SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title: MICROPROCESSOR CIRCUITS AND APPLICATIONS

Course No.: CET228-5

Program: COMPUTER ENGINEERING TECHNOLOGY

Semester: THREE

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Author: TYCHO BLACK

New:____ Revision:__X_

APPROVED: _____ 89/03/31
Chairperson Date

CET228

MICROPROCESSOR CIRCUITS AND APPLICATIONS

GENERAL OBJECTIVES

This course will expand a student's understanding of microprocessor circuits and applications and the peripheral devices used to support them, as well as strengthen his/her 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, 16 and 32 bit microprocessors is undertaken. Types of memory, bus concepts, I/O servicing, interrupts, direct memory access, system timing and the functions of various support chips will be included. The essential principles of operation of common peripherals found in microcomputer systems including keyboards, parallel ports, and floppy disk drives will be studied. The 8088 microprocessor will be used as the basis of many computer system examples. The IBM-PC will be studied as a computer "system" to illustrate the interaction between components and subsystems.

An important component of this course involves the study of maintenance and troubleshooting procedures on PC's.

In the lab, projects in the following areas will develop practical experience to reinforce the theory:

EPROM programming, 8086 microprocessor trainer, 8255 PPI programming, PC troubleshooting and an introduction to IBM-PC interfacing.

TEXTBOOK:

"SMALL COMPUTER THEORY AND APPLICATIONS"

by Denton Dailey (McGraw-Hill)

ASSESSMENT:

3 THEORY TESTS	60%
LAB PROJECTS/ASSIGNMENTS QUIZZES AND PRACTICAL TESTS	40%

(The percentages shown above may vary slightly where circumstances warrant.)

TIME: 6 HOURS PER WEEK for 16 WEEKS

GRADING SCHEME

COURSE: CET228

1. TESTS

Written tests will be conducted as deemed necessary. They will be announced about one week in advance. Quizzes may be conducted without advance warning.

2. GRADING SCHEME

A+	90	-	100%	Outstanding achievement
A	80	-	89%	Above average achievement
B	70	-	79%	Average Achievement
C	55	-	69%	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 instances where special circumstances have prevented the student from completing objectives by the end of the 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.			

4. UPGRADING OF INCOMPLETES

When a student's course work is incomplete or final grade is below 55%, there is the possibility of upgrading to a pass when the student's performance warrants it. Attendance and assignment completion will have a bearing on whether upgrading will be allowed. A failing grade on all tests may remove the option of any upgrading in which case an R grade will result. The highest grade on re-written tests or assignments will be 56%.

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

SPECIFIC OBJECTIVES

CET228 : MICROPROCESSOR CIRCUITS AND APPLICATIONS

BLOCK 1: MICROPROCESSOR SYSTEMS

1. Discuss the evolution of microprocessor technology.

2. Describe the major building blocks of microcomputer systems and the principles of operation of their main peripheral devices.

3. Discuss microcomputer Input/Output (I/O) fundamentals in the following categories:

   a) Computer Buses
   b) Three-state logic, multiplexed buses and bus "contention"
   c) Bus handshaking
   d) Polled I/O vs. Interrupt-driven I/O
   e) Dedicated (or Isolated) I/O vs. Memory-mapped I/O
   f) Direct Memory Access (DMA)

4. Describe and compare the architecture for the following microprocessors: 6800 , 8085, 8088, 8086, 80286, 68000.

BLOCK 2: 8088 CPU OPERATION AND SYSTEM ORGANIZATION

1. Describe the 8088 CPU, its internal organization, timing, pin definitions and operating modes.

2. Describe the way bus multiplexing is accomplished in 8088-based systems with (and without) the 8288 Bus Controller.

3. Discuss the operation of the 8284 Clock Generator.

4. Describe basic memory and I/O operations in 8088 systems.

5. Describe the system level organization of an IBM PC and the function of all major components.

BLOCK 3: MEMORY DEVICES AND MEMORY INTERFACING

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, FPLAs and bubble memory and be able to discuss their advantages and disadvantages for various applications.

3. Be able to analyze and design the address decoding for simple memory systems.

4. Describe the memory organization in an IBM PC and AT.

BLOCK 4: 8088 I/O INTERFACING FUNDAMENTALS

1. Understand the operation and function of various buffers, latches and register circuits including the 74244, 74245, 74151, 74155, 74138, 74374, 8282.

2. Describe address decoding techniques for I/O ports.

3. Discuss the use of interrupts in the 8088 and understand the operation of the Intel 8259 Programmable Interrupt Controller.

4. Describe the architecture of the Intel 8255 Programmable Peripheral Interface (PPI) and be able to program it in a variety of modes.

5. Be able to describe the nature of asynchronous serial data transmission.

6. Describe the nature of a Centronics Parallel Interface.

BLOCK 5: A/D AND D/A CONVERSION

1. Discuss the principles of operation of various Digital-to-Analog converters.

2. Discuss the concepts of Analog-to-Digital conversion from the points of view of sample rates, step size, and error characteristics.

3. Discuss the principles of operation of various types of analog-to-digital converters, their advantages and disadvantages.

4. Understand the operation of the A/D and D/A circuitry in the Microcomputer Application Trainers and be able to interface them and control them with Assembler programs.

BLOCK 6: MICROCOMPUTER SYSTEM PERIPHERALS

1. Discuss the principle of operation of various keyboards.

2. Be able to describe the nature of floppy disks, various formatting standards and digital encoding techniques used in magnetic media.

3. Describe the organization and operation of the Intel 8272 Floppy Disk Controller.

4. Describe the principles of operation of a typical disk drive.

BLOCK 7: TROUBLESHOOTING PROCEDURES

This block includes practical information and procedures which will be partly taught and tested in the lab. Its content is based on the "Troubleshooting PC's" Lab Manual and includes the following topics:

1. PC/XT/AT Model characteristics including busses, memory organization, clock, power supply and system components.

2. Preventative Maintenance in PC's.
3. General Troubleshooting procedures.

    1. Power On Self-test (POST) and the sequence of events when a system is "booted".
    2. Board identification.
    3. DMA, IRQ, I/O Ports and DIP switches in common systems.
    4. Finding and replacing bad boards.
    5. Chip-level troubleshooting.
    6. System Board troubleshooting.
    7. Memory errors.

4. Power Supply Troubleshooting.
5. Hard Disk Drive Characteristics installation and Troubleshooting. Backup and Low-level formatting of hard disks.
6. Floppy Disk Drive characteristics and troubleshooting.
7. Printer and Serial Port problems.
8. Keyboard and Display problems.

9. Describe the modes of operation and capabilities of synchronous and asynchronous logic analysers and be able to apply them to troubleshooting microprocessor-based circuits.

10. Describe the application of signature analysis to troubleshooting.