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

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New: X Revision: _____

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, printers, 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.

In the lab, projects will concentrate on MC6800 system interface devices such as the 6821 PIA, the 6850 ACIA, the 6840 PTM, 6845 CRT controller, 6843 floppy disk controller, 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 Prom blasting, signature analysis, Voelker Craig terminal analysis and voice synthesis using the Digitalker set of chips.

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

*NOTE: This set of objectives may require some modifications as the semester progresses since this is a new course. Any revisions to the objectives will be issued before tests occur.

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 and Z80.

3. Identify and compare the addressing modes and instructions for the systems in above (in 2.).

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

1. Discuss the principles of 3-state circuit operation, multiplexed buses, bus contention and handshaking.

2. Describe fully memory-mapped and isolated I/O techniques.

3. Be able to describe and implement the 6821 PIA, Peripheral Interface Adapter in all of its operating modes. Compare it with the Intel PPI device.

4. Describe the 6850 ACIA, Asynchronous Communications Interface Adapter from the points of view of its internal architecture, its programming and its interfacing in MC6800-based systems. Be able to describe the nature of serial data transmission as implemented with this device.

5. Discuss the techniques of I/O servicing through polling and interrupt handling and be able to program 6800-based devices to implement them.

6. 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.

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 and PLA's, and be able to design circuit applications using them. Also discuss their advantages and disadvantages.

3. Discuss the principles of operation of bubble memory.

4. Be able to analyze and design the address decoding for 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 and the format of IBM diskettes in particular. Describe the principles of operation of a typical disk drive.

2. 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 8087 (CHAP 9 AND 10)

1. Describe the internal architecture of the Intel 8088 microprocessor, its use of registers, I/O lines, and timing. Describe the system level organization of an IBM PC and the function of components.

2. Describe the 8087 Numeric Data Processor's capabilities and applications.

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

1. Describe the architecture of the MC68000 processor, discuss its interfacing requirements, and identify the function of the I/O lines on chip.

2. 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.

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ADDITIONAL REQUIREMENTS:

Completion of the required lab projects is necessary for success in this course. Late submission of reports and poor attendance will have a bearing on final evaluation ; generally, a late report will be given a C grade unless extenuating circumstances are involved.

Informal lab reports are due one week after completion and will include the following:

1. Title page including Title,Date,Lab partner and Project number (#1,2,3..5)

2. Statement of the lab's objectives.

3. Brief statement of the procedure.

4. Circuit diagrams properly labelled.

5. Program listings properly documented, data tables, timing diagrams, etc.

6. Where any specific questions have been asked as part of the lab procedure include both the question and the answer.

7. Discussion or Conclusion section in which the results are evaluated, deficiencies are discussed, the degree of completeness is identified, and the important objectives are summarized.

When a lab group works on a project together, a single report showing contributions from both members will be submitted. Where the contribution of one member of a group is seen to be significantly less than another, as would occur for example, when one member is absent from lab sessions, he may not be credited with the lab project and be required to do another in its place.

GRADING SCHEME

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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%.