



NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

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| Name of the programme and specialization | M.TECH. DATA ANALYTICS | | |
| Course Title | REAL TIME SYSTEMS | | |
| Course Code | CS618 | No. of Credits | 03 |
| Course Code of Pre-requisite subject(s) | OS | | |
| Session/Semester | January 2022/ II Semester | Section (if, applicable) | - |
| Name of Faculty | B. SHAMEEDHA BEGUM | Department | CSE |
| Official Email | shameedha@nitt.edu | Telephone No. | 0431-2503215 |
| Name of Course Coordinator(s) (if, applicable) | - | | |
| Official E-mail | - | Telephone No. | - |
| Course Type (please tick appropriately) | <input checked="" type="checkbox"/> Core course | <input type="checkbox"/> Elective course | |

Syllabus (approved in BoS)

Unit – I

Introduction to real-time computing - Structure of a real-time system - Characterization of real-time systems and tasks - Performance measures.

Unit – II

Task Assignment and Scheduling - Uniprocessor scheduling algorithms - Task assignment - Mode changes - Fault tolerant scheduling.

Unit – III

Real-time Communication - Network topologies and architecture issues - Protocols - Contention-based, token-based, polled bus - Fault tolerant routing.

Unit – IV

Real-time Databases - Transaction priorities and aborts - Concurrency control issues - Scheduling algorithms - Two-phase approach to improve predictability.

Unit – V

Programming Languages and Tools - Hierarchical decomposition - Run-time error handling - Overloading - Timing specification - Recent trends and developments.



| COURSE OBJECTIVES | |
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| <ul style="list-style-type: none"> To study issues related to the design and analysis of systems with real-time constraints. To learn the features of Real time OS. To study the various Uniprocessor and Multiprocessor scheduling mechanisms. To learn about various real time communication protocols. To study the difference between traditional and real time databases | |
| MAPPING OF COs with POs | |
| Course Outcomes | Programme Outcomes (PO) (Enter Numbers only) |
| <ul style="list-style-type: none"> Knowledge about Schedulability analysis. | 1, 2 |
| <ul style="list-style-type: none"> Ability to learn Real-time programming environments. | 3, 4, 5 |
| <ul style="list-style-type: none"> Knowledge about real time communication and databases. | 6, 8 |
| <ul style="list-style-type: none"> Ability to develop real time systems. | 6, 8 |

| COURSE PLAN – PART II | | | |
|--|---------------------------|---------------------------------------|---------------------------------|
| COURSE OVERVIEW | | | |
| <p>The course addresses basic concepts of real-time systems, presents examples of real-time systems, covers real-time systems analysis and design, and gives an in-depth treatment of timing analysis and scheduling. The course is organized around the issue of real-time requirements and their impact on the architecture of a system. The considered system domain will be networked embedded. Topics include the description/application of real time systems, system architectures, programming concepts, inter-process communication and synchronization, real-time databases, and design methodology. Applications will be introduced using appropriate programming models or simulation tools.</p> | | | |
| COURSE TEACHING AND LEARNING ACTIVITIES | | | (Add more rows) |
| S.N o. | Week/Contact Hours | Topic | Mode of Delivery(Online) |
| 1 | 1/1 | Introduction to real-time systems | PPT |
| 2 | 1/1 | Structure of a real-time system | |
| 3 | 1/1 | Characterization of real-time systems | |
| 4 | 2/1 | Tasks | |
| 5 | 2/1 | Performance measures | |
| 6 | 2/1 | Performance measures | |
| 7 | 3/1 | Uniprocessor scheduling algorithms | |
| 8 | 3/1 | Uniprocessor scheduling algorithms | |
| 9 | 3/1 | Uniprocessor scheduling algorithms | |
| 10 | 4/1 | Problems | |
| 11 | 4/1 | Task assignment | |



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| 12 | 4/1 | Problems | PPT |
| 13 | 5/1 | Mode changes | |
| 14 | 5/1 | Fault tolerant scheduling | |
| 15 | 5/1 | Fault tolerant scheduling | |
| 16 | 6/1 | Problems | |
| 17 | 6/1 | Network topologies | |
| 18 | 6/1 | Architecture issues | |
| 19 | 7/1 | Protocols | |
| 20 | 7/1 | Contention-based | |
| 21 | 7/1 | Token-based | |
| 22 | 8/1 | Polled bus | |
| 23 | 8/1 | Problems | |
| 24 | 8/1 | Fault tolerant routing | |
| 25 | 9/1 | Transaction priorities | |
| 26 | 9/1 | Aborts | |
| 27 | 9/1 | Problems | |
| 28 | 10/1 | Concurrency control issues | |
| 29 | 10/1 | Scheduling algorithms | |
| 30 | 10/1 | Problems | |
| 31 | 11/1 | Scheduling algorithms | |
| 32 | 11/1 | Two-phase approach to improve predictability | |
| 33 | 11/1 | Hierarchical decomposition | |
| 34 | 12/1 | Run-time error handling | |
| 35 | 12/1 | Overloading | |
| 36 | 12/1 | Timing specification | |
| 37 | 13/1 | Recent trends and developments | |
| 38 | 13/1 | Problems | |
| 39 | 13/1 | Discussions | |

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

| S. No. | Mode of Assessments | Week / Date | Duration | % Weightage |
|--------|---|-------------------|----------|-------------|
| 1. | Cycle Test – 1-Online | As per Schedule | 1 Hr | 30 |
| 2. | Cycle Test – 2 - Online | As per Schedule | 1 Hr | 30 |
| 3. | Assignment -1 | Mid-week of April | 1 Week | 10 |
| CPA | Compensation Assessment *For absentees in CT1 or CT2 | As per Schedule | 1 Hr | 30 |
| 5. | Final Assessment - Online | | 2 Hours | 30% |



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| Total | 100% |
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| COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed) | |
| 1. Online feedback 2. Live feedback in the class | |
| COURSE POLICY (including compensation assessment to be specified) | |
| <u>MODE OF CORRESPONDENCE (email/ phone etc)</u> Email correspondence is preferable. | |
| <u>COMPENSATION ASSESSMENT</u> To be absent from cycle test 1 & 2 prior permission from the faculty is required. | |
| <u>ATTENDANCE POLICY :NA</u> | |
| <u>ACADEMIC DISHONESTY & PLAGIARISM</u> | |
| <ul style="list-style-type: none">➤ Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.➤ Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.➤ The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.➤ The above policy against academic dishonesty shall be applicable for all the programmes. | |
| ADDITIONAL INFORMATION, IF ANY | |
| Students can contact the faculty to clarify their doubts in person any time during working hours. | |
| FOR APPROVAL | |
| Course Faculty <u>B. Sharmila</u> | CC- Chairperson <u>Res. J.</u> HOD <u>P. S. J.</u> |