6th Semester	RCS6D001	Real-Time System	L-T-P 3-0-0	3 Credits

Objectives
☐ To understand concepts of real-time system
☐ To understand resource sharing and dependencies among real-time tasks
☐ To understand real-time OS and Database

Module-I: **(09 Hours)**
Introduction: What is real-time, Applications of Real-Time systems, A basic model of Real-time system, Characteristics of Real-time system, Safety and Reliability, Types of Real-time tasks, timing constraints, Modelling timing constraints Real-Time Task Scheduling: Some important concepts, Types of Real-time tasks and their characteristics, Task scheduling, Clock-Driven scheduling, Hybrid schedulers, Event Driven scheduling, Earliest Deadline First (EDF) scheduling, Rate monotonic algorithm (RMA). Some issues Associated with RMA. Issues in using RMA practical situations

Module-II: **(09 Hours)**
Handling Resource Sharing and dependencies among Real-time Tasks: Resource sharing among real-time tasks. Priority inversion. Priority Inheritance Protocol (PIP), Highest Locker Protocol (HLP). Priority Ceiling Protocol (PCP). Different types of priority inversions under PCP. Important features of PCP. Some issues in using a resource sharing protocol. Handling task dependencies. Scheduling Real-time tasks in multiprocessor and distributed systems: Multiprocessor task allocation, Dynamic allocation of tasks. Fault tolerant scheduling of tasks. Clock in distributed Real-time systems, Centralized clock synchronization

Module-III: **(09 Hours)**
Commercial Real-time operating systems: Time services, Features of a Real-time operating system, Unix as a Real-time operating system, Unix-based Real-time operating systems, Windows as a Real-time operating system, POSIX-RT, A survey of contemporary Real-time operating systems. Benchmarking real-time systems.
Module IV **(09 Hours)**
Real-time Databases: Example applications of Real-time databases. Review of basic database concepts, Real-time databases, Characteristics of temporal data. Concurrency control in real-time databases. Commercial real-time databases. Real-time Communication: Basic concepts, Examples of applications, Real-time communication in a LAN and Real-time communication over packet switched networks.

Outcomes
☐ Ability to understand concepts of real-time system
☐ Ability to analyze real-time OS
☐ Ability to work out real-time database

Books:
[1]   Real-time Systems Theory and Practice by Rajib Mall, Pearson Publication, 2008.
[2]   Jane W. S. Liu, Real-Time Systems, Pearson Education, 2000

[3]   C.M. Krishna and K.G. Shin, Real-Time Systems, TMH, 2017