

COURSE CODE	COURSE NAME	L-T-P-C	YEAR OF INTRODUCTION
EC366	Real Time Operating Systems	3-0-0-3	2016
Prerequisite: EC206 Computer Organization			
Course objectives: <ul style="list-style-type: none"><li>To understand the basics of operating systems tasks and basic OS architectures and develop these to RTOS</li><li>To understand concepts of task scheduling</li><li>To understand problems and issues related with multitasking</li><li>To learn strategies to interface memory and I/O with RTOS kernels</li><li>To impart skills necessary to develop software for embedded computer systems using a real-time operating system.</li></ul>			
Syllabus: Introduction to OS and RTOS, Process management of OS/RTOS, Process Synchronization, Memory and I/O management, Applications of RTOS			
Expected outcome: The students will be familiar with operating systems, the real time operating systems and its applications.			
Text Books: 1. C.M. Krishna and G.Shin, Real Time Systems, McGraw-Hill International Edition, 1997. 2. William Stallings, Operating Systems: Internals and Design Principles, 7/e, Prentice Hall			
References: 1. Micro C/OS-II, The Real Time Kernel, CMP Books, Jean J Labrosse, 2011 2. Qiong Li and Caroline Yoa, Realtime Concepts for Embedded Systems, CRCPress 3. Real-Time Embedded Components and Systems: With Linux and RTOS (Engineering) by Sam Siewert, John Pratt, 2015 4. Tanenbaum, Modern Operating Systems, 3/e, Pearson Edition, 2007. 5. VxWorks: Programmer's Guide 5.4, Windriver, 1999 6. Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design, 2/e, Kindle Publishers, 2005.			
Course Plan			
Module	Course content	Hours	End Sem. Exam Marks
I	Operating system objectives and functions, Virtual Computers, Interaction of O. S. & hardware architecture, Evolution of operating systems	2	15
	Architecture of OS (Monolithic, Microkernel, Layered, Exo-kernel and Hybrid kernel structures)	3	
	Batch, Multi programming, Multitasking, Multiuser, parallel, distributed & real –time O.S.	3	
II	Uniprocessor Scheduling: Types of scheduling	2	15
	Scheduling algorithms: FCFS, SJF, Priority, Round Robin	3	
	UNIX Multi-level feedback queue scheduling, Thread Scheduling, Multiprocessor Scheduling concept	3	
FIRST INTERNAL EXAM			

III	Concurrency: Principles of Concurrency, Mutual Exclusion H/W Support, software approaches, Semaphores and Mutex, Message Passing techniques	2	15
	Classical Problems of Synchronization: Readers-Writers Problem, Producer Consumer Problem, Dining Philosopher problem.	3	
	Deadlock: Principles of deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, An Integrated Deadlock Strategies.	3	
IV	Memory Management requirements, Memory partitioning: Fixed, dynamic, partitioning	3	15
	Memory allocation Strategies (First Fit, Best Fit, Worst Fit, Next Fit), Fragmentation, Swapping, Segmentation, Paging, Virtual Memory, Demand paging	2	
	Page Replacement Policies (FIFO, LRU, Optimal, clock), Thrashing, Working Set Model	3	
SECOND INTERNAL EXAM			
V	I/O Management and Disk Scheduling: I/O Devices, Organization of I/O functions	2	20
	Operating System Design issues, I/O Buffering, Disk Scheduling (FCFS, SCAN, C-SCAN, SSTF), Disk Caches	3	
VI	Comparison and study of RTOS: Vxworks and $\mu$ COS	3	20
	Case studies: RTOS for Control Systems.	3	
END SEMESTER EXAM			

### Question Paper

The question paper shall consist of three parts. Part A covers I and II module, Part B covers III and IV module, Part C covers V and VI module. Each part has three questions, which may have maximum four subdivisions. Among the three questions, one will be a compulsory question covering both modules and the remaining from each module, of which one to be answered. Mark patterns are as per the syllabus with 50 % for theory and 50% for logical/numerical problems, derivation and proof.

