Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
TEITC503	Microcontroller and Embedded Systems	4	-	-	4	-	-	4
		Examination Scheme						
		ISE	MSE	ESE				
		10	30	100 (60%Weightage)				

Pre-requisite Course Codes	IT42 (Computer Organization and Architecture)	
After successful completion of the course, student will be able to:		
Course Outcomes	CO1	Discuss the basics of embedded systems.
	CO2	Recognize the basics of organizational and architectural issues of a microcontroller.
	CO3	Experiment the programming techniques used in microcontroller.
	CO4	Demonstrate basic concept of ARM processor.
	CO5	Discuss the fundamentals of embedded/real time operating system.

Module No.	Topics	Ref.	Hrs.
1	**Introduction to Embedded Systems:** Overview of Embedded System Architecture, Application areas, Categories of embedded systems, specialties of embedded systems. Recent trends in embedded systems. Brief introduction to embedded microcontroller cores CISC, RISC, ARM, DSP and SoC	3,W1	6
2	**The Microcontroller Architecture:** Introduction to 8051 Microcontroller, Architecture, Pin configuration, Memory organization, Input /Output Ports, Counter and Timers, Serial communication, Interrupts	1,W1	8
3	**Assembly Language Programming of 8051:** Instruction set, Addressing modes, Development tools, Assembler Directives, Programming based on Arithmetic & Logical operations, I/O parallel and serial ports, Timers & Counters, and ISR	1,W1	10
4	**ARM 7 architecture:** Architectural inheritance, Detailed study of Programmer's model, ARM Development tools, Instruction set: Data processing, Data transfer, Control flow. Addressing modes. Writing simple assembly language programs. Pipelining, Brief introduction to exceptions and interrupts handling.	5,W1	10

5	**Embedded / Real Time Operating System:** Architecture of kernel, Task and Task scheduler, Interrupt service routines, Semaphores, Mutex, Mailboxes, Message queues, Event registers, Pipes, Signals, Timers, Memory management, Priority inversion problem. Off-the-Shelf Operating Systems, Embedded Operating Systems, Real Time Operating System (RTOS) and Handheld Operating Systems.	3,4	8
6	**Embedded System - Design case studies:** Digital clock, Battery operated smart card reader, Automated meter reading system, Digital camera.	W1	6
	Total hours of instructions		48

References:

1. M. A. Mazidi, J. G. Mazidi, R. D.McKinlay ,"*The 8051 microcontroller & Embedded systems*", Pearson.
2. Kenneth J. Ayala, Dhananjay V. Gadre ,"*The 8051 microcontroller & Embedded systems*", Cengage Learning
3. Dr. K.V. K. K. Prasad,"*Embedded / real – time systems: concepts, design & programming*", Black Book, Reprint edition 2013, Dreamtech press,
4. Shibu K. V., "*Introduction to embedded systems*", McGraw Hill
5. Steve Furber,"*ARM System on chip Architecture*", 2nd edition, Pearson.
6. Laya B. Das,"*Embedded systems an integrated approach*", Third impression, 2013, Pearson,
7. Andrew N. Sloss, Dominic Symes, Chris Wright,"*ARM system developer's guide*", Morgan Kaufmann Publishers.
8. Frank Vahid, Tony Givargis," *Embedded system design A Unified hardware/software Introduction"*,Wiely
9. ARM Technical Reference manual.

WEB REFERENCE:

W1: www.nptel.ac.in