

PRINCIPLES OF DISTRIBUTED EMBEDDED SYSTEMS

I Semester: ECE(ES)								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BESC10	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 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. Design principles of real time systems and its classifications for the design of embedded system.
- II. The working environment of real time operating system for processes data and events that have time constraints.
- III. The CAN protocol and its standards to allow the all embedded devices to communicate with each other in a network.

III. COURSE VOUTCOMES:
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:

MODULE-I: REAL-TIME ENVIRONMENT (9)
Real-time computer system requirements, classification of real time systems, simplicity, global time, internal and external clock synchronization, real time model. Real time communication, temporal relations, dependability, power and energy awareness, real time communication, event triggered, rate constrained, time triggered.

MODULE-II: REAL-TIME OPERATING SYSTEMS (9)
Inter component communication, task management and dual role of time; Inter task interactions, process input/output, agreement protocols, error detection.

MODULE-III: SYSTEM DESIGN(9)

Scheduling problem, static and dynamic scheduling, system design.

Validation, time-triggered architecture.

MODULE-IV: INTRODUCTION TO CAN(9)

Introduction to CAN open CAN open standard, object directory, electronic data sheets and devices.

MODULE – V: CAN STANDARDS (9)

D Introduction to CAN open CAN open standard, object directory, electronic data sheets and devices.

V. TEXT BOOKS:

1. Hermann Kopetz, “Real-Time systems-Design Principles for distributed Embedded Applications”, Springer, 2nd Edition, 2011.
2. Glaf P. Feiffer, Andrew Ayre and Christian Keyold, “Embedded networking with CAN and CANopen”, Copperhill Media Corporation, 1st Edition, 2008.

VI. REFERENCE BOOKS:

1. Rajkamal, “Embedded System-Architecture-Programming-Design”, Tata McGraw Hill, 3rd Edition, 2011.
2. Frank Vahid, Tony Givargis, “Embedded System Design”, John Wiley and sons, 2nd Edition, 2002.
3. Lyla B Das, “Embedded Systems-An Integrated Approach”, Pearson, 1st Edition, 2013.
4. David E. Simon, “An Embedded Software Primer”, Pearson Education, 1st Edition, 1999.

VII. WEB REFERENCES:

1. <https://www.upf.edu/prae/en/3376/22580>.
2. https://onlinecourses.nptel.ac.in/noc20_cs16/preview
3. <https://www.coursera.org/learn/real-time-embedded-systems>.
4. <https://mitpress.mit.edu/books/real-time-embedded-systems>.
5. <http://www.apress.com>

VIII. E-TEXT BOOKS:

1. <http://infinity.wecabrio.com/1441982361-real-time-systems-design-principles-for-distribut.pdf>
2. https://do1-vbox1.web.tku.edu.tw/kVuxfO_real-time-systems-design-principles-fordistribut_XJQN.pdf