REAL TIME CONCEPTS OF EMBEDDED SYSTEMS (ELECTIVE-II)

Course Code: 13EE2116

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Pre requisites: Basic Knowledge of Microcontrollers.

Course Outcomes:

At the end of the course, the student will be able to

CO 1: Explain the Basics of design aspects of Embedded Systems and Applications of 8051 Microcontroller.

CO 2: Describe Real Time Operating Systems.

CO 3: List the design features of Real-Time Operating systems.

CO 4: Evaluate the advanced architectures of ARM and SHARC Processors.

CO 5: Design of application coding for calculating physical quantities.

UNIT-I

EMBEDDED COMPUTING:

Introduction, Complex Systems and Microprocessor, the Embedded System Design Process, Formalisms for System Design, Design Examples. 8051 Micro controller - Instruction Set, I/O Ports, Memory, Counters and Timers, Interrupts, Assembly Language Programming, Programming Tools and Techniques, Interfacing with Keyboards, Displays, D/A and A/D Conversions, Serial Data Communication.

UNIT-II

INTRODUCTION TO REAL – TIME OPERATING SYSTEMS:

Tasks and Task States, Tasks and Data, Semaphores, and Shared Data; Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment.

UNIT-III

BASIC DESIGN USING A REAL-TIME OPERATING SYSTEM:

Principles, Semaphores and Queues, Hard Real-Time Scheduling Considerations, Saving Memory and Power, An example RTOS like UC-OS (Open Source); Embedded Software Development Tools: Host and Target machines, Linker/Locators for Embedded Software, Getting Embedded Software into the Target System; Debugging Techniques :Testing on Host Machine, Using Laboratory Tools, An Example System.

UNIT-IV

INTRODUCTION TO ADVANCED ARCHITECTURES

ARM and SHARC Processor and memory organization and Instruction level parallelism; Networked embedded systems: Bus protocols, I2C bus and CAN bus; Internet-Enabled Systems, Design Example-Elevator Controller.

UNIT-V

ARM PERIPHERALS AND APPLICATION CODING

GPIO, Timers, Counters, PWM, ADC, Serial Communication Channels. Application Coding Examples- Measurement of time, Frequency, Power Control**.**

Text books:

1. Wayne Wolf, "*Computers as Components*", Morgan Kaufman, 2010. (Unit I, IV)
2. B.KantaRao,"*Embedded Systems*",PHI, 1st Edition, 2011 (Unit I,IV,V)
3. David E. Simon, "*An Embedded Software Primer*", Pearson Education, 2011. (Unit II, III)

Reference Books:

1. Jean. J. Labrosse,"*Embedded System building blocks*", 2nd edition, CMP publishers,1999.
2. Raj Kamal,"*Embedded Systems: Architecture, Programming and Design*", 2nd Edition, TMH, 2008.
3. Kenneth J. Ayala, "*The 8051 Microcontroller"*, Third Edition, Cenage Learning, 2010.
4. Frank Vahid, Tony Givargis, "*Embedded System Design*", JohnWiley, 2011.