Course Title	Introduction to Microprocessors and Microcontrollers
Course Code	EE4402
No. of Credit Hrs (Lecture + Tutorial + Lab)	4 (3+0+1)
No. of Contact Hrs (Lecture + Tutorial + Lab)	5 (3+0+2)
Level-Year	7 – 4
Prerequisite	EE3301

1) Course Objectives:

This course provides basic concepts, theories, architecture and programming of microprocessors-based systems. It provides methodologies of designing, analyzing, and programming using register, memories, and instruction to solve issues related to data processing, calculations, communications, data transfer and system design. In addition to microprocessor-based systems, the course provides exposure to microcontrollers and microcontroller based embedded systems (such as Arduino uno) used in various day to day applications at home, office, automotive, medical and domains etc. Finally, it is practically highlighting the topics and concepts taught in microprocessors & microcontrollers lab.

2) Expected Learning Outcomes:

Upon completion of this course, student will be able to:

1. **Define and differentiate** the architecture, pin configuration, registers, and peripherals of microprocessors and microcontrollers. **PLO1 [1]**
2. **Identify and distinguish** different addressing modes used in microprocessor and microcontroller systems. **PLO1 [1]**
3. **Design and implement** interface circuits using programmable peripheral interface (e.g., 8255) to demonstrate operating modes. **PLO2 [2]**
4. **Apply** the fundamentals of assembly language programming to solve basic computational and control problems. **PLO1 [1]**
5. **Develop and analyze** assembly-level programs by employing correct syntax for data and code segments, and validate results against theoretical concepts. **PLO3 [6]**
6. **Communicate** programming solutions and experimental outcomes effectively through technical reports. **PLO8 [3]**

3) Course Contents

1. Microprocessor Model-Technologies Used in Microprocessor
2. Architecture of 8086 Microprocessor
3. Registers and Memory Segmentation
4. Stack segment
5. Addressing Mode
6. Instruction Sets, 8255 for Interfacing
7. Develop a basic C/C++ code via IDE compilator and run the test (Hard and soft) for some basic system: speed control of a DC motor, Make ON OFF for LED, read and write date using Arduino
8. Develop an APL for a specific problem
9. Connect an Arduino (Atmega 328 microcontroller) with a given load: fan, LED, DC motor

4) Microprocessors & Microcontrollers lab Contents:

Upon completion of this course, student will be able to:

1. Program for 16-bit arithmetic operations for 8086 (using Various Addressing Modes).
2. Program for sorting an array for 8086.
3. Program for searching for a number or character in a string for 8086.

4. Program for string manipulations for 8086.
5. Program for digital clock design using 8086.
6. Interfacing ADC and DAC to 8086.
7. Perform parallel communication between two microprocessors using 8255.
8. Perform serial communication between two microprocessor kits using 8251.
9. Interfacing to 8086 and programming to control stepper motor.
10. Programming using arithmetic, logical and bit manipulation instructions of 8051.
11. Program and verify Timer/Counter in 8051.
12. Program and verify Interrupt handling in 8051.
13. Design a simple C/C++ code to run Arduino board and Connect load via Arduino and make the required C/C++ code to run the overall system (Hard and soft)

5) Teaching Methods:
- Lectures and Discussion
- Videos
- Self-learning
- Laboratory demonstrations

6) Mode of Evaluation: Course Assessment Methods
- Quizzes , Assignment, Homeworks, Reports, Presentations etc.
- Lab Work
- Mid Exam
- Final Exam

Evaluation

No	Assessment Activities *	Percentage
1.	Assignments/Quizzes/HomeWorks/Mini-Projects/Presentations/Reports+Quizzes	15%
2.	Mid Exam	25%
3.	Lab/Tutorial (Lab Exam)	10%
4.	Lab/Tutorial (Lab Reports)	10%
5.	Final Exam	40%

7) Textbook(s):
- "Microprocessor Architecture, Programming, and the Applications with the 8085"
- Triebel and Singh, "The 8088 and 8085 Microprocessors", Prentice Hall, most recent edition Mechanism and Machine Theory; J S Rao
- Lab Manual

8) References:
- Microprocessor and microcontroller System", A.P Godse and Mrs. D. A. Godse, Technical Publications