GUJARAT TECHNOLOGICAL UNIVERSITY

ELECTRONICS & COMMUNICATION (WIRELESS COMMUNICATION TECHNOLOGY) (44)
EMBEDDED SYSTEM AND ITS APPLICATIONS
Subject Code: 2724410
M. E. Semester – II

Type of course: Open Elective

Prerequisite: The fundamental of Analog Electronics, Digital Electronics, Concept of Microprocessors (8085 / 8086) and basic knowledge of Computer

Rationale: This Subject provides the concept of Embedded System Design by understanding various microcontrollers, programming skills and operating systems. This subject covers sufficient knowledge in all aspects to design own Small Scale Embedded Systems.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks		Practical Marks				
				ESE (E)	PA (M)	ESE (V)		PA (I)		
						ESE	OEP	PA	RP	
3	2#	2	5	70	30	20	10	10	10	150

Content:

Sr.No.	Course Contents	TotalHrs	% Weightage
1	**Introduction to Embedded Systems :** Definition of Embedded System, Embedded Systems Vs General Computing Systems, Embedded Hardware units and Devices in System, Embedded Software in a System, Design Process in Embedded Systems, Classifications of Embedded Systems, Examples of Embedded Systems.	4	8-10
2	**Platforms For Embedded System Design :** **(a) 8051 Architecture:** Architecture, Memory Organization, Addressing Modes, Instruction Set, Timers, Interrupts, I/O Ports, Interfacing I/O Devices, Serial Communication, KEIL IDE. **(b) PIC Architecture (16F Series):** Architecture, Memory Organization, Addressing Modes, Instruction Set, Timers, Interrupts, I/O Ports, Interfacing I/O Devices, Serial Communication, MPLAB.	11	30-32
3	**Programming the Embedded Systems :** Introduction to Assembly and Embedded C Language, Introduction to KEIL IDE and MPLAB IDE, Basics of Embedded C --Data types, Looping, Functions, Array, String, Pointers, I/O Programming in C, Arithmetic & Logical Operations in C, Data Serialization in C, Data Conversion in C etc.	10	30 - 32
4	**Embedded System Design – Case Study :** Interfacing LCD Display, Keypad Interfacing, ADC, DAC and Sensor Interfacing, DC Motor Control with PWM Generation, UART Interfacing, RTC interfacing, I2C Bus Interfacing	7	20 - 22
5	**Fundamentals of Operating Systems :** Overview of OS Services and Goals, Various types of Real Time Operating Systems, Real Time Vs Conventional Operating Systems,	4	8 - 10

	Introduction to Embedded Operating Systems		

Reference Books:
1. Embedded Systems By Raj Kamal, Second Edition, Tata McGraw-Hill
2. The 8051 Microcontroller and Embedded Systems By Muhammad Ali Mazidi, Janice G. Mazidi and Rolin D. McKinlay, Prentice Hall, 2005.
3. PIC Microcontroller and Embedded Systems using Assembly and C for PIC18 By Muhammad Ali Mazidi, Rolin D. Mckinlay, Danny Causey, Pearson Education 2008
4. The 8051 Microcontroller Architecture, Programming & Applications.
5. PIC Microcontroller Project Book By John Iovine, McGraw Hill 2000

Course Outcome:
1. Understand Embedded Systems and its need in today's electronics world.
2. Understand the detailed concepts of 8051 and PIC series of 8-bit Microcontrollers which is mostly used for controlling applications.
3. Learn the programming of microcontrollers with various dedicated compilers with 'C'Language.
4. To Understand the basic concepts of Operating Systems.
5. To Get a Complete Design Flow of Embedded System Design with Hardware and Software Designing.

List of Experiments:
Based on syllabus

Open Ended Problems:

1. Design system using PIC microcontroller which generates maximum number of PWM signals with maximum supported frequency, two edges controlled and precise control over duty cycle individually.
2. Design system using PIC microcontroller for real time Analog Signal Processing Link using ADC and DAC. (which provides low cost solution of DSP for specific applications)

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website.