**Course Plan**

**S.E. (ECS) (Semester IV)**

Microprocessors and Microcontrollers

Subject code: ECC 404

Teacher-in-charge: Dr. Sapna Prabhu Academic Term: January-April 2023

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| Module  No. | Unit No. | Contents | Hrs. |
| 1 |  | **The 8086 Microprocessor** | 06 |
| 1.1 | 8086 Architecture |
| 1.2 | Memory Segmentation |
| 1.3 | 8086 pin description |
| 1.4 | Interrupts and Interrupt service routines, Dedicated interrupts, Software interrupts |
| 2 |  | **8086 programming** | 06 |
| 2.1 | Addressing modes |
| 2.2 | Instruction Set and Assembler Directives |
| 2.3 | Assembly language programming |
| 3 |  | **8086 Interfacing –Part I** | 05 |
| 3.1 | Generating the 8086 System Clock and Reset Signals using 8284 clock generator |
| 3.2 | 8086 Minimum and Maximum Mode CPU Modules |
|  | 3.3 | Minimum and Maximum Mode Timing Diagrams |  |
|  | 3.4 | Memory interfacing |  |
| 4 |  | **8086 Interfacing –Part II** | 06 |
| 4.1 | 8255-PPI:Functional Block Diagram and description, Operating Modes |
| 4.2 | 8259- PIC: Functional Block Diagram and description, Cascaded mode of operation |
| 4.3 | System design (including Memory and I/O) |
| 5 |  | **The 8051 Microcontroller** | 08 |
| 5.1 | Differences between a Microprocessor and Microcontroller |
| 5.2 | Architecture of 8051 |
|  | 5.3 | Memory Organization of the 8051 |
|  | 5.4 | Addressing modes |
|  | 5.5 | Instruction set |
|  | 5.6 | Assembly language programming. |
| 6 |  | **8051 Interfacing** | 08 |
| 6.1 | I/O port programming |
| 6.2 | Programming 8051 Timers |
| 6.3 | Serial Port Programming |
| 6.4 | Interrupts Programming |  |
| 6.5 | LCD & Keyboard Interfacing |  |
| 6.6 | ADC, DAC & Sensor Interfacing |  |
| 6.7 | Stepper Motor and DC motor Interfacing |  |
|  | Total | 39 |

**Course Objectives:**

1. To study the concepts and basic architecture of a Microprocessor and Microcontroller.

2. To write Assembly language programs for Microprocessors and Microcontrollers for various applications.

3. To know the importance of different peripheral devices and their interfacing to 8086 and 8051

4. To build Microprocessor and Microcontroller based systems.

**Course Outcomes:**

**At the end of the course student will be able to**

ECC 404.1: Explain 16-bit Microprocessor architectures and fundamental concepts of Microcontrollers

ECC 404.2: Develop programming skills for Microprocessors and Microcontrollers

ECC 404.3: Interface various peripherals in Microprocessor and Microcontroller systems.

ECC 404.4: Design and implement Microprocessor and Microcontroller based systems.

**CO-PO-PSO Mapping**:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| ECC 404.1 | 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ECC 404.2 | 3 |  |  |  | 2 |  |  |  |  |  |  |  |  |  |
| ECC 404.3 | 3 |  | 2 |  | 2 |  |  |  |  |  |  |  |  |  |
| ECC 404.4 | 2 |  | 2 |  | 2 |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

**CO-PO Mapping :** (BL – Blooms Taxonomy, C – Competency, PI – Performance Indicator)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| CO | BL | C | PI | PO |
| ECC 404.1 | 2 | 1.4 | 1.4.1 | PO1 |
| ECC 404.2 | 6 | 1.4 | 1.4.1 | PO1 |
| 5.2 | 5.2.2 | PO5 |
| ECC 404.3 | 6 | 1.4 | 1.4.1 | PO1 |
| 3.3 | 3.3.1 | PO3 |
| 5.2 | 5.2.2 | PO5 |
| ECC 404.4 | 6 | 1.4 | 1.4.1 | PO1 |
| 3.3 | 3.3.1 | PO3 |
| 5.2 | 5.2.2 | PO5 |

**CO Assessment Tools:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Course Outcome*** | ***Assessment Method*** | | | | | |
| ***Direct Method (80 %)*** | | | | | ***Indirect Method (20%)*** |
| **Unit Tests** | | **Assignment** | **Design assignment** | **University**  **Results** | **Course exit survey** |
| 1 | 2 |  |
| ECC 404.1 | 10% | 10% | 20% | - | 60% | 100% |
| ECC 404.2 | 10% | 10% | 20% | - | 60% | 100% |
| ECC 404.3 | - | 10% | - | 30% | 60% | 100% |
| ECC  404.4 | 10% | - | - | 30% | 60% | 100% |

CO calculation= (0.8 \*Direct method + 0.2\*Indirect method)

**Rubrics for assessing Course Outcome with each assessment tool:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Rubrics** |  |  |  |
| **Assignment** | **Timeline(4)**  On time -4  One day late-2  Later than one day -0 | **Level of content(4)**  Excellent-4  Good -3  Satisfactory-2 | **Neatness(2)**  Neat -2  Else-0 |
| Design Sheet | **Timeline(4)**  On time -4  One day late-2  Later than one day -0 | **Level of content(4)**  Excellent-4  Good -3  Satisfactory-2 | **Neatness(2)**  Neat -2  Else-0 |

**Content beyond syllabus: 1. Evolution of microprocessors**

**2. Current microcontroller enhancements**

**Text Books:**

1. 8086/8088 family: Design Programming and Interfacing: By John Uffenbeck (Pearson Education)

2. Microprocessor and Interfacing: By Douglas Hall (TMH Publication)

3. The 8051 Microcontroller and Embedded Systems Using Assembly and C: By M. A. Mazidi, J. C. Mazidi, Rolin D. McKinlay, Pearson Education, 2ndEdition.

4. The 8051 Microcontroller: ByKenneth J. Ayala, Cengage Learning India Pvt. Ltd, 3rdEdition

**Reference Books:**

1. Microcomputer Systems: 8086/8088 family Architecture, Programming and Design: By Liu & Gibson (PHI Publication).

2. The INTEL Microprocessors, Architecture, Programming and Interfacing: By Barry B. Brey (Pearson Publishers, 8th Edition)

3. Microcontrollers: Architecture, Programming, Interfacing and System Design: By RajKamal, Pearson Education, 2005.

4. The 8051 Microcontroller Based Embedded Systems: By Manish K Patel, McGraw Hill, 2014. 5. Microcontroller Theory And Applications:By Ajay V Deshmukh, Tata Mcgraw Hill

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| BE Electronics and Computer Science, Semester IV | | | | |
| January-April 2023 | | | | |
| Microprocessors and Microcontrollers (ECC 404) | | | | |
| Lectures | | | 3 per week | |
|  | | | Hours | | Marks |
| Theory examination | | | 3 | | 80 |
| Internal Assessment | | | - | | 20 |
| Total | | | -- | | 100 |
| Day | | | Time | |
| Monday | | | 9 am-10 am | |
| Thursday | | | 11.15 am-12.15 pm | |
| Friday | | | 10 am-11 am | |
| Lecture No. | Dates | | | Topic | Remarks | |
| Planned | Actual | |
| 1 | 9/1/23 | 9/1/23 | | Evolution of Microprocessors | **Content Beyond syllabus** | |
| 2 | 11/1/23 | 11/1/23 | | 8086 Architecture |  | |
| 3 | 12/1/23 | 12/1/23 | | Memory Segmentation ,Addressing modes |  | |
| 4 | 16/1/23 | 16/1/23 | | Instruction Set and Assembler Directives |  | |
| 5 | 18/1/23 | 18/1/23 | | Assembly language programming |  | |
| 6 | 19/1/23 | 19/1/23 | | Instruction Set and Assembler Directives |  | |
| 7 | 23/1/23 | 23/1/23 | | Assembly language programming |  | |
| 8 | 27/1/23 | 27/1/23 | | Instruction Set and Assembler Directives |  | |
| 9 | 30/1/23 | 30/1/23 | | Assembly language programming |  | |
| 10 | 2/2/23 | 2/2/23 | | Instruction Set and Assembler Directives |  | |
| 11 | 3/2/23 | 3/2/23 | | Assembly language programming |  | |
| 12 | 6/2/23 | 6/2/23 | | 8086 pin description |  | |
| 13 | 9/2/23 | 9/2/23 | | Interrupts and Interrupt service routines, |  | |
| 14 | 10/2/23 | 10/2/23 | | Dedicated interrupts, Software interrupts |  | |
| 15 | 13/2/23 | 13/2/23 | | Generating the 8086 System Clock and Reset Signals using 8284 clock generator |  | |
| 16 | 16/2/23 | 16/2/23 | | 8086 Minimum and Maximum Mode CPU Modules |  | |
| 17 | 17/2/23 | 17/2/23 | | 8086 Minimum and Maximum Mode CPU Modules |  | |
| 18 | 17/2/23 | 17/2/23 | | 8086 Minimum and Maximum Mode CPU Modules |  | |
| 19 | 23/2/23 | 23/2/23 | | Minimum and Maximum Mode Timing Diagrams |  | |
| 20 | 24/2/23 | 24/2/23 | | Memory interfacing | **Design sheet** | |
| **Unit Test 1- February 28-March 1,2023** | | | | | | |
| 21 | 2/3/23 | 2/3/23 | | 8255-PPI:Functional Block Diagram and description, Operating Modes |  | |
| 22 | 3/3/23 | 3/3/23 | | 8255-PPI:Functional Block Diagram and description, Operating Modes | **Assignment 1** | |
| 23 | 6/3/23 | 6/3/23 | | 8259- PIC: Functional Block Diagram and description, Cascaded mode of operation |  | |
| 24 | 9/3/23 | 9/3/23 | | 8259- PIC: Functional Block Diagram and description, Cascaded mode of operation |  | |
| 25 | 10/3/23 | 10/3/23 | | System design (including Memory and I/O) |  | |
| 26 | 13/3/23 | 13/3/23 | | Differences between a Microprocessor and Microcontroller |  | |
| 27 | 16/3/23 | 16/3/23 | | Architecture of 8051 |  | |
| 28 | 17/3/23 | 17/3/23 | | Memory Organization of the 8051 |  | |
| 29 | 20/3/23 | 20/3/23 | | Addressing modes | **Current**  **microcontroller enhancements** | |
| 30 | 23/3/23 | 23/3/23 | | Instruction set |  | |
| 31 | 24/3/23 | 24/3/23 | | Assembly language programming. |  | |
| Euphoria week | | | | | | |
| 32 | 3/4/23 | 3/4/23 | | I/O port programming | **Assignment 2** | |
| 33 | 6/4/23 | 6/4/23 | | Programming 8051 Timers |  | |
| 34 | 7/4/23 | 7/4/23 | | Serial Port Programming |  | |
| 35 | 7/4/23 | 7/4/23 | | Interrupts Programming |  | |
| 36 | 10/4/23 | 10/4/23 | | LCD & Keyboard Interfacing |  | |
| 37 | 10/4/23 | 10/4/23 | | ADC, DAC & Sensor Interfacing |  | |
| 38 | 13/4/23 | 13/4/23 | | Stepper Motor Interfacing |  | |
| 39 | 14/4/23 | 14/4/23 | | DC motor Interfacing |  | |
| **Unit test 2 – April 17-10 ,2023** | | | | | | |

**Examination Scheme**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Module** | | **Lecture Hours** | **Marks distribution in Test (For internal assessment/TW)** | | **Approximate Marks distribution in Sem. End Examination** |
| **Test 1** | **Test 2** |
| 1 | The 8086 Microprocessor | 06 | 10 |  | 20 |
| 2 | 8086 programming | 06 | 05 |  | 10 |
| 3 | 8086 Interfacing –Part I | 05 | 05 |  | 10 |
| 4 | 8086 Interfacing –Part II | 06 |  | 05 | 10 |
| 5 | The 8051 Microcontroller | 08 |  | 510 | 15 |
| 6 | 8051 Interfacing | 08 |  |  | 15 |

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| Submitted By | Approved By |
| Dr Sapna Prabhu | Dr D.V. Bhoir |
| Sign: | Sign: |
|  |  |
| Date of Submission: | Date of Approval: |
|  | |