# Birla Institute of Technology & Science, Pilani, Hyderabad Campus

### First Semester 2021-2022

#### Course Handout: Part-II

  16/08/2021

In addition to Part-I (General Handout for all courses appended to the Time-Table) this document provides specific details regarding the course.

##### Course No.: BITS G553

**Course Title: REAL TIME SYSTEMS**

**Instructor-In-Charge: SOUMYA J**

**1. Description of the course:** Real time software, Real time operating systems-scheduling, virtual memory issues and file systems, real time data bases, fault tolerance and exception handling techniques, reliability evaluation, data structures and algorithms for real time/embedded systems, programming languages, compilers and run time environment for real time/embedded systems, real time system design, real time communication and security, real time constraints and multi processing and distributed systems.

2. Scope:

The course focuses on the basic theory of Real-Time systems, tools, and real time operating systems. Specifically, we discuss Real-Time Scheduling and validation, Real-Time communication, Real-Time Operating Systems, and Performance analysis and Optimization.

3. Objective:

Real-time systems need deterministic upper time-bound for the execution of a job. The objective of the course is to expose the students in characterization, design and validation issues of Real-time systems. After the completion of the course, students should be able to design complex real time systems using formal methods.

4. Text Books:

1. Jane Liu W. S.: Real-Time Systems, Pearson Education, India 2003

# 5. Reference books:

1. Laplante Phillip A.: Real-Time System Design and Analysis. Third Edition PHI 2005.
2. Krishna C.M. & Shin K.G.: Real-Time Systems, McGraw-Hill 1997

# 6. Course Plan and Learning Objectives

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| --- | --- | --- | --- | --- |
| **Module** | **Title** | **No of classes** | **Reference** | **Learning Objectives** |
| 1 | Typical real-time applications | 2 | Ch2-T1 | Understand several representative classes of real-time applications, the characteristics of the workloads generated by the applications and the relation between their timing and functional requirements |
| 2 | Reference model of Real-Time Systems | 4 | Ch3-T1 | Understand a reference model characterizing 1)a workload model ,2) a resource model and (3) algorithms that define how the application uses the resources at all times. |
| 3 | Approaches to Real-Time Scheduling | 4 | Ch4-T1 | Understand commonly used approaches for scheduling realtime systems |
| 4 | Clock-driven Scheduling | 4 | Ch5-T1 | Understand details of clock-driven scheduling its merits and de-merits. |
| 5 | Priority-driven Scheduling of periodic tasks | 4 | Ch6-T1 | Understand priority-driven algorithms for scheduling periodic tasks on a processor and examine the merits and de-merits. |
| 6 | Scheduling Aperiodic and Sporadic jobs | 4 | Ch7-T1 | Understand algorithms for scheduling aperiodic and sporadic jobs in a priority-driven system. |
| 7 | Resource Management | 4 | Ch8-T1 | Study resource contention affects on the  execution behavior and schedulability of jobs and study various resource access-control protocols . |
| 8 | Real time communications | 5 | Ch11-T1 | Study networking protocols with deterministic responses . |
| 9 | Real-Time Operating Systems (RTOS) | 5 | Ch12-T1 | Study operating systems supporting real-time  scheduling and resource management policies. POSIX is taken as example standard. |
| 10 | Advanced Topics | 4 | - | Research papers in the area of RTS. |

**7. Evaluation Scheme:**

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| **EC No.** | **Evaluation Component** | **Type** | **Duration** | **Weight** | **Date** |
| 1 | Mid Semester Test | Open Book | 90 minutes | **25% (75 M)** | To be announced |
| 2 | Assignments+ Lab+Project+Presentations | Open Book | - | **35% (105 M)** | To be announced |
| 3 | Comprehensive Exam | **Open Book** | 2 hours | **40% (120 M)** | To be announced |

**8. Make-up Policy:**

Prior Permission of the Instructor-in-Charge is required to take a make-up for any component. A make-up test shall be granted only in **genuine** cases. There will be no make-up for the project /term paper presentations.

**9. Chamber Consultation Hours:** To be announced in the class.

**10. Notices:** All notices will be posted on CMS.

**Academic Honesty and Integrity Policy:** Academic honesty and integrity are to be maintained by all the students throughout the semester and any mode of academic dishonesty will not be acceptable.

**Instructor-in-Charge**-

**BITS G553**