Academic Course Description

SRM University
Faculty of Engineering and Technology
Department of Electronics and Communication Engineering

EM2112 Real Time Systems

First Semester, 2013-14 (Odd semester)

Course (catalog) description

This is a course on the design and applications of all real time aspects of various system components, like OS, memory, communication and an introduction to reliability evaluation methods.

Compulsory/Elective course: Elective for Embedded students

Credit hours: 3 credits

Relationship to other courses

Pre-requisites	*:*	Nil
Assumed knowledge	*:*	concepts of real time systems and their analysis
Following courses	*:*	Nil

Class schedule : Four 50 minutes lecture sessions per week, for 11-12 weeks

Professional component

General	-	5%
Basic Sciences	-	5%
Engineering sciences & Technical arts	-	10%
Professional subject	-	80%

Broad area : | Signal Processing | System Design | VLSI | Embedded

Test Schedule

S. No.	Test	Portions	Duration
1	Test-1	Session 1 to 4	2 Periods
2	Test-2	Session 1 to 12	3 Hrs

Course objectives

- To study the basic of tasks and scheduling
- To understand programming languages and databases
- To analyze real time communication
- To analyze evaluation techniques and reliability models for Hardware Redundancy

- To understand clock synchronization

Syllabus Contents

UNIT I - INTRODUCTION TO TASK SCHEDULING (9 hours)

Introduction - Issues in Real Time Computing, Structure of a Real Time System, Task classes, Performance Measures for Real time Systems, Task Assignment and Scheduling – Classical uniprocessor scheduling algorithms, RM algorithm with different cases-Priority ceiling-precedence constraints- using of primary and alternative tasks.

UNIT II - UNI AND MULTI PROCESSOR SCHEDULING (9 hours)

Uniprocessor scheduling of IRIS tasks, Task assignment, Utilization balancing – Next fit- Bin packing- Myopic off-line - Focused addressing and bidding- Buddy strategy- Fault Tolerant Scheduling.-Aperiodic scheduling - Spring algorithm, Horn algorithm- Bratley. - Sporadic scheduling.

UNIT III - REAL TIME COMMUNICATION (9 hours)

Introduction – VTCSMA – PB CSMA- Deterministic collision resolution protocol- DCR for multi packet messages- dynamic planning based- Communication with periodic and aperiodic messages.

UNIT IV - REAL TIME DATABASES (9 hours)

Basic Definition, Real time Vs General purpose databases, Main Memory Databases, Transaction priorities, Transaction Aborts, Concurrency control issues, Disk Scheduling Algorithms, Two-phase Approach to improve Predictability, Maintaining Serialization Consistency, Databases for Hard Real Time System.

UNIT V - REAL-TIME MODELING AND CASE STUDIES (9 hours)

Petrinets and applications in real-time modeling, Air traffic controller system – Distributed air defense system.

References

1. C.M. Krishna, Kang G. Shin, *"Real Time Systems",* Tata McGraw - Hil, 2010.
2. Giorgio C. Buttazzo , *"Hard real-time computing systems: predictable scheduling algorithms and applications"* **,** Springer, 2008.
3. C. Siva Ram Murthy, G. Manimaran, *"Resource management in real-time systems and networks",* PHI, 2009.

WEEKLY TEACHING PLAN

Week #	Topics	Text / Chapter
1.	Introduction to task sheduling – Issues in Real Time Computing Structure of a Real Time System, Task classes, Performance Measures for Real Time Systems	[R1], Chap- 1 [R1],Section 2.2
2.	Task Assignment and Scheduling Classical uniprocessor scheduling algorithms, RM algorithm with different cases, Priority ceiling	[R1], Chap – 3 [R2],Section 4.3 [R2],Section 7.7
3.	Precedence constraints- using of primary and alternative tasks. Uniprocessor scheduling of IRIS tasks, Task assignment, Utilization balancing, Next fit, Bin packing Algorithm	[R1], Chap – 3 Assignment one
4.	Myopic off-line algorithm Focused addressing and bidding, Buddy strategy, Fault Tolerant Scheduling.	[R1], Chap – 3 [R3], Chap –10
5	Aperiodic scheduling ,Spring algorithm, Horn algorithm Bratley,Sporadic scheduling. Introduction to Real Time Communication VTCSMA	http://www.rtsj.org/docs/joyOfMIT.html [R2], Chap – 3 Assignment two
6.	PB CSMA, Deterministic collision resolution protocol, Deterministic collision resolution protocol, DCR for multi packet messages	[R3], Chap –10
7.	Dynamic planning based Communication with periodic messages. Communication with aperiodic messages. Real time Databases – Basic Definition, Real time Vs General Purpose	[R3], Chap –10 [R1], Chap – 5 Assignment Three
8.	Main Memory Databases Transaction priorities, Transaction Aborts,Concurrency control issues, Disk Scheduling Algorithms, Disk Scheduling Algorithms,	[R1], Chap – 5

Week #	Topics	Text / Chapter
9.	Two-phase Approach to improve Predictability, Maintaining Serialization Consistency, Maintaining Serialization Consistency Databases for Hard Real Time System.	[R1], Chap – 5 Assignment Four
10.	Real-time modeling-Introduction Petrinets and applications in real-time modeling, applications in real-time modeling, Case Study-Air traffic controller system	http://www.cs.uga.edu/~eileen/WebEffectiveness/Papers/PetriNetsAndIndustrialApplications.pdf [R3], Chap - 12
11.	Case Study-Air traffic controller system Air traffic controller system Case Study -Distributed air defense system. Distributed air defense system	[R3], Chap - 12 [R3], Chap - 11 Assignment Five
12.	Distributed air defense system	[R3], Chap - 11

Evaluation methods

Attendance	-	5%
Cycle Test	-	25%
Model Test	-	25%
Surprise Test	-	5%
Home Work	-	10%
Final exam	-	30%

Dated: December 30, 2013 **Revision No.:** 01 **Date of revision:** June 20, 2014

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