

**GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT**

**COURSE CURRICULUM**  
**COURSE TITLE: MICROPROCESSOR AND ASSEMBLY LANGUAGE**  
**PROGRAMMING**  
**(Code: 3340302)**

Diploma Programmes in which this course is offered	Semester in which offered
Biomedical Engineering	4 <sup>th</sup> Semester

### 1. RATIONALE

Microprocessors are being excessively used in the field of medical instrumentation. This course is intended to help the students to understand the architecture and programming of a typical Microprocessor. The course will also deal with the architecture and introduction to 8085 and other advanced microprocessors. The course in addition, will provide knowledge of block diagram of some microprocessor based medical equipment. Therefore, this course is designed to develop in students the requisite cognitive and practical skills in performing effectively as biomedical engineer.

### 2. COMPETENCY

The course content should be taught and curriculum should be implemented with the aim to develop required skills in students so that they are able to acquire following competencies:

- **Interface the medical equipments and it's attachments with microprocessor.**

### 3. COURSE OUTCOMES

The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

- i. Identify different blocks of microprocessor.
- ii. Correct the instructional syntax errors.
- iii. Develop logic for data transfer and arithmetic and logical operations.
- iv. Develop logic for branching and looping operations.
- v. Identify different blocks of advance microprocessor.
- vi. Enlist microprocessor based medical equipments.

### 4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
L	T	P		Theory Marks		Practical Marks		Total Marks
			C	ESE	PA	ESE	PA	
4	0	2	06	70	30	20	30	150

**Legends:** L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit; ESE - End Semester Examination; PA - Progressive Assessment.

## 5. COURSE DETAILS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
<b>Unit – I Micro-processor Architecture &amp; Micro-processor system</b>	1a. Draw and explain basic architecture of Microprocessor. 1b. Explain the difference between Von Neumann and Harvard architecture. 1c. Draw and explain block diagrams of bus organization, Functional, Programming model, Pin-out diagram, Signaling Diagram. 1d. Describe the Microcomputer System. 1e. Describe the data bus, control signals, power supply and clock frequency, Serial I/O ports and timing signal diagram.	1.1 Microprocessor Architecture and its operation: Microprocessor initiated operations and 8085 bus organization, internal data operations and 8085 registers.  1.2 Memory: Memory organization, memory map, memory read and writes.  1.3 Microcomputer system  1.4 Microprocessor 8085: Block diagram, address and data bus, control and status signals, power-supply and clock frequency, interrupts and externally initiated operations, serial i/o ports, bus timings, flags.
<b>Unit– II 8085 Instruction and Timing</b>	2a. Classify various Instruction set. 2b. Describe different instruction syntax and its memory occupation. 2c. Write simple programs using different instructions.	2.1 Instruction classification: Review of 8085 operations 2.2 Instruction Formats: Single bytes, two bytes and three bytes instructions, op-code format, instruction timings and operation status, simple programs.
<b>Unit– III 8085 Instruction set</b>	3a. Explain different addressing modes. 3b. Explain the purpose of various instructions. 3c. Use instructions to write simple program.	3.1 Data transfer instructions. 3.2 Arithmetic instructions. 3.3 Logical operations. 3.4 Branch operations. 3.5 Stack, I/O and Machine control Instructions. 3.6 Simple programs using 8085 instructions.
<b>Unit – IV Programm-ing Techniques</b>	4a. Describe different types of programming techniques. 4b. Write simple programs on different programming techniques.	4.1. Looping, counting and indexing. 4.2. Logic operations 4.3. Counter and timing delays. 4.4. Stack and subroutines. 4.5. Code conversion, BCD arithmetic and 16 bit data operations.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
<b>Unit – V Advance Microprocessor and its medical applications.</b>	5a. Draw and explain basic block diagrams of 8086/8088 processors. 5b. Draw and explain block diagram of Pentium processor 5c. Describe the RISC processor with its features. 5d. Draw and explain block diagram of temperature monitoring system and ECG.	5.1 8086 /8088 architecture. 5.2 32 bit Microprocessor 80386: Introduction/Architecture 5.3 The Intel Pentium processor: Internal block diagram 5.4 RISC processor: Introduction & features. 5.5 Human body temperature measurement using microprocessor. 5.6 Microprocessor based Electrocardiograph (ECG) monitoring system.

## 6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Microprocessor Architecture & Microprocessor system	12	14	07	00	21
II	8085 Instruction and Timing	08	02	08	02	12
III	8085 Instruction set	14	00	06	10	16
IV	Programming Techniques	10	00	02	05	07
V	Advance Microprocessor and its medical applications.	12	10	02	02	14
	<b>Total</b>	<b>56</b>	<b>26</b>	<b>25</b>	<b>19</b>	<b>70</b>

**Legends:** R = Remember; U=Understand; A = Apply and above levels (Bloom's Revised 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.

## 7. SUGGESTED LIST OF EXERCISES/PRACTICALS

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills (**outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

**Note:** Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes** (as given in a common list at the beginning of curriculum document for this programme) would be assured.

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Approx Hrs. required
1	I	Demonstrate hardware & software development tool for 8085	02
2	III	Develop & execute programs on 8 bit data transfer instructions	02
3	III	Develop & execute programs on 16 bit data transfer instructions	02
4	III	Develop & execute programs on 8 bit Arithmetic instructions.	02
5	III	Develop & execute programs on 16 bit Arithmetic instructions.	02
6	III	Develop & execute programs on 8 bit Logical instructions.	02
7	III	Develop & execute programs on 16 bit Logical instructions.	02
8	III	Develop & execute programs on Machine control instructions.	02
9	IV	Develop & execute program to find bit to bit similarity between two numbers	02
10	IV	Develop & execute program to check whether given no is odd or even	02
11	IV	Develop & execute program to sum integers from 0 to 9.	02
12	IV	Develop & execute program to multiply two 8 bit numbers.	02
13	IV	Develop & execute program to move block of memory to given location and length of block is given in specific memory location	02
14	IV	Develop & execute program to find smallest number from an array of N number	02
15	IV	Develop & execute program to count negative values in given block of data.	02
16	IV	Develop & execute program to find the square of given integer using look up table method	02
17	IV	Develop & execute program to find Hex to ASCII code conversion.	02
18	IV	Develop & execute program to convert BCD number to an equivalent Hex number.	02
19	IV	Develop & execute program to sort given array of ten bytes in descending order.	02
20	V	Measure human body temperature using microprocessor.	02
21	V	Measure Electrocardiograph using microprocessor	02
<b>Total Hrs</b> (Perform practical worth 28 hours such that most units are covered)			<b>42</b>

## 8. SUGGESTED LIST OF STUDENT ACTIVITIES

Following is the list of proposed student activities like:

- i. Student should perform various tasks related to microprocessor in laboratory.
- ii. Student should perform various practical using 8085 simulator in laboratory.

## 9. SPECIAL INSTRUCTIONAL STRATEGIES

- i. Give practice for as much programming as possible
- ii. Arrange visit to nearby hospital and show features, functioning and maintenance of microprocessor based medical equipments

## 10. SUGGESTED LEARNING RESOURCES

### A) List of Books

S.No.	Title of Book	Author	Publication
1.	Microprocessor Architecture, Programming & Applications with 8085 and 8080 A	R.S. Gaonkar	Willey Eastern Ltd.
2.	Introduction to microprocessor	A.P. Mathur	TMH
3.	8080A/8085 assembly language programming	Lance A. Leventhal	PHI
4.	The 8086/8088 family: Design, Gross & Interfacing	John Uffenbeck	PHI
5.	Handbook of Bio-Medical Instrumentation	R.S.Kahandpur	PHI

### B) List of Major Equipment/ Instruments

- i. Microprocessor Trainer kit
- ii. Computer
- iii. Microprocessor Simulators
- iv. Microprocessor based temperature monitor
- v. Microprocessor based Electrocardiograph

### C) List of Software/Learning Websites

- i. [www.isro.org](http://www.isro.org)
- ii. <http://www.electronics-tutorials.com/>
- iii. <http://www.efymag.com/>
- iv. [www.nptl.iitm.ac.in](http://www.nptl.iitm.ac.in)
- v. [www.ocw.mit.edu](http://www.ocw.mit.edu)

## 11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

### Faculty Members from Polytechnics

- **Prof. A. K. Bula**, Lecturer, Dept. of Instrumentation Engineering, G.P.Gandhinagar
- **Prof. N. D. Makwana**, Lecturer, Dept. of Biomedical Engineering, G.P.Gandhinagar
- **Prof. M. H. Dave**, Lecturer, Dept. of Biomedical Engineering, G.P.Gandhinagar
- **Prof. S. S. Malkan**, Lecturer, Dept. of Biomedical Engineering, G.G.P.Ahmedabad

### Faculty Members from NITTTR

- **Prof. (Ms.) Susan S. Mathew**, Associate Professor, Department of Electrical and Electronics Engineering
- **Dr. S. K. Gupta**, Professor and Coordinator for State of Gujarat