GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163207

MICROPROCESSOR AND MICROCONTROLLER

6th SEMESTER

Type of course: Undergraduate

Prerequisite: Students should have logical ability and programming skills to develop the code.

Rationale: The knowledge of microprocessor & microcontroller is very essential for a student of BE in Information & Communication engineering as the world is migrating towards automation rapidly in every fields.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
4	0	2	5	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.	% Weightage
1	**Introduction of Microprocessor of 8085:** Introduction of Microprocessors, Microcomputer System, Difference between Microcontrollers & Microprocessors.	4	6
2	**Architecture of Microprocessor of 8085 & 8051 Microcontroller:** 8085 Microprocessor Architecture, Address, Data and Control Buses, Pin Functions, De-multiplexing of Buses, Generation Of Control Signals, Memory Interfacing, Architecture of 8051, Pin Function of 8051 microcontroller.	9	22
3	**Introduction To 8-bit AVR Microcontroller:** Overview of AVR family, AVR Microcontroller architecture, Register, AVR status register, ROM space and other hardware modules, ATmega32 pin configuration & function of each pin.	9	20
4	**AVR Assembly Language Programming:** Addressing modes of AVR, Data transfer, Arithmetic, Logic and Compare, Rotate and Shift, Branch and Call instructions. AVR data types and assembler directives, AVR assembly language programs, AVR I/O Port Programming, Time delay loop.	13	20
5	**AVR Programming in C:** Data types, I/O programming, logic operations, Timer programming in assembly and C, Interrupt programming in assembly and C, Serial Port programming in assembly and C.	10	20
6	**Peripheral Interfacing:** 7-Segment LED Display, LCD and Keyboard Interfacing, ADC, DAC and sensor interfacing, Relay, Opto-isolator and Stepper Motor Interfacing, DC motor control, I2C Protocol and RTC interfacing.	11	12

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
12	**22**	**24**	**8**	**4**	**-**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. The AVR Microcontroller and Embedded Systems Using Assembly and C, by Muhammad Ali Mazidi, Sarmad Naimi and Sepehr Naimi, Pearson EducationElectronic Communication Systems, George Kennedy, Bernard Davis, S R M Prasanna.
2. Microprocessor Architecture Programming and Applications by R. S. Gaonkar – Fourth Edition (WEL).
3. Mohammad Ali Mazidi, Janice Gillispie Mazidi and Rolin McKinlay ,The 8051 Microcontroller and Embedded Systems using Assembly and C, 2/e Second Edition, Pearson Education .
4. Programming and Customizing the AVR Microcontroller, by Dhananjay Gadre, McGraw Hill Education.

Course Outcome: After learning the course the students should be able to:

Sr. No.	CO Statement	Marks % Weightage
CO-1	Understand the architectures of Microprocessor and Microcontroller.	25
CO-2	Apply the basic concepts of digital fundamentals to Microprocessor and Microcontroller based systems.	15
CO-3	Analyze the properties of Microprocessor and Microcontroller.	15
CO-4	Perform programming to solve real world problems.	30
CO-5	Illustrate how the different peripherals are interfaced with Microcontroller.	15

List of Experiments:

1. To study the PIN Diagram & block diagram of 8085 Microprocessor & 8051 Microcontroller.
2. To study the AVR Studio and Arduino Software.
3. Write and simulate minimum of 5 programs (Assembly) to be written making effective use of all the instructions and on-chip peripheral.
4. Write program for blinking LED.
5. Read Push-button switch and display its status on LED.
6. Interfacing Buzzer with AVR Board.
7. Interfacing 7-Segment LED Display with AVR Board.

8. Interfacing of 16x2 LCD with Arduino board and display message on it.
9. Interface 4x4 matrix keyboard with AVR microcontroller. Display value of pressed switch on LCD.
10. Interface temperature sensor LM35 with Arduino board and display temperature on LCD.
11. Write a Program for the Relay, Stepper Motor Interfacing.
12. Write a Program for DC motor control in clockwise and anticlockwise direction.

Design based Problems (DP)/Open Ended Problem:

1. Connect infrared sensor with AVR microcontroller. Control electrical device with help of IR remote control.
2. Read 100 temperature readings using LM35 and Arduino board, take average of it and send it to PC using serial communication.
3. Interface LDR with Arduino board. Display light intensity on LCD. If light intensity is less than certain threshold value, switch ON lamp connected with Arduino board with help of driver circuit.

Major Equipment:

1. AVR ATmega32 microcontroller trainer kit with peripheral devices.
2. Arduino Software, Proteus Software for Simulation, Arduino Board.
3. Computer system.

List of Open Source Software/learning website:

1. Open source AVR simulator.
2. www.atmel.com
3. www.arduino.cc

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the website of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.