Subject Description Form

Subject Code	EE514
Subject Title	Real Time Computing
Credit Value	3
Level	5
Pre-requisite/ Co-requisite/ Exclusion	Nil
Objectives	1. To understand the properties of real time programming languages, operating systems and associated hardware. 2. To apply real time system technologies and concepts in engineering applications. 3. To demonstrate and realize advantages in real time system underlying in today advanced technological evolvements.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. Appreciate the important issues in real time computing systems, and their relations in engineering applications. b. Identify and understand the complications in a real time computing system. The mechanism of overcoming these obstacles is explored. c. Communicate effectively with concerned topics during discussions and presentations. d. Equip individual the ability to analyse related issues and identify the proper solution in a real-time computing design.
Subject Synopsis/ Indicative Syllabus	1. ***Real time computing systems concepts*****:** Characteristics of Real Time Computing. Properties and Speed Requirements of Real Time Systems. Synchronous Real Time Systems: Polled, Main Polled Loop with Interrupts, Cyclic Schedulers. Multi-Processors Real Time Systems: Multi-Processor Structures, Process Dispatch Latency, Inter CPU Communication, Hierarchical Approach to Real Time Systems. Process Scheduling Architecture of Cloud Computing. Example: A Real Time Control System in Coal-Fired Power Plant. 2. ***Real time systems design issues*****:** Time Handling: Representation of Time, Time constraints, Time Service and Synchronization, Real Time System Life Cycle: Requirement Specification. Real Time System Modelling Example: Cluster computing, Internet of things in power energy platform. 3. ***Real time system applications*****:** System supervision in Power System Process Operation. Implementation of IoT technology to resolve the real-time system operation issues. **Mini-Project:** Implementation of a real-time computing system based on the Real-time OS

Teaching/Learning Methodology

Lectures and tutorials are the primary means of conveying the basic concepts and theories. Experiences on design and practical applications are given through a mini-project, in which the students are expected to understand design problems with real-life constraints and to attain pragmatic solutions.

Teaching/Learning Methodology	Outcomes			
	a	b	c	d
Lectures	√	√	√	
Tutorials	√	√	√	
Mini-project	√	√	√	√

Assessment Methods in Alignment with Intended Learning Outcomes

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
		a	b	c	d
1. Examination	50%	√	√	√	
2. Test	15%	√	√	√	
3. Assignments	10%	√	√	√	
4. Mini-project	25%	√	√	√	√
Total	100%				

The outcomes on concepts, design and applications of real-time systems are assessed by the usual means of examination and test whilst those on analytical skills, problem-solving techniques and practical considerations, as well as technical reporting and teamwork, are evaluated by a mini-project.

Student Study Effort Expected

Class contact:	
▪ Lecture/Seminar	33 Hrs.
▪ Mini-project presentation demonstration	6 Hrs.
Other student study effort:	
▪ Mini-project	30 Hrs.
▪ Self-study	41 Hrs.
Total student study effort	110 Hrs.

Reading List and References

Reference books/materials:

1 Hermann Kopetz, Real-Time Systems: Design Principles for Distributed Embedded Applications, 2nd Ed., Springer, 2013

2. C.M.Krishna, K.G.Shin, Real-Time systems, McGraw-Hill, 2015

3. J.E. Cooling, Software Design for Real-time Systems, Chapman & Hall, 1991

4. J.A. Stankovic and K. Ramamritham, Advances in Real-Time Systems, IEEE Computer & Society Press, 1993

5. Selected papers from Proceedings of Real-time Systems Symnposium (IEEE)

6. Chris Moyer, Building Applications in the Cloud, Pearson Education, 2011