

**GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT**

**COURSE CURRICULUM**  
**COURSE TITLE: MICROPROCESSOR AND ASSEMBLY LANGUAGE**  
**PROGRAMMING**  
**(Code: 3341101)**

Diploma Programme in which this course is offered	Semester in which offered
Electronics and Communication Engineering	4 <sup>th</sup> Semester

**1. RATIONALE**

Microprocessor is the heart of embedded system and computers. This course will provide basic knowledge of microprocessor architecture and programming in assembly language. The basic knowledge of microprocessor and assembly language programming will enable the students to learn microcontroller and embedded systems in the higher semesters. The intention of this course is to help the student to maintain microprocessor based electronic equipments.

**2. COMPETENCY:**

The course content should be taught and implemented with the aim to develop different types of skills so that students are able to acquire following competency:

- **Maintain microprocessor based electronic equipment.**

**3. COURSE OUTCOMES**

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

- i. Analyse the architecture of the Intel 8085 microprocessor for its various applications.
- ii. Develop simple arithmetic programmes
- iii. Use the addressing modes and timing diagram for executing programmes efficiently
- iv. Develop assembly language program using stack and subroutine for various applications
- v. Interface peripheral devices with 8085 microprocessor

**4. TEACHING AND EXAMINATION SCHEME**

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
L	T	P		Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	150
3	0	2	5	70	30	20	30	

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; 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 Microprocessor Architecture</b>	1a. Define microprocessor and Differentiate between types of microprocessor	1.1 Microprocessor and types of microprocessor
	1b. Describe the function of pins in the pin diagram of 8085 microprocessor with a sketch.	1.1 Pin diagram of 8085 microprocessor
	1c. Define and explain different operations performed by Microprocessor	1.2 Microprocessor operations
	1d. Describe the 8085 microprocessor architecture diagram with its functioning.	1.3 8085 Microprocessor architecture diagram with its functions
	1e. Describe the register set of 8085 1f. Describe the impact of ALU on flags of 8085 1g. Describe interrupt and serial I/O	1.4 Register set of 8085 1.5 Flag Classification 1.6 1.7 Interrupt types and serial I/O
	1h. Define the various types of buses and clock speed. 1i. Importance of demultiplexing of address/data bus and control signal 1j. State the significance of clock speed.	1.7 Bus organisation: Address & Data bus and control bus and demultiplexing of buses 1.8 Clock speed
<b>Unit-II 8085 Microprocessor Instruction set</b>	2a. Differentiate between opcode and operand with examples	2.1 Opcode and operand
	2b. Define the classification of the instruction set	2.2 Instructions: Data transfer, Arithmetic, Logical, Branch, Stack and I/O read and write cycle
<b>Unit-III Addressing Mode And Timing Diagram</b>	3a. Define the need of addressing modes. 3b. Classify the various addressing modes	3.1 Type of addressing mode of 8085
	3c. Differentiate between T-state, machine cycle and instruction cycle	3.2 T-state, Machine Cycle, Instruction cycle
	3d. Explain with sketches the timing diagram for I/O and memory read/write cycle	3.3 Timing diagram
	3e. Describe the timing delay using NOP instruction	3.4 Timing Delays
<b>Unit-IV Programming In 8085</b>	4a. Develop to execute simple addition and subtraction programmes using the instruction set 4b. Develop to execute simple multiplication and division programmes using the instruction set	4.1 Addition and subtraction programmes 4.2 Multiplication and division programmes
	4c. Develop to execute various assembly language programs using looping and	4.3 Looping, Counting and Indexing.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
	counting concept.	
	4d. Develop to execute assembly language programs using logical functions	4.4 Logic operations viz. AND, OR, NOR, NAND NOT, EXOR.
	4e. Develop to execute an assembly language to generate delay of specific time.	4.5 Counter and Timing delays.
	4f. Develop to execute an assembly language sub program based on Stack and Subroutine concept.	4.6 Stack and subroutines.
<b>Unit-V Interfacing Of 8085</b>	5a. Define memory mapping. 5b. Discriminate between memory mapped I/O and I/O mapped I/O	5.1 Memory and I/O mapping.
	5c. Explain the functions of the chip selection and decoder interfacing.	5.2 Chip selection and decoder interfacing.
	5d. Interface 8085 to EPROM.	5.3 Interfacing to EPROM and R/W Memory
	5e. Sketch the interfacing circuit for LED using 74LS245	5.4 Interfacing LEDs and Switches using 74LS245
	5f. Explain the function of IC 8255 with a block diagram. 5g. Develop to execute assembly language program to read and display the data from IC 8255 ports.	5.5 Programmable Peripheral Interface- IC 8255: Configuration, Modes and Operation

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

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Microprocessor Architecture	10	8	6	4	18
II	8085 microprocessor instruction set	6	2	4	4	10
III	Addressing mode and Timing Diagram	10	4	6	6	16
IV	Programming in 8085	8	2	6	4	12
V	Interfacing of 8085	8	4	4	6	14
	<b>Total</b>	<b>42</b>	<b>20</b>	<b>26</b>	<b>24</b>	<b>70</b>

## 7. SUGGESTED LIST OF EXERCISES/PRACTICAL

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.

Sl. No.	Unit No.	Practical/Exercise (outcome in psychomotor domain)	Approx. Hrs. Required
1.	I	Identify the components of the microprocessor trainer to configure in the programming mode	2
2.	II	Develop/Execute a simple programme to move data from one register to the other	2
3.	II	Develop/Execute programme immediate data between different registers	2
4.	II	Develop/Execute a programme for addition	2
5.	II	Develop/Execute a programme for subtraction	2
6.	II	Develop/Execute a programme for multiplication	2
7.	II	Develop/Execute a programme for division	2
8.	III	Develop/Execute an Assembly language program to convert Hexadecimal to ASCII code conversion.	2
9.	IV	Develop/Execute Assembly language program to check whether given no is odd or even	2
10.	IV	Develop/Execute a programme to transfer a block of data from one memory location to another memory location	2
11.	IV	Develop/Execute a programme to add two 32-bit numbers	2
12.	IV	Develop/Execute a programme to add 2 decimal numbers in BCD format	2
13.	IV	Develop/Execute a programme to convert data from grey code to binary code	2
14.	IV	Develop/Execute a programme to convert data from binary code to grey code	2
15.	IV	Develop/Execute an Assembly language programs based on 8 bit Logical instructions.	2
16.	IV	Develop/Execute an Assembly language programme to sum integers from 0 to 9.	2
17.	IV	Develop a programme to find the smallest number from an array of N numbers	2
18.	IV	Develop a programme to count negative values in given block of data.	2
19.	IV	Develop/Execute a Subroutine to find the square of given integer.	2
20.	V	Develop/Execute an Assembly language programme to sort given array of ten bytes in descending order.	2
21.	V	Develop/Execute an Assembly language programme to alternatively blink LEDs connected on Port –B of 8255 at an	2

Sl. No.	Unit No.	Practical/Exercise (outcome in psychomotor domain)	Approx. Hrs. Required
		interval of 0.1 second. Draw Interface diagram.	
22.	V	Develop/Execute an Assembly language programme for 8255 to Interface keypad and display an LED	2
<b>Total</b>			<b>44</b>

### 8. SUGGESTED LIST OF STUDENT ACTIVITIES.

Following is the list of proposed student activities like:

- i. Develop unit wise topics related programs in laboratory.
- ii. Develop any module of to be useful in real life application.
- iii. Prepare Multimedia presentation of module developed by students.
- iv. Prepare the charts of block diagram, circuit diagram and timing diagrams.
- v. Interface with IC 8259, IC 8279, IC 8254, IC 8251.

### 9. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

- i. As much programming
- ii. Animation/Video presentation session.
- iii. Group discussion and seminar.

### 10. SUGGESTED LEARNING RESOURCES

#### A) List of Books

S. No.	Title of Books	Author	Publication
1	Microprocessor Architecture Programming and Application	Ganonker, Ramesh	PHI Learning, New Delhi, latest edition
2	The 8080/85 Family: Design, Programming and Interfacing	Ufferbeck, John	PHI Learning, New Delhi, latest edition
3	Introduction to Microprocessor	Mathur, A.P.	TMH, New Delhi, latest edition
4	Microprocessor and its application	Ram, B.	BPB, New Delhi, latest edition
5	Microprocessor and Interfacing	Hall, Douglas	TMH, New Delhi, latest edition
6	Microprocessors and Microcontrollers	Kumar, Senthil, Saravanan, Jeevananthan	Oxford University, New Delhi, latest edition

#### B) List of Major Equipment/Materials with Broad Specifications

- i. 8085 microprocessor kits and simulator
- ii. Peripheral Interfacing circuit board of IC 8255.
- iii. CRO and Logic Analyser
- iv. Computer Systems with minimum P III processor (or equivalent) and 512 MB RAM.
- v. Multimedia Projector

#### C) List of Software/Learning Websites

- i. Go for free open source software wherever applicable
- ii. Simulator such as : <http://8085simulator.codeplex.com/> <http://gnusim8085.org/> or its

Equivalent.

- iii. Latest processor configuration : <http://www.intel.com/pressroom/kits/quickreffam.htm>
- iv. Intel 8085 microprocessor architecture: <http://www.cpu-world.com/Arch/8085.html>

## 11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

### **Faculty from Polytechnic Group**

- **Prof. D. B. Vagadia**, HOD (EC), Government Polytechnic, Rajkot
- **Prof R. D. Raghani**, HOD (EC), L.E. Collage, Morbi
- **Prof. T. R. Parmar**, Sr. Lecturer (EC), Government Polytechnic, Palanpur
- **Prof. K. N. Vaghela**, Sr. Lecturer (EC) , Government Polytechnic, Ahmedabad
- **Prof. J D Chauhan**, Sr.Lecturer (EC), BBIT, Vallabh Vidhyanagar
- **Prof. (Ms) Sthuthi Rachel Joshua**, Assistant Professor, Oriental College of Engineering, Bhopal

### **Coordinator and Faculty Members from NITTTR Bhopal**

- **Prof. (Mrs.) Anjali Potnis**, Assistant Professor, Department of Electrical and Electronics Engineering.
- **Prof. (Mrs.) Susan S. Mathew**, Associate Professor, Department of Electrical and Electronics Engineering.