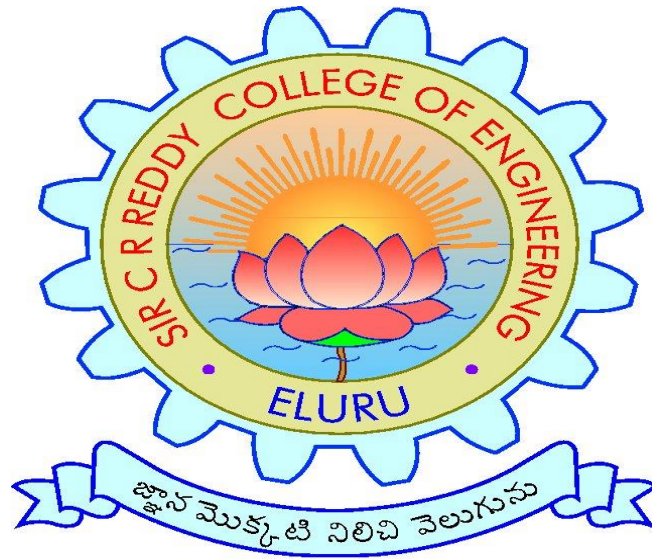


SIR C.R.REDDY COLLEGE OF ENGINEERING, ELURU

DEPARTMENT OF INFORMATION TECHNOLOGY

LESSON PLAN



SUBJECT: CSE 4.1.1 EMBEDDED SYSTEMS

CLASS: 4/4 B.Tech., I SEMESTER, A.Y.2019-20

INSTRUCTOR: T. Satya Nagamani

Sir C R Reddy College of Engineering
DEPT. OF INFORMATION TECHNOLOGY

Course Description:

This is a graduate course surveying topics in Embedded systems. It covers basic need of Embedded systems and features and working of them, Microprocessors role in embedded systems and their functionality with the operating systems loaded with and semaphores and RTOS functionality and debugging tools and techniques.

This course builds upon the topics covered in undergraduate operating systems course, such as process synchronization, inter process communication, and Semaphores, other topics such as Microprocessor working, bus configuration, interfacing, interrupts and handling. After a brief review, these topics are studied in the context of embedded systems.

Scope and objectives :

This course is built on the student's background in Embedded systems . It covers some basic perspectives of Operating Systems, Microprocessors and Programming concepts also. Incorporates and anticipates the major developments in Embedded systems.

Prerequisite:

Students are expected to know and understand the fundamentals of microprocessors, operating systems, basic programming languages as taught in an undergraduate course using a text such as *Embedded Software Primer by David.E.Simon*, *Operating System Concepts by Silberschatz & Galvin*, *Mastering C by Venugopal*, *OOAD by E.Bala Guruswamy* . Topics covered should include basics of microprocessors and interrupt handling by microprocessor, design and implementation of operating systems, file systems, and programming concepts.

Embedded Systems

Introduction to Embedded systems hardware needs; typical and advanced, timing diagrams, memories (RAM, ROM, and EPROM). Tri state devices, Buses, DMA, UART and PLD's. Built-ins on the microprocessor.

Interrupts basics, ISR; Context saving, shared data problem. Atomic and critical section, Interrupt latency.

Survey of software architectures, Round Robin, Function queue scheduling architecture, Use of real time operating systems.

RTOS, Tasks, Scheduler, Shared data reentrancy, priority inversion, mutex binary semaphore and counting semaphore.

Inter task communication, message queue, mailboxes and pipes, timer functions, events. Interrupt routines in an RTOS environment.

Embedded system software design using an RTOS. Hard real time and soft real time systems principles, Task division, need of interrupt routines, shared data.

Embedded software development tools. Host and target systems, cross compilers, linkers, locators for embedded systems. Getting embedded software into the target systems.

Debugging techniques. Testing on host machine, instruction set emulators, logic analyzers. In-circuit emulators and monitors.

Prerequisite

Operating systems, Microprocessors, Computer Organization and Electronic Devices

Internal Assessment Details:

The Assessment of a student's performance shall be evaluated as suggested below:

1. For theory subjects the distribution shall be 30 marks for Internal Evaluation And 70 marks for the End - Examinations.
2. Out of 30 internal marks, the division shall be as shown below:
 - internal i & internal ii $\frac{2}{3}$ rd of obtained marks plus assignment marks gives total 30 marks
 - each assignment carries 10 marks
 - take average of two internals

Total: 30 Marks

SIR C R REDDY COLLEGE OF ENGINEERING:: ELURU
DEPARTMENT OF INFORMATION TECHNOLOGY
COURSE SCHEDULE

The schedule for the whole course/subject is:

Unit No	Description of the Chapter	Description of the Topics	Total no of periods (L+T)
1	To Identify have a first look at Embedded Systems and some examples of Embedded systems	Introduction, Examples of ES	8+2
2	Typical Hardware needs	Hardware needed by Embedded systems other than normal desktop systems.	12
3	Hardware Fundamentals for the software engineer.	Terminology Gates Other basic information regarding hardware devices Timing diagrams Memory	4+2
4	Advanced Hardware Fundamentals	Microprocessors Buses Direct Memory Access Interrupts Other common parts like PAL, UART Built-ins on microprocessor	4+2
5	Interrupts basics	Microprocessor Architecture Interrupt Basics like ISR and	3

		context saving	
6	The Shared Data Problem	Atomic and Critical Section	2+2
7	Interrupt Latency	Interrupt Latency in Embedded Systems	1+1
8	Survey of Software architectures	Round Robin architecture Round Robin With Interrupts Architecture Function-queue Scheduling Architecture Real-Time Operating systems Architecture	2+1
9	Selecting an Architecture	Tips to be followed in selecting an architecture	2
10	Introduction to Real-Time Operating Systems	Tasks and Task States Tasks and Data	2
11	Shared data reentrancy and Semaphores	Semaphores and Shared Data	5+3
12	Intertask communication	Message Queues, Mail boxes and Pipes	3+2
13	Timer Functions	Timer Functions	1
14	Events	Events	2
15	Introduction to 8051 architecture	Microcontrollers Vs Microprocessors, architecture of 8051 microcontroller and programming model, registers	3+2
16	Instruction set	Instruction set of 8051	1
17	Programming	Different AL programs of 8051	2
15	Basic Design using RTOS	Overview	2+1

	Hard RTOS and soft RTOS principles, Task Division, need of Interrupts	Principles	
16	Embedded software development tools	Host and Target Machines Cross Compilers	3+2
17	Linkers, Locators for Embedded Systems	Linker/Locators for Embedded Software	2
18	Getting Embedded software onto the Target system	Getting Embedded software into the target system	3+2
19	Debugging Techniques	Testing on your Host Machine Instruction Set Simulators, Logic Analyzers, In-circuit Emulators ,Monitors	3+1
20	IOT introduction	History, architecture,M2M,Web of things	2
21	IOT communication	Protocols, layering architecture	1

Total no of instructional periods available for the course : 95 periods
Total no of estimated periods : 70 periods

Signature of the H.O.D

**Signature of the Faculty
Date:**

	<u>LECTURE PLAN</u>
DEPARTMENT	INFORMATION TECHNOLOGY
NAME OF LECTURER	T. Satya Nagamani

Expected (Planned) date of completion of the course:

Unit Number:1 30th June 2019

Unit Number: 2 15th July 2019

Unit Number: 3 30th July 2019

Unit Number: 4 15th August 2019

Unit Number: 5 2nd September 2019

Unit Number: 6 25th September 2019

Sl.No	Topics to be covered	No. of Lecture hours	Teaching method	Text book	CO Mapping
UNIT-1					
1	Introduction, Examples of ES	8+2	BB	TB1	
2	Hardware needed by Embedded systems other than normal desktop systems.	12	BB	TB1	
3	Terminology Gates Other basic information regarding hardware devices Timing diagrams Memory	4+2	PPT with LCD	TB1	
4	Microprocessors Buses Direct Memory Access	4+2	BB	TB1	

	Interrupts Other common parts like PAL, UART Built-ins on microprocessor				
5	Microprocessor Architecture Interrupt Basics like ISR and context saving	3	PPT with LCD	TB1	
6	Atomic and Critical Section	2+2	BB	TB1	
7	Interrupt Latency in Embedded Systems	1+1	BB	TB1	
8	Microcontrollers Vs Microprocessors, architecture of 8051 microcontroller and programming model, registers	3+2	BB	TB2	
9	Instruction set of 8051	1	BB	TB2	
10	Different AL programs of 8051	2	BB	TB2	
Actual date of completion:					
Remarks:					
UNIT-2					
9	Round Robin architecture Round Robin With Interrupts Architecture Function-queue Scheduling Architecture Real-Time Operating systems Architecture	2+1	BB	TB1	
10	Tips to be followed in selecting an architecture	2	PPT with LCD	TB1	
Actual date of completion:					

Remarks:					
UNIT-3					
11	Tasks and Task States Tasks and Data	2	BB	TB1	
15	Semaphores and Shared Data	5+3	PPT with LCD	TB1	
16	Message Queues, Mail boxes and Pipes	3+2	BB	TB1	
17	Timer Functions	1	BB	TB1	
18	Events	2	PPT with LCD	TB1	
Actual date of completion:					
Remarks:					
UNIT-4					
19	RTOS Overview Principles	2+1	BB	TB1	
Actual date of completion:					
Remarks:					
UNIT-5					
26	Host and Target Machines Cross Compilers	3+2	BB	TB1	
27	Linker/Locators for Embedded Software	2	BB	TB1	
28	Getting Embedded software into the target system	3+2	PPT with LCD	TB1	

29	Testing on your Host Machine Instruction Set Simulators, Logic Analyzers, In-circuit Emulators, Monitors	3+1	BB	TB1	
Actual date of completion:					
Remarks:					
UNIT-6					
30	IOT introduction	2	BB	TB3	
31	IOT communication	1	BB	TB3	
Actual date of completion:					
Remarks:					
	Total classes	95			
Actual syllabus completion:					
Faculty Remarks:					
HoD Remarks:					