The LNMIIT, Jaipur Department of Electronics and Communication Engineering Real Time Operating Systems (ECE-XXXX)	LNMIIT The LNM Institute of Information Technology

Programme: B. Tech. (ECE)	Course Title: Real Time Operating Systems			Course Code: ECE-
Type of Course: Program Elective	Prerequisites: MICROI and Computer Programing			Total Contact Hours: 40
Year/Semester: 6	Lecture Hrs/Week: 3	Tutorial Hrs/Week: 0	Practical Hrs/Week: 0	Credits: 3

Learning Objective:

To serve real-time applications in modern consumer electronics devices, RTOS plays a significant role. Weather it is a smart watch, rover, or control system in an industrial production line, RTOS is functioning at the backend. This course will cover all the core concepts of real-time operating system design, followed by case studies and hands-on sessions. The student will be able to understand and design RTOS after completion of this course.

Course outcomes (COs):

On completion of this course, the students will have the ability to:		Bloom's Level
CO-1	To **define**, **explain** and examine core features of RTOS.	**1, 2, 4**
CO-2	To **recognize** and **evaluate**, principles and applications of RTOS	**1, 4**
CO-3	To **examine** and **demonstrate** various outcomes of the OS design	**3, 4**
CO-4	To **recognize** and **Implement** Process Synchronization and Task Scheduling	**1, 4**
CO-5	To **recognize** and **Implement** Resource Allocation and Kernel features	**1, 4**
CO-6	To **define**, **recognize** and **implement** System startup, Memory management features in RTOS	**1, 2, 3**

Topics	Lecture Hours	
UNIT – I (Introduction)		4
1.1 Introduction, Motivation and Overview	1	
1.2 Classification of operating systems	1	
1.3 Application of RTOS, components of Kernel	2	
UNIT – II (Task Scheduling)		13
2.1 Basic Task Scheduling, Cyclic executives	2	
2.2 Cyclic executives and event driven schedulers	2	
2.3 Rate Monotonic algorithm and deadlocks	2	
2.4 Process handling in RTOS	1	
2.5 Types of process and Interrupt Service Routines	2	
2.6 Round Robin, SJF, LST, EDF	4	
UNIT - III (Resource Allocation)		10
3.1 Semaphore and Mutex	2	
3.2 Message Queues and Mailboxes	2	

3.3 Resource Sharing among Real Time Tasks	3	
3.4 Priority handling and Highest Locker Protocol	3	
UNIT - IV Real Time Kernel		
4.1 Kernel Architecture	2	7
4.2 Hardware model and pooled loop systems	1	
4.3 Memory Management	2	
4.4 PCB and Microkernel	1	
4.5 RTOS Porting and design issues	1	
UNIT - V Bootstrap and Case studies		
5.1 System Start-up	1	7
5.2 Task Startup	1	
5.3 Analysis of PCP priority inversions	2	
5.4 Unix as RTOS and Yocto Project	2	
5.5 Android Environment	1	

Textbook References:

[1]. Qing Li, "Real Time concepts for Embedded Systems" CMP Books, 2003
[2]. Jim Cooling "Real Time Operating Systems: Book 1" — Independently published, 2017
[3]. Charles Crowley, "Operating Systems-A Design Oriented approach" McGraw Hill,1997

Reference books:

[1]. Karim Yaghmour, Building Embedded Linux System",O'reilly Pub,2003
[2]. Marko Gargenta,"Learning Android ",O'reilly 2011.

Additional Resources (NPTEL, MIT VEdio Lectures, Web resources etc):

[1]. Real Time Operating System by Prof. Rajib Mall, IIT Kharagpur Link: https://nptel.ac.in/courses/106/105/106105172/

Evaluation Methods:

Item	Weightage
Quiz1	10
Quiz2	
Project and Lab	20
Midterm	30
Final Examination	40

* Please note, as per the existing institute's attendance policy the student should have a minimum of 75% attendance. Students who fail to attend a minimum of 75% lectures will be debarred from the End Term/Final/Comprehensive examination.

CO and PO Correlation Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	1									2	3	1	
CO2	3	3	2									3	3	1	
CO3	3	3	2	1		1						3	2	1	
CO4	3	3	3	2								3	3	2	
CO5	3	2	3	2				1				2	2	2	
CO6	3	3	3	2								3	3	2	

Last Updated On: 27 May 2021
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Approved By: