SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY
SAULT STE MARIE, ON

COURSE OUTLINE

Course Title: Microprocessor Circuits and Systems

Code No.: CST200 Semester: 4

Program: Computer Engineering Technology

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Date: January, 2001 Previous Outline Date: JAN. 2000

Approved: _____ _____
Dean Date

Total Credits: 4 Prerequisite(s): CST100, CST202
Length of Course: 16 WKS Total Credit Hours: 64

I. COURSE DESCRIPTION:

This course will introduce the student to microprocessor circuits and systems 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, based on the intel processor and the ISA bus, will reinforce the theory. The essential principles of operation of microprocessor-based systems are approached from the point of view of modifying and designing interfaces for them, and writing software routines to test and control them.

II. LEARNING OUTCOMES AND POTENTIAL ELEMENTS OF THE PERFORMANCE:

A. Learning outcomes:

1. Describe the organisation of typical microprocessor systems as implemented with address, data and control busses.
2. Describe the operation of the 8088 microprocessor in detail, including the various support chips required in typical microprocessor-based systems.
3. Describe the different types of memory devices found in computer systems, their advantages and disadvantages, principles of operation.
4. Describe and build memory and I/O address decoders.
5. Utilise an Analogue-to-Digital and Digital-to-Analogue converter to digitise and reconstruct an analogue signal.
6. Implement techniques of I/O interfacing including handshaking, polling, interrupts, DMA and describe the operation of the devices used to support these methods.
7. Utilise a Logic Analyser to analyse bus traffic within a Microprocessor based system.

Learning Outcomes and Potential Elements of the Performance:

Upon successful completion of this course the student will demonstrate the ability to:

1. Describe the organisation of typical microprocessor systems as implemented with address, data and control busses.

Potential Elements of the Performance:

- Describe the general nature and detailed operation of address, data and control busses in microcomputer systems.
- Describe and construct circuits that utilise flip-flops, buffers and transceivers in computer systems.

- Discuss the need for 3-state logic and the use of 3-state devices in computer systems in general.

This learning outcome will constitute approximately 10% of the course.
Reference: Text Chap. 7

2. Describe the operation of the 8088 microprocessor in detail, including the various support chips required in typical microprocessor-based systems.

Potential Elements of the Performance:

- Describe the 8088 CPU, internal organisation, pin functions and operating modes.
- Describe how bus multiplexing is accomplished.
- Describe the 8088 timing diagram and be able to use a logic analyser to demonstrate this understanding.
- Describe the role of the 8284 Clock Generator and the 8288 Bus Controller

This learning outcome will constitute approximately 10% of the course.
Reference: Text Chap. 9

3. Describe the different types of memory devices found in computer systems, their advantages and disadvantages, principles of operation.

Potential Elements of the Performance:

- Identify the principal types of static (SRAM) and dynamic (DRAM) Read/Write Memory (RWM or RAM) and describe their features, operation, advantages and disadvantages and their implementation in memory systems.
- examine the characteristics of state-of-the-art memory devices used in personal computers today and describe their advantages over older devices
- Describe the characteristics of various ROM,(Read-Only Memory devices), PROMs,EPROMs, and EEPROMs and understand the process of EPROM programming.
- Describe the characteristics of various Programmable Logic Devices (PLD's), PLAs, PAL's and ASICs.

This learning outcome will constitute approximately 10% of the course.
Reference: Text Chap. 11

4. Describe and build memory and I/O address decoders.**

Potential Elements of the Performance:

- analyse and/or design an address decoder utilising the 74138 to selectively enable memory or I/O devices.
- Describe the use of memory maps, memory mapped I/O and dedicated I/O

This learning outcome will constitute approximately 20% of the course.
Reference: Text Chap. 12.

5. Utilise an Analogue-to-Digital and Digital-to-Analogue converter to digitise and reconstruct an analogue signal.

Potential Elements of the Performance:

- Describe the nature of an A/D and D/A converter
- Draw the block diagram of a system utilising an A/D and D/A
- Write a program to utilise an A/D and D/A converter.

This learning outcome will constitute approximately 15% of the course.
Reference: ch12, Handouts.

6. Implement I/O interfacing techniques including handshaking, polling, interrupts, DMA and describe the devices used to support these methods.

Potential Elements of the Performance:

- Implement hardware handshaking in order to perform a parallel data transfer between two computers
- Describe the difference in nature between polled I/O, interrupt I/O and DMA
- Describe the role of the 8259 Programmable Interrupt Controller (PIC) and the sequence of events that occur during an Interrupt event
- Develop an interrupt based software interface (driver) for the a/d converter
- Describe the role of the 8237 DMA controller and the sequence of events in a DMA transfer
- Describe the 8253 Programmable Interval Timer (PIT), its operation and function.

This learning outcome will constitute approximately 20% of the course.
Reference: Text Chap.13,14,15

7. Utilise a Logic Analyser to analyse bus traffic within a Microprocessor based system.

Potential Elements of the Performance:

- capture and display the signal traffic as it travels along the address, data and control bus during an I/O or Memory data transfer cycle

This learning outcome will constitute approximately 15% of the course.
Reference: Class Notes

III. TOPICS TO BE COVERED:

1. Microprocessor system organisation and bus structure.
2. 8088 CPU architecture, timing and operation.
3. Analogue to Digital and Digital to Analogue converters.
4. Memory devices and memory systems used in microcomputer systems.
5. The ISA BUS and I/O subsystems
6. The logic analyser.

IV. REQUIRED STUDENT RESOURCES/TEXTS:

1) TEXT BOOK: The 80x86 IBM PC and Compatible Computers (Vol I and II)
by: Muhammad Ali Mazidi and Janace Gillispie Mazidi

V. EVALUATION PROCESS/GRADING SYSTEM:

3 WRITTEN TESTS	60%
LAB PROJECTS	35%
QUIZZES/ASSIGNMENTS	5%

(The percentages shown above may vary slightly if circumstances warrant.)
Special Note: It is necessary for students to have a passing grade in the written test portion of the course before they will be eligible to pass the course.

GRADING SYSTEM

A+	90	-	100%
A	80	-	89%
B	70	-	79%
C	60	-	69%
R	Repeat Less than 60%		
X	Incomplete		

UPGRADING OF INCOMPLETES

When a student's course work is incomplete or final grade is below 60%, there is the possibility of upgrading to a pass when a student meets all of the following criteria:

1. The students attendance has been satisfactory.
2. An overall average of at least 50% has been achieved.
3. The student has not had a failing grade in all of the theory tests taken.
4. The student has made reasonable efforts to participate in class and complete assignments.

The nature of the upgrading requirements will be determined by the instructor and may involve one or more of the following: completion of existing labs and assignments,

completion of additional assignments, re-testing on individual parts of the course or a comprehensive test on the entire course.

ATTENDANCE:

Absenteeism will affect a student's ability to succeed in this course. Absences due to medical or other unavoidable circumstances should be discussed with the instructor.

VI. SPECIAL NOTES:

- **Special Needs**
  Students with special needs (eg. physical limitations, visual or hearing impairments, or learning disabilities) are encouraged to discuss any required accommodations confidentially with the instructor and/or contact the Special Needs Office so that support services can be arranged.

- **Retention of Course Outlines**
  It is the responsibility of the student to retain al course outlines for possible future use in acquiring advanced standing at other post-secondary institutions.

- **Course Modifications**
  Your instructor reserves the right to make reasonable modifications to the course as deemed necessary to meet the needs of students or take advantage of new or different learning opportunities.

VII. PRIOR LEARNING ASSESSMENT:

Students who wish to apply for advanced standing in the course should consult the instructor. This course is not eligible for challenge at the present time.