

**3EC44: INTRODUCTION TO REAL TIME OPERATING SYSTEM
CREDITS - 3 (LTP: 3,0,0)**

Course Objective:

To obtain a broad understanding of the technologies and applications for the domain of real-time operating system.

Teaching and Assessment Scheme:

Teaching Scheme (Hours per Week)			Credits	Assessment Scheme				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE	CE	ESE	CE	100	
3	0	0	3	60	40	00		00

Course Content:

Unit No.	Topics	Teaching Hours
1.	Introduction : Introduction to Operating System: Computer Hardware Organization, BIOS and Boot Process, Multi-threading concepts, Processes, Threads, Scheduling.	08
2.	Basics of real-time concepts : Terminology: RTOS concepts and definitions, real-time design issues, examples, Hardware Considerations: logic states, CPU, memory, I/O, Architectures, RTOS building blocks, Real-Time Kernel.	10
3.	Process Management : Concepts, scheduling, IPC, RPC, CPU Scheduling, scheduling criteria, scheduling algorithms Threads: Multi-threading models, threading issues, thread libraries, synchronization Mutex: creating, deleting, prioritizing Mutex, Mutex internals.	10
4.	Inter-Process Communication : Messages, Buffers, mailboxes, queues, semaphores, deadlock, priority inversion, Pipes Memory Management : Process stack management, run-time buffer size, swapping, overlays, block/page management, replacement algorithms, real-time garbage collection	09
5.	Case Studies: Case study Linux POSIX system, RTLinux / RTAI, Windows system, Vxworks, ultron Kernel Design Issues: structure, process states, data structures, inter-task communication mechanism, Linux Scheduling	08
Total		45

List of References :

1. Raj Kamal, “*Embedded Systems – Architecture, Programming and Design*”, 2nd Edition, McGraw Hill, 2009
2. J. J Labrosse, “*MicroC/OS-II: The Real-Time Kernel*”, 2nd Edition, Newnes, 2002.
3. Jane W. S. Liu, “*Real-time systems*”, 1st Edition, Prentice Hall, 2000.
4. Philips A. Laplante, “*Real-Time System Design and Analysis*”, 3rd Edition, John Wiley & Sons, 2004
5. Doug Abbott, “*Linux for Embedded and Real-Time Applications*”, 2nd Edition, Newnes, 2011.

Course Outcomes (COs):

By learning this course students will be able to ...

1. Understand the features and structures of practical Operating System implementations.
2. Acquire practical knowledge Real Time Operating Systems used in embedded system.
3. Understand the use of multitasking techniques in Real Time Systems.
4. Compare different scheduling algorithms and the schedulability criteria.
5. Analyze real time systems with regard to keeping time and resource restrictions.