EC515 - EMBEDDED SYSTEM DESIGN CONCEPTS

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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 Learning Outcomes:

- 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

UNIT – I **(9 hours)**

An Introduction to Embedded Systems: An Embedded system, processor in the system, other hardware units, 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 **(9 hours)**

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 **(9 hours)**

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 **(9 hours)**

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 **(9 hours)**

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.
2.Arnold S. Burger, “Embedded System Design – Introduction to Processes, Tools, Techniques”, CMP Books.
3.Steve Heath, “Embedded Systems Design”, 2nd Edition, Newnes.

REFERENCES:

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.