Prasad V. Potluri Siddhartha Institute of Technology, Kanuru, Vijayawada.

1/2 M.Tech. SECOND SEMESTER

CSCS2T5C **EMBEDDED SYSTEMS** **Credits: 4**

ELECTIVE – I

Lecture: 4 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period /week **Semester end examination: 70 marks**

Objectives:

The objective of this course is to equip the students with the basic concepts of Embedded system, applications in which they are used, 8051 microcontroller programming concepts and various aspects of embedded system design from Hardware and Software points of view and It describes tools and methodologies needed for embedded system design. It provides RTOS concepts for coding the embedded system software routines. It tells what makes a system a real-time system and describes the characteristics of latency in real-time systems.

1. List the Difference between microcontrollers and microprocessors.
2. Describe the prominent standard features of a typical microcontroller.
3. Identify the major components of a microcontroller development system.
4. Understanding the 8051 Architecture.
5. Describe the hardware features of the 8051 microcontroller.
6. Learning the Basic Assembly Language Programming Concepts.
7. Describe the standards of Real-Time Operating System (RTOS).
8. Basic Design Using a Real-Time Operating System

Learning Outcomes:

Students will be able to

1. Differentiate between microprocessor and microcontroller
2. Understand the basics of an Embedded system(ES)
3. Develop 8051 microcontroller programming
4. State difference between general purpose computer system and ES
5. State application of ES in various fields.
6. Draw hardware and software architecture of ES
7. Understand the concepts of RTOS
8. Design and implement simple embedded systems in real time

Unit I

Embedded Systems Basics: Introduction to Embedded systems, Examples of embedded systems, Typical Hardware, Gates, Timing Diagrams, Memory, Microprocessors, Buses, Direct Memory Access, Interrupts, Microprocessor Architecture, Interrupt Basics, The Shared Data Problem, Interrupt Latency.

Unit II

The 8051 Architecture : Introduction, 8051 Micro controller Hardware, Input/Output Pin Ports and Circuits, External Memory, Serial data Input/Output, Interrupts.

Unit III

Basic Assembly Language Programming Concepts: The Assembly Language Programming Process, Programming Tools and Techniques, Programming the 8051.

Unit IV

Moving Data: Introduction, Addressing Modes, External Data Moves, Code Memory Read-Only Data Moves, Push and Pop Opcodes, Data Exchanges.

Unit-V

Applications: Introduction, keyboards, Human Factor, Key Switch Factors, KeyBoard Configurations, Displays, Seven-Segment Numeric Display, D/A and A/D Conversions.

Unit VI

Introduction to Real – Time Operating Systems: Survey of software Architectures:Round Robin,Round Robin with Interrupts,Function Queue Scheduling Architecture,Real Time Operating System Architecture,Selecting an Architecture,Tasks and Task States, Tasks and Data, Semaphores, and Shared Data;

Unit VII

Basic Design Using a Real-Time Operating System: Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment,Principles, Semaphores and Queues, Hard Real-Time Scheduling Considerations, Saving Memory and Power, An example RTOS like uC-OS (Open Source);

Unit VIII

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.

Learning Resources

Text Books:

1. An Embedded Software Primer, David E. Simon, Pearson Education.
2. The 8051 Microcontroller, Third Edition, Kenneth J.Ayala, Thomson.

Reference Books:

1. 8051 Microcontrollers, Satish Shah, Oxford Higher Education.
2. Embedded Microcomputer Systems Real Time Interfacing, Jonathan W.Valvano, Cengage Learning.
3. Micro Controllers, Ajay V Deshmukhi, TMH.
4. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley.
5. Microcontrollers, Raj kamal, Pearson Education.