SEMESTER S5

REAL TIME OPERATING SYSTEMS

Course Code	PEEVT 527	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	PBEVT504, PBECT404 (Course code)	Course Type	Theory

Course Objectives:

1. To develop skills in Real Time operating system to apply the same in real life applications.
2. Understand the concept of real time operating system along with its synchronization, communication and interrupt handling tools.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Operating system: Types, Objectives and functions, Kernel, Process - States, Process Control Block, Operations on processes.	9
2	Process Scheduling: FCFS, SJF, Priority, Round-Robin, Multilevel Queue and Multilevel Feedback Queue Scheduling. Thread: Structure. User and Kernel level threads, multi-threading models, multiprocessor scheduling.	9
3	Real Time Operating Systems: Structure and characteristics of Real Time Systems, Task: Task states, Task synchronization -Semaphores- types, Inter Task communication mechanisms: message queues, pipes, event registers, signals, Exceptions and interrupt handling.	9
4	Task constraints, Task scheduling: Aperiodic task scheduling: EDD. EDF, LDF, EDF with precedence constraints. Periodic task scheduling: Rate monotonic and Deadline monotonic, Real time Kernel- Structure, State transition diagram, Kernel primitives. Features of Free RTOS and Linux, Case study of (Kernel design, threads and task scheduling) RTOS: MicroC/OS-II, RTOS control system used in real life applications - in adaptive cruise Control	11

Course Assessment Method
(CIE: 40 marks, ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
• 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks **(8x3 =24marks)**	• Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. **(4x9 = 36 marks)**	**60**

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Summarize the functions and structure of general-purpose operating systems.	**K2**
CO2	Use different scheduling algorithms on processes and threads.	**K3**
CO3	Interpret a real time operating system along with its synchronization, communication and interrupt handling tools.	**K2**
CO4	Illustrate task constraints and analyse the different scheduling algorithms on tasks.	**K4**
CO5	Illustrate the applications of real time operating systems.	**K3**

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

CO-PO Mapping Table (Mapping of Course Outcomes to Program Outcomes)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3		1							2
CO2	2	3	2								2	2
CO3	3	3	2		2						3	2
CO4	3	2	3								2	2
CO5	3	3	2		1						2	3

Note: *1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

Text Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Operating System Principles	Abraham Silberschatz	Wiley India	7th edition, 2011
2	Operating systems- Internals and design principles	William Stallings	Prentice Hall	7th edition, 2011
3	Real-Time Concepts for Embedded Systems	Qing Li	CMP Books	2nd Edition,2013
4	HARD REAL-TIME COMPUTING SYSTEMS Predictable Scheduling Algorithms and Applications	Giorgio C. Buttazzo	Kluwer Academic Publishers	1st Edition,1997

Reference Books				
Sl. No	**Title of the Book**	**Name of the Author/s**	**Name of the Publisher**	**Edition and Year**
1	Modern Operating Systems	Tanenbaum	Pearson Edition	3rd Edition, 2007
2	Micro C/OS-II, The Real Time Kernel	Jean J Lambrosse	CMP Books	2nd Edition,2011
3	Real-Time Systems: Theory and Practice	Rajib Mall	Pearson	1st Edition,2008
4	An Embedded Software Primer	David E Simon	Pearson	2nd Edition,2012

Video Links (NPTEL, SWAYAM…)	
Module No.	**Link ID**
1	https://archive.nptel.ac.in/courses/106/105/106105172/ - Week 1
2	https://archive.nptel.ac.in/courses/106/105/106105172/ - Week 2
3	https://archive.nptel.ac.in/courses/106/105/106105172/ - Week 3
4	https://archive.nptel.ac.in/courses/106/105/106105172/ - Week 4