Lesson Plan

Faculty : Dr. Sapna Prabhu

CLASS	BE Electronics, Semester VII
Academic Term	July 2018 – November 2018
Subject	**Embedded System Design EXC 701**

Periods (Hours) per week	***Lecture***	***4***	
Evaluation System		***Hours***	***Marks***
	End Semester Examination	3	80
	Internal Assessment (Average of Test 1 and Test 2)	--	20
	Oral/Practical Examination	--	-
	Term work	--	-
	Total	--	100

Time Table	***Day***	***Time***
	Tuesday	9.45 am -10.45 am
	Wednesday	8.45 am -9.45 am
	Thursday	9.45 am -10.45 am
	Friday	

Course Content and Lesson plan

Lecture No.		**Date**		**Topic**	**Remarks(If any)**
		Planned	**Actual**		
Module 1 : Fundamentals of Embedded System					
1	1.1	4-7-17	4-7-17	Core of the Embedded system, Memory	
2		5-7-17	5-7-17	Sensors (resistive, optical, position, thermal), Actuators (solenoid valves, relay/switch,Optocouplers), Communication Interface	

	3		6-7-17	6-7-17	Embedded firmware (RTOS, Drivers, Application programs), Power-supply (Battery technology, Solar)	
	4		7-7-17	7-7-17	PCB and Passive components, Safety and Reliability, Environmental issues. Ethical practice.	
	5	1.2	11-7-17	11-7-17	Characteristics and Quality Attributes (Design Metric) of Embedded system.	
	6		12-7-17	12-7-17	Real Time system requirements, Real Time issues, Interrupt Latency	
	7	1.3	13-7-17	13-7-17	Embedded Product Development life cycle, Program modeling concepts: DFG, FSM	
	8		14-7-17	14-7-17	Petri-net, UML	
	Module 4 : Embedded Software, Firmware Concepts and Design					
	9	4.1	18-7-17	18-7-17	Embedded C-programming concepts (from Embedded system point of view): Optimizing for Speed/Memory needs, Interrupt service routines, macros, functions	
	10		19-7-17	19-7-17	Modifiers, Data-types, Device Drivers, Multithreading programming. (Laboratory work on J2ME Java mobile application).	
	11	4.2	20-7-17	20-7-17	Basic Embedded C programs/applications for ARM-v7 using ARM-GCC-tool-chain	
	12		21-7-17	21-7-17	Emulation of ARM-v7 (e.g. using QEMU), and Linux porting on ARM-v7 (Emulation) board	
	13	4.3	25-7-17	25-7-17	Real time operating system: POSIX Compliance, Need of RTOS in Embedded system software	
	14		26-7-17	26-7-17	Foreground/Background systems, Multitasking, Context switching, IPC	
	15		27-7-17	27-7-17	Scheduler policies, Architecture of kernel, Task scheduler	

	16		28-7-17	28-7-17	ISR, Semaphores, mailbox, message queues,	
	17		1-8-2017	1-8-2017	Pipes, events, timers, memory management	
	18		2-8-17	2-8-17	RTOS services in contrast with traditional OS.	
	19	4.4	3-8-17	3-8-17	Introduction to μCOS-II RTOS, study of kernel structure of μCOS-II	**Assignment 1**
	20		4-8-17	4-8-17	Synchronization in μCOS-II, Inter-task communication in μCOS-II	
	21		8-8-17	8-8-17	Memory management in μCOS-II	
	22		9-8-17	9-8-17	Porting of RTOS on ARM-v7 (emulation) board	
	23		10-8-17	10-8-17	Application development using μCOS-II	
	24		11-8-17	11-8-17	Introduction Linux OS, Linux IPC usage, basic device (drivers) usage.	
	Module 2: Embedded Serial Communication					
	25	2.1	22-8-17	22-8-17	Study of basic communication protocols like SPI, SCI (RS232, RS485)	
	26		23-8-17	23-8-17	I_2C, CAN	
	27		24-8-17	24-8-17	Field bus (Profibus), USB (v2.0)	
	28		30-8-17	30-8-17	Bluetooth, Zig-Bee, Wireless sensor network	
	Module 3: Embedded Hardware and Design					
	29	3.1	31-8-2017	31-8-2017	Low power hardware design (MSP430 / Cortex-M3 based Real time clock and PWM dc motor control as a case study using on chip timers and watch-dog-timers).	
	30		1-9-2017	1-9-2017		
	31	3.2	5-9-2017	5-9-2017	Introduction to ARM-v7-M (Cortex-M3)	
	32		6-9-217	6-9-217	Comparison of ARM-v7-A (CortexA8), ARMv7-R (CortexR4), ARM-v7-M (Cortex-M3)	
	33		7-9-2017	7-9-2017		
	34		8-9-2017	8-9-2017		

	35	3.3	12-9-2017	12-9-2017	Direct digital solution using CPLD, FPGA, its advantages, and introduction to related development methodology	**Assignment 2**
	Module 5 : Simulation, Testing and Debugging Methodology and Tools					
	36	5.1	13-9-17	13-9-17	GNU Debugger (gdb), Boundary-Scan/JTAG interface concepts,	
	37		14-9-17	14-9-17	Black-box, White-box testing, Hardware emulation, Logic analyzer.	
	Module 6: Embedded System Designing					
	38	6.1	15-9-17	15-9-17	Requirement analysis, Hardware blocks diagram	
	39		19-9-17	19-9-17	System model (like FSM, UML), Software architectures (modules, drivers)	
	40		20-9-17	20-9-17	Component/hardware selection, covering following cases: Hard real time/ Mission critical: Missile	**Case studies**
	41		21-9-17	21-9-17	Car cruise control, Medical monitoring systems	
	42					
			22-9-17	22-9-17	Process Control system (Temp, Pressure)	
	43		26-9-17	26-9-17	Soft real time: Automated Vending machines, Digital camera, Media-player.	
	44		27-9-17	27-9-17	Communication: Embedded Web servers	
	45		28-9-17	28-9-17	Routers, Wireless (Sensor) networks.	
	46		29-9-17	29-9-17	Revision	

Recommended Books:

1. Embedded Systems, Rajkamal , TMH, 2008.
2. Frank Vahid - Embedded Systems , Wiley India, 2002
3. ARM System-on-Chip Architecture, Steve Furber - Pearson 2005
4. Jean J Labrose - MicroC / OS-II, Indian Low Price Edition 2002
5. DR.K.V.K.K. Prasad - Embedded / real time system, Dreamtech
6. Iyer, Gupta - Embedded real systems Programming , TMH
7. Embedded systems software primer, David Simon - Pearson
8. ARM System Developers Guide- Sloss, Symes, Wright, Elsevier Morgan Kaufman, 2005
9. LPC2148 Data Sheets www.arm.com
10. ARM Programmers /architectural manual.
11. MSP430 architectural manual.
12. Embedded Microcomputer Systems - Real Time Interfacing - Jonathan W. Valvano; Cengage Learning; Third or later edition.

Examination Scheme

Module		Lecture Hours	Marks distribution in Test		Approximate Marks distribution in Sem. End Examination
			Test 1	Test 2	
1	Fundamentals of Embedded System	08	07	05	15

2	Embedded Serial Communication	04	-	04	15
3	Embedded Hardware and Design	07		05	20
4	Embedded Software, Firmware Concepts and Design	16	13	06	40
5	Simulation, Testing and Debugging Methodology and Tools	02	-	-	10
6	Embedded System Designing	07	-	-	20

Internal Assessment (IA):

Two tests must be conducted which should cover at least 80% of syllabus. The average marks
of both the test will be considered for final internal assessment.

End Semester Examination:

1. Question paper will comprise of 6 questions, each of 20 marks.
2. Total 4 questions need to be solved.
3. Question No.1 will be compulsory and based on entire syllabus wherein sub questions of 2
to 5 marks will be asked.
4. Remaining question will be selected from all the modules.

Submitted By	**Approved By**
Dr. Sapna Prabhu	ii) Prof. K. Narayanan Sign:
Sign:	ii) Dr. Sapna Prabhu Sign:
	iii) Prof. Shilpa Patil Sign:
	iv) Prof. Monica Khanore Sign:
Date of Submission:	**Date of Approval:**
Remarks by PAC (if any)	