	SRAM & Peripherals such as 8255,8253,8251,8279 with keyboard & seven segments Display.	
Unit VI	**Advanced I/O Controllers**	
	Introduction to Intel 58X chipset, Intel® 82801IJR I/O Controller Hub, Study of Intel i5 Motherboard Block Diagram	**(8 Hrs)**

Text Books:

1. Douglas Hall, "Microprocessors & Interfacing", McGraw Hill, Revised 2nd Edition, 2006 ISBN 0-07-100462-9
2. John Uffenbeck," The 8086/88 Family: Design, Programming & Interfacing", PHI,
3. A.Ray, K.Bhurchandi, "Advanced Microprocessors and peripherals: Arch, Programming & Interfacing", Tata McGraw Hill,2004 ISBN 0-07-463841-6
4. Introduction to 64 bit Intel Assembly Language Programming for Linux, 2nd Edition, Ray Seyfarth, ISBN10: 1478119209, ISBN-13: 9781478119203, 2012

References Books:

1. Liu, Gibson, "Microcomputer Systems: The 8086/88 Family", 2nd Edition, PHI,2005
2. Kenneth Ayala, "The 8086 Microprocessor: Programming & Interfacing the PC", Cengage Learning, Indian Edition, 2008
Ray Dunkon, "Advanced MSDOS Programming", 2nd Edition, BPB Publication.
3. Kip Irvine, "Assembly language for IBM PC", PHI, 2nd Edition, 1993
4. Peter Abel, "Assembly language programming", Pearson Edu,5th Edition,2002
5. Intel Microprocessor and peripheral Handbook: Volume 1
6. Yashwant Kanitkar, "TSR through C", BPB Publication, 1995, ISBN 81- 7029-520-3.

MICROPROCESSOR INTERFACING LABORATORY

Suggested List of Assignments

Group A

1. Write X86/64 Assembly language program (ALP) to add array of N hexadecimal numbers stored in the memory. Accept input from the user.
2. Write X86/64 ALP to perform non-overlapped and overlapped block transfer (with and without string specific instructions). Block containing data can be defined in the data segment.
3. Write 64 bit ALP to convert 4-digit Hex number into its equivalent BCD number and 5-digit BCD number into its equivalent HEX number. Make your program user friendly to accept the choice from user for:
(a) HEX to BCD b) BCD to HEX (c) EXIT.
Display proper strings to prompt the user while accepting the input and displaying the result. (use of 64-bit registers is expected)
4. Write X86/64 ALP for the following operations on the string entered by the user. (use of 64-bit registers is expected)
a) Calculate Length of the string b) Reverse the string
c) Check whether the string is palindrome
OR
Make your program user friendly by providing MENU like:
(a) Enter the string b) Calculate length of string c) Reverse string d) Check palindrome e) Exit
Display appropriate messages to prompt the user while accepting the input and displaying the result.
5. Write 8086 ALP to perform string manipulation. The strings to be accepted from the user is to be stored in data segment of program_l and write FAR PROCEDURES in code segment program_2 for following operations on the string:

(a) Concatenation of two strings (b) Number of occurrences of a sub-string in the given string Use PUBLIC and EXTERN directive. Create .OBJ files of both the modules and link them to create an EXE file.
6. Write X86/64 ALP to perform multiplication of two 8-bit hexadecimal numbers. Use successive addition and add and shift method. Accept input from the user. (use of 64-bit registers is expected)
7. Write 8087ALP to obtain:
i) Mean ii) Variance iii) Standard Deviation
For a given set of data elements defined in data segment. Also display result.

Group B

1. 8255

(a) Write 8086 ALP to convert an analog signal in the range of 0V to 5V to its corresponding digital signal using successive approximation ADC and dual slope ADC. Find resolution used in both the ADC's and compare the results.
(b) Write 8086 ALP to interface DAC and generate following waveforms on oscilloscope,
(i) Square wave - Variable Duty Cycle and Frequency.
(ii) Ramp wave - Variable direction, (iii) Trapezoidal wave (iv) Stair case wave
(c) Write 8086 ALP to rotate a stepper motor for given number of steps at a given angle and in the given direction of rotation based on the user choice such as
(i) If 'C' key is pressed - clockwise rotation, (ii) If 'A' key is pressed -
anticlockwise rotation. (iii) If 'B' is pressed - 1/2 clockwise and Vz
Anti-clock wise rotation, (iv) If 'S' key is pressed - stop rotation. Also write routines to accelerate and de-accelerate the motor.
(d)Write 8086 ALP to print a text message on printer using Centronixs parallel printer interface.
NOTE: Select any two from 8255 assignments

2. 8253

Write 8086 ALP to program 8253 in Mode 0, modify the program for hardware retriggerable Mono shot mode. Generate a square wave with a pulse of 1 ms. Comment on the difference between Hardware Triggered and software triggered strobe mode. Observe the waveform at GATE & out pin of 1C 8254 on CRO

3. 8279

Write 8086 ALP to initialize 8279 and to display characters in right entry mode.
Provide also the facility to display
• Character in left entry mode.
• Rolling display.
• Flashing display

4. 8251

Perform an experiment to establish communication between two 8251 systems A and B. Program 8251 system A in asynchronous transmitter mode and 8251 system B in asynchronous receiver mode. Write an ALP to transmit the data from system A and receive the data at system B. The requirements are as follows:

Transmission:

• message is stored as ASCII characters in the memory.
• message specifies the number of characters to be transmitted as the first byte.

Reception:

• Message is retrieved and stored in the memory.
• Successful reception should be indicated.

5. 8259

Write 8086 APL to interface 8259 in cascade mode (M/S) and demonstrate execution of ISR in following manner:
Main program will display two digits up counter. When slave IRQ interrupt occurs, it clears the counter and starts up counting again. When Master IR1 interrupt occurs, it resets the counter to FFH and starts down counting.

6. TSR Program

Write a TSR program in 8086 ALP to implement Real Time Clock (RTC). Read the Real Time from CMOS chip by suitable INT and FUNCTION and display the RTC at the bottom right corner on the screen. Access the video RAM directly in your routine.

7. TSR Program

Write a TSR program in 8086 ALP to implement Screen Saver. Screen Saver should get activated if the keyboard is idle for 7 seconds. Access the video RAM directly in your routine.

Group C

1. Study of Intel i5 Motherboard Block Diagram, Peripheral Connectors Pin Diagrams and functioning of I/O Hub, DDR-3 memory BUS

Student will submit the term work in the form of Journal consisting of minimum of 13 experiments with all seven experiments from group A and any 5 assignments from group B and group C assignments. Practical examination will be based on the term work and questions will be asked to judge the understanding of assignments performed at the time of examination.