

8. LAB DETAILS

8.1 MICROPROCESSOR AND MICROCONTROLLERS LAB

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8.1.1 OBJECTIVE AND RELEVANCE

The main objective of this lab course is to gain the practical hands on experience of programming the 8086 microprocessor and 8051 microcontroller and also to gain knowledge on interfacing of different peripherals to microprocessor.

Microprocessor technology is an exciting, challenging and growing field which will pervade industry for decades to come. To meet the challenges of this growing technology, one has also to be conversant with the programming aspects of the microprocessor and microcontroller.

8.1.2 SCOPE

Microprocessor technology is an exciting, challenging and growing field which will pervade industry for decades to come. Ever since, the invent of first microprocessor to the latest, microprocessors have been used in different applications. This practical course of microprocessor and microcontrollers presents an integrated approach to hardware and software in the context of 8086 microprocessor and 8051 microcontroller.

List of Experiments:

The following Programs/experiments are to be written for assembler and execute the same with 8086 and 8051 kits

- 1 Programs for 16 bit arithmetic operations of 8086 (using various addressing modes)
- 2 Program for sorting an array for 8086
- 3 Program for searching for a number or character in a string for 8086
- 4 Program for string manipulations for 8086
- 5 Program for digital clock design using 8086
- 6 Interfacing ADC and DAC to 8086
7. Parallel communication between two microprocessors using 8255
- 8 Serial communication between two microprocessor kits using 8251
- 9 Interfacing to 8086 and programming got control stepper motor
- 10 Programming using arithmetic, logical and bit manipulation instructions of 8051
- 11 Program and verify Timer/ counter in 8051
- 12 Program and verify interrupt handling in 8051
- 13 UART operation in 8051
- 14 Communication between 8051 kit and PC
- 15 Interfacing LCD to 8051
- 16 Interfacing Matrix / Key board to 8051
- 17 Data Transfer from peripheral to memory through DMA controller
8237 / 8257

8.1.3 SYLLABUS - JNTU

EXPERIMENT No. 1

JNTU SYLLABUS: Programs for 16 bit arithmetic operations of 8086 (using various addressing modes)

OBJECTIVE

To perform 16 bit addition, subtraction, multiplication and division in different addressing modes.

PRE-REQUISITE

Assembly language programming
TASM commands
Architecture of 8086
Arithmetic Instructions of 8086

DESCRIPTION

Write Program to perform 16 bit addition in different addressing modes and execution.
Write Program to perform 16 bit subtraction in different addressing modes and execution.
Write Program to perform 16 bit multiplication in different addressing modes and execution.
Write Program to perform 16 bit division in different addressing modes and execution.

APPLICATIONS:

ALU designing.

EXPERIMENT No. 2:

JNTU SYLLABUS: Program for sorting an array for 8086

OBJECTIVE:

To understand the Branch Instructions and to sort the numbers in ascending and descending order.

PRE-REQUISITE

Assembly language programming
TASM commands
Architecture of 8086
Arithmetic Instructions of 8086
Branch Instructions of 8086

DESCRIPTION

Write a program to sort the given array in ascending order and execution.
Write a program to sort the given array in descending order and execution.

APPLICATION:

Data processing and acquisition applications.

EXPERIMENT No. 3:

JNTU SYLLABUS: Program to search for a number or character in a string for 8086

OBJECTIVE

To understand how to search for a number or character in a string.

PRE-REQUISITE

Assembly language programming
TASM commands
Architecture of 8086

Instruction set of 8086

DESCRIPTION

Write a program to search for a number or character in a string and display a message to indicate whether the number is found or not.

APPLICATIONS:

Data acquisition and processing.
Password Verification.

EXPERIMENT No. 4:

JNTU SYLLABUS: Program for string manipulations for 8086

OBJECTIVE

To understand how to use the string manipulation instructions.

PRE-REQUISITE

Assembly language programming
TASM commands
Architecture of 8086
String manipulation instructions of 8086

DESCRIPTION

Write a program to move the string from one location to another and execution.
Write a program to reverse the string and execution.

APPLICATIONS:

Data acquisition and processing.

EXPERIMENT No. 5:

JNTU SYLLABUS: Program for digital clock design using 8086

OBJECTIVE

To understand how to design digital clock design using 8086

PRE-REQUISITE

Assembly language programming
TASM commands
Architecture of 8086
Instruction set of 8086.

DESCRIPTION

Write a program to design a digital clock displaying Hours, Minutes and seconds

APPLICATIONS:

Timer for different applications, To generate delays.

EXPERIMENT No. 6:

JNTU SYLLABUS: Interfacing ADC and DAC to 8086

OBJECTIVE

To understand how to Interface ADC and DAC to 8086

PRE-REQUISITE

Assembly language programming
TASM commands
Knowledge of ADC and DAC
Architecture of 8086
Architecture and control words of 8255
Instruction set of 8086.

DESCRIPTION

Write a program to read Analog input and Display digital value.
Write a program to accept Digital input and Display various wave forms viz. Sine, Triangle, and square

APPLICATIONS:

Interfacing of analog peripherals
Data acquisition and processing

EXPERIMENT No. 7:

JNTU SYLLABUS: Parallel communication between two microprocessors using 8255

OBJECTIVE

To understand how to establish parallel communication between two microprocessors using 8255

PRE-REQUISITE

Assembly language programming
TASM commands
Architecture of 8086
Architecture and control word of 8255
Instruction set of 8086.

DESCRIPTION:

Write a program to transmit parallel data from microprocessor through port of 8255 and read the same in to another microprocessor.

APPLICATIONS:

Data transfer between processors

EXPERIMENT No. 8:

JNTU SYLLABUS: Serial communication between two microprocessor kits using

8251

OBJECTIVE

To understand how to establish serial communication between two microprocessors using 8251

PRE-REQUISITE

Assembly language programming
TASM commands
Architecture of 8086
Architecture and control word of 8251
Instruction set of 8086.

DESCRIPTION

Write a program to transmit serial data from microprocessor through 8251 and read the same in to another microprocessor.

APPLICATION:

Data communication.

EXPERIMENT No. 9:

JNTU SYLLABUS: Interfacing to 8086 and programming to control stepper motor

OBJECTIVE

To understand Interfacing and control of stepper motor to 8086 through 8255.

PRE-REQUISITE

Assembly language programming
TASM commands
Architecture of 8086
Architecture and control word of 8255
knowledge of stepper motor.
Instruction set of 8086.

DESCRIPTION

Writing programs to rotate the stepper motor clock-wise/ anti-clockwise and execution.

APPLICATIONS:

Robots.
Automation.

EXPERIMENT No. 10:

JNTU SYLLABUS: Programming using arithmetic, logical and bit manipulation instructions of 8051

OBJECTIVE

To understand arithmetic, logical and bit manipulation instructions of 8051

PRE-REQUISITE

Assembly language programming
Keil software
Architecture of 8051
Instructions of 8051

DESCRIPTION

Writing programs to perform addition, subtraction, multiplication, division and execution.
Writing programs to perform logical AND, OR, XOR and execution
Writing programs to perform Shifting operations, swapping and execution

APPLICATION:

ALU designing.

EXPERIMENT No. 11:

JNTU SYLLABUS: Program and verify Timer/ counter in 8051

OBJECTIVE

To verify the timer operation and counter operation in 8051.

PRE-REQUISITE

Assembly language programming
Keil software usage
Timer/counter registers and modes in 8051
Instructions of 8051

DESCRIPTION

Write the program to verify the operation of timer in different mode and execution.
Write the program to verify the operation of counter in different mode and execution.

APPLICATION:

To generate delays.
External events counter.

EXPERIMENT No. 12:

JNTU SYLLABUS: Program and verify interrupt handling in 8051

OBJECTIVE

To understand internal and external interrupt handling in 8051.

PRE-REQUISITE

Assembly language programming
Keil software usage
Interrupt structure of 8051 microcontroller
Instructions of 8051

DESCRIPTION

Writing programs to verify interrupts handling in 8051 and execution.

APPLICATION:

Peripheral interfacing

EXPERIMENT No. 13:

JNTU SYLLABUS: UART operation in 8051

OBJECTIVE

To understand UART operation in 8051

PRE-REQUISITE

Assembly language programming
Keil software usage
UART operating modes
Instructions of 8051

DESCRIPTION

Writing a program to serially transmit the data using UART.
Writing program to serially receive the data using UART

APPLICATION:

Data transfer

EXPERIMENT No. 14:

JNTU SYLLABUS: Communication between 8051 kit and PC

OBJECTIVE

To establish Communication between 8051 kit and PC

PRE-REQUISITE

Assembly language programming
Keil software usage
Architecture of 8051
Instruction set of 8051

DESCRIPTION:

Writing a program to establish Communication between 8051 kit and PC

APPLICATION:

Data transfer

EXPERIMENT No. 15:

JNTU SYLLABUS: Interfacing LCD to 8051

OBJECTIVE

To understand Interfacing LCD to 8051

PRE-REQUISITE

Assembly language programming
Keil software usage
Architecture of 8051.
Basics operation of LCD.
Instruction set of 8051.

DESCRIPTION:

Explanation of LCD display commands
Writing program to interface LCD and execution.

APPLICATION:

Displays.

EXPERIMENT No. 16:

JNTU SYLLABUS: Interfacing Matrix / Key board to 8051.

OBJECTIVE

To understand the Interfacing Matrix / Key board to 8051.

PRE-REQUISITE

Assembly language programming
Keil software usage
Architecture of 8051.
Basics operation keyboard
Instruction set of 8051.

DESCRIPTION:

Explanation of keyboard operation.
Writing program to interface keyboard and execution.

APPLICATION:

Keyboard as an input device

EXPERIMENT No. 17:

JNTU SYLLABUS: Data Transfer from peripheral to memory through DMA controller
8237 / 8257

OBJECTIVE

To understand how Data is transferred from peripheral to memory through DMA controller 8237 / 8257

PRE-REQUISITE

Assembly language programming
Architecture of 8237/8257.

DESCRIPTION:

Interfacing of a peripheral to memory through DMA and writing program for data transfer.

APPLICATION:

Direct memory Access

8.1.4 SUGGESTED BOOKS

TEXT BOOKS

- T1. Advanced Microprocessors and Peripherals, A.K. Ray and K.M. Bhurchandi , TMH
- T2. Microprocessors and Interfacing, Douglas V. Hall , II Edn , TMH.
- T3. The 8086/ 8088 Family, John Uffenbeck , PHI
- T4. 8051 Microcontroller, Kenneth J. Ayala, Penram International

REFERENCE BOOKS

- R1. Microcomputer systems: The 8086/8088 Family, Architecture, Programming and Design, Yu Cheng Liu and Glenn A Gibson, II Edn, PHI
- R2. Microprocessors, Interfacing and Applications, Ramsingh and B.P. Singh, New Age Publishers
- R3. The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, and Pentium Pro Processor, Architecture, Programming and Interfacing, Barry b. Brey, IV Edn, PHI.
- R4. Microprocessors Principles and Applications, Gillmore, II Edn, TMH.

8.1.5 WEBSITES

- 1. www.deas.harvard.edu/
- 2. www.manchester.ac.uk/research/areas/
- 3. www.eecs.umich.edu/eecs/research/resprojects.html
- 4. www.kabuki.eecs.berkeley.edu/papers.html
- 5. www.intel.com
- 6. www.bdbestoff.com/importers
- 7. www.ece.uiuc.edu
- 8. www.pearsoned.co.uk
- 9. www.atmel.com

8.1.6 EXPERTS' DETAILS

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8.1.7 LAB SCHEDULE