

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

COURSE OUTLINE: MICROPROCESSOR PROGRAMMING
CODE NO.: CET127-4
PROGRAM: ELECTRICAL/ELECTRONIC TECHNOLOGY
SEMESTER: THREE
DATE: SEPTEMBER 1993
PREVIOUS
OUTLINE DATED: JANUARY 1993
AUTHOR: ENO LUDAVICIUS

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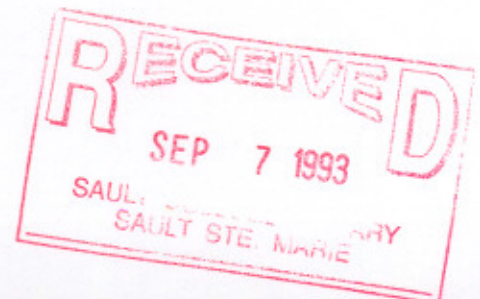
APPROVED:

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COORDINATOR

Sep 2/93
DATE

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93-09-02
DATE



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TOTAL CREDIT HOURS: 64

PREREQUISITE(S): CET110 - 3

PHILOSOPHY/GOALS:

THE COURSE INTRODUCES STUDENTS TO 8088 ASSEMBLY LANGUAGE PROGRAMMING. AS A FIRST COURSE IN ASSEMBLY LANGUAGE PROGRAMMING IT IS NECESSARY TO STUDY NUMBER SYSTEMS AND THE FUNDAMENTALS OF MICROPROCESSOR ARCHITECTURE IN ADDITION TO THE SPECIFIC REGISTERS, ADDRESSING MODES AND INSTRUCTIONS OF THE 8088 MICRO. MORE SIGNIFICANT ASSEMBLY LANGUAGE PROGRAMMING SKILLS WILL BE DEVELOPED IN SUBSEQUENT COURSES.

STUDENT PERFORMANCE OBJECTIVES:

UPON SUCCESSFUL COMPLETION OF THIS COURSE, THE STUDENT WILL BE ABLE TO:

- 1) MANIPULATE AND CONVERT NUMBERS IN BINARY, HEXADECIMAL, DECIMAL AND OCTAL NUMBER SYSTEMS.
- 2) DESCRIBE THE ARCHITECTURE OF THE 8088 MICROPROCESSOR INCLUDING ITS REGISTERS, MEMORY ORGANIZATION, THE STACK AND INTERNAL ORGANIZATION.
- 3) OPERATE WITH THE 8088 ADDRESSING MODES EFFECTIVELY.
- 4) DEMONSTRATE THE USE OF DEBUG TO ASSEMBLE, LOAD, SAVE, UNASSEMBLE, SINGLE STEP, EXAMINE AND TROUBLESHOOT SIMPLE INSTRUCTIONS.
- 5) WRITE ASSEMBLY LANGUAGE PROGRAMS UTILIZING THE SUBSET OF COMMONLY-USED 8088 INSTRUCTIONS TO SOLVE SIMPLE PROBLEMS.
- 6) DEMONSTRATE PROFICIENCY IN DEVELOPING AND TROUBLESHOOTING ASSEMBLY LANGUAGE PROGRAMS UTILIZING MICROSOFT ASSEMBLER.

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TOPICS TO BE COVERED:

- 1) NUMBERS SYSTEMS: BINARY, OCTAL, HEXADECIMAL AND DECIMAL.
- 2) HARDWARE CONCEPTS: 8088 MICROPROCESSOR ORGANIZATION AND REGISTERS INCLUDING DIFFERENCES BETWEEN 8088, 8086, 80286, 80386 AND 80486 PROCESSORS.
- 3) SOFTWARE CONCEPTS: 8088 ADDRESSING MODES
- 4) THE USE OF DEBUG TO ASSEMBLE AND TROUBLESHOOT SIMPLE PROGRAMS.
- 5) INSTRUCTION SET OF THE 8088 MICROPROCESSOR.
- 6) WRITING ASSEMBLY LANGUAGE PROGRAMS TO SOLVE PROBLEMS.
- 7) USING MICROSOFT ASSEMBLER AS A PROGRAM DEVELOPMENT ENVIRONMENT.

LEARNING ACTIVITIES

- 1.0) INTRODUCTION TO ASSEMBLY LANGUAGE
- 1.1) DESCRIBE WHAT ASSEMBLY LANGUAGE IS AND WHY LEARNING ASSEMBLY IS IMPORTANT.
- 1.2) BE ABLE TO MANIPULATE NUMBERS IN BINARY, HEXADECIMAL, OCTAL AND DECIMAL NUMBER SYSTEMS AND PERFORM CONVERSIONS BETWEEN THEM.
- 1.3) BE ABLE TO USE DEBUG TO RUN SAMPLE PROGRAMS.
- 1.4) UNDERSTAND BASIC PROGRAM SYNTAX AND STRUCTURE.
- 1.5) BE ABLE TO EXECUTE FIRST ASSEMBLY PROGRAM CALLED HELLO
- 2.0) HARDWARE AND SOFTWARE ARCHITECTURE
- 2.1) INTRODUCTION TO MICROCOMPUTER HARDWARE COMPONENTS AND INTEL FAMILY OVERVIEW.
- 2.2) BE ABLE TO DESCRIBE SYSTEM ARCHITECTURE.
- 2.3) DISCUSS SYSTEM SOFTWARE AND MEMORY.
- 2.4) UTILIZING DEBUG TO RUN SIMPLE PROGRAMS TO VIEW SYSTEM ARCH.

REQUIRED RESOURCES

TEXTBOOK:
ASSEMBLY LANGUAGE FOR
THE IBM-PC (2nd EDITION)
TEXT: CHAPTER #1

TEXT: CHAPTER #2

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<u>3.0) ASSEMBLY LANGUAGE FUNDAMENTALS</u>	<u>REQUIRED RESOURCES</u>
3.1) DESCRIBE DATA DEFINITION DIRECTIVES AND APPLY THEM TO DATA TRANSFER INSTRUCTIONS.	TEXT: CHAPTER #3
3.2) INTRODUCTION TO BASIC INTEGER ARITHMETIC INSTRUCTIONS.	
3.3) OVERVIEW OF THE FIVE TYPES OF ADDRESSING MODES USED TO LOCATE MEMORY LOCATIONS.	
3.4) DISCUSS PROGRAM STRUCTURE INVOLVING STANDARD MEMORY MODEL.	
<u>4.0) THE MACRO ASSEMBLER: THE ASSEMBLY PROCESS</u>	
4.1) DISCUSS THE ASSEMBLE-LINK-EXECUTE CYCLE.	TEXT: CHAPTER #4
4.2) UNDERSTANDING THE RELATED FILES THAT ARE CREATED DURING THE ASSEMBLY PROCESS.	
4.3) DISCUSS ASSEMBLY SYMBOLIC NAMES, OPERATORS, EXPRESSIONS AND TRANSFER OF CONTROL.	
4.4) DISCUSS THE UTILIZATION OF THE 80386 PROCESSOR.	
4.5) TROUBLESHOOTING PROGRAMS WITH DEBUG.	
<u>5.0) INPUT AND OUTPUT: SERVICES</u>	
5.1) DISCUSS THE USE ASSEMBLY SUBROUTINES FOR I/O SERVICES.	TEXT: CHAPTER #5
5.2) DEFINE AND DISCUSS HARDWARE AND SOFTWARE INTERRUPTS.	
5.3) DISCUSS DOS FUNCTION CALLS FOR CONSOLE AND KEYBOARD INPUT AND OUTPUT.	
5.4) DISCUSS THE UTILIZATION OF BIOS-LEVEL VIDEO CONTROL.	
5.5) TROUBLESHOOTING INPUT/OUTPUT PROGRAMS WITH DEBUG.	

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6.0) CONDITIONAL PROCESSING
(BRANCHING WITH CONDITIONS)

- 6.1) DESCRIBE USE OF BOOLEAN AND COMPARISON INSTRUCTIONS TO MANIPULATE DATA BITWISE.
- 6.2) INTRODUCTION TO CONDITIONAL JUMPS IN ASSEMBLY STRUCTURES.
- 6.3) INTRODUCTION TO CONDITIONAL LOOPS IN ASSEMBLY STRUCTURES.
- 6.4) DISCUSS HIGH-LEVEL LOGIC STRUCTURES IN ASSEMBLY LANGUAGE.

7.0) ARITHMETIC IN ASSEMBLY
LANGUAGE

- 7.1) DISCUSS MULTIPLICATION AND DIVISION BY SHIFTING AND ROTATING BITS.
- 7.2) UNDERSTANDING SAMPLE EXAMPLES USING SHIFTS AND ROTATES.
ie.DISPLAY A NUMBER IN ASCII
- 7.3) DISCUSS THE DIFFERENCES BETWEEN SIGNED AND UNSIGNED ARITHMETIC.
- 7.4) DISCUSS THE UTILIZATION OF ASCII AND PACKED DECIMAL ARITHMETIC.

8.0) NUMERICAL CONVERSIONS USING
ASSEMBLY LANGUAGE

- 8.1) DISCUSS THE USE XLAT FOR CHARACTER TRANSLATION.
- 8.2) UTILIZATION OF CONVERSION ALGORITHMS: BINARY TO ASCII
: ASCII TO BINARY
- 8.3) UNDERSTAND THE USE OF EXTERNAL SUBROUTINES TO CREATE OBJECT LIBRARIES.
- 8.4) DISCUSS THE UTILIZATION OF STACK PARAMETERS.

REQUIRED RESOURCES

TEXT: CHAPTER #6

TEXT: CHAPTER #7

TEXT: CHAPTER #8

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<u>9.0) UTILIZATION OF OBJECT LIBRARIES</u>	<u>REQUIRED RESOURCES</u>
9.1) DEVELOPMENT OF A LIBRARY OF STRING ROUTINES WHICH ARE LINKED TO ASSEMBLY LANGUAGE PROGRAMS.	TEXT: CHAPTER #9
9.2) INTRODUCTION TO DISK STORAGE HANDLING WITH ASSEMBLY LANGUAGE STRUCTURES.	TEXT: CHAPTER #11
9.3) INTRODUCTION TO FILE PROCESSING IN ASSEMBLY LANGUAGE STRUCTURES.	TEXT: CHAPTER #12

REQUIRED STUDENT RESOURCES
(INCLUDING TEXTBOOKS & WORKBOOKS)

- 1) KIP R. IRVINE, ASSEMBLY LANGUAGE FOR THE IBM-PC
MACMILLAN 1993 SECOND EDITION

ADDITIONAL RESOURCE MATERIALS

- 1) A.SINGH & A.TRIBEL, IBM PC/8088 ASSEMBLY LANGUAGE PROGRAMMING
PRENTICE HALL
- 2) J.GODFREY, IBM MICROCOMPUTER ASSEMBLY LANGUAGE
BEGINNING TO ADVANCED
PRENTICE HALL, 1989
- 3) J. PEROZZO, ASSEMBLING AND TROUBLESHOOTING MICROCOMPUTERS
DELMAR, 1991
- 4) MUELLER , UPGRADING AND REPAIRING PC'S
QUE, 1992 SECOND EDITION

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METHOD(S) OF EVALUATION

THE FINAL GRADE OF THIS COURSE WILL BE DIVIDED BETWEEN THE THEORY (60%), AND LABWORK(40%).

EACH UNIT OF THE COURSE WILL BE INDEPENDENTLY ASSESSED, AND EACH MUST BE SUCCESSFULLY COMPLETED TO COMPLETE THE COURSE.

THE FINAL GRADE FOR WILL BE DERIVED FROM THE RESULTS OF THREE TEACHER ASSIGNED TESTS AND EIGHT LAB ASSIGNMENTS.

THREE TESTS	60%	(20% PER TEST)
ASSIGNMENTS	40%	(5% PER ASSIGNMENT)
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TOTAL	100%	

THE GRADING SYSTEM USED WILL BE AS FOLLOWS:

A+	>= 90%	CONSISTENTLY OUTSTANDING ACHIEVEMENT
A	80-89%	EXCELLENT ACHIEVEMENT
B	70-79%	ABOVE AVERAGE ACHIEVEMENT
C	55-69%	SATISFACTORY ACHIEVEMENT
R		REPEAT
X		INCOMPLETE

NOTE: THERE ARE NO REWRITES IN THIS COURSE!