17ES003 EMBEDDED SYSTEM DESIGN CONCEPTS

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	

WA/RA	SSH/HSH	CS	SA	S	BS
15	30	-	5	5	-

Course Objectives:

- To study the overview of Embedded System Architecture
- To focus on distributed Embedded Architecture and its accessing protocols
- To understand about the design methodologies in hardware and software design

Course Outcomes:

The student will be able to:

- Explain various embedded system applications and design requirements
- Construct embedded system hardware
- Develop software programs to control embedded system
- Generate product specification for embedded system
- Outline validation and testing methodologies for embedded system

SKILLS :

- Able to analyze design requirements.
- Able to design new hardware and software for different applications.
- Able to test and validate the different embedded system applications

ACTIVITIES:

- *Able to analyze design requirements.*
- *Able to design new hardware and software for different applications.*
- *Able to test and validate the different embedded system applications.*

UNIT – I

AN INTRODUCTION TO EMBEDDED SYSTEMS: An Embedded system, processor in the system, other hardware UNITs, and software embedded into a system, Exemplary embedded systems, embedded system – on – chip (SOC) and in VLSI circuit. Processor and memory organization –Structural UNITs in a Processor, Processor selection for an embedded system, memory devices, memory selection for embedded systems, allocation of memory to program cache and memory management links, segments and blocks and memory map of a system, DMA, interfacing processors, memories and Input Output Devices.

UNIT – II

EMBEDDED DESIGN LIFE CYCLE: Introduction, Product Specification, Hardware/ software partitioning, Iteration and Implementation, Detailed hardware and software design, Hardware/Software integration, Product Testing and Release, Maintaining and upgrading existing products.

Selection Process: Packaging the Silicon, Adequate Performance, RTOS Availability, Tool chain Availability, Other issues in the Selection process.

Partitioning Decision: Hardware/Software Duality, Hardware Trends, ASICs and Revision Costs.

UNIT – III

DEVELOPMENT ENVIRONMENT: The Execution Environment, Memory Organization, System Startup.

Special Software Techniques: Manipulating the Hardware, Interrupts and Interrupt service Routines (ISRs), Watchdog Times, Flash Memory, Design Methodology.

Basic Tool Set: Host – Based Debugging, Remote Debuggers and Debug Kernels, ROM Emulator, Logic Analyzer.

Debugging Techniques: Background Debug Mode (BDM), Joint Test Action Group (JTAG) and Nexus.

UNIT - IV

TESTING: Why Test? When to Test? Which Test? When to Stop? Choosing Test cases, Testing Embedded Software, Performance Testing, Maintenance and Testing, The Future.

Writing Software for Embedded Systems: The compilation Process, Native Versus Cross-Compilers, Runtime Libraries, Writing a Library, Using alternative Libraries, using a standard Library.

UNIT-V

BUFFERING AND OTHER DATA STRUCTURES: What is a buffer? Linear Buffers, Directional Buffers, Double Buffering, Buffer Exchange, Linked Lists, FIFOs, Circular Buffers, Buffer Under run and Overrun, Allocating Buffer Memory, Memory Leakage. Memory and Performance Trade-offs.

TEXT BOOKS:

1. Raj Kamal, “Embedded Systems Architecture Programming and Design”, 2nd Edition Tata McGra-Hill.2012
2. Arnold S. Burger, “Embedded System Design – Introduction to Processes, Tools, Techniques”, CMP Books.2011
3. Steve Heath, “Embedded Systems Design”, 2nd Edition, Newnes.2014

REFERENCE BOOKS:

1. Butter worth Heinemann, Steve Heath; “Embedded systems design: Real world design”, Newton mass, USA 2002.
2. David E. Simon, An embedded software primer, Addison Wesly-1999.