GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering Power Electronics
Subject Code: 3722906
Semester – II
Subject Name: EMBEDDED SYSTEMS

Type of course:

Prerequisite: Assembly and C language.

Rationale: PG Students of Power Electronics Engineering need to possess good understanding of the fundamentals and applications of Embedded System as it is an emerging field.

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)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	• Embedded systems description, definition, design considerations & requirements • Embedded processor selection & tradeoffs , embedded design life cycle • Embedded Micro controller Cores, Embedded memories, SRAM, DRAM Controllers • Embedded System Design Aspects, Custom single-purpose processor, General - purpose processor, standard single purpose processor, its basic architecture, operation and design.	8
2	8051 micro-controller: • Assembly language programming and C programming, instruction set, interrupts, timers, memory, I/O ports, serial communication, interfacing, keyboard, LED display, external memory, DC, DAC, LCD, RTC.	8
3	Real Time system: • Introduction, interrupt driven system, context switching • scheduling, round robin, rate monotonic, foreground and background process, inter task communication • buffering data, semaphores-deadlock-process stack management • dynamic allocation, response time calculation, interrupt latency.	8
4	• RISC concepts, PIC (16F72) processor- architecture • elementary programming, interrupts, timers ,memory, I/O ports, SPI, I2C bus • A/D converter, USART, PWM, interfacing • Modems, USB, Introduction to JTAG Port.	8
5	• Measurement of analog and electrical variables, control of electrical devices	8

	• User interface in embedded systems, data communication in embedded systems. • Case study of Embedded Applications.	

Reference Books:

1. Mazidi, "Embedded systems design using 8051 microcontroller", Pearson.
2. Frank Vahid and Tony Givargis, "Embedded system design", Wiley –India.
3. J. W. Valvo, "Embedded Micro computer system", Brooks.
4. Philip a Laplante, "Real time system design and analysis", PHI.
5. Lyla B. Das, "Embedded systems-An Integrated Approach", Pearson-2013.

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	To understand the concept of embedded system design and its application in different design and product	25
CO-2	To understand architecture and working of processor with functionalities of each block inside the processor.	20
CO-3	To understand multitasking environment and development tools	20
CO-4	To understand Interface peripherals with the board.	20
CO-5	To understand different communication protocols	15

List of Experiments:

1. To write an assembly language program to add, subtract, multiply, divide 16 bit data for microcontroller.

2. To study and analyze the interfacing of 16 x 2 LCD.

3. To study of implementation, analysis and interfacing of seven segment display.

4. To study of implementation of steeper motor angle control.

5. To study of Programming and Transmission and Reception of data through serial port.

6. To write an assembly language program to generate 10 KHz frequency using interrupt.

7. To study of implementation of DC Motor control using PWM method.

8. To study implementation and programming of Temperature measurement.

9. To study real time operating system.

10. To study analog to digital converter.

Major Equipment:

- ✓ Simulation software like MATLAB along with necessary toolbox, PSIM or Scilab,

- ✓ Micro-controller/DSP/ARM Controller trainer kit.

List of Open Source Software/learning website:
1. http://www.freertos.org/
2. http://ecos.sourceware.org/
3. https://www.kernel.org/
4. http://www.embeddedcraft.org/listrtos.html
5. www.embedded.com