SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title: MICROPROCESSOR CIRCUITS AND APPLICATIONS

Course No.: CET228-5

Program: COMPUTER TECHNOLOGY

Semester: THREE

Date: AUGUST,1987

Author: TYCHO BLACK

New:__ __ Revision: X

APPROVED: L.P. Arsenault

Chairperson Date

CET228

MICROPROCESSOR CIRCUITS AND APPLICATIONS

GENERAL OBJECTIVES

This course will expand the student's understanding of microprocessor applications and the peripheral devices used to support them as well as strengthen their knowledge of digital devices in general. Microcomputer system hardware components will be studied and practical lab exercises will reinforce the theory.

A comparative study of various 8 and 16 bit microprocessors such as the 6800, 6809, Z80, 8088 and 68000 will be carried out with system level analysis of typical components emphasized. The essential principles of operation of common peripherals found in microcomputer systems including keyboards, video displays, magnetic tape and floppy disk drives will be studied. Types of memory, bus concepts, I/O servicing and troubleshooting techniques such as the application of the HP1611 synchronous logic analyser to 6800-based circuits will be included. The IBM-PC will be studied as a computer "system" to illustrate the interaction between components and subsystems in an actual system.

In the lab, projects will concentrate on MC6800 system interface devices such as the 6850 ACIA, the 6840 PTM, and a 16K expanded memory board. Z80 system exercises will be done on the "FOX" kit with analogue I/O board. Other areas of project work include EPROM programming, signature analysis, and IBM-PC interfacing.

The hardware principles learned in this course will be expanded to more complex environments in CET302, "Interfacing".

TEXTBOOK:

"MICROPROCESSORS HARDWARE AND APPLICATIONS"

by Andrew Veronis

ASSESSMENT:

3 THEORY TESTS	60%
QUIZZES & ASSIGNMENTS	10%
LAB PROJECTS	30%

The percentages shown above may vary slightly where circumstances warrant.

SPECIFIC OBJECTIVES

CET228 : MICROPROCESSOR CIRCUITS AND APPLICATIONS

BLOCK: 1 MICROPROCESSOR ARCHITECTURE AND INSTRUCTIONS (Chap 1)

1. Discuss the evolution of microprocessor technology.
2. Describe the architecture and timing for the following microprocessors: 8085,6800, 6502 ,Z80 and 8088.
3. Describe the characteristics of the main logic families in use today, including TTL, LSTTL, ECL, CMOS, NMOS, and HCMOS.
4. Describe the nature of the manufacturing process used in IC fabrication.

BLOCK 2 INPUT/OUTPUT TECHNIQUES (Chap 4 and 5)

1. Be able to describe and implement the 6821 PIA, Peripheral Interface Adapter in all of its operating modes.
2. Be able to describe the use of the PIA in various applications including the D2 and D3 M6800-based systems.
3. Be able to describe the operation of the following common methods of parallel data transfer:
   a)Simple I/O
   b)Simple strobe I/O
   c)Single Handshake I/O
   d)Double Handshake Data Transfer
4. Be able to describe the architecture of the INTEL 8255 PPI, Programmable Parallel Interface and compare its operation to the 6821 PIA.
5. Describe the nature of a Centronics Parallel Printer interface and how an 8255 PPI could be used in such an interface.
6. Be able to describe the nature of asynchronous serial data transmission.
7. Describe the internal organization of the 6850 ACIA, Asynchronous Communications Interface Adapter, and identify the function of its internal registers.
8. Be able to initialize and program the ACIA to operate in all of its operating modes.

9. Discuss the principles of 3-state circuit operation, multiplexed buses, bus contention and handshaking. Describe the operation of such 3-state devices as the 8T97 and 8T26 bus driver and receiver.

10. Describe fully, memory-mapped and isolated I/O addressing techniques.

11. Be able to describe the typical keyboard scanning circuits including the operation of a 128 key TTL ASCII keyboard. Be able to describe how this keyboard implements the four functions of a keyboard:

    a) keyboard scanning
    b) Key debouncing
    c) Key encoding
    d) Data available indication

12. Describe how the keyboard in an IBM-PC is interfaced to the system.

13. Describe how typical microprocessor-based systems like the D2 and D3 6800-family systems, interface 7-segment displays to the system.

14. Discuss the techniques of I/O servicing through polling and interrupt handling.

15. Describe the interrupt systems in 6800,8085 and Z80 systems.

16. Describe the function of the 8259 programmable interrupt controller and the tasks it "off-loads" from the processor.

17. Describe the technique of "daisy-chaining" interrupts and describe how it is implemented in a Z80 system.

18. Describe the function of the following devices and be able to use them in computer interfacing applications: shift registers, decoders, data selectors and priority encoders, latches and 3-state registers.

BLOCK 3 MEMORY SYSTEMS (Chap 2 and 3)

1. Identify the principal types of static and dynamic Read/Write Memory (RWM or RAM) and describe their features, their advantages and disadvantages and their implementation in memory systems.
2. Describe the characteristics of ROM,(Read-Only Memory devices), PROMs, EPROMs, EEPROMs,EAROMs, PLAs AND FPLAs and be able to discuss their advantages and disadvantages for various applications.
3. Discuss the principles of operation of bubble memory.
4. Be able to analyze and design the address decoding for simple memory systems.
5. Describe the refresh requirements for various dynamic memory systems and be able to describe fully the operation of the MMS68104 16K expanded memory board for the 6800-based D2 kit.

BLOCK 4 AUXILLIARY STORAGE DEVICES (CHAP. 7)

1. Be able to describe the nature of floppy disks, various formatting standards and digital encoding techniques used in magnetic media.
2. Describe the principles of operation of a typical disk drive.
3. Describe the techniques of magnetic-tape recording and describe the Kansas City Standard Format. Be able to analyse a circuit which implements the KCSF.

BLOCK 5 THE 8088 AND THE IBM-PC

1. Describe the internal architecture of the Intel 8088 microprocessor, its use of registers, I/O lines, and timing.
2. Describe the system level organization of an IBM PC and the function of all major components.
3. Describe the activities that take place in an IBM PC when a "cold" or a "warm" boot occurs.
4. Describe the 8087 Numeric Data Processor's capabilities, modes of operation and applications.
5. Describe at a block diagram level the operation of the colour video circuitry in an IBM-PC and the nature of the composite video signal.

BLOCK 6 16-BIT PROCESSOR ARCHITECTURE - THE 68000 (Chap 13)

1. Describe the characteristics of the Intel and Motorola families of 16 and 32 bit processors.
2. Describe the architecture of the MC68000 processor, discuss its interfacing requirements, and identify the function of the I/O lines.
3. Describe the addressing modes of the 68000 and special features which make it a versatile 16-bit processor.

BLOCK 7 TROUBLESHOOTING MICROPROCESSORS (Chap 14)

1. Be able to describe the application of synchronous logic analyzers to troubleshooting 6800-based systems. The HP1611 logic analyser will be used in this exercise.
2. Describe the modes of operation and capabilities of asynchronous logic analysers and be able to apply them to troubleshooting microprocessor-based circuits.
3. Describe the application of signature analysis to troubleshooting.

GRADING SCHEME

COURSE: CET228

1. TESTS

Written tests will be conducted as deemed necessary, generally at the end of one or two blocks of work. They will usually be announced about one week in advance. Quizzes may be conducted without advance warning.

2. GRADING SCHEME

A	80 - 100 %	OUTSTANDING ACHIEVEMENT
B	66 - 79 %	AVERAGE ACHIEVEMENT
C	55 - 65 %	SATISFACTORY ACHIEVEMENT
I		INCOMPLETE - COURSE WORK NOT COMPLETE AT MID-TERM. ONLY USED AT MID-TERM.
R		REPEAT
X		A TEMPORARY GRADE THAT IS LIMITED TO RARE INSTANCES WHERE SPECIAL CIRCUMSTANCES HAVE PREVENTED THE STUDENT FROM COMPLETING OBJECTIVES BY THE END OF SEMESTER. AN X GRADE MUST BE AUTHORIZED BY THE CHAIRMAN. IT REVERTS TO AN R IF NOT UPGRADED IN AN AGREED-UPON TIME, LESS THAN 120 DAYS.

3. UPGRADING OF INCOMPLETES

The method of upgrading is completely at the discretion of the teacher and may consist of one or more of the following options; assigned make-up work, completing or repeating of lab projects or assignments, the re-writing of tests, or the writing of a comprehensive supplemental examination.

Where a student's overall performance has been consistently unsatisfactory , an R grade may be assigned without the option of make-up work. For example, a failing grade on all tests will remove the option of any upgrading and an R grade will result.

Attendance and assignment completion will also have a bearing on whether make-up work to upgrade an X grade will be allowed.

The highest grade obtainable on re-written tests and assignments is 56%.

GRADING SCHEME

COURSE: CS7319

1. TESTS

Written tests will be conducted as deemed necessary, generally at the end of one or two blocks of work. They will usually be announced about one week in advance. Quizzes may be conducted without advance warning.

2. GRADING SCHEME

A	80 - 100 %	OUTSTANDING ACHIEVEMENT
B	65 - 79 %	AVERAGE ACHIEVEMENT
C	55 - 64 %	SATISFACTORY ACHIEVEMENT
I		INCOMPLETE - COURSE WORK NOT COMPLETE AT MID-TERM. ONLY USED AT MID-TERM.
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Attendance and assignment completion will also have a bearing on whether make-up work to upgrade an X grade will be allowed.

The highest grade obtainable on re-written tests and assignments is 50%.