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

COURSE OUTLINE

Course Title: **ASSEMBLY LANGUAGE PROGRAMMING**

Code No.: **CST202** Semester: **3**

Program: **COMPUTER ENGINEERING TECHNICIAN**

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Date: **SEPT , 2000** Previous Outline Date: **AUG 1998**

Approved: _____ _____
Dean Date

Total Credits: **4** Prerequisite: **NONE**

Length of Course: **16 weeks** Total Credit Hours: **64**

Assembly Language Programming — CST202
COURSE NAME — *CODE NO.*

I. COURSE DESCRIPTION:

This course introduces students to Assembly Language Programming in a PC environment. As a first course in assembly language programming it is necessary to study the fundamentals of microprocessor architecture in addition to the specific registers, addressing modes and instructions of the Intel 80x86/88 microprocessors.

Initially the concentration is on the development of simple instruction sequences using DEBUG, an interactive debugging utility that is available as part of DOS/Windows. Later, the use of an Assembler such as Microsoft's MASM or Borland's Turbo Assembler will be used to assemble and test assembly programs. The student will also learn how to write programs that utilize DOS and BIOS services in order to do Input/Output with the keyboard, screen and disk. Finally, the student will write programs to perform direct INPUT/OUTPUT with devices such as LEDs and DIP switches or other appropriate devices.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

(Generic Skills Learning Outcomes placement on the course outline will be determined and communicated at a later date.)

A. Learning outcomes:

1. Describe the architecture of the 8088 microprocessor including its registers, memory organization, the stack and internal organization.

2. Demonstrate the use of DEBUG to assemble, load, save, unassemble, single step, examine and troubleshoot simple instruction sequences.

3. Write assembly language programs utilizing the subset of commonly used 8088 instructions and memory addressing modes to solve simple problems.

4. Demonstrate proficiency in developing and troubleshooting assembly language programs utilizing an Assembler.

5. Write programs utilizing DOS and BIOS services for performing Screen, Keyboard and Disk Input/Output.

6. Write simple programs using the IN and OUT instructions to interact with Input/Output devices.

B. Learning Outcomes and Elements of the Performance:

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

1) Describe the architecture of the 8088 microprocessor including its registers, memory organization, the stack and internal organization.

Elements of the Performance:

- Describe the Software model of the 8088 microprocessor.
- Describe and demonstrate the nature and functioning of the 8088 internal registers.
- Calculate a physical address given a logical and segment address.
- Utilize the stack as a temporary storage mechanism

This learning outcome will constitute approximately 10% of the course.
Reference: Text chapt. 1.2.

2) Demonstrate the use of DEBUG to assemble, load, save, unassemble, single step, examine and troubleshoot simple instruction sequences.

Elements of the Performance:

- Compare and contrast machine code and assembly language
- Describe the method of converting assembly language instructions to machine language.
- Demonstrate the use of DEBUG on the PC to:
  - examine and modify the contents of memory and registers
  - to load and save machine code programs on disk
  - to Assemble and Unassemble instructions
  - to execute and single-step through programs and other tasks required in program debugging.

This learning outcome will constitute approximately 20% of the course.
Reference: Text chapt. Appendix A

3) Write assembly language programs utilizing the subset of commonly used 8088 instructions and memory addressing modes to solve simple problems.

Elements of the Performance:

- The student will demonstrate the operation of the following groups of instructions and their proper utilization in programs:

Text Reference

a)	Data transfer instructions	1.3,
b)	Arithmetic instructions	3.1, 3.2
c)	Logic instructions	3.3
d)	Shift and rotate instructions	3.5, 3.6
e)	Flag-control instructions	pg:851,852,868
f)	Compare instructions	3.3
g)	Jump and loop instructions	2.4
h)	Subroutine handling	2.4
i)	String instructions	6.2

- Students will demonstrate the ability to solve assigned problems using the instructions and addressing modes most appropriate to the task.

This learning outcome will constitute approximately 25% of the course.

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4) Demonstrate proficiency in developing and troubleshooting assembly language programs utilizing an Assembler.

Elements of the Performance:

- Be able to develop programs on the PC using an assembler such as MASM or TASM and be able to use proper statement syntax, program initialization and pseudo operations (pseudo-ops).
- Be able to create assembler programs in both an IDE (integrated development environment) and command line environment.

This learning outcome will constitute approximately 20% of the course.
Reference: Text chapt. 2.2.

5) Write programs utilizing DOS and BIOS services for performing Screen, Keyboard and Disk Input/Output.

Elements of the Performance:

- Describe the relationship of the system software components (DOS, BIOS) that are between an application program and the input/output hardware
- Write programs that utilize DOS and BIOS services in order to perform Input/Output

This learning outcome will constitute approximately 10% of the course.
Reference: Chapt 4.

6) Write simple programs using the IN and OUT instructions to interact with Input/Output devices.

Elements of the Performance:

- Write programs to turn on and off LED's on the Microcomputer Application Trainer (MAT) systems
- Write programs to read in and test the status of DIP switches on the MAT.

This learning outcome will constitute approximately 15% of the course.
Reference: Chapt 12.1

III. TOPICS TO BE COVERED:

1. 8088 Microprocessor Organization and Registers.
2. 8088 Addressing Modes.
3. The use of DEBUG to assemble and troubleshoot simple programs.
4. Instruction Set of the 8088 Microprocessor.
5. Using an Assembler as a Program Development Tool.
6. Writing Assembly Language programs to solve problems.
7. Input/output Programming

IV. REQUIRED STUDENT RESOURCES/TEXTS:

TEXT BOOK:
"The 80x86 IBM PC and Compatible Computers Vol I & II. (3rd Edition)
by Muhammad Ali Mazidi & Janice Gillispie Mazidi.

V. EVALUATION PROCESS/GRADING SYSTEM:

3 WRITTEN TESTS	60%
LAB PROJECTS/ASSIGNMENTS	30%
QUIZZES	5%
LAB ATTENDANCE	5%

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

NOTE: *It is required to pass both the theory and the lab part of this course. For example, it is not possible to pass the course if a student has a failing average in the three written tests but is passing the lab portion, (or vice versa).*

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 55%, 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 45% 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.

LABS:

Lab activities represent a very important component of this course. Because of this, **attendance is mandatory** and the satisfactory completion of all lab activities is required. *It is the student's responsibility to discuss absences from regularly scheduled labs with the instructor so that alternate arrangements (where possible) can be made to complete the lab requirements.*

LAB PROGRAMMING ASSIGNMENTS

It is acceptable that students consult with each other in relation to their assigned problems. However, it is unacceptable to copy programs written by someone else and submit them as your own work. Where plagiarism or copying is found and it is impossible to determine whose original work it is, a mark of zero will be assigned to all assignments involved.

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 all 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.