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EC817 EMBEDDED SYSTEM DESIGN

UNIT I

Introduction to Embedded Computing: Characteristics of Embedding Computing Applications, Concept of Real time Systems, Challenges in Embedded System Design, Design Process. Embedded System Architecture: Instruction Set Architecture, CISC and RISC instruction set architecture, Basic Embedded Processor/Microcontroller Architecture (8051, ARM, DSP Processors, PIC) Memory System Architecture, I/O Sub-system, Co-processors.

UNIT II

Designing Embedded Computing Platform: Bus Protocols, Bus Organization, Memory Devices and their Characteristics, I/O Devices, Timers and Counters, Watchdog Timers, Interrupt Controllers, DMA Controllers, A/D and D/A Converters, Displays, Keyboards, Infrared devices. Component Interfacing: Memory Interfacing, I/O Device Interfacing, Interfacing Protocols (GPIB, FIREWIRE, USB, IRDA). Designing with Processors: FPGA Based Design, SOC.

UNIT III

Programming Embedded Systems: Basic Features of an Operating System, Kernel Features, Real-time Kernels, Processes and Threads, Context Switching, Scheduling, Shared Memory Communication, Message-Based Communication, Real-time Memory Management, Dynamic Allocation, Device Drivers, Real-time Transactions and Files, Real-time OS (VxWorks, RT-Linux, Psos), Evaluating and Optimizing Operating System Performance, Power Optimization Strategies for Processes.

UNIT IV

Network Based Embedded Applications: Network Fundamentals, Layers and Protocols, Distributed Embedded Architectures , Elements of Protocol Design , Networks for Embedded systems, Network Based Design, Internet-Enabled Systems, Wireless Applications, Blue-tooth, CAN.

UNIT V

Embedded System Development :Design Methodologies: UML as Design tool, UML notation, Requirement Analysis and Use case Modeling, Static Modeling, Object and Class Structuring, Dynamic Modeling, Architectural Design, Hardware-Software Partitioning, Hardware-Software Integration, Design Examples : Data compressor, Alarm clock, Video Accelerator, Elevator Control System, ATM System.

Text Books:

1. Wayne Wolf, "Computers as Components- Principles of Embedded Computing System Design", Morgan Kaufmann Publishers, Second edition, 2008.
2. Andrew N. Sloss, Dominic Symes, Chris Wright, "ARM System developer's Guide- Designing and Optimizing System software", Morgan Kaufmann Publishers, 2005.
3. John B. Peatman, "Design with PIC Microcontroller", Pearson Education Asia, 2002.
4. C.M. Krishna, Kang G. Shin, "Real time systems", Mc-Graw Hill, 2010.

Reference Books:

1. Tim Wilmshurst, "The design of Small -Scale Embedded Systems", Palgrave, 2003. .
2. Marwedel Peter, "Embedded System Design", Kluwer Publications, 2004.

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