REAL TIME SYSTEMS

I Semester: ES

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BESB04	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

This course introduces the foundation in the system concepts of distributed computing for widely used in small embedded systems. It covers basic system concepts, real time systems, real time communications, System design and CAN protocols. Through the knowledge of distributed embedded computing used to design and implement the prototype on embedded intelligence in an ever-growing array of application fields, and engineering disciplines.

II. COURSE OBJECTIVES:

The students will try to learn:

I. The process of real-time system design.
II. Use different scheduling algorithms for design of real time systems
III. The tools and programming language for development of real time systems.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO1	Illustrate the principles of real time computer systems for the system design to controls the environment.	Understand
CO2	Demonstrate the classifications of real time systems and its components for the design of reliable embedded system.	Understand
CO3	Select the suitable Time based triggered or event-triggered control strategies for stabilization of rate constrained in the distributed real time communication systems.	Apply
CO4	Summarize the fundamental aspects of real time operating system as, Task scheduling, Task management, Intertask communication, Process input/output to implement in the real time applications.	Understand
CO5	Identify the scheduling problems and algorithms to resolve it in order to design and implementation of dependable distributed embedded systems.	Apply
CO 6	Model a time-triggered architecture system for the use of a single interrupt and to activate any specific activity either hardware or software.	Apply

IV. SYLLABUS:

UNIT-I	INTRODUCTION	Classes: 09

Introduction, issues in real time computing, structure of a real time system, task classes performance measures for real time systems, estimating program run times, characteristics of real time systems, classification of real time systems, applications of real time systems, safety and reliability; Basic concepts of scheduling: Real time applications, basic concepts for real time task scheduling; Scheduling of independent tasks: Basic on-line algorithms for periodic tasks: Hybrid task sets scheduling.

UNIT-II	SCHEDULING IN REAL,TIME SYSTEMS	Classes: 09
Scheduling of dependent tasks: Tasks with precedence relations ships, tasks sharing critical resources, scheduling schemes for handling overload: Scheduling techniques in overload conditions, handling real time tasks with varying timing parameters, handling overload conditions for hybrid task sets. Multiprocessor scheduling: Introduction, first results and comparison with uni processor scheduling, schedulability conditions, scheduling algorithms.		
UNIT-III	**PROGRAMMING LANGUAGES AND TOOLS**	**Classes: 09**
Structures facilitating hierarchical decomposition, packages, run time (exception) error handling overloading and generics, multitasking. Low level programming, task scheduling, timing specifications, programming environments, run-time support, taxonomy of real time software architectures.		
UNIT-IV	**REAL-TIME SYSTEM DESIGN**	**Classes: 09**
General introduction to design of real time systems: Specification document, preliminary design, single program approach, foreground/background system, multi-tasking approach, mutual exclusion, monitors rendezvous; Real time system development methodologies: Yourdon methodology, Ward and Mellor method, Hatley and Pirbhai method; MASCOT: Basic features of MASCOT , General design approach textual representation of MASCOT designs, other features, Paisley System for real time software development. Design analysis: Petri Nets.		
UNIT-V	**FAULT TOLERANCE AND RELIABILITY EVALUATION TECHNIQUES**	**Classes: 09**
Fault tolerance techniques, fault types, fault detection, fault error containment, redundancy, data diversity, reversal checks, integrated failure handling. Reliability evaluation techniques: Obtaining parameter values, reliability models for hardware redundancy, software error models; Case studies: Advanced control in thermal power plants / current status of microcomputer applications in railway transportation systems.		

Text Books:

1. C.M. Krishna, Kang G. Shin, "Real-Time Systems", Mc Graw Hill International Editions, 1997.
2. Stuart Bennett, "Real-time Computer Control", Pearson Education Ltd,2nd Edition, 2012.

Reference Books:

1. Francis Cottet, Joelle Delacroix and Zoubir Mammeri, "Scheduling in Real-Time Systems", John Wiley & Sons Ltd., 2002.
2. Rajib Mall, "Real-Time Systems: Theory and Practice", Pearson Education.
3. Pittsburgh, "The Concise Handbook of Real-Time Systems", Time Sys Corporation, PA, 2002.
4. Spyros G Tzafestas and J K Pal, "Real Time Microcomputer Control of Industrial Processes", Kluwer Academic Publishers, the Netherlands, 1990.

Web References:

1. http://www.materialdownload.in/article/Real-Time-Systems_71/
2. http://nptel.ac.in/courses/106105036/2
3. http://www.nptelvideos.in/2012/11/real-time-systems.html
4. http://iiscs.wssu.edu/drupal/node/4450
5. http://faculty.cs.tamu.edu/bettati/Courses/663/Video/presentation.html