Banasthali Vidyapith
Department of Computer Science
Course Handout- B.Tech. CS (VI Sem) Dec 2022 –May 2023

Date: 18-12-2022

Course Code: ELE 509 **Course Name:** Microprocessors & Microcontrollers
Credit Points: 4 **Max Marks: 100 (CA: 40 + ESA: 60)**
Course Instructor: Dr. Rahul Kumar Vijay (CS –A & B),
Assistant Professor, Computer Science

Learning Outcomes:

The Students will be able to:

- Analyze the architecture, programming and interfaces of Microprocessor 8086.
- Evaluate the detailed working of microprocessor based computers and development boards
- Implement the interfacing of peripheral devices in Microprocessors based in real time projects
- Utilize the architecture, programming and interfacing skills to build projects using Microcontroller 8051
- Understand the concepts of industrial and real time embedded system applications.

Syllabus:

Section A

Assembly Language Programming of 8086: Instruction Format, Instruction Set, Data Transfer instructions, Arithmetic instructions, Logical instruction, Shift instructions, Rotate instructions, Flag control instructions, Compare instructions, Jump instructions, Subroutine & the subroutine handling instructions, Loop & loop handling instructions, String instructions**.**

8086 Programming Addressing modes, Instructions, Functional schematic, Minimum and Maximum mode operations of 8086, 8086 Control signal interfacing, Timing Diagrams Interrupts, Bus timings, Demultiplexing.

8086/8088 Microprocessor: Pin Assignment, Architecture, Functional Diagram, Register

Organization Memory address space & data organization, Segment registers & Memory segmentation, Dedicated & general use of memory, Addressing modes

Section-B

Peripheral Devices and Their Interfacing: Introduction, memory and I/O interfacing with 8086, data transfer schemes

Programmable peripheral interface (8255) , Programmable DMA controller (8257), Programmable interrupt controller (8259), Programmable communication interface (8251), Programmable counter/interval timer (8253 and 8254), Special purpose interfacing devices, elements and circuits for interfacing. Communication Interface: Serial Communication Standards, USART Interfacing RS- 232, IEEE-488, 20mA Current Loop, Prototyping and Trouble shooting, Software Debugging tolls, MDS.

Section C

Introduction to Microcontrollers: Overview of 8051 Micro Controller, Architecture, I/O ports and Memory Organization

Addressing modes and Instruction set of 8051, Simple Programs using Stack Pointer, Assembly language programming

8051 Interrupts Communication: Interrupts, Timer/Counter and Serial Communication, Programming Timer Interrupts, Programming External H/W interrupts, Programming the serial communication interrupts, Interrupt Priority in the 8051, Programming 8051 Timers, Counters and Programming. Interfacing & Industrial Applications: Applications of Micro Controllers, Interfacing 8051 to LED's, Push button, Relay's and Latch Connections Keyboard Interfacing, Interfacing Seven Segment Display, ADC and DAC Interfacing

Suggested Books:

R1. Bhurchandi, K.M. and Ray A.K. (2017), "Advanced Micro Processors and Peripherals", 3rd Edition, Tata McGraw-Hill.

R2. Hall, D.V. (2005), "Microprocessors and Interfacing ", 2nd Edition, Tata McGraw-Hill.

R3. Ayala, K. J. (2005), "The 8086 Microprocessor: Programming and Interfacing The PC ", 2nd Edition, Pearson Education.

R4. Mazidi, M.A., Mazidi, J.G. and McKinlay, R. (2008). "The 8051 Microcontroller and Embedded Systems", 2nd Edition, Pearson

R5. Ayala, K. J. (2007), "The 8051 Microcontroller Architecture, Programming and Applications (3rd Edition), Thomson Publishers".

Suggested E-Resources:

- https://swayam.gov.in/explorer?searchText=microprocessor
- https://nptel.ac.in/courses/108/105/108105102/
- https://nptel.ac.in/courses/106/108/106108100/
- https://onlinecourses.nptel.ac.in/noc19_ee11/preview
- https://www.coursera.org/learn/comparch#syllabus

Evaluation Scheme:

Component	Marks	Submission/ Examination Date(s)	Allotment
Assignment I	10	18 January, 2023	Topics shall be allotted in the class by 2 January 2023
Periodical Test I	10	1-4 February, 2023*	Lecture No. 01 to Lecture No. 16
Assignment II	10	27 February, 2023	Topics shall be allotted in the class by 13 February, 2023
Periodical Test II	10	15-18 March, 2023*	Lecture No. 17 to Lecture No. 38
Semester Examination	60	16 April- 4 May, 2023*	Entire Syllabus

*subject to change.

Lecture-Wise Schedule:

Lecture Number	Topics to be Covered	Suggested Readings
	Section A	
1-4	8086/8088 Microprocessor: Evolution, Basics about the Processor, Introduction, Register Organization, Memory Organization.	R1,R2
5-7	Pin diagram, Architecture of 8086	R1, R2
8-10	Modes of Operation, Maximum mode and Minimum mode, Timing diagrams	R1, R2
11-13	8086 Programming Assembly Language Programming of 8086: Instruction Format, Instruction Set, Data Transfer instructions, Arithmetic instructions, Logical instruction, Shift instructions, Rotate instructions, Flag control instructions, Compare instructions, Jump instructions, Subroutine & the subroutine handling instructions, Loop & loop handling instructions, String instructions**.**	R1, R3
14-16	Addressing modes, Assembler directives, Interrupts	R1, R3
	Section-B	
17-20	Peripheral Devices and their Interfacing: Introduction, memory and I/O interfacing with 8086, data transfer schemes	R1, R3
21-23	Programmable peripheral interface (8255)	R1
24-25	Programmable DMA controller (8257)	R1
26-27	Programmable interrupt controller (8259)	R1
28-29	Programmable communication interface (8251),	R1
30-31	Programmable counter/interval timer (8253 and 8254),	R1
32-35	Special purpose interfacing devices, Communication Standards, USART Interfacing RS-232, IEEE-488,	R1
	Section-C	
36-38	Introduction to Microcontrollers: Overview of 8051 Micro Controller, Architecture, I/O ports and Memory Organization	R4
39-41	Addressing modes and Instruction set of 8051, Simple Programs using Stack Pointer, Assembly language programming	R4
42-44	8051 Interrupts Communication: Interrupts, Timer/Counter and Serial Communication, Programming Timer Interrupts, Programming External H/W interrupts, Programming the serial communication interrupts,	R4
45-46	Interrupt Priority in the 8051, Programming 8051 Timers, Counters and Programming.	R4
47-48	Interfacing & Industrial Applications: Applications of Micro Controllers, Interfacing 8051 to LED's, Push button, Relay's and Latch Connections	R4, R5
49-50	Keyboard Interfacing, Interfacing Seven Segment Display, ADC and DAC Interfacing	R4, R5