SCHEME OF COURSE WORK

Course Details:

Course Title	: Microcontrollers and Applications			
Course Code	: 13EC1124	L T P C	: 4 0 0 3	
Program:	: B.Tech.			
Specialization:	: Communications and Signal Processing			
Semester	: VI			
Prerequisites	: Microprocessors and Interfacing			
Courses to which it is a prerequisite	:	Embedded systems		

Course Outcomes (COs):

1	Comprehend the architecture of 8051microcontrollers.
2	Comprehend real time control interrupts & timers.
3	Design interface for peripherals and high power devices.
4	Analyze real time operating system for MCUs & MCU based industrial applications.
5	Comprehend the architecture of 16-bit (8096/80196) & ARM microcontrollers.

Course Outcomes versus Program Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	M	M	M						
CO2	S	S	S	S	S	M						M
CO3	S	S	M	M	S							
CO4		M	M		M	M						
CO5		S	M	M								M

S - Strongly correlated, M - Moderately correlated, Blank - No correlation

Assessment Methods:	Assignment / Quiz / Seminar / Case Study / Mid-Test / End Exam

Teaching-Learning and Evaluation

Week	Topic / contents	Course outcomes	Sample questions	Teaching-learning strategy	Assessment method & schedule
1	Introduction to Microcontroller Architecture of 8051microcontroller, internal and external memories	CO-1	1. Describe the Architecture of 8051 microcontroller. 2. Explain the Pin Configuration.	▫ Lecture ▫ Discussion	Assignment 1/ Quiz1/ Mid1
2	Basic assembly language programming, Data transfer instructions, Data and Bit manipulation instructions, Arithmetic instructions,	CO-1	1. Describe the instruction set with examples. 2. Write ALP for arithmetic operations.	▫ Lecture ▫ Discussion ▫ PPT	Assignment 1/ Quiz1/ Mid1
3	Instructions for Logical operations on the Bytes among the Registers, Internal RAM, and SFRs, Program flow control and Interrupt control flow instructions.	CO-1	1. Explain memory organization of 8051. 2. Explain MOVC and MOVX instructions with example.	▫ Lecture ▫ Discussion	Assignment 1/ Quiz1/ Mid1
4	Interrupt handling structure of an MCU, Interrupt Latency and Interrupt deadline. Multiple sources of the interrupts, Non-maskable interrupt sources,	CO-2	1. Explain the interrupt structure in 8051. 2. Define Interrupt Latency, Interrupt deadline, Interrupt interval and density constraints.	▫ Lecture ▫ Discussion ▫ PPT	Assignment 1/ Quiz1/ Mid1
5	Enabling or Disabling of the sources, Polling to determine the Interrupt source and assignment of the priorities among them, Interrupt structure in Intel 8051.	CO-2	1. Explain IE register. 2. Explain SCON register 3. Explain PCON register	▫ Lecture ▫ Discussion	Assignment 1/ Quiz1/ Mid1
6	Programmable Timers in the MCUs, Free running counter and real time control – Interrupt interval and density constraints.	CO-2	1. Explain TMOD and TCON register and mod 0,1,2,3 configurations. 2. Design a square wave generator. 3. Explain Free running counter.	▫ Lecture ▫ Discussion ▫ Program solving	Assignment 1/ Quiz1/ Mid1
7	Synchronous serial communication asynchronous serial communication – ADC Circuit Interfacing – DAC Circuit Interfacing – stepper motor	CO-3	1. Explain frame format of UART. 2. Designing H/W for ADC, DAC, stepper motor, interfacings and writing the necessary software.	▫ Lecture ▫ Discussion	Assignment 1/ Quiz1/ Mid1

8	Digital and Analog Interfacing Methods, Switch, Keypad and Keyboard interfacings – LED and Array of LEDs – LCD interface –	CO-3	1. Designing hardware for Keyboard interfacings and writing the necessary software. 2. Designing hardware for LED interface, Array of LEDs interface, LCD interface and writing the necessary software.	▫ Lecture ▫ Program Solving	Assignment 1/ Quiz1/ Mid1
9	**Mid-Test 1**				
10	Programmable instruments interface using IEEE 488 Bus – Interfacing with the Flash Memory – Interfaces –	CO-3	1. Explain IEEE 488 Bus Standards. 2. Designing hardware for Flash memory interfacings and writing the necessary software.	▫ Lecture ▫ Discussion ▫ PPT	Assignment 2/ Quiz2/ Mid2
11	Interfacing to High Power Devices – Analog input interfacing – Analog output interfacing.	CO-3	1.Explain how High Power Devices are interfaced to microcontrollers 2. Explain how Analog input is interfaced to microcontrollers	▫ Lecture ▫ Discussion	Assignment 2/ Quiz2/ Mid2
12	Real Time operating system, RTOS of Keil (RTX51), Use of RTOS in Design, Software development tools for Microcontrollers.	CO-4	1. Explain the basics of RTOS with examples. 2. What are the different Software development Tools	▫ Lecture ▫ Discussion ▫ PPT	Assignment 2/ Quiz2/ Mid2
13	Optical motor shaft encoders, Industrial control, Industrial process control system, Prototype MCU based Measuring instruments.	C0-4	1. Explain how optical shaft encoder and measuring instruments are interfaced to microcontrollers. 2. Explain industrial process control system.	▫ Lecture ▫ Discussion	Assignment 2/ Quiz2/ Mid2
14	80196 Architecture, Memory map in I/O ports.	CO-5	1. Explain 80196 Architecture. 2. Explain memory organization of 80196.	▫ Lecture ▫ Discussion	Assignment 2/ Quiz2/ Mid2
15	Programmable Timers and High-speed outputs and input captures, Interrupts.	CO-5	1. Explain 80196 Timers and High-speed outputs and input captures. 2. Explain interrupts in 80196.	▫ Lecture ▫ Discussion	Assignment 2/ Quiz2/ Mid2
16	Introduction to 16/32 Bit	CO-5	1. Explain the ARM	▫ Lecture	Assignment

	processors ARM architecture and organization		architecture. 2. Define Pipeline and explain 5-stage pipeline technique.	▫ Discussion	2/ Quiz2/ Mid2
17	ARM / Thumb programming model, ARM / Thumb instruction set.	CO-5	1. Explain ARM/Thumb programming model. 2. Describe ARM and Thumb instruction set with examples.	▫ Lecture ▫ Discussion	Assignment 2/ Quiz2/ Mid2
18	**Mid-Test 2**				
19/20	**END EXAM**				