Course Name	: Electronics Engineering Group
Course Code	: ET/EN/EX/EJ/IE/IS/IC/DE/EV/MU/IU/ED/EI
Semester	: Sixth for ET/EN/EX/EJ/IE/IS/IC/DE/EV/MU and Seventh for IU/ED/EI
Subject Title	: Embedded System
Subject Code	: 17658

Teaching and Examination Scheme:

Teaching Scheme				Examinati	on Scheme		(
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03		02	03	100	50#		25@	175

NOTE:

- > Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.
- > Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW).

Rationale:

In the age of computer we are surrounded by the Embedded System - at home, office, colleges, canteen, toys, cell phones, transit, aerospace technology, military application. Out of millions of processor manufactured every year, nearly 95% processors are used in Embedded System. The Embedded Systems design is with or without OS. Most of them are Real Time Embedded Systems.

Due to such tremendous growth of Embedded Systems in recent years, one needs to be familiar with its design aspects, characteristics. Also the knowledge and programming of Real Time Embedded System is must. This subject is the advanced part of the subject Microcontroller.

General Objectives:

- 1. Differentiate and decide the architectures of processors for application.
- 2. Define communication media.
- 3. Design and development of small Embedded Systems.
- 4. Development of software.
- 5. Understand architecture of RTOS.

Learning Structure:

Application



Theory:

Topic and Contents	Hours	Marks
Topic 1: Architecture of Microprocessor and Microcontroller		
Specific Objectives:		
Study of Architecture of microcontroller 89C51.		
Distinguish Microprocessor and Microcontroller architectures.		
Contents:		
1.1 Architecture of Microcontroller 89C51		
GPR, SFR		
Address, Data & Control bus generation.		
Memory structure (Data and Program memory)		0.0
• IO Ports, Interrupts,	08	08
Timer/Counter, Serial Communication		
1.2 Block diagram and description of architectures of Processors:		
Von Neumann		
Harvard		
• RISC		
• CISC		
• DSP		
Multi Core Processor		
Tonic 2: Programming Microcontroller 89C51 with 'C'		
Use Integrated Development Tools		
 Develop Program logic with 'C' 		
Contents:		
2.1 Software Development Tools: Operation and selection (08 Marks)		
Integrated Development Environment (IDE): Cross-Complier		
Emulator and Flash/OTP Programmer		
• In-Circuit Emulator (ICE) debugger ITAG nort		
Embedded C: Assembly Language V/S Embedded C		
 Programming Microcontroller 80C51 with C 		
• 1 Togramming Wierocontroller 89C51 with C. • (C' Compiler for Microcontroller 80C51: SPI Systems, Keil	10	24
C Completific for Microcontroller 89051. St J Systems, Ken	12	24
• Flogramming with 'C': (16 Marks)		
2.2 I logramming with C . (10 Marks)		
Input/output operations Dit/Dute experations		
• Bit/Byte operations.		
• Arithmetic and Logical operations on data.		
• Time delay routines.		
• Timer/Counter operations.		
• Generation of patterns on port lines.		
• Serial Communication.		
• Use of Assembly Instruction in 'C' program.		
Topic 3: Communication Protocols		
Use of communication modes and protocols.		
Contents:		
• Need of communication interface in embedded system.		
• Serial V/S Parallel Communication, Synchronous V/S Asynchronous	06	16
Communication	ſ	
• RS232: DB9-pin functions, MAX 232, MAX 233, Microcontroller	ſ	
8051 connection with RS232 and RS485	ſ	
Communication protocols		

 Parallel Communication Protocol: PCI, PCI-X Wireless Communication Protocol: IrDA, Bluetooth, Zigbee, IEEE802.11 Topic 4: I/O interfacing Interface different devices to Microcontroller 89C51. Develop logic of program to work with different devices. Contents: Interfacing Keys, LEDs and relay and its programming with 'C'. Interfacing LCD and its programming with 'C'. Interfacing ADC and its programming with 'C'. Interfacing ADC and its programming with 'C'. Interfacing BCD and its programming with 'C'. Interfacing DC and its programming with 'C'. Interfacing BCC and its programming with 'C'. Interfacing BCM dotor and its programming with 'C'. Interfacing DC Motor and its programming with 'C'. Interfacing DC Matacteristics of embedded system. Classify and specify characteristics of Embedded System: Processor power, memory operating system, Reliability, performance, power consumption, NRE cost, unit cost, size, flexibility, time-topprotype, time-to-market, maintainability, corr	• Serial Communication Protocol: I2C, CAN, USB, Serial Peripheral Interface (SPI) Synchronous Serial Protocol (SSP)		
 Wireless Communication Protocol: IrDA, Bluetooth, Zigbee, IEEE802.11 Topic 4: I/O interfacing Interface different devices to Microcontroller 89C51. Develop logic of program to work with different devices. Contents: Interfacing matrix keyboard and its programming with 'C'. Interfacing DCD and its programming with 'C'. Interfacing DC and its programming with 'C'. Interfacing DC Motor and its programming with 'C'. Interfacing DC Motor and its programming with 'C'. Interfacing DC Motor and its programming with 'C'. Topic 5: Embedded System Design Classify and specify characteristics of embedded system. Contents: Classification of Embedded System: Small scale, medium scale, sophisticated, stand-alone, reactive/real time (soft and hard real time), Networked, Mobile, Single functioned, Tightly constrained, Design Metrics/Specifications/Characteristics of Embedded System: Processor power, memory, operating system, Reliability, performance, power consumption, NRE cost unit cost, size, flexibility, time-to-prototype, time-to-market, mantainability, correctness and safety. Topic 6: Real Time Operating System Operating System functions of operating system. Operating System functions of operating system. Architecture of Real Time Operating System (RTOS). Scheduling architecture. Multitasking. Share data problem. Semaphore. Deal lock. Inter-task Communication. 	Parallel Communication Protocol: PCL PCI-X		
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Inter-task Communication. Total 48 100	• Dead lock.		
Total 48 100	Inter-task Communication.		
	Total	48	100

Intellectual Skills:

- 1) Use IDE for Microcontroller programming with 'C'.
- 2) Develop Logic of program.
- 3) Write 'C' Program.

Motor Skills:

- 1) Use of IDE for Microcontroller programming.
- 2) Interface Microcontroller Evaluation boards & peripherals.

List of Practical:

Write and execute 'C' Programs:

- 1) Input and output operation via ports.
- 2) Arithmetic and logic operations on data.
- 3) Use of assembly language instruction in 'C' program.
- 4) Generation of pulse/square wave on port line/s.
- 5) Reading key status and LED ON/OFF.
- 6) Operating Relay to activate connected devices to relay.
- 7) Reading matrix keyboard.
- 8) Read ADC and display it on LCD.
- 9) Generating different patterns with DAC
- 10) Running Stepper motor with different speed (CW/CCW)

Learning Resources:

1. Books:

Sr. No.	Author	Title	Publisher
1	Frank Vahid & Tony Givargis	Embedded System Design A Unified Hardware/Software Introduction	Wiley
2	Raj Kamal	Embedded System Architecture, Programming and Design	Tata McGraw Hill
3	Dr K.V.K.K. Prasad	Embedded/Real-Time Systems: Concept, Design & Programming	Dreamtech Press
4	Jean J Labrosse	Micro C/OS-II The Real Time Kernel	CPM Books
5	Mazidi, Mazidi & McKinlay	The 8051 Microcontroller and Embedded System Using Assembly and C	Prentice Hall
6	Ajay V. Deshmukh	Microcontrollers (Theory and Applications)	Tata McGrawHill

2. Websites:

- 1) http://developer.apple.com/documentation/mac/devices-313.html
- 2) http://en.wikipedia.org/wiki/Integrated development environment
- 3) http://en.wikipedia.org/wiki/communication protocol
- 4) http://en.wikipedia.org/wiki/RS-232
- 5) http://en.wikipedia.org/wiki/Embedded_system
- 6) http://en.wikipedia.org/wiki/Real_time_operating_system