

Progressive Education Society's
Modern College of Arts, Science and Commerce,
Shivajinagar, Pune – 5
(Autonomous College)
Third Year of B.Sc. (Computer Science) Major Elective: Electronics
Under NEP_2020(NEP 2023)
SEMESTER VI

Course Code: 23CsEleU6203

Course Name: Embedded System

Teaching Scheme: TH: 2 hrs / Week

Credit : 02

Examination Scheme: CIA: 20 Marks

End-Sem: 30 Marks

Prerequisites: Basic knowledge of Microcontroller, Digital Electronics, and C Programming.

Course Objectives: This course will enable the students to:

1. To understand the architecture 8-bit microcontroller
2. To understand registers and modules of PIC controller.
3. To understand basics of interfacing concepts.
4. To learn software techniques to embed codes into the systems.
5. To interface different peripherals to PIC controller.
6. To learn communication standards and protocols

Course Outcomes

- Understand the architecture and components of embedded systems.
- Understand the **architecture and operation** of PIC microcontrollers.
- **C programming** for PIC.
- Design and develop embedded system applications using hardware and software tools.
- Interface peripherals such as sensors, actuators, and communication devices with PIC.
- Develop **real-time embedded applications**.
- Gain exposure to **PIC development tools** and simulation software.

Course Contents

Chapter 1	Introduction to Embedded Systems & PIC Microcontrollers	8 hrs
	Definition and characteristics of embedded systems, Applications of embedded systems, Differences between general-purpose and embedded systems, Embedded system design process, Introduction to PIC microcontrollers , PIC microcontroller families & selection criteria, Applications of PIC-based systems .	
Chapter 2	PIC Microcontroller Architecture	16 hrs
	Internal architecture of PIC microcontrollers:- CPU, Memory (Flash, RAM, EEPROM), I/O Ports and Pin configuration, Clock and Reset circuits, Power-saving modes. Interrupt handling & Priorities	
Chapter 3	PIC Programming Fundamentals	8Hrs
	Assembly vs. Embedded C programming Overview of MPLAB X IDE and XC8 Compiler Writing, compiling, and debugging programs, Interfacing LEDs, switches, and buzzers, Introduction to Timers & Delays, Timers and Counters (PWM generation), Serial Communication (UART, SPI, I2C)	
Chapter 4	Sensor Interfacing & Data Acquisition	6Hrs
	Analog-to-Digital Converter (ADC), Digital-to-Analog Conversion (DAC) ,Interfacing Temperature Sensors (LM35, DHT11, etc.) IR Sensors, Ultrasonic Sensors, Accelerometer & Gyroscope Interfacing Data acquisition and real-time applications	

Text/ Reference Books:

1. "PIC Microcontroller and Embedded Systems" – Muhammad Ali Mazidi
2. "Programming PIC Microcontrollers in C" – Lucio Di Jasio
3. "Embedded C Programming & the Microchip PIC" – Richard H. Barnett
4. Microchip Official Website & Documentation
5. MPLAB X IDE & XC8 Compiler User Guides

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SEMESTER VI

Course Code: 23CsEleU6203

Course Name: Lab Course on Embedded system

Teaching Scheme: PR: 4 hrs / Week

Credit : 02

Examination Scheme: CIA: 20 Marks

End-Sem: 30 Marks

Prerequisites: Basic knowledge of Digital Electronics and C programming

Course Outcomes:

- Understand the architecture and components of embedded systems.
- Understand the architecture and operation of PIC microcontrollers.
- Develop basic C programming for PIC microcontroller.
- Design and develop embedded system applications using hardware and software tools.
- Understand to Interface peripherals such as sensors, actuators, and communication devices with PIC.
- Develop soft real-time embedded applications.
- Gain exposure to PIC development tools and simulation software.

List of Practical

1. Getting Started with MPLAB X IDE & XC8 Compiler.
2. Arithmetic operations of PIC using MPLAB X software.
3. Basic I/O operations of PIC with Switch Interfacing: Single key interface result on LED.
4. Study of LED bank interfacing and programming to PIC microcontroller.
5. To study for Generating Delays using Timers and SSD Interfacing to PIC microcontroller.
6. Study of waveform generations using DAC and PIC.
7. Study for PWM Generation for speed control of DC motor using PIC.
8. Study of External interrupt as input switch press, output at relay.
9. Study to interface ADC for reading of sensor values using PIC.
10. Programming for UART Communication of PIC with PC.
11. To study the I2C Interfacing with external EEPROM.
12. To study programming for LCD Interface (16x2 & Graphical LCD).
13. Study to interface Stepper Motor to PIC.
14. Study Wireless communication using Bluetooth module and PIC.
15. Mini project Embedded system based on PIC microcontroller.