

EMBEDDED REAL TIME OPERATING SYSTEMS

II Semester: ECE(ES)								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BESC16	ELECTIVE	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes:45			
I. COURSE OVERVIEW: This course is intended to provide overview of LINUX commands and approaches in the design of real-time operating systems. It covers design considerations, task scheduling, communication and synchronization. The knowledge acquired from this course will enable the students to develop real time operating systems in image processing, fault tolerant and control system applications.								
II. COURSE OBJECTIVES: The students will try to learn: I. The operating systems principles and implementation aspects of real time concepts in embedded systems. II. The design of real time operating system and digital integrated circuits (IC) at discrete and micro circuit level. III. The software development process and Vxworks and µCOS tools for real time operating system.								
III. COURSEOUTCOMES: After successful completion of the course, students should be able to:								
CO1	Outline the components of real time operating systems for the design of reliable embedded system.						Understand	
CO2	Interpret real time operating system to provide resource management and synchronization for communication systems.						Apply	
CO3	Identify Real-Time Clocks and System Clocks to keep tracks of current time and clock speeds.						Apply	
CO4	Construct memory management system for fragmentation and compaction.						Apply	
CO5	Examine hierarchical Timing Wheels to reduce timer overflow in single timing wheel and multiple timing wheels.						Analyze	
CO6	Analyze finite state machine for the task scheduling and execution in kernel models.						Analyze	
IV. SYLLABUS: MODULE – I:INTRODUCTION Introduction to UNIX/LINUX, overview of commands, file I/O (open, create, close, lseek, read, write),process control(fork, vfork, exit, wait,waitpid,exec). MODULE – II:REAL TIME OPERATING SYSTEMS Brief history of OS, defining RTOS, Scheduler, objects, services, characteristics of RTOS, defining a task,tasks states and scheduling, task operations, structure, synchronization, communication and concurrency, defining semaphores, operations and use, defining message queue, states, content, storage, operations and use. MODULE – III:OBJECTS, SERVICES AND I/O Pipes, event registers, signals, other building blocks, component configuration. Basic I/O concepts, I/O subsystem.								

MODULE – IV: EXCEPTIONS, INTERRUPTS AND TIMERS

Exceptions, interrupts, applications, Closer Look at Exceptions and Interrupts, processing of exceptions and spurious .

Interrupts, real time clocks, programmable timers, timer interrupt service routines, soft timers, Timing Wheels, operations.

MODULE – V: CASE STUDIES OF RTOS

RT linux, Micro C/OS-II, Vx works, embedded linux, tiny OS and basic concepts of android OS.

V. TEXT BOOKS:

1. QingLi, “RealTimeConceptsforEmbeddedSystems”, Elsevier, 1st Edition, 2011

VI. REFERENCE BOOKS:

1. Rajkamal, “Embedded Systems, Architecture, Programming and Design”, Tata McGraw Hill, 2nd Edition, 2003.
2. RichardStevens, “AdvancedUNIXProgramming”, Addison-WesleyProfessional, 3rd Edition, 2013.
3. Dr. Craig Hollabaugh, “Embedded Linux: Hardware, Software and Interfacing”, Addison Wesley, 1st Edition, 2002.

VII. WEB REFERENCES:

1. <http://nptel.ac.in/courses/106105036/>
2. <https://www.youtube.com/watch?v=rpdygqOI9mM>

VIII. E-TEXT BOOKS:

1. <https://xesoa.com/wp-content/uploads/2014/04/APUE-3rd.pdf>
2. <https://www.csie.ntu.edu.tw/~b98902107/Advanced%20Programming%20in%20the%20Unix%20Environment%20-%202.pdf>