REAL TIME CONCEPTS OF EMBEDDED SYSTEMS (ELECTIVE-II)

Course Code: 13EE2116	**L**	**P**	**C**
	4	**0**	**3**

Pre requisites: Basic Knowledge of Microcontrollers.

Course Educational Objectives: To provide the student with in-depth knowledge of embedded systems including overall system design, interfacing, Operating Systems, Data Acquisition, Communication Protocols, and Real-Time Performance.

Course Outcomes: At the end of the course, the student will be able to

1. Know the Basics of design aspects of Embedded Systems and Applications of 8051 Microcontroller.
2. Learn design aspects of Systems using Real Time Operating Systems.
3. Understand the features of advanced architectures in ARM and SHARC processors.
4. Understand applications of ARM processors in Electrical Engineering and write programs.

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.