



**GOVERNMENT POLYTECHNIC, AMRAVATI**  
(AN AUTONOMOUS INSTITUTE OF GOVERNMENT OF MAHARASHTRA)  
**CURRICULUM DEVELOPMENT CELL**

PROGRAMME TITLE: DIPLOMA IN COMPUTER ENGINEERING  
COURSE CODE: CM 3409  
COURSE TITLE: MICROPROCESSORS

**TEACHING SCHEME:**

LEVEL OF COURSE	PRERE- QUISITE	WEEKLY CONTACT HRS.			TOTAL CREDITS	TOTAL WEEKS	TOTAL CONTACT HOURS		
		L	T	P			L	T	P
III	-	04	-	02	06	16	64	-	32

**EXAMINATION SCHEME:**

ESE PAPER HRS.	THEORY (Marks)				PRACTICAL (Marks)		TOTAL (Marks)
	ESE	PA	TOTAL		ESE	PA	
3Hrs \$	MAX. 70	30	100		50#	25^	175
	MIN.	---	40		20		

@: Internal Assessment #: External Practical based \$: online examination

(\*) Under the Theory PA, Out Of 15 Marks, 10 Marks is the Average of Two Tests and 05 Marks are for Micro project-

(^ ) Under practical PA Continuous Assessment of Practical Work is to be done by Course Teacher as per CDC norms.

For the courses having only practical examination, PA has two parts (i) Continuous Assessment of Practical work - 60% and (ii) microproject-40%.

**1. RATIONALE:**

Microprocessor is brain of computer. Intel family is widely used all over the world. 8085 is the 8-bit CPU and 8086 is the 16-bit CPU. 8086 is the base of all upward developed processors. It is more powerful and efficient computing machine. It overcomes all major limitations of the previous processors. It is able to get interfaced with 8-bit, 16-bit systems. IBM PC is introduced in 1980 with 10MB hard disk, one double side double density floppy disk drive, monitor and asynchronous communications adapter. This subject covers Basics of 8085, architecture of 8086 along instruction set. It also covers interfacing with memory devices. This will act as base for the advanced microprocessor based design.

**2. COURSE OUTCOMES (COs)**

At the end of this course, student will be able to: -

- 1) Identify different types of microprocessor.
- 2) Analyze the functional block of 8086 microprocessor.
- 3) Use instructions for different addressing modes.
- 4) Write assembly language programs for given problem.
- 5) Develop assembly language program using procedure and macros.
- 6) Determine the concept of I/O interfaces with memory.

**3. DETAILED CONTENTS: THEORY**

Unit	Unit Outcomes (UOs) (In cognitive domain)	Topic and Sub-topics	CO No.	Hrs	Mark s
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Unit 1 Basics of Microprocessor	1v. Identify the types of microprocessor. 1w. Differentiate Microprocessor and Microcomputers. 1x. Explain need of multiprocessing and distributed processing.	1.1 Evolution of Microprocessor and its types. 1.2 Microprocessor and Microcomputers. 1.3 Multiprocessing and distributed processing. 1.4 Limitation of 8 bit microprocessor. 1.5 Introduction & Salient features of 8086.	1	08	08
Unit 2 16 bit Microprocessor	2a. Describe the functions of 8086 microprocessor. 2b. State the functions of given registers of 8086. 2c. Calculate the physical address for given segment of 8086. 2d. Describe the limitation of 8086.	2.1 Pin Diagram of 8086 2.2 Architecture of 8086: Functional block diagram, Register organization 2.3 Concept of pipelining. 2.4 Memory segmentation, Physical memory address generation.	2	10	10
Unit 3 8086 Instruction set overview	3a. Identify the different types of instruction format. 3b. Classify different types of addressing modes with example. 3c. Explain the execution of an instruction. 3d. Explain the instruction set of 8086.	3.1 8086 instruction formats. 3.2 Addressing modes of 8086. 3.3 Fetching and execution of an instruction. 3.4 Addressing modes 3.5 Instruction set of 8086. Groups of Instruction: Arithmetic instruction, logical instruction, Data transfer instruction, String operation instructions, Program control transfer or branching instructions, Process control instructions.	3	12	14
Unit 4 The art of assembly language Programming	4a. Write the program development steps. 4b. Identify the tools of ALP. 4c. Describe different assembly directives. 4d. Explain the standard format to write program.	4.1 Program development steps: Defining problem and constraints, Writing algorithms, Flowchart, Initialization checklist, Choosing instruction, Converting algorithms to assembly language programs. 4.2 Assembly Language Programming Tools: Editor, assembler, Linker, Debugger. 4.3 Assembler directives 4.4 Programming using assembler.	4	14	14

Unit 5 Procedure and Macro	5a.Explain address decoding with neat diagram 5b.Develop an assembly language program using the relevant procedure for the given problem. 5c. .Develop an assembly language program using the macros for the given problem. 5d. Compare the procedure and macro.	5.1 Addressing Memory & port, address decoding. 5.2 Procedure: defining and calling procedure-PROC, ENDP, FAR and NEAR Directives, CALL and RET instructions; parameter passing methods, Assembly Language Program using Procedure. 5.3 Macro: Defining Macros, MACRO and ENDM directives, Macro with parameters, Assembly Language Programs using Macros.	5	12	12
Unit 6 System Interfacing	6a. State the interrupt with its types. 6b. Describe the procedure to interface the 8255 PPI. 6c. Explain working of the timer, counter. 6d. Explain the A/D & D/A convertor.	6.1 Interrupt & interrupt service procedure, Interrupt Vector Table. 6.2 Interfacing of 8255 PPI 6.3 8254 timer/counter, simple keyboard, stepper motor. 6.4 A/D convertor interfacing D/A convertor interfacing with 8255	6	08	12

#### 4. LIST OF PRACTICALS:

Sr No.	PRACTICAL OUTCOMES (PrOs)	CO NO.
1	Perform the execution & implementation of arithmetic instructions.	1
2	Perform an assembly language program for adding 2 numbers.	1
3	Write an assembly language program for data transfer group (a) Byte transfer (b) Block transfer (c) Reverse transfer.	2
4	Write an ALP to (a) compare two strings (b) find length of string (c) concatenate two string.	3
5	To write an assembly language program to swap the contents of 2 registers	3
6	To write an assembly language program perform OR, XOR & AND operation.	3
7	To write an assembly language program for multiplication of two numbers using multiple addition method.	4
8	To write an assembly language program for multiplication of two 8-bit numbers using shift method.	4
9	To write an assembly language program for finding larger of two numbers using procedure.	5
10	Perform addition of two numbers by using macro.	5
11	Write an assembly language program for flashing of LED's at PORT A of 8255.	6
12	Interface 8254 timer with 8086 as odd addressed device and generate a square wave at its output.	6
	Total	

#### Note

- i) The entire above listed practical's need to be performed compulsorily, so that the student reaches the 'Precision level of Dave's Psychomotor Domain.



- ii) *The Process and Product related skills associated with each practical outcome shall be assessed on basis of following performance indicators.*

S. No.	Performance Indicators	Weightage in %
a	Execution of given program within time	25
b	Neatness and drawing skills	15
c	Accurate output with justification	15
d	Debug ,test and execute the programs.	15
e	Able to answer oral question.	10
f	Submission of report in time	10
Total		100%

The above PrOs also comprise of the following social skills/attitudes which are Affective Domain Outcomes (ADOs) that are best developed through the laboratory/field based experiences:

- Follow safety practices.
- Demonstrate working as a leader/a team member.
- Maintain tools and equipment.
- Follow ethical Practices.

The ADOs are not specific to any one PrO, but are embedded in many PrOs. Hence, the acquisition of the ADOs takes place gradually in the student when s/he undertakes a series of practical experiences over a period of time. Moreover, the level of achievement of the ADOs according to Krathwohl's 'Affective Domain Taxonomy' should gradually increase as planned below:

- 'Valuing Level' in 1<sup>st</sup> year
- 'Organising Level' in 2<sup>nd</sup> year and
- 'Characterising Level' in 3<sup>rd</sup> year

## 5. SUGGESTED STUDENT ACTIVITIES

Other than the classroom and laboratory learning, following are the suggested student-related *co-curricular* activities which can be undertaken to accelerate the attainment of the various outcomes in this course: Students should conduct following activities in group and prepare reports of about 5 pages for each activity, also collect/record physical evidences for their (student's) portfolio which will be useful for their placement interviews:

- Undertake a market survey of different processors used in market.
- Prepare charts of microprocessor.
- Observe different flags after execution of programs.
- Teacher guided self-learning activities
- Course/ library /internet based mini-projects.
- Literature survey of available at institute library regarding microprocessor material used for different purposes and situations.
- Develop Power point presentation or animation for demonstrating the architecture /working of microprocessor.
- Seminar on any relevant topic related to microprocessor.

## 6. SUGGESTED INSTRUCTIONAL STRATEGIES

Following are suggested instructional strategies, which the teacher can adopt for the attainment of the various outcomes in this course:

- Massive open online courses (*MOOCs*) may be used to teach various topics/sub topics.
- The teacher needs to ensure to create opportunities and provisions for *co-curricular activities*.
- Guide student(s) in undertaking micro-projects.
- Arrange visit to nearby industries and workshops for understanding various microprocessor structure.
- Use different instructional strategies in classroom teaching.
- Draw all the symbols on black board and explained to students. Show Charts to the students.



- g. About 10-15% of the topics/sub-topics/contents which is relatively simpler or descriptive in nature may be given to the students for *self-directed learning* and assess the development of the COs through classroom presentations. Keep the record of the topics/sub-topics/contents given to the students.

## 7. SUGGESTED MICRO-PROJECTS.

Only one micro-project is to be undertaken by a student in the beginning of the semester. S/he ought to submit it by the end of semester. Each micro-project should include two or more Cos. The micro-project could be industry application based, internet based, laboratory based, field based and survey based. In all semesters, it could be group-based to build up skill and confidence in every student. Each student will have to maintain dated work diary consisting of individual contribution in the project work and give a seminar presentation of it before submission. The student ought to submit micro-project by the end of the semester to develop the industry oriented COs. A suggested list is given below. Similar micro projects could be added by concerned faculty.

- Collect the information of latest microprocessor.
- Prepare charts showing the pin as well as architectural diagram.
- Survey on the latest microprocessor in use.
- Comparison of latest microprocessor with the 8086 microprocessor.
- Convert hexadecimal number to equivalent BCD.
- Separate the odd and even number from given array, store them in separate array and find the sum.
- Generate Fibonacci series.
- Find factorial of number.
- Convert lower case string to uppercase string.
- Sort the given array in ascending order.

## 8. MAJOR EQUIPMENTS/INSTRUMENTS REQUIRED

Sr No.	Equipment Name with Broad Specification	Practical No.
1	Operating System: Windows XP/Windows 7	All
2	Software: Editor: EDIT,NOTEPAD Assembler: TASM/MASM Linker: TLINK/LINK Debugger:TD/Debug of windows Operating System	

## 9. SUGGESTED SPECIFICATION TABLE FOR QUESTION PAPER DESIGN

Unit No.	Unit Title	Marks per Unit	Distribution of Theory Marks		
			R Level	U Level	A Level
1	Basics of Microprocessor	08	4	4	
2	16 bit Microprocessor	10	2	4	4
3	8086 Instruction set overview	14	4	4	6
4	The art of assembly language Programming	14	2	6	6
5	Procedure and Macro	12	4	4	4
6	System Interfacing	12	4	4	4
Total		70	20-30	40-55	30-45



R= Remember, U= Understanding, A=Application and above (*Bloom's Revised taxonomy*)

Note: This specification table provides general guidelines to assist student for their learning and to teachers to teach and assess students with respect to attainment of UOs. The actual distribution of marks at different taxonomy levels (of R, U and A) in the question paper may vary from above table.

#### 10. SUGGESTED LEARNING RESOURCES:

Sr.No.	Title Of Book	Author	Publication
1.	The 8086 and 8088 Microprocessor	Triebel, Avtar Singh, Walter A	Pearson Publications, New Delhi, 2015, ISBN 13:9780130930811
2.	Microprocessor and interfacing (Programming and hardware)	Hall Douglas V.	McGraw Hill Education, New Delhi, 2015, ISBN-13: 9780070257429
3.	Microprocessor and Microcontrollers	Latha, C., Murugeswari, B.	SCITECH Publications Chennai, 2015, ISBN :978-81-8371-702-1

#### 11. SOFTWARE/LEARNING WEBSITES.

- [WWW.INTEL.COM](http://WWW.INTEL.COM)
- [www.pcguides.com/ref/CPU](http://www.pcguides.com/ref/CPU)
- Assembler TASM/MASM, Linker LINK/TLINK, Debugger OS DEBUGE/TD
- [www.slideshare.com](http://www.slideshare.com)
- [www.tutorialspoint.com/assembly\\_programming](http://www.tutorialspoint.com/assembly_programming)

#### 12. COURSE CURRICULUM DEVELOPMENT COMMITTEE:

SR. NO.	NAME	DESIGNATION	INDUSTRY/INSTITUTE
1	Prof. K.P.Ukey	Lecturer in IT	Govt. Polytechnic Amravati
2	Prof. R.R.Bhoge	Lecturer in IT	Govt. Polytechnic Amravati
3	Dr. P.P.Karde	Head of department Department of IT	Govt. Polytechnic Amravati

Govt. Polytechnic, Programme Board of Studies (Computer Engineering) has approved the above course curriculum on 19.7.18 and is adopted for Computer Engineering Programme.

CHAIRMAN  
PROGRAMME BOARD OF STUDIES,  
COMPUTER ENGINEERING  
GOVERNMENT POLYTECHNIC,  
AMRAVATI.

The General Board of Studies has approved the above course curriculum on 24/07/18

The Governing Body has approved the above course curriculum on 06/08/18