

## CSE3021: Real Time Systems

Programme: B.Tech CSE, ECE, CCE

Year: IV

Semester: VII

Course: Program Elective

Credits: 3

Hours: 40

### Course Context and Overview:

A real-time system is a system in which the correctness of the system depends on the time when results are generated. Real-time systems interact with a more or less time-critical environment. Examples of real-time systems are control systems for cars, aircraft and space vehicles, manufacturing system, financial transaction systems, computer games and multimedia applications. This course is intended to give basic knowledge about methods for the design and analysis of real-time systems.

**Prerequisites Courses:** CSE-215: Data Structures

### Course outcomes(COs):

<b>On completion of this course, the students will have the ability to:</b>
CO1: learn Real-Time systems concepts and terminology
CO2: learn the design/performance issues in Real-Time Systems
CO3: examine and verify algorithms used to design Real-Time Systems
CO4: learn and apply resources reservation algorithm in operating systems

### Course Topics:

Contents	Lecture Hours
<b>UNIT 1 Introduction</b>	5
Application domains. Typical system requirements. Limits of traditional approaches. Task models. Typical timing constraints. Task Scheduling. Metrics for performance evaluation.	
<b>UNIT 2 Real-Time Scheduling Algorithms</b>	7
Algorithm taxonomy. Scheduling with precedence constraints. Scheduling periodic tasks. Utilization-based analysis. Response-time analysis.	
<b>UNIT 3 Protocols for Accessing Shared Resources</b>	8
The priority inversion phenomenon. Non-preemptive protocol, Highest Locker Priority, Priority Inheritance and Priority Ceiling Protocol. Stack Resource Policy. Estimating blocking times. Schedulability analysis under blocking times.	
<b>UNIT 4 Aperiodic Task Handling</b>	8
Fixed-priority servers (Polling, Deferrable and Sporadic Server). Dynamic priority servers (Total and Constant Bandwidth Server). Resource reservation for temporal isolation among multiple applications.	

<b>UNIT 5 Overload management</b>	8
Definition of computational load. Methods for overload handling. Admission Control. Robust Scheduling. Imprecise Computation. JobSkipping. Elastic scheduling. Handling overruns. Resource reservation mechanisms.	
<b>UNIT 6 Real-Time Communications</b>	4
Real-time flow control. Scheduling schemes for packet switched networks. Medium access protocols for broadcast networks. Resource reservation.	

**Textbook References:**

1. Jane W. S. Liu, “*Real-Time Systems*”, Prentice-Hall, Inc. 2000
2. G.C. Buttazo, “*Hard Real-time Computing Systems: Predictable scheduling algorithms and applications*”, Second edition, Springer, 1997.

**Evaluation Methods:**

Item	Weightage
Quiz/Assignment/Project/Attendance	30
Midterm	25
Final Examination	45

**Prepared By:****Last Update: June 24, 2016**