4/4 B.Tech. SEVENTHSEMESTER
ELECTIVE – III

EM7T4C REAL TIME OPERATING SYSTEMS Credits: 3
Lecture: 3 periods/week Internal assessment: 30 marks
Tutorial: 1 period /week Semester end examination: 70 marks

Course Objective:

- To develop an understanding of the fundamental principles of real-time operating systems and to gain experience using a real-time OS in applications.
- Introducing Real-time System Concepts, Real-Time Kernels, Task Management, Time Management, Event Control Blocks, Signals, Semaphores, Message Queues.

Learning Outcomes:

Students will be able to:

- define an embedded system.
- List characteristics of real-time operating systems (RTOS).
- compare hard and soft real-time systems.
- list features and services that are typically provided by an RTOS.
- compare binary semaphores, counting semaphores, and mutexes.
- escribe how message queues are used in RTOS applications.
- describe how shared memory is used in RTOS applications.
- escribe how timers are used in RTOS applications.
- describe how signals are used in RTOS applications.

Unit – I

Introduction : Introduction to UNIX, Overview of Commands, File I/O,(open, create, close, lseek, read, write), Process Control (fork, vfork, exit, wait, waitpid, exec), Signals, Interprocess communication,(pipes, fifos, message queues, semaphores, shared memory)

Unit II

Real Time Systems: Typical real time applications, Hard Vs Soft real-time systems, A reference model of Real Time Systems: Processors and Resources, Temporal Parameters of real Time Work load, Periodic task model precedence constraints and data dependency, functional parameters, Resource Parameters of jobs and parameters of resources.

Unit III

Scheduling : Commonly used Approaches to Real Time Scheduling Clock Driven, Weighted Round Robin, Priority Driven, Dynamic Vs State Systems, Effective release time and Deadlines, Offline Vs Online Scheduling.

Unit IV

Inter-process Communication : Inter-process Communication and Synchronization of Processes, Tasks and Threads- Multiple Process in an Application, Problem of Sharing data by multiple tasks & routines, Inter-process communication

Unit V

Real Time Operating Systems : Operating Systems Services, I/O Subsystems, RT & Embedded Systems OS, Interrupt Routine in RTOS Environment

Unit VI

Programming Tools: Micro C/OS-II- Need of a well Tested & Debugged RTOs,Use of □COS-II

Unit VII

VX Works: Memory managements task state transition diagram, pre-emptive priority, Scheduling context switches- semaphore- Binary mutex, counting watch dugs, I/O system

Unit VIII

Case Studies: Case Studies of programming with RTOS- Case Study of Automatic Chocolate Vending m/c using □COS RTOS, case study of sending application Layer byte Streams on a TCP/IP network, Case Study of an Embedded System for a smart card.

TEXT BOOKS:

1.Embedded Systems- Architecture, Programming and Design by Rajkamal, 2nd ed., 2008,TMH.
2. Real Time Systems- Jane W. S. Liu- PHI.
3. Real Time Systems- C.M.Krishna, KANG G. Shin, 1996, TMH

REFERENCES:

1. Advanced UNIX Programming, Richard Stevens
2. VX Works Programmers Guide