17CS003 EMBEDDED SYSTEMS

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Course Description and Objectives:
This course emphasizes on comprehensive treatment of embedded hardware and real time operating systems along with case studies, in tune with the requirements of Industry. The objective of this course is to enable the students to understand embedded-system programming and apply that knowledge to design and develop embedded solutions.

Course Outcomes:
The student will be able to:
- ✓ Understand the concept of embedded system, microcontroller, different components of microcontroller and their interactions.
- ✓ Get familiarized with programming environment to develop embedded solutions.
- ✓ Program ARM microcontroller to perform various tasks.
- ✓ Understand the key concepts of embedded systems such as I/O, timers, interrupts and interaction with peripheral devices.

Activities:
- ✓ Identify hardware and software components to build an embedded system.
- ✓ Demonstrate the interfacing of peripherals with 8051/ARM microcontroller.
- ✓ Porting of OS on to ARM processor board.
- ✓ Demonstrate Deadlock situation in RTOS.
- ✓ Demonstrate Inter-task communication methods in RTOS.

Skills:
- ✓ Programming the ARM processors.
- ✓ Design of microcontroller based embedded system.
- ✓ Interfacing of various peripherals with ARM processors.
- ✓ Expertise in writing multiple tasks under RTOS environment.
- ✓ To handle shared data issues in RTOS environment

Unit - I
Introduction to Embedded Systems: Definition, Applications of ES, Embedded Hardware Units and Devices, Embedded Software, Design Metrics in ES, Challenges in ES Design.

Unit- II
Architecture of 8051: 8051 Micro controller Hardware, Input/output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/output, Interrupts and Programming 8051.

UNIT –III
ARM- Embedded Processor: History, Architecture, Interrupt vector, Programming the ARM, ARM Assembly language, Instruction set, Conditional Execution, Arithmetic and Logical Compare.

UNIT – IV
ARM PROGRAMMING: Assembly programming, General structure of assembly language, Writing programs, Branch instructions, Loading constrains, load and store instructions, Read-only and read/write Memory, Multiple Register Load and Store.

UNIT – V
REAL TIME OPERATING SYSTEMS: Introduction, Tasks and Task States, Tasks and Data, Reentrancy, Semaphores and Shared Data, Inter Process Communication-Message Queues, Mailboxes and Pipes.

TEXT BOOKS:
1. Raj Kamal, "Embedded Systems", 2nd edition, Tata McGraw Hill, 2009.
2. Lyla B Das, "Embedded Systems an Integrated Approach", 1st edition, Pearson, 2012.
3. David E. Simon, "An Embedded Software Primer", 1st edition, Pearson Education, 2008.

REFERENCE BOOKS:
1. Wayne Wolf, "Computers as Components-principles of Embedded Computer system Design", 1st edition, Elseveir, 2009.
2. Labrosse, "Embedding system building blocks", 2rd edition, CMP Publishers, 2007.
3. Kenneth J. Ayala and Thomson, "The 8051 Microcontroller", 3rd edition, Thompson Delmar, Learning, 2008.
4. Frank Vahid, Tony Givargis and John Wiley, "Embedded System Design, Microcontrollers", 3rd edition, Pearson Education, 2008.
5. Michael J. Pont, "Embedded C", Addison Wesley, 2002