

REAL-TIME EMBEDDED SYSTEM

(Elective Subject)

Course Code:	12M1WEC232	Semester:	B.Tech.(8th Sem.), M.Tech. (2nd Sem.)
Credits:	3	Contact Hours:	L-3, T-0, P-0

Course Objectives

The objectives are to study

1. Introduction of the real-time systems.
2. Computing required for the real-time embedded systems.
3. Communication required for the real-time embedded systems.

Course Outcomes

After studying this course the students would gain enough knowledge

1. To present the mathematical model of the system.
2. To develop real-time algorithm for task scheduling.
3. To understand the working of real-time operating systems and real-time database.
4. To work on design and development of protocols related to real-time communication.

Course Contents

Unit	Topics	References (chapter number, page no. etc)	Lectures
1.	Introduction: Applications of real-time systems, basic model and characteristics of a real-time system, safety and reliability, types of real-time tasks.	[1,chapter 1(1-22)], [2,3]	3
2.	Modeling Timing constraints: Timing constraints, events, classifications, modeling timing constraints.	[1,chapter 1(23-40)], [2,3]	3
3	Scheduling Real-Time Tasks: Task scheduling types, Types of Schedulers, clock driven, table-driven, Cyclic, EDF, RMA	[1,chapter 2(41-73)], [2,3]	5
4	Handling Resource sharing among real-time tasks: Resource sharing among real-time tasks, inversion, HLP,PCP	[1,chapter 3(74-97)], [2,3]	5
5	Scheduling Real-Time Tasks in Multiprocessor and Distributed systems: Multiprocessor task allocation, dynamic allocation of tasks, fault-tolerant scheduling of tasks, clocks in distributed real-time systems	[1,chapter 4(98-104)], [2,3]	5
6	Real-time operating systems: Features of real-time operating systems, time services	[1,chapter 5(1-40)], [2,3]	4
7	Real-Time Communication: Types of networks, QoS, traffic categorization, LAN architecture, soft and hard real-time	[1,chapter 7(139-177)], [2,3]	5

	communication, QoS framework, routing, resource reservation, rate control, QoS models.		
8	Real-Time Databases: Review, design issues, consistency, concurrency control, commercial real-time databases.	[1,chapter 8(178-190)], [2,3]	4
9	Study of Practical Systems: Networked control systems, cyber-physical system, controller area network.	[1,chapter 8], [2,3]	3
Total Lecture			42

Evaluation Scheme

1. Test 1 :15 marks
2. Test 2 : 25 marks
3. Test 3 : 35 marks
4. **Internal Assessment** : 25 marks
 - 10 Marks : Class performance, Tutorials & Assignments
 - 10 Marks : Quizzes
 - 5 marks : Attendance

Text Books

1. Rajib Mall, Real-Time Systems: Theory and Practice, Pearson Education, 2007.

Reference Books

1. C. Siva Ram Murthy and G. Manimaran, 'Resource Management in Real Time Systems and Networks', the MIT Press, 2001.