AC– 20/5/2025
Item No.–6.57 (N) 10

As Per NEP 2020

University of Mumbai

Syllabus forMinor Vertical 2		
Faculty of Engineering		
Board of Studies in Electronics Engineering		
Second Year Programme in Minor (Microprocessors and Microcontrollers Subject)		
Semester	**IV**	
Title of Paper (Theory)	**Sem.**	**Total Credits 4**
I) Microprocessors and Microcontrollers	**IV**	**3**
Title of Paper (Lab)		**Credits**
II) Microprocessors and Microcontrollers Lab	**IV**	**1**
From the Academic Year		**2025-26**

Sem. - IV

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned			
		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
	Microprocessors and Microcontrollers	**2**	**2**	**-**	**2**	**-**	**-**	**2**

Course Code	Course Name	Theory							Total
		Internal Assessment (IAT)			End Sem Exam	Exam Duration (in Hrs)			
		IAT-I	IAT-II	IAT-I + IAT-II (Total)					
	Microprocessors and Microcontrollers	20	20	40	60	2			100

Course Objectives:

1	To study the concepts and basic architecture of a Microprocessor and Microcontroller.
2	To write Assembly language programs for Microprocessors and Microcontrollersfor 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: After the successful completion students should be able to :-

CO1	Explain the architectural features of 16-bit Microprocessors like the 8086 and microcontrollers like the 8051
CO2	Develop Assembly language programs for the 8086 and the 8051
CO3	Design a microprocessor-based system including memory and I/O
CO4	Interface the 8051 to various devices including displays and actuators
CO5	Highlight the differences between basic and advanced microprocessors and microcontrollers

DETAILED SYLLABUS:

Module No.	Unit No.	Topics	References	Hrs.
1	**The 8086 Microprocessor**			**06**
	1.1	**8086 Architecture**	**1,2,5**	

	1.2	**Memory Segmentation**	**1,2,5**	
	1.3	**8086 pin description**	**1,2,5**	
	1.4	**Interrupts and Interrupts processing**	**1,2,5**	
2	**8086 programming**			**06**
	2.1	**Addressing modes**	**1,2**	
	2.2	**Instruction Set and Assembler Directives**	**1,2**	
	2.3	**Assembly language programming**	**1,2**	
3	**8086 Interfacing**			**06**
	3.1	**Clock and Reset Circuits of 8086**	**1,2**	
	3.2	**8255-PPI: Functional Block Diagram and description, Operating Modes**	**1,2**	
	3.3	**System design (including Memory and I/O)**	**1,2**	
4	**The 8051 Microcontroller**			**08**
	4.1	**Differences between a Microprocessor and Microcontroller**	**4,6,7,8**	
	4.2	**Architecture of 8051**	**4,6,7,8**	
	4.3	**Memory Organization of the 8051**	**4,6,7,8**	
	4.4	**Addressing modes**	**4,6,7,8**	
	4.5	**Instruction set**	**4,6,7,8**	
	4.6	**Assembly language programming.**	**4,6,7,8**	
5	**8051 Interfacing**			**8**
	5.1	**I/O port programming**	**3**	
	5.2	**Programming 8051 Timers**	**3**	
	5.3	**Serial Port Programming**	**3**	

	5.4	**LCD Interfacing**	**3**	
	5.5	**Stepper Motor and DC motor Interfacing**	**3**	
6	**Case-Studies**			**05**
	6.1	**Case Study on Pentium processor (Features and Architecture only)**	**9**	
	6.2	**Case Study on ARM Cortex cores (Features and Architecture only)**	**10**	
			Total	**39**

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: By Kenneth J. Ayala, Cengage Learning India Pvt. Ltd, 3rdEdition Microcomputer Systems: 8086/8088 family Architecture, Programming and Design: By Liu & Gibson (PHI Publication).

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

[6] Microcontrollers: Architecture, Programming, Interfacing and System Design: By RajKamal, Pearson Education, 2005.

[7] The 8051 Microcontroller Based Embedded Systems: By Manish K Patel, McGraw Hill, 2014.

[8] Microcontroller Theory And Applications: By Ajay V Deshmukh, Tata Mcgraw Hill

[9] Don Anderson, Tom Shanley, "Pentium Processor System Architecture", Addison Wesley Professional, 2nd Edition.

[10] Joseph Yiu, "The Definitive guide to ARM CORTEX-M3 & CORTEX-M4 Processors", Elsevier, 2014, 3rd Edition.

Assessment:

Internal Assessment (IA) for 20 marks each:

- IA will consist of Two Compulsory Internal Assessment Tests. Approximately 40% to 50% of the syllabus content must be covered in the IAT-I and the remaining 40% to 50% of the syllabus content must be covered in the IAT-II.

End Semester Theory Examination:

- **Question paper format**
  - Question Paper will comprise a total of **six questions each carrying 15 marks Q.1** will be **compulsory** and should **cover the maximum contents of the syllabus**
  - **Remaining questions** will be **mixed in nature** (part (a) and part (b) of each question must be from different modules. For example, if Q.2 has part (a) from Module 3 then part (b) must be from any other Module randomly selected from all the modules)
  - A total of **four questions** need to be answered

Course Code	Course Name	Teaching Scheme (Contact Hours)	Credits Assigned

		Theory	Pract.	Tut.	Theory	Pract.	Tut.	Total
	Microprocessors and Microcontrollers Laboratory	**-**	**2**	**-**	**-**	**1**	**-**	**1**

Course Code	**Course Name**	**Examination Scheme**						
		Theory Marks				**Term Work**	**Practical/ Oral**	**Total**
		Internal assessment (IAT)			**End Sem. Exam**			
		IAT I	**IAT-II**	**IAT-I +IAT-II (Total)**				
	Microprocessors and Microcontrollers Laboratory	--	--	--	--	25	25	50

Laboratory Objectives	1.	To apply assembly language programming for Arithmetic, Logical and control tasks using 8086 and 8051.
	2	To analyse and implement peripheral interfacing techniques for real-world applications.
	3.	To design and develop hardware-software solutions using Microprocessors and Microcontrollers.
Laboratory Outcomes	After the successful completion students should be able to:	
	LO 1	Develop and debug Assembly programs for 8086 and 8051.
	LO 2	Interface various peripherals with 8086 and 8051.
	LO 3	Create Microprocessor and Microcontroller-based solutions for practical applications.

DETAILED SYLLABUS:

Suggested List of Laboratory Experiments:

Sr. No.	Title of experiment	Module	Reference
1.	Arithmetic Operations (using 8086)	**2**	**1,2**
2.	Logical Operations (using 8086)	**2**	**1,2**
3.	BCD Operations (using 8086)	**2**	**1,2**
4.	Arrange block of data in Ascending /Descending order (using 8086)	**2**	**1,2**
5.	32 Bit multiplication (using 8086)	**2**	**1,2**
6.	Password verification (using 8086)	**2**	**1,2**
7.	String operations (Reversing of string and Palindrome) (using 8086)	**2**	**1,2**
8.	Code conversions (using 8086)	**2**	**1,2**
9.	Finding GCD and LCM of Two Numbers (using 8086)	**2**	**1,2**
10.	Hexadecimal to ASCII Conversion (using 8086)	**2**	**1,2**
11.	Serial port programming of 8051	**5**	**3**
12.	Applications of Timers of 8051	**5**	**3**
13.	LCD Interfacing (using 8051)	**5**	**3**
14.	Sensor interfacing using an ADC (using 8051)	**5**	**3**
15.	Generation of different waveforms using DAC (using 8051)	**5**	**3**
16.	Speed Control of DC Motor (using PWM) (using 8051)	**5**	**3**
17	Stepper Motor Interfacing (using 8051)	**5**	**3**
18	Traffic Light Controller Simulation	**5**	**3**

Laboratory Assessment:

Assessment:

Term Work: Term Work shall consist of at least 10 to 12 practicals based on the above list. Also, Termwork Journal must include at least 2 assignments.

Term Work Marks: 25 Marks (Total marks) = 15 Marks (Experiment) + 5 Marks (Assignments) + 5 Marks (Attendance)

Practical/ Oral Exam: An Oral examination will be held based on the above syllabus.

Recommended 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.

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