GUJARAT TECHNOLOGICAL UNIVERSITY

COMPUTER ENGINEERING (SOFTWARE ENGINEERING) (02)
EMBEDDED SYSTEM
SUBJECT CODE: 2720212
SEMESTER: II

Type of course: Elective

Prerequisite: NA

Rationale: NA.

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#	0	4	70	30	30	0	10	10	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	Introduction -Embedded Systems Overview, Design Challenge — Optimizing Design Metrics, Processor Technology, IC Technology, Design Technology, Trade-offs	6	10
2	Custom Single-Purpose Processors: Hardware- Introduction, Combinational Logic, Sequential Logic, Custom Single-Purpose Processor Design, RT-Level Custom Single-Purpose Processor Design, Optimizing Custom Single-Purpose Processors, Custom Single-Purpose Processor Design, RT-Level Custom Single-Purpose Processor Design, Optimizing Custom Single-Purpose Processors, Optimizing the Original Program, Optimizing the FSMD, Optimizing the Datapath Optimizing the FSM	8	20
3	General-Purpose Processors Software Introduction, Basic Architecture, Operation, Programmer's View, Development Environment, Application-Specific Instruction-Set Processors (ASIPs), Selecting a Microprocessor, General-Purpose Processor Design,	6	15
4	Standard Single-Purpose Processors Peripherals- Introduction, Timers, Counters, and Watchdog Timers, UART, Pulse Width Modulators, LCD Controllers, Keypad Controllers, Stepper Motor Controllers, Analog-to-Digital Converters, Real-Time Clocks	6	10
5	Memory Introduction, Memory Write Ability and Storage Permanence, Common Memory Types, Composing Memory, Memory Hierarchy and Cache, Advanced RAM	4	5
6	Interfacing – Introduction, Communication Basics, Microprocessor Interfacing: I/O Addressing- Interrupts and Direct Memory Access, Arbitration, Multilevel Bus Architectures, Advanced Communication	4	10

	Principles, Serial Protocols, Parallel Protocols		
7	The 8051 Microcontrollers- Microcontrollers & Embedded Processors, Overview of 8051 family, Real World Interfacing	4	10
8	8051 Assembly Language Programming- Inside the 8051,Introduction to 8051 Assembly Programming, Assembling and running 8051 Program, The Program Counter and ROM space in the 8051, Data Types and Directives, 8051 flag bits and the PSW register, 8051 register banks and stack	3	10
9	Real Time Systems Basics of Real Time Systems, types and working of Real Time systems	2	5

Reference Books:
1. Embedded System Design: A Unified Hardware / Software Introduction By Frank Vahid and Tony Givargis, (WILEY-INDIA III Edition)
2. The 8051 Microcontroller and Embedded Systems : Using Assembly and C By M.A. Mazidi, J.G. Mazidi & R.D. McKinlay (Pearson Education II Edition)
3. Embedded Systems: Architecture, Programming And Design By Raj Kamal (TMH Publication III Edition)

Course Outcome:
After learning the course the students should be able to:

1. Understand embedded systems
2. For embedded systems it will enable you to :
3. Understand the basics of an embedded system
4. Basic level Programming skill of an embedded system
5. Design, implement and test an embedded system.

List of Tutorials:

1. Design with 8 bit Microcontrollers 8051/PIC Microcontrollers
   i)   I/O Programming, Timers, Interrupts, Serial port programming
   ii)   PWM Generation, Motor Control, ADC/DAC, LCD and RTC Interfacing, Sensor Interfacing
   iii)   Both Assembly and C programming
2. Design with 16 bit processors
   I/O programming, Timers, Interrupts, Serial Communication,
3. Design with ARM Processors.
   I/O programming, ADC/DAC, Timers, Interrupts,
4. Electronic Circuit Design of sequential, combinational digital circuits using CAD Tools
5. Programming with DSP processors for
   Correlation, Convolution, Arithmetic adder, Multiplier, Design of Filters -   FIR based , IIR based
6. Design with Programmable Logic Devices using Xilinx/Altera FPGA and CPLD
7. Design and Implementation of simple Combinational/Sequential Circuits
8. Network Simulators Simple wired/ wireless network simulation using NS2
9. Study of one type of Real Time Operating Systems (RTOS)

List of Open Source Software/learning website:

- Berkeley Design technology, Inc.: http://www.bdti.com
- Embedded Systems Tutorial: http://www.learn-c.com/
  Embedded Linux Journal: http://embedded.linuxjournal.com
- Embedded.com: http://www.embedded.com/

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.