2	2	-	-	-	-	-	1	1	1	1	1	2
CO 6	1	2	2	-	-	-	-	-	1	1	1	1	1	2

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 Wiley Publications, 2013.
2. Embedded Systems-Lyla B.Das-Pearson Publications, 2013.