

NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B. Tech.in Electronics and Instrumentation Engineering
Semester:	IV
Course Code:	2EI604
Course Title:	Microcontroller and its Applications
Course Type:	Core
Year of Introduction:	2023-24

L	T	Practical component				C
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Course Learning Outcomes (CLOs):

At the end of the course, students will be able to –

1. infer architecture of microcontroller ICs (BL2)
2. demonstrate the program for in various language for the given operations (BL2)
3. develop embedded application-based interfacing. (BL3)
4. illustrate the knowledge of operation of integrated hardware components. (BL2)

Unit	Syllabus	Teaching Hours: 30 Teaching hours
Unit-I	Introduction to microcontroller Architecture of microcontroller, Registers, Pin diagram, I/O ports functions, Internal memory organisation.	02
Unit-II	Instruction set and programming PIC series microcontroller programming structures, simple programs involving logical, branch and loop instruction, string manipulations, software design using various compilers with examples, advanced assembly instructions and C directives.	07
Unit-III	Memory and I/O device Interfacing with EEPROM, special memory operation, data memory and special function registers, I/O bit manipulation programming.	04
Unit-IV	Hardware features and interrupt programming Timer/Counter programming algorithm, CCP and ECCP modules, serial communication standards, serial programming using USART, SPI bus and I ² C protocols, interrupt concept, working with interrupt using examples.	07
Unit-V	Peripheral Interfacing and application Interfacing with relays, various motor interfacing, PWM generation using module, ADC/DAC interfacing, various sensor interfacing, serial communication-based sensor interfacing, LCD interfacing, keypad matrix interfacing, case studies of PIC based embedded applications.	10

Laboratory Work:

This shall consist of at least 10 practicals based on the above syllabus.

Suggested Reading:

1. Muhammad Ali Mazidi, RolinMcKinlay, Danny Causey, "PIC Microcontroller and Embedded Systems: Using Assembly and C for PIC18", Prentice Hall publications, 2007
2. Myke Predko, Michael Predko, "Programming and customizing the PIC microcontroller", McGraw-Hill publication, 2008
3. Tim Wilmshurst, "Designing Embedded Systems with PIC microcontrollers- Principles and Applications", Newnes Publications, 2007
4. Martin Bates, "Interfacing PIC microcontrollers-Embedded Design by Interactive Simulation", Newnes Publication, 2006
5. Dogan Ibrahim, "Advanced PIC microcontroller projects in C", Newnes publication, 2012

**Suggested List of Experiments (not restricted to the following):
(Only for Information)**

Hrs.	Title of Experiment	
1.	Introduction to IDE, assembler, compiler, linker, simulator, debugger and assembler directives	2
2.	PIC Assembly language programming based on data transfer, arithmetic and logical group instructions	2
3.	PIC Assembly language programming using bit manipulation instructions	2
4.	PIC Assembly language programming using branching group instructions	2
5.	PIC Timer/counter programming using assembly language and C.	2
6.	PIC Serial programming using assembly and embedded C	2
7.	I/O port related programming in embedded C.	2
8.	Programming of LCD in assembly & embedded C.	2
9.	Programming of matrix keyboard and seven segment in assembly & embedded C.	2
10.	Programming of parallel ADC and DAC in assembly & embedded C.	2
11.	Programming to interfacing and drive various Motor.	2
12.	Speed Control of DC motor using PWM technique and Microcontroller	2
13.	Communication on serial port with using Microcontroller	2
14.	Interfacing multiple devices to design problem 1 using Microcontroller.	2
15.	Interfacing multiple devices to design problem 2 using Microcontroller	2

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. the academic year 2023 - 24 and onwards