

Devi Ahilya University, Indore, India Institute of Engineering & Technology				III Year B.E. (Electronics & Instrumentation Engg.)			
Subject Code & Name	Instructions Hours per Week			Credits			
EIR5E1 Microcontroller	L	T	P	L	T	P	Total
	3	1	2	3	1	1	5
Duration of Theory Paper: 3 Hours							

Prerequisite: Students should have in depth knowledge of Digital Logic Design, Microprocessor architecture as well as logical ability and programming skills to develop the code

Rationale: The knowledge of microcontroller is very essential for a student of BE in Electronics and Communication/instrumentation Engineering as the world is migrating towards automation rapidly in each and every fields. The students studying the subject are supposed to learn the architecture and programming of typical microcontroller. Students will be taught the basic use of an assembly as well as embedded C programming environment to control peripheral devices. Students will also understand the interfacing of various peripheral elements with microcontroller to design an automated system. The course will cover AVR, 8-bit Microcontroller in detail with sufficient exposure to design an automated system.

Unit 1: Introduction To Microcontroller

Microcontrollers and Embedded processors, Microcontroller survey, Overview of AVR family, AVR Microcontroller architecture, Register, status register, ROM space and other hardware modules, ATmega32 pin configuration & function of each pin.

Unit 2: AVR Assembly Language Programming

Addressing modes of AVR, Different instructions, assembly language programs, I/O Port Programming, Time delay loop, BCD, ASCII conversion Program, Look-up table, Bit addressability, MACROs.

Unit 3: AVR Programming in C

Data types, I/O programming, logic operations, Intel HEX file, Timer programming in assembly and C, Input capture and Wave Generator, PWM programming

Unit 4 : Interrupt & Serial port programming

Interrupt environment ,Interrupt programming and applications, Serial Port programming and applications

Unit 5 : Peripheral Interfacing

LCD and Keyboard Interfacing, ADC, DAC and sensor interfacing, Relay, Opto-isolator and Stepper Motor Interfacing, DC motor control, SPI protocol and Display interfacing, I2C Protocol and RTC interfacing

Reference Books:

1. The AVR Microcontroller and Embedded Systems Using Assembly and C, By Muhammad Ali Mazidi, Sarmad Naimi and Sepehr Naimi, Pearson Education.
2. Programming and Customizing the AVR Microcontroller, By Dhananjay Gadre, McGraw Hill Education
3. AVR ATmega32 data sheet

Course Outcome:

After learning the course the students should be able to:

1. Understand the architecture of AVR 8-bit Microcontroller.
2. Describe the importance and function of each pin of AVR ATmega32 Microcontroller.
3. Write, debug and simulate assembly as well as embedded C language programs.
4. Understand Timer operation, Interrupt environment and Serial Communication.
5. Interface I/O peripheral devices with microcontroller.
6. Summarize the functionality of I2C and SPI protocol.

List of Open Source Software/learning website:

1. Open source AVR simulator.
2. www.atmel.com
3. <http://www.arduino.cc/>