TCET
DEPARTMENT OF ELECTRONICS ENGINEERING (ETRX)

Credit Based Grading Scheme(Revised - 2012) - University of Mumbai

CBGS-2012(R)

TCET/FRM/IP-02/09			**Semester Plan (Theory)**				**Revision: A**
Semester: VII		**EXC701**					**Course: ETRX**
Subject: : EXC7054: : Embedded System Design							**Class: BE ETRX**
S. No.	**Prerequisite/ Bridge course:**			**Duration (Week /Hrs)**	**Modes of Learning**	**Recommended Sources**	
1	**Prerequisite: 1. Microprocessors and peripherals 2. Microcontroller Applications 3. Computer Organization** **Bridge course**: Design on IoT			20 hours	NPTEL on line Course	**Textbooks: RajKamal Home page**	

(Theory)

Semester: **VIII** **Course: BE-Electronics**

Subject: **Embedded System Design (ESD)** **Class: BE**

No. of Lectures as per syllabus (50)

Sr. N	Module No.	Lesson No.	Topics Planned (Technology to be used)	Teaching Aids Required	Planned/Completion Date	Module page	Resource Book Reference	Remarks
1	SOP	L1.1	L1.1	ESD (theory)	Power point presentation, Chalk & Board	12.07.17		
2	SOP	L1.2	L1.2	ESD (OBE)	Power point presentation, Chalk & Board	12.07.17		
3	SOP	L1.3	L1.3	ESD (pract)	Power point presentation, Chalk & Board	13.07.17		
4	1	2.1	**Chapter 1: Fundamentals of Embedded System** - Core of the embedded system, Memory	Black Board & Chalk, Power point presentation	19-07-2017	7-8	Module – 1 Chapter - 1	

							M8.1, 8.3	
5	1	2.2	Sensors (resistive, optical, position, thermal) and Actuators (solenoid valves, relay/switch,	Black Board & Chalk, Power point presentation	20/7/017	09-11	M1.8.4, 8.5	
6	1	2.3	Communication Interface, technology, Solar),	Black Board & Chalk, Ppts	21-07-2017	13-14	M1.8.6, 8.7, 8.8	
7	1	2.4	PCB and Passive components Safety and reliability, environmental	Black Board & Chalk, Ppts	24-07-2017	14	M 1.8.9, 8.10,8.11	
8	1	3.1	issues , Ethical practice Characteristics and quality attributes (Design Metric) of embedded system. Real time system's requirements, real time issues, interrupt latency.	Black Board & Chalk, Ppts	26-07-2017	17-23	M1.8.12,8.13, 8.14	
9	1	3.2	Embedded Product development life cycle, Program modeling concepts: DFG, FSM,	Black Board & Chalk, Ppts	27-07-2017	23-30	M1.8.15,8.16	
10	1	3.3	Petri-net, UML Revision on chapter 1 and online test	Black Board & Chalk, Ppts	28-07-2017	07-51		
11	2	3.4	**Chapter 2 - Embedded Serial Communication** Study of basic communication protocols like SPI, SCI (RS232, RS485), I^2C	Black Board & Chalk, Ppts	31-07-2017	52-56	Module – 2 Chapter - 2 M2.8.1,8.2,8.3	
12	2	4.1	CAN, Fieldbus	Black Board & Chalk, Ppts	02-08-2017	62-64	M2.8.4, 8.5,8.6	

			(Profibus), USB (v2.0)					
13	2	4.2	Bluetooth, Zig-Bee	Black Board & Chalk, Ppts	03-08-2017	66-67	M2.8.8, 8.9	
14	2	4.3	Wireless sensor network	Black Board & Chalk, Ppts	04-08-2017	79	M2.8.10	
15	2	4.4	Revision on chapter 2 and online Quiz	Black Board & Chalk, Ppts	07-08-2017	52-69		
16	3	5.1	**Chapter 3 - Embedded Hardware and Design** Low power hardware design - MSP430	Black Board & Chalk, Ppts	09-08-2017	70-74	Module – 3 Chapter - 3 M 3.8.1	
17	3	5.2	Low power hardware design Cortex-M3 based Real time	Black Board & Chalk, Ppts	10-08-2017	85-99	M3.8.1	
18	3	5.3	Low power hardware design Cortex-M3 based PWM dc motor control	Black Board & Chalk, Ppts	11-08-2017	85-99	M 3.8.1	
19	3	5.4	case study using on chip timers and watch-dog-timers	Black Board & Chalk, Ppts	14-08-2017	85-99	M 3.8.1	
20	3	6.1	Introduction to ARM-v7-M (Cortex-M3)	Black Board & Chalk, Ppts	16-08-2017	99-116	M 3.8.2	
21	3	6.2	Introduction to ARM-v7-M (Cortex-M3)	Black Board & Chalk, Ppts	18-08-2017	99-116	M 3.8.2	
22	3	6.3	Comparison of ARM-v7-A (CortexA8), ARMv7-R (CortexR4), ARM-v7-M (Cortex-M3)	Black Board & Chalk, Ppts	28-08-2017	117	M 3.8.3	

23	3	8.1	Comparison of ARM-v7-A (CortexA8), ARMv7- R (CortexR4), ARM-v7-M (Cortex-M3)	Black Board & Chalk, Ppts	28-08-2017	117	M 3.8.3	
24	3	8.2	Direct digital solution using CPLD, FPGA, its advantages, and introduction to related development methodology	Black Board & Chalk, Ppts	30-08-2017	118	M 3.8.4	
25	3	8.3	advantages of CPLD, FPGA over other technologies, introduction to related	Black Board & Chalk, Ppts	31-08-2017	118	M 3.8.4	
26	3	9.1	Revision on chapter 3 and online test	Black Board & Chalk, Ppts	01-09-2017	70-121		
27	4	9.2	**Chapter 4 -Embedded Software, Firmware Concepts and Design** Embedded C-programming concepts (from embedded system point of view):	Black Board & Chalk, Ppts	04-09-2017	122-134	Module – 4 Chapter - 4 M 4.8.1	
28	4	9.3	Optimization for Speed/Memory needs, Interrupt service routines, macros, functions, modifiers, data types	Black Board & Chalk, Ppts	06-09-2017	122-134	M 4.8.1	
29	4	9.4	Device drivers and Multithreading programming.	Black Board & Chalk, Ppts	08-09-2017	122-134	M 4.8.1	

30	4	10.1	Basic embedded C programs/applications for ARM-v7, using ARM-GCC-tool-chain,	Black Board & Chalk, Ppts	11-09-2017	135-143	M 4.7.2	
31	4	10.2	Emulation of ARM-v7 (e.g. using QEMU),	Black Board & Chalk, Ppts	13-09-2017	144	M 4.7.3	
32	4	10.3	Linux porting on ARM-v7 (emulation) board	Black Board & Chalk, Ppts	14-09-2017	148	M 4.7.4	
33	4	10.4	Real time operating system: POSIX Compliance , Need of RTOS in Embedded system software, Foreground /		15-09-2017	148-149	M 4.7.5	
34	4	11.1	Real time operating system:, multitasking, context switching, IPC	Black Board & Chalk, Ppts	18-09-2017	148-149	M 4.7.5	
35	4	11.2	Real time operating system: Scheduler policies, Architecture	Black Board & Chalk, Ppts	20-09-2017	148-149	M 4.7.5	
36	4	11.3	RTOS : message queues, pipes, events, timers, memory management, RTOS services in	Black Board & Chalk, ppts	21-09-2017	148-149	M 4.7.5	
37	4	11.4	Introduction to µCOS-II RTOS, study of kernel structure of µCOS-II, Synchronization in µCOS-II, Device drivers programming.	Black Board & Chalk, Ppts	22-09-2017	150-151	M 4.7.6	
38	4	12.1	Inter-task communication in µCOS-II, Memory management in µCOS-II	Black Board & Chalk, Ppts	25-09-2017	150-151	M 4.7.6	

39	4	12.2	porting of RTOS on ARM-v7 (emulation) board, Application developments using µCOSII.	Black Board & Chalk, Ppts	27-09-2017	150-151	M 4.7.6	
40	4	12.3	Introduction Linux OS, Linux IPC usage, basic device (drivers) usage	Black Board & Chalk, Ppts	27-09-2017	150-151	M 4.7.6	
41	4	12.4	Revision on chapter 4 and online test	Black Board & Chalk, Ppts	28-09-2017	122-154		
42	5	13.1	**Chapter 5 - Simulation, Testing and Debugging Methodology and Tools** GNU Debugger (gdb), Boundary-Scan/JTAG interface concepts	Black Board & Chalk, Ppts	29-09-2017	155	Module – 5 Chapter - 5 M 5.7.1,7.2	
43	5	13.2	Black-box, White-box testing,	Black Board & Chalk, Ppts	04-10-2017	160	M 5.7.3	
44	5	13.3	Hardware emulation, logic analyzer	Black Board & Chalk, Ppts	05-10-2017	162, 163	M 5.7.4, 7.5	
45	5	14.1	Revision on chapter 5 and online test	Black Board & Chalk, Ppts	06-10-2017	155-168		
46	6	14.2	**Chapter 6 -Embedded System Designing –** Requirement analysis, Hardware blocks diagram, System model (like FSM, UML)	Black Board & Chalk, Ppts	11-10-2017	169	Module – 6 Chapter - 6 M 6.7.1	

47	5	14.3	Software architectures (modules, drivers), and Component/hardware selection	Black Board & Chalk, Ppts	11-10-2017	170	M 6.7.2	
48	5	15.1	cases study: Hard real time / Mission critical: Missile, Car cruise control, medical monitoring systems process control system (temp, pressure)	Black Board & Chalk, Ppts	12-10-2017	171	M 6.7.3	
49	5	15.2	Soft real time: Automated vending machines, digital Communication: Embedded web serverscamera, media-player routers, Wireless (sensor) networks.	Black Board & Chalk, Ppts	13-10-2017	171	M 6.7.3	
50	6	15.3	Revision on chapter 6 and online test	Black Board & Chalk, Ppts	16-10-2017	172	M 6.7.4	
Remark:			Syllabus Coverage:		Practice Session:		Beyond Syllabus:	
Course:								
		No. of (Lectures planned)/ (Lecture taken): 51 /						

Note:

1. Plan date and completion date should be in compliance
2. Courses are required to be taught with emphasis on resource book, course file, text books, reference books, digital references etc.
3. Planning is to be done for 15 weeks where 1st week will be SOP, 2nd -13th for effective teaching practice session and semester consolidation.
   and 14th -15th week for effective university examination oriented teaching, mock
4. According to university syllabus where lecture of 4 hrs/per week is mentioned minimum 55 hrs and in case of 3 lectures per week minimum 45 lectures are to be engaged are required to be engaged during the semester and therefore accordingly semester planning for delivery of theory lectures shall be planned.

5. In order to improve score in NBA, faculty members are also required to focus course teaching beyond university prescribed syllabus and measuring the outcomes w.r.t learning course and programme objectives.
6. Text books and reference books are available in syllabus. Here only additional references w.r.t. non –digital/ digital sources can be written (if applicable)
7. Technology to be used in class room during lecture shall be written below the topic planned within the bracket.

Text 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

Reference Books:

8. ARM System Developers Guide- Sloss, Symes, Wright, ElsevierMorgan Kaufman,
9. LPC2148 Data Sheets www.arm.com
10. ARM Programers/architectural manual.
11. MSP430 architectural manual.
12. Embedded Microcomputer Systems – Real Time Interfacing – Jonathan W. Valvano; Cengage Learning; Third or later edition.

Digital Reference:

1. https://onlinecourses.nptel.ac.in/explorer
2. www.circuitstoday.com/8051-microcontroller
3. electronicsforu.com/microcontroller-projects-ideas
4. https://www.arm.com
5. ARM Processor - nptel
6. www.TI.com

Name & Signature of Faculty Signature of HOD Signature of Principal/Dean (Academic)

Date: Date: Date: