GOVERNMENT POLYTECHNIC, NAGPUR.

(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME	:	**DIPLOMA IN CM / IT**
LEVEL NAME	:	**PROFESSIONAL COURSES**
COURSE CODE	:	**CM407E**
COURSE TITLE	:	**MICROPROCESSORS**
PREREQUISITE	:	**EC310E**
TEACHING SCHEME	:	**TH:03;TU:00;PR:02(CLOCK HRs.)**
TOTAL CREDITS	:	**04 (1 TH/TU CREDIT = 1 CLOCK HR., 2 PR CREDIT = 1 CLOCK HR.)**
THEORY TEE	:	**03 HRs**
PRACTICAL TEE	:	**02 HRs (Internal)**
PT EXAM	:	**01 HR**

❖ 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. This subject covers Basics of 8085, architecture of 8086 along instruction set. It also covers assembly language programming with effective use of procedure and macros. This will act as base for the advanced assembly language programming for next generation microprocessors.

❖ COURSE OUTCOMES:

After completing this course students will be able to–

1. Apply the fundamentals of assembly language programming in developing microprocessor based applications.
2. Develop assembly language program for interfacing various peripheral devices.
3. Identify and illustrate the need of advance microprocessors
4. Develop and execute programs in 8086 assembly language.
5. Design the hardware and software necessary to realize a project idea.
6. Interface external devices to the processor according to user requirements to create novel products and solutions for real life problems.

❖ **COURSE DETAILS:**

A. THEORY:

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
01.8-Bit Microprocessor	1. Describe the evolution of microprocessors. 2. Enlist the features of 8085. 3. Describe the architecture of 8085. 4. Illustrate the 8085 flag register. 5. Illustrate how the control and status signals can be separated.	1.1. Evolution of microprocessors 1.2. 8085 bus structure 1.3. Salient features of 8085 microprocessor 1.4. Architecture of 8085 microprocessor 1.5. 8085 pin diagram 1.6. Control & status signals 1.7. Separation of control signals 1.8. 8085 flags 1.9. Limitations of 8-bit microprocessors	06
02. 16-Bit Microprocessor 8086	1. Enlist the features of 8086 microprocessor. 2. Describe the architecture of 8086. 3. Enlist and specify the buses in 8086. 4. Describe the 8086 minimum/maximum system configuration. 5. Illustrate how memory addresses are generated. 6. Illustrate the pipelining Process. 7. Generate the memory address for interfacing a block of memory to 8086.	2.1 Features of 8086 microprocessor 2.2 Register organization of 8086microprocessor 2.3 8086 architecture 2.4 Signal descriptions of 8086 2.5 General Bus operation 2.6 I/O addressing capability 2.7 Minimum mode 8086 system 2.8 Maximum mode 8086 system 2.9 Concepts of pipelining, memory segmentation and memory address generation.	10
03.8086 Assembly Language Programming	1. Identify the addressing mode of a particular instruction. 2. Select a particular instruction for a specified action. 3. Develop basic programs for 8086 microprocessor. 4. Illustrate different types of microprocessor instructions with suitable example programs 5. Develop and execute a program to perform	3.1 Machine language instruction formats 3.2 Addressing modes of 8086 3.3 8086 Instruction set 3.4 Assembler directives and operators 3.5 Simple programs based on instruction set 3.6 Assembly Language Programming tools- Editor, Assembler, Linker, Debugger. 3.7 Program development steps: • Defining problem • Algorithms	10

	arithmetic operations.	• Flowchart • Initialization checklist • Choosing instructions • Converting algorithm to ALP 3.8 Programming using assembler	
04.Interrupts, Procedures & Macro	1. Describe the operation of stack and its significance. 2. Classify interrupts. 3. Illustrate the use of interrupts with suitable programs. 4. Describe various maskable and non-maskable interrupts. 5. Describe the CALL procedure. 6. Describe Macros. 7. the use of procedures and macros with suitable example programs. 8. Develop and execute a program for transferring a block of data using stack. 9. Develop and execute a program making use of non-maskable interrupts.	4.1 Introduction to stack 4.2 Stack structure of 8086 4.3 Interrupts and Interrupt Service Routine 4.4 Interrupt cycle of 8086 4.5 Non-maskable interrupts 4.6 Maskable Interrupt (INTR) 4.7 Software interrupts 4.8 Defining Procedure (Directives used, FAR and NEAR, CALL and RET instructions) 4.9 Nested, Reentrant & Recursive procedures 4.10 Defining and calling a Macro without parameters, Passing parameters to macros 4.11 Assembly language programs using procedures and macros.	8
05.System Interfacing	1. Describe I/O mapping and memory mapping. 2. Illustrate the odd and even bank memory concept. 3. Describe the interfacing of 8255 PPI with 8086 microprocessor. 4. Describe the interfacing of ADC 0808 with 8086 microprocessor. 5. Describe the interfacing of DAC 0800 with 8086 microprocessor 6. Develop and execute a program to interface ADC for converting a signal from analog to digital.	5.1 Memory interfacing techniques (I/O mapped I/O, Memory mapped I/O, Comparison of both) 5.2 Even and Odd bank concept 5.3 Memory Interfacing - RAM, ROM 5.4 Interfacing Input/ Output (I/O) ports 8255 Programmable Peripheral Interface – Configuration, Operation Modes, Interfacing 8255 with 8086 microprocessor 5.5 Interfacing of Analog to Digital converter 5.6 Interfacing of Digital to Analog converter	8
06.32-Bit Microprocessors	1. State the features of advance microprocessors 80286, 80386, 80486, 80586. 2. Compare advance	6.1 Salient features of 80286 microprocessor 6.2 Salient features of 80386 microprocessor 6.3 Salient features of 80486	06

	microprocessors. 3. State the need of higher processors.	microprocessor 6.4 Comparison of various microprocessors 6.5 Introduction to Pentium processors.	
		Total Hrs	48

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practicals	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Develop and execute an Assembly Language Program (ALP) to add / subtract two 16 bit numbers	8086 Assembly Language Programming	2
2	Develop and execute an ALP to find sum of series of numbers.		2
3	Develop and execute an ALP to multiply two 16 bit unsigned/ signed numbers. **OR** Develop and execute an ALP to divide two unsigned/ signed numbers (32/16, 16/8, 16/16, 8/8).		4
4	Develop and execute an ALP to find smallest/ largest number from array of *n* numbers. **OR** Develop and execute an ALP to arrange numbers in array in ascending/ descending order.		4
5	Develop and execute an ALP to perform block transfer data using string instructions / without using string instructions.		4
6	Develop and execute an ALP to compare two strings using string instructions / without using string instructions. **OR** Develop and execute an ALP to display string in reverse order, string length, Concatenation of two strings.		2
7	Determine digital equivalent of a analog signal by interfacing ADC with 8086 microprocessor.	System Interfacing	2
8	Generate a square wave, ramp wave by interfacing a DAC with IC8255 to 8086 microprocessor		2
9	Develop and execute an ALP to interface a stepper motor to 8086 microprocessor and rotate it in clockwise and anticlockwise direction.		2
10	Design and Prepare mini project based on any one application of 8086 microprocessor.	Mini-Project	6
		Skill Assessment	2
		Total Hrs	**32**

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	U	A	
01	8-Bit Microprocessor	04(00)	04(04)	00(00)	08(04)
02	16-Bit microprocessor 8086	02(00)	04(04)	08(04)	14(08)
03	8086 assembly language programming	02(00)	08(04)	06(06)	16(10)
04	Interrupts, Procedure & Macro	00(02)	08(00)	06(06)	14(08)
05	System Interfacing	02(02)	04(04)	06(00)	12(06)
06	32-bit microprocessors	00(00)	06(04)	00(00)	06(04)
	Total	10(04)	34(20)	26(16)	**70(40)**
				Total Marks	**70(40)**

R – Remember U – Understand A – Analyze / Apply

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	T	L	M	
01	1	R	2	1	R	2	2	R	2	3	R	2	5	R	2	4	R	2	**5/7**
	5	R	2																
02	1	U	4	2	U	4	3	U	4	1	U	4	2	U	4				**3/5**
03	3	U	4	4	U	4	5	U	4	2	A	4	3	U	4				**3/5**
04	2	A	4	2	A	4	4	U	4	5	U	4	6	U	4				**3/5**
05	3	A	6	4	A	6	3	A	6										**2/3**
06	5	A	6	6	U	6	4	A	6										**2/3**

T= Unit/Topic Number L= Level of Question M= Marks

R-Remember U-Understand A-Analyze/ Apply

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Drawing circuit diagram, selection of equipment's. writing procedure etc.	10
2	Performance	20
3	Calculation, Result, Drawing Graphs(if any	10
5	Viva voce	10
	TOTAL	**50**

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

1. Computer Engineering:-

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	-	-	-	-	-	-	-	3	3	-
2	-	3	-	-	-	-	-	-	-	3	3	-
3	-	3	-	-	-	-	-	-	-	3	3	-
4	-	3	3	3	-	-	-	3	3	3	3	-
5	-	3	3	3	-	-	-	3	3	3	3	-
6	-	3	3	3	-	-	-	3	3	3	3	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

2.Information Technology :-

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	2	3	4	5	6	7	8	9	10	1	2
1	-	3	-	-	-	-	-	-	-	3	-	3
2	-	3	-	-	-	-	-	-	-	3	-	3
3	-	3	-	-	-	-	-	-	-	3	-	3
4	-	3	3	3	-	-	-	3	3	3	-	3
5	-	3	3	3	-	-	-	3	3	3	-	3
6	-	3	3	3	-	-	-	3	3	3	-	3

❖ **REFERENCE & TEXT BOOKS:**

S.N.	Title	Author, Publisher, Edition and Year Of publication	ISBN Number
1.	Microprocessor and Interfacing (Programming and hardware)	Douglas V. Hall, Tata McGraw Hill, Second Edition, 1974	978007601673
2.	Advanced microprocessor & peripherals	A.K. Ray & K.M. Bhurchandi, Tata McGraw Hill, Second Edition, 2009	0070606587
3.	Microprocessor Architecture programming & applications with 8085	Ramesh A. Gaonkar, Penram International, Fourth Edition, 1999	0139012578
4.	Advance Microprocessor and interfacing	Badri Ram, Tata McGraw-Hill Education, 12th Reprint, 2001	0070434484, 9780070434486

❖ **E-REFERENCES:**

1. **www.electronics.dit.ie/staff/tscarff/8086_instruction_set/8086_instruction_set.html , assessed on 30th August, 2016**
2. **http://ece425web.groups.et.byu.net/stable/labs/8086Assembly.html , assessed on 30th August, 2016**
3. **nptel.ac.in>pdf>Teacher_Slides>mod1 , assessed on 30th August, 2016**

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

1. PS – 8086 Specifications
   - i. Operating frequency: 18.432MHz
   - ii. 16KB powerful software monitor two 27C256 EPROM
   - iii. Three 16-bit programmable timers from 8253
   - iv. 48 programmable I/O lines from 8255
   - v. Serial interface using 8251
   - vi. 50 pin FRC connector for bus expansion
   - vii. 20pin FRC connector foe user interface from 8255
   - viii. 9 pin D type connector for RS232 interface
   - ix. 101 PC type keyboard for entering user data/address and for commands

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Shri S. S. Tadas	HOD, Electronics	Government Polytechnic, Nagpur.
2.	Shri A. A. Ali	HOD, Electronics (IInd Shift)	Government Polytechnic, Nagpur.
3.	Ms. K. G. Giri	Lecturer, Electronics	Government Polytechnic, Nagpur.
4	Mr.Sandip V.Darwhekar	Director	Beta Computronics Pvt.Ltd.Nagpur