# INSTITUTE OF AERONAUTICAL ENGINEERING

**(Autonomous)**

Dundigal, Hyderabad -500 043

## COMPUTER SCIENCE ENGINEERING

### COURSE DESCRIPTOR

| Course Title | MICROPROCESSORS AND INTERFACING LAB | | | | |
|---|---|---|---|---|---|
| Course Code | AEC115 | | | | |
| Programme | B.Tech | | | | |
| Semester | V | CSE | | | |
| Course Type | Core | | | | |
| Regulation | IARE - R16 | | | | |
| Course Structure | **Theory** | | | **Practical** | |
| | **Lectures** | **Tutorials** | **Credits** | **Laboratory** | **Credits** |
| | - | - | - | 3 | 2 |
| Chief Coordinator | Mr. Mohd.Khadir, Assistant Professor | | | | |
| Course Faculty | Dr.P S L Murthy, Professor<br>Mr. Mohd.Khadir, Assistant Professor<br>Ms. K Sravani, Assistant Professor<br>Mrs. Lakshmi Prasanna, Assistant Professor | | | | |

## I.  COURSE OVERVIEW:

This laboratory course builds on the lecture course "Microprocessors and Interfacing" which  is mandatory for all students of information technology. The course aims at practical experience with the characteristics and theoretical principles of computer organization and various practical real time applications.

## II.  COURSE PRE-REQUISITES:

| Level | Course Code | Semester | Prerequisites | Credits |
|---|---|---|---|---|
| UG | AEC116 | III | Digital Logic Design Laboratory | 3 |

## III.  MARKS DISTRIBUTION:

| Subject | SEE Examination | CIA Examination | Total Marks |
|---|---|---|---|
| Microprocessors and Interfacing Laboratory | 70 Marks | 30 Marks | 100 |

## IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

| ✘ | Chalk & Talk | ✘ | Quiz | ✘ | Assignments | ✘ | MOOCs |
|---|---|---|---|---|---|---|---|
| ✔ | LCD / PPT | ✘ | Seminars | ✘ | Mini Project | ✔ | Videos |
| ✔ | Open Ended Experiments | | | | | | |

## V. EVALUATION METHODOLOGY:

Each laboratory will be evaluated for a total of 100 marks consisting of 30 marks for internal assessment and 70 marks for semester end lab examination. Out of 30 marks of internal assessment, continuous lab assessment will be done for 20 marks for the day to day performance and 10 marks for the final internal lab assessment.

**Semester End Examination (SEE):** The semester end lab examination for 70 marks shall be conducted by two examiners, one of them being Internal Examiner and the other being External Examiner, both nominated by the Principal from the panel of experts recommended by Chairman, BOS.

The emphasis on the experiments is broadly based on the following criteria:

| 20 % | To test the preparedness for the experiment. |
|---|---|
| 20 % | To test the performance in the laboratory. |
| 20 % | To test the calculations and graphs related to the concern experiment. |
| 20 % | To test the results and the error analysis of the experiment. |
| 20 % | To test the subject knowledge through viva – voce. |

**Continuous Internal Assessment (CIA):**
CIA is conducted for a total of 30 marks (Table 1), with 20 marks for continuous lab assessment during day to day performance, 10 marks for final internal lab assessment.

Table 1: Assessment pattern for CIA

| Component | Laboratory | | Total Marks |
|---|---|---|---|
| **Type of Assessment** | Day to day performance | Final internal lab assessment | |
| **CIA Marks** | 20 | 10 | 30 |

**Continuous Internal Examination (CIE):**
One CIE exams shall be conducted at the end of the 16th week of the semester. The CIE exam is conducted for 10 marks of 3 hours duration.

| Preparation | Performance | Calculations and Graph | Results and Error Analysis | Viva | Total |
|---|---|---|---|---|---|
| 2 | 2 | 2 | 2 | 2 | 10 |

## VI.  HOW PROGRAM OUTCOMES ARE ASSESSED:

| | Program Outcomes (POs) | Strength | Proficiency assessed by |
|---|---|---|---|
| PO 1 | **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. | 3 | Lab related Exercises |
| PO 2 | **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences | 3 | Lab related Exercises |
| PO3 | **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. | 2 | Lab related Exercises |
| PO4 | **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. | 2 | Lab related Exercises |

**3 = High; 2 = Medium; 1 = Low**


## VII.  HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

| | Program Specific Outcomes (PSOs) | Strength | Proficiency assessed by |
|---|---|---|---|
| PSO 1 | **Professional Skills:** The ability to understand ,analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based system of varying complexity. | 2 | Lab related Exercises |
| PSO 2 | **Problem-Solving Skills:** The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success. | 2 | Lab related Exercises |
| PSO 3 | **Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, and a zest for higher studies. | - | - |

**3 = High; 2 = Medium; 1 = Low**

## VIII. COURSE OBJECTIVES (COs):

**The course should enable the students to:**

| S.No | Description |
|------|-------------|
| I | Understand the assembly level programming |
| II | Identify the assembly level programming in given problem. |
| III | Compare different implementations and designing with interfacing circuits |
| IV | Understand the basic programming knowledge on processor and controller |
| V | Understand and develop assembly language programming with various applications |

## IX. COURSE LEARNING OUTCOMES (CLOs):

| CLO Code | CLO's | At the end of the course, the student will have the ability to: | PO's Mapped | Strength of Mapping |
|----------|-------|-----------------------------------------------------------------|-------------|---------------------|
| AEC115.01 | CLO 1 | Design and develop an Assembly language program using 8086 microprocessor | PO 1, PO2 | 3 |
| AEC115.02 | CLO 2 | Understand the 16 Bit arithmetic and logical operations using WIN862 software | PO 1, PO 2 | 2 |
| AEC115.03 | CLO 3 | Understand the program to perform multi byte addition, subtraction and 3*3 matrix multiplication using 8086 microprocessor | PO 1, PO 2 | 3 |
| AEC115.04 | CLO 4 | Understand the to perform ascending and descending order using 8086 microprocessor | PO 1, PO 2, PO 4 | 2 |
| AEC115.05 | CLO 5 | Understand the programming concepts on strings using 8086 | PO 1, PO 2 | 2 |
| AEC115.06 | CLO 6 | Understand the programming for Code converters using 8086 | PO 1, PO 2, PO4 | 2 |
| AEC115.07 | CLO 7 | Design and interacting stepper motor to 8086 microprocessor. | PO 1, PO 2, PO3 | 3 |
| AEC115.08 | CLO 8 | Analyze and interfacing to convert analog to digital using 8086 microprocessor | PO 1, PO3 | 2 |
| AEC115.09 | CLO 9 | Analyze and interfacing to convert digital to analog using 8086 microprocessor | PO 1, PO 2, PO3 | 2 |
| AEC115.10 | CLO 10 | Develop and design a ALP program to interfacing keyboard to 8086 microprocessor | PO 1, PO3 | 2 |
| AEC115.11 | CLO 11 | Develop and design an Interface traffic light controller and tone generator using 8086 microprocessor. | PO1,PO2, PO3 | 3 |
| AEC115.12 | CLO 12 | Develop and design an ALP program to interfacing Elevator to 8086 microprocessor. | PO 1, PO 2, PO 3 | 2 |

| AEC115.13 | CLO 13 | Develop and design an ALP program to interfacing LCD display to 8086 microprocessor | PO 2, PO 3 | 2 |
|---|---|---|---|---|
| AEC115.14 | CLO 14 | Develop and design an ALP program to interfacing LED display to 8086 microprocessor | PO 2, PO 3 | 2 |

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## X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

| Course Learning Outcomes (CLOs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes (PSOs) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CLO 1 | 3 | 3 | | | | | | | | | | | 2 | | |
| CLO 2 | 2 | 2 | | | | | | | | | | | 2 | | |
| CLO 3 | 3 | 3 | | | | | | | | | | | 2 | | |
| CLO 4 | 2 | 2 | | 2 | | | | | | | | | 1 | 2 | |
| CLO 5 | 3 | 2 | | | | | | | | | | | 1 | 2 | |
| CLO 6 | 2 | 2 | | 2 | | | | | | | | | 1 | 2 | |
| CLO 7 | 3 | 3 | 3 | | | | | | | | | | 2 | 1 | |
| CLO 8 | 2 | | 2 | | | | | | | | | | 2 | | |
| CLO 9 | 3 | | 2 | | | | | | | | | | 2 | | |
| CLO 10 | 2 | 2 | | | | | | | | | | | 2 | | |
| CLO 11 | 3 | 2 | 3 | | | | | | | | | | | 2 | |
| CLO 12 | 2 | 3 | 2 | | | | | | | | | | 2 | | |
| CLO 13 | 2 | | | | | | | | | | | | | | |
| CLO 14 | | 2 | | | | | | | | | | | | | |

**3 = High; 2 = Medium; 1 = Low**

## XI. ASSESSMENT METHODOLOGIES – DIRECT

| CIE Exams | PO 1, PO 2 PO 3, PO 4, PSO 1,PSO 2 | SEE Exams | PO 1, PO 2 PO 3, PO 4, PSO 1, PSO 2 | Assignments | - | Seminars | - |
|---|---|---|---|---|---|---|---|
| Laboratory Practices | PO 1, PO 2 PO 3, PO 4, PSO 1,PSO 2 | Student Viva | - | Mini Project | - | Certification | - |

## XII. ASSESSMENT METHODOLOGIES - INDIRECT

| | | | |
|---|---|---|---|
| ✔ | Early Semester Feedback | ✔ | End Semester OBE Feedback |
| ✘ | Assessment of Mini Projects by Experts | | |

## XIII. SYLLABUS

| LIST OF EXPERIMENTS |
|---|
| **Week-1**     **DESIGN APROGRAM USING WIN862** |
| Design and develop an Assembly language program using 8086 microprocessor and to show the following aspects.<br>a. Programming<br>b. Execution<br>c. Debugging<br>To Demonstrate the Tool Chain for MASM and Hardware for 8086 Microprocessor |
| **Week-2**     **16 BITARITHMETIC AND LOGICAL OPERATIONS** |
| Write an ALP program to perform 16 Bit arithmetic and logical operations using WIN862 software |
| **Week-3**     **MULTIBYTE ADDITION AND SUBRACTION** |
| a. Write an ALP program to perform multi byte addition and subtraction<br>b. Write an ALP program to perform 3*3 matrix multiplication and addition |
| **Week-4**     **PROGRAMS TO SORT NUMBERS** |
| a. Write an ALP program to perform ascending order using 8086<br>b. Write an ALP program to perform descending order using 8086 |
| **Week-5**     **PROGRAMS FOR STRING MANIPULATIONS OPERATIONS** |
| a. write an ALP program to insert or delete a byte in the given string<br>b. Write an ALP program to search a number/character in a given string<br>c. Write an ALP program to move a block of data from one memory location to the other & Write an ALP program for reverse of a given string. |
| **Week-6**     **CODE CONVERSIONS** |
| a. Write an ALP program to convert packed BCD to Unpacked BCD<br>b. Write an ALP program to convert packed BCD to ASCII<br>c. Write an ALP program to convert hexadecimal to ASCII |
| **Week-7**     **INTERFACING STEPPER MOTOR** |
| a. Write an ALP program to rotate stepper motor in clockwise direction<br>b. Write an ALP program to rotate stepper motor in anti clockwise direction |
| **Week-8**     **INTERFACING ADC & DAC DEVICES** |
| a. Write an ALP program to convert analog to digital using 8086<br>b. Write an ALP program to convert digital to analog using 8086 |
| **Week-9**     **INTERFACING TRAFFIC LIGHT CONTROLLER AND TONE GENERATOR** |
| a. Write an generator ALP program to interface traffic light controller<br>b. Write an ALP program to interface tone |
| **Week-10**     **INTERFACING KEYBOARD** |
| Write an ALP program to interfacing keyboard to 8086 |

| WeeK-11 | SERIAL AND PARALLEL COMMUNICATION |
|---------|-----------------------------------|
| a. Parallel communication between two microprocessors using 8255. b. Serial communication between two microprocessor kits using | |
| **Week-12** | **INTERFACING ELEVATOR** |
| Write an ALP program to interfacing Elevator to 8086 | |

**Text Books:**

1. D. V. Hall, "Microprocessors and Interfacing", TataMcGraw-Hill Education, 3$^{rd}$ Edition 2013.
2. A. K Ray, K. M. Bhurchandani, "Advanced Microprocessors and Peripherals", TataMcGraw-Hill Education, 2$^{nd}$ Edition 2006.

**Reference Books:**

1. N. Senthil Kumar, M. Saravanan, S. Jeevanathan, S. K. Shah, "Microprocessors and Interfacing", Oxford University, 1$^{st}$ Edition, 2012.
2. Lyla B. Das, "The x86Microprocessors", Pearson India, 2$^{nd}$ Edition, 2014
3. Daniel Tabak, "Advanced Microprocessors", Addison-Wesley, 2$^{nd}$ Edition, 1996.
4. Triebel, Singh, "The 8088 and 8086 Microprocessors", PHI, 4$^{th}$ Edition 2003.

**Web Reference:**

1. https://www.tutorialspoint.com/microprocessor/microprocessor_io_interfacing_overview.html
2. https://www.slideshare.net/VikasGupta319/interfacing-memory-with-8086-microprocessor

## XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

| Week No. | Topics to be covered | Course Learning Outcomes (CLOs) | Reference |
|----------|----------------------|----------------------------------|-----------|
| 1 | Design and develop an Assembly language program using 8086 microprocessor and to show the following aspects. a. Programming b. Execution c. Debugging To Demonstrate the Tool Chain for MASM and Hardware for 8086 Microprocessor | CLO 1, CLO 2 | T1:1.4 R1:1.2 |
| 2 | Develop an ALP program to perform 16 Bit arithmetic and logical operations using WIN862 software | CLO 1, CLO 2 | T1:1.5 R1:2.4 |
| 3 | Develop an ALP program to perform multi byte addition and subtraction and 3*3 matrix multiplication and addition | CLO 1, CLO 2, CLO 3 | T1:2.5 R1:2.5 |
| 4 | Develop an ALP program to perform ascending order using 8086 descending order using 8086 | CLO 1, CLO 2, CLO 4 | T1:2.5 R1:2.6 |
| 5 | Develop an ALP program to insert or delete a byte in the given string. Search a number/character in a given string. Program to move a block of data from one memory location to the other & Write an ALP program for reverse of a given string. | CLO 1, CLO 2, CLO 5 | T1:22.7 |
| 6 | Develop ALP program to convert packed BCD to Unpacked BCD , BCD to ASCII and hexadecimal to ASCII | CLO 1, CLO 2, CLO 6 | T1:6.3 R1:5.3 |

| 7 | Design and develop an ALP program to rotate stepper motor in clockwise direction as well as anti clock wise direction. | CLO 1, CLO 2, CLO 7 | T1:7.5 R1:6.3 |
|---|---|---|---|
| 8 | Design and develop a ALP program to convert analog to digital and digital to analog using 8086 | CLO 1, CLO 2, CLO 8 | T1:8.5 R1:6.8 |
| 9 | Design and develop an ALP program to interface traffic light controller and tone generator. | CLO 1, CLO 2, CLO 9 | T1:12.2 R1:13.1 |
| 10 | Write an ALP program to interfacing keyboard to 8086 | CLO 1, CLO 2, CLO 10 | T1:12.3 R1:13.2 |
| 11 | Design and develop a Parallel communication between two microprocessors using 8255. Serial communication between two microprocessor kits using 8086 | CLO 1, CLO 2, CLO 11 | T1:12.10 R1:13.7 |
| 12 | Write an ALP program to interfacing Elevator to 8086 | CLO 1, CLO 2, CLO 12 | T1:13.2 R1:10.3 |
| 13 | Develop and design an ALP program to interfacing lcd display to 8086 | CLO 1, CLO 2, CLO 13 | T1:13.2 R1:10.4 |
| 14 | Develop and design an ALP program to interfacing LED display to 8086 | CLO 1, CLO 2, CLO 14 | T1:13.2 R1:10.5 |

## XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

| S. No | Description | Proposed actions | Relevance with POs | Relevance with PSOs |
|---|---|---|---|---|
| 1 | To improve standards and analyze the concepts. | Lab Practices | PO 1, PO 2 | PSO 1 |
| 2 | Design and develop interfacing programs with advanced devices | Lab Practices / NPTEL | PO 3, PO4 | PSO 1 |
| 3 | Encourage students to solve real time applications and prepare to wards competitive examinations. | NPTEL | PO 3, PO 4 | PSO 1 |

**Prepared by:**
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