

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

COURSE TITLE: MICROPROCESSOR PROGRAMMING

CODE NO.: CET 205 - 5

PROGRAM: ELECTRICAL & ELECTRONIC  
TECHNICIAN / TECHNOLOGIST

SEMESTER: THREE

AUTHOR: PETER SAVICH

DATE: AUGUST 23, 1991

PREVIOUS OUTLINE  
DATED: FEBRUARY 3, 1990

APPROVED:

*P. Savich*  
DEAN

9/1/91  
DATE

COURSE NAME:

CODE NO.:

MICROPROCESSOR PROGRAMMING

CET 205 - 5

TOTAL CREDIT HOURS: 80

LENGTH OF COURSE: 5 HOURS PER WEEK FOR 16 WEEKS  
THREE 1 HOUR THEORY CLASSES PER WEEK  
ONE 2 HOUR LAB CLASS PER WEEK

PREREQUISITE(S): NONE

I. PHILOSOPHY / GOALS

THE OBJECTIVE OF THIS COURSE IS TO ENHANCE THE STUDENT'S KNOWLEDGE OF MICROPROCESSOR THEORY, PRACTICE AND APPLICATIONS. THE COURSE USES THE 8088 ASSEMBLY LANGUAGE TO PROVIDE THIS KNOWLEDGE OF MICROPROCESSORS. THE CET228 COURSE OFFERING IN FOURTH SEMESTER WILL FOLLOW UP ON HARDWARE INTERFACING AND INTERRUPTS. THE STUDENT OF THE CET205 COURSE WILL BE GIVEN TIME TO ACQUIRE THE EDITING, ASSEMBLING, LINKING, DEBUGGING SKILLS FOR RUNNING ASSEMBLY PROGRAMS. THIS REQUIRES THE STUDENT TO FIRST UNDERSTAND THE VARIOUS ADDRESSING MODES AND INSTRUCTION SETS AVAILABLE.

II. STUDENT PERFORMANCE OBJECTIVES

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

1. TURN ON THE IBM PC MICROCOMPUTER, AND RUN APPLICATION PROGRAMS
2. USE "TED" EDITOR TO EDIT, "MASM" TO ASSEMBLE, AND "DEBUG" AND "CODEVIEW" TO RUN SIMPLE ASSEMBLY PROGRAMS.
3. USE "DEBUG" TO SAVE, RETRIEVE, ASSEMBLE, UNASSEMBLE, TRACE, AND EXAMINE SIMPLE ASSEMBLY PROGRAMS.
4. USE "CODEVIEW" TO EXAMINE SIMPLE ASSEMBLY PROGRAMS REQUIRING THE FLOATING POINT INSTRUCTIONS AND THE 8087 CO-PROCESSOR.
5. DEMONSTRATE KNOWLEDGE OF THE ADDRESSING MODES, INSTRUCTION SET, AND REGISTERS OF THE 8088 MPU BY CORRECTING AND IMPROVING ASSEMBLY LANGUAGE PROGRAMS PRESENTED TO HIM/HER.

BLOCKS OF STUDY  
(SYLLABUS)

<u>BLOCK</u>	<u>TOPICS TO BE COVERED</u>	<u>CHAPTERS IN TEXTBOOK</u>
I. DOS REVEIW	1	NONE
II. 8088/8086 ARCHITECTURE	2,3,4	1,23,24,25
III. INSTRUCTION SET MASM, LINK, DEBUG	5,6,7,8	1,2,3,4
IV. INPUT/OUTPUT	9	8,9,10
V. ARITHMETIC OPERATIONS	10	12,13
VI. LINKING SUBPROGRAMS	11	21

APPROXIMATE NUMBER OF HOURS ON EACH BLOCK:

<u>BLOCK</u>	<u>DESCRIPTION</u>	<u>HOURS</u>
I	DOS OP/SYS	5 HOURS
II	ARCHITECTURE	5 HOURS
III	PROGRAMMING	40 HOURS
IV	I/O	5 HOURS
V	ARITHMETIC	15 HOURS
VI	LINKING SUBPRO	10 HOURS
		80 HOURS

BLOCK III 40 HOURS  
BLOCK

COURSE NAME:

CODE NO.:

MICROPROCESSOR PROGRAMMING

CET 205 - 5

III. TOPICS TO BE COVERED

1. REVIEW BOOTING UP THE MS DOS OPERATING SYSTEM, RE-LEARNING THE MS DOS COMMANDS.
2. ARCHITECTURE OF THE 8086/8088
3. LEARNING THE SUPPORT CHIPS OF THE 8088
4. MEMORY MAPPING FOR THE 8088
5. REGISTERS, ADDRESSING MODES, AND INSTRUCTION SET OF THE 8088
6. HOW TO USE DEBUG TO LOAD AND WRITE SIMPLE ASSEMBLY PROGRAMS
7. HOW TO USE "TED" EDITOR TO CREATE SIMPLE ASSEMBLY PROGRAMS
8. ASSEMBLING USING "MASM", LINKING, AND RUNNING ASSEMBLY PROGRAMS
9. DOING KEYBOARD I/O USING DOS INT 21
10. ARITHMETIC INSTRUCTIONS USING THE 8088 MPU AND THE 8087 CO-PROCESSOR FLOATING POINT INSTRUCTION SET
11. LINKING SUBPROGRAMS, HIGH-LOW LEVEL LANGUAGES

COURSE NAME:

CODE NO.:

MICROPROCESSOR PROGRAMMING

CET 205 - 5

IV. LEARNING ACTIVITIES

<u>LEARNING ACTIVITIES</u>	<u>REQUIRED RESOURCES</u>
<u>1.0 REVIEWING BOOTING UP/LEARNING MS DOS</u>	
UPON SUCCESSFUL COMPLETION OF THIS UNIT, THE STUDENT WILL BE ABLE TO:	TEXT & HANDOUTS
1.1 DEMONSTRATE KNOWLEDGE OF GENERAL COMPUTER CONCEPTS BY DEFINING WHAT IS: DATA, INFORMATION, HARDWARE, SOFTWARE, OPERATING SYSTEMS, APPLICATION PROGRAMS	
1.2 DESCRIBE THE COMPONENTS OF A COMPUTER: INPUT, OUTPUT, STORAGE, PROCESSING.	
1.3 DISCUSS HOW MEMORY IS CONSTRUCTED OF TWO TYPES: ROM AND RAM, AND HOW DATA IS STORED IN THE COMPUTER	
1.4 DEFINE THE COMPUTER'S SIZE AND THE TERMS: MICROCOMPUTER, MINICOMPUTER, MAINFRAME, SUPERCOMPUTER	
1.5 BOOT UP THE IBM PC'S USING WARM BOOT AND COLD BOOT PROCEDURES.	
1.6 FORMAT FLOPPY DISKS AND COPY TEXT FILES. GIVE THE DISK ORGANIZATION FOR DOUBLE DENSITY, DOUBLE SIDED DISKS, AND RECITE THE RULES FOR "DISKETTE CARE"	
1.7 FAMILIARIZE AND PRACTICE USING THE FOLLOWING SHORT LIST OF DOS COMMANDS: DIR, TIME, DATE, DELETE, COPY, TYPE, FORMAT, DISKCOPY, CHKDSK, PRINT	

COURSE NAME:

CODE NO.:

MICROPROCESSOR PROGRAMMING

CET 205 - 5

2.0 ARCHITECTURE OF THE 8086/8088

UPON SUCCESSFUL COMPLETION OF THIS UNIT, TEXT & HANDOUTS  
THE STUDENT WILL BE ABLE  
TO:

- 2.1 DESCRIBE THE INTERNAL STRUCTURE OF THE 8086 MICROPROCESSOR
- 2.2 DRAW A BLOCK DIAGRAM OF A BASIC MICROCOMPUTER AND IDENTIFY THE COMPONENTS
- 2.3 DEFINE THE FOLLOWING TERMS: MICROPROCESSOR, MICROCOMPUTER, CLOCK, MEMORY DEVICE, I/O DEVICE, RAM, ROM, INSTRUCTION, MACHINE CODE, BYTE, WORD, DOUBLE WORD, REGISTER, ADDRESS

3.0 LEARNING THE SUPPORT CHIPS OF THE 8088

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

- 3.1 BRIEFLY DESCRIBE THE FIVE PROGRAMMABLE CHIPS:  
PIC, PIT, PPI, PCI, PKDB HANDOUTS
- 3.2 BRIEFLY DESCRIBE THE FIVE CONTROLLER CHIPS:  
CRT, KEYBOARD, DMA, FLOPPY/HARD DISK, BUS HANDOUTS
- 3.3 BRIEFLY DESCRIBE FIVE OTHER CHIPS:  
NUMERIC CO-PROCESSOR, ROM, RAM, CLOCK GENERATOR,  
VIDEO CHARACTER DISPLAY GENERATOR HANDOUTS
- 3.4 BRIEFLY DESCRIBE THE I/O CHANNEL HANDOUTS

COURSE NAME:

MICROPROCESSOR PROGRAMMING

4.0 MEMORY MAPPING FOR THE 8086/8088

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

- 4.1 DESCRIBE THE DIFFERENCE BETWEEN LOGICAL ADDRESSING AND PHYSICAL ADDRESSING
- 4.2 DESCRIBE THE DIFFERENCE BETWEEN MEMORY MAPPED VERSUS ISOLATED I/O ADDRESSING
- 4.3 DESCRIBE WHAT THE INTERRUPT VECTOR TABLE IS USED FOR
- 4.4 UNDERSTAND WHY THE SYSTEM MEMORY MAP AND THE I/O SPACE MAP IS USED IN A MICROCOMPUTER DESIGN

CODE NO.:

CET 205 - 5

TEXT:

TEXT &  
HANDOUTS

5.0 REGISTERS, ADDRESSING MODES, AND INSTRUCTION SET OF 8088

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

- 5.1 DEMONSTRATE UNDERSTANDING OF THE 16 BIT WIDE REGISTERS BY USING DEBUG TO OPEN THE 14 DIFFERENT REGISTERS
- 5.2 SET THE CONDITIONS OF THE FLAG REGISTER
- 5.3 USE THE SEVEN DATA ADDRESSING MODES IN DEBUG
- 5.4 KNOW THE JMP INSTRUCTION AND ALL ITS DERIVATIVES
- 5.5 KNOW THE STACK ADDRESSING INSTRUCTIONS: PUSH AND POP
- 5.6 RELATE SOME OF THE INSTRUCTIONS STUDIED TO THE ADDRESSING MODES, REG/MEM, TO THE NUMBER OF CYCLES NEEDED, AND NUMBER OF TRANSFERS

TEXT

CHAPTER 1

HANDOUTS

HANDOUT

COURSE NAME:

CODE NO.:

MICROPROCESSOR PROGRAMMING

CET 205 - 5

6.0 HOW TO USE DEBUG TO LOAD AND WRITE SIMPLE ASSEMBLY PROGRAMS

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

TEXT:  
CHAPTER 2

6.1 USE ANY OF THE FOLLOWING DEBUG COMMANDS:  
A,C,D,E,F,G,H,I,L,M,N,O,Q,R,S,T,U,W

HANDOUT

6.2 USE DEBUG WRITE A SERIES OF SIMPLE  
ASSEMBLY PROGRAMS THAT USE DIFFERENT  
ADDRESSING MODES TO SOLVE A "CALCULATOR"  
TYPE PROBLEM

7.0 HOW TO USE "TED" EDITOR TO CREATE SIMPLE ASSEMBLY PROGRAMS

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

TEXT:

7.1 WRITE SIMPLE PROGRAMS USING THE EDITOR

7.2 KNOW THE ASSEMBLY DIRECTIVES NEEDED AND THE  
PROGRAM INITIALIZATION

7.3 USE THE SKELETON PROGRAM TO SPEED UP THE  
WRITING OF SOURCE CODE

7.4 SAVE, RENAME, RETRIEVE SOURCE CODE

ASSIGNMENT



COURSE NAME:

CODE NO.:

MICROPROCESSOR PROGRAMMING

CET 205 - 5

8.0 ASSEMBLING USING "MASM", LINKING, AND RUNNING ASSEMBLY PROGRAMS

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

TEXT: IBM PC/8088  
CHAPTER 4

8.1 ASSEMBLE USING "MASM", CORRECTLY  
KNOW THE ERROR MESSAGES IF INCORRECT, AND  
THEN RE-ASSEMBLE

8.2 LINK THE OBJECT CODE TO PRODUCE EXECUTABLE  
CODE. KNOW THE ERROR MESSAGES

8.3 RUN THE EXECUTABLE CODE WITHIN DEBUG  
OR CODEVIEW

ASSIGNMENT

9.0 DOING KEYBOARD I/O USING DOS INT 21

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

TEXT: IBM PC/8088  
CHAPTER 8,9,10

9.1 PERFORM SIMPLE OUTPUT TO THE SCREEN  
USING DOS INT 21

9.2 PERFORM SIMPLE INPUT TO THE COMPUTER  
VIA THE KEYBOARD USING DOS INT 21

HANDOUTS  
ASSIGNMENT

10. ARITHMETIC INSTRUCTIONS USING THE 8088 MPU AND THE  
8087 CO-PROCESSOR FLOATING POINT INSTRUCTION SET

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

TEXT: IBM PC/8088  
CHAPTER 12  
& HANDOUTS

10.1 USE "CODEVIEW" TO EXAMINE WORD, SHORT,  
AND LONG INTEGERS; EXAMINE SHORT, LONG  
AND TEMPORARY REAL NUMBERS

10.2 UNDERSTAND THE INTEGER ARITHMETIC INSTRUCTIONS  
OF THE 8088: ADD, SUB, MUL, DIV, IMUL, IDIV.  
WRITE PROGRAMS USING THESE INSTRUCTIONS.

10.2 UNDERSTAND THE FLOATING POINT INSTRUCTION  
SET OF THE 8087: FADD, FSUB, FMUL, FDIV.  
WRITE PROGRAMS USING THESE (AND OTHER)  
FLOATING POINT INSTRUCTIONS.

HANDOUTS

11.0 LINKING SUBPROGRAMS, HIGH-LOW LEVEL LANGUAGES

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

TEXT: IBM PC/8088  
CHAPTER 21  
& HANDOUTS

11.1 MODULARIZE THE LARGE ASSEMBLY PROGRAMS INTO  
SEVERAL SEPARATELY ASSEMBLED SUBPROGRAMS.

11.2 WRITE IN THE HIGH LEVEL LANGUAGE "BASIC"  
MAIN PROGRAMS CALLING LOW LEVEL ASSEMBLY  
SUBPROGRAMS.

COURSE NAME:

CODE NO.:

MICROPROCESSOR PROGRAMMING

CET 205 - 5

V. METHOD(S) OF EVALUATION

1.

THE STUDENT WILL BE ASSESSED THROUGH A SERIES OF THREE (3) WRITTEN TESTS. THESE TESTS WILL EACH BE WEIGHTED TO 20% OF THE FINAL MARK.

THE TENTATIVE DATES ARE: OCT 3 /89  
NOV 7 /89  
DEC 19/89

THESE TEST DATES WILL BE RE-ANNOUNCED APPROXIMATELY ONE WEEK IN ADVANCE.

2.

THE STUDENT WILL BE ASSESSED THROUGH A SERIES OF UNANNOUNCED QUIZZES. THE TOTAL WEIGHT OF THESE QUIZZES ARE NOT TO EXCEED 10% OF THE FINAL MARK.

3.

THE STUDENT WILL BE ASSESSED THROUGH A SERIES OF LAB ASSIGNMENTS. COLLECTIVELY THESE ASSIGNMENTS WILL BE WEIGHTED TO 25% OF THE FINAL MARK.

4.

THE STUDENT WILL BE ASSESSED ON HIS/HER ABILITY TO ANSWER QUESTIONS ABOUT THE LAB ASSIGNMENT ONCE SUBMITTED. THE STUDENT'S RESPONSE TO THESE LAB DEMONSTRATION QUESTIONS WILL BECOME PART OF HER/HIS "PRACTICAL DEMONSTRATION" MARK. THIS MARK WILL BE WEIGHTED TO 5% OF THE FINAL MARK.

5.

THE STUDENT ATTENDING MORE THAN 80% OF THE TIME WILL RECEIVE A BONUS OF 2%.

COURSE NAME:

MICROPROCESSOR PROGRAMMING

CODE NO.:

CET 205 - 5

SUMMARY OF FINAL MARK

1.	TESTS	60%
2.	QUIZZES	10%
3.	ASSIGNMENTS	25%
4.	DEMOS	5%
		----
		100%
5.	ATTENDANCE	2% BONUS ONLY

COURSE GRADING SCHEME

A+	90+	OUTSTANDING ACHIEVEMENT
A	80 - 89	ABOVE AVERAGE ACHIEVEMENT
B	70 - 79	AVERAGE ACHIEVEMENT
C	55 - 69	SATISFACTORY ACHIEVEMENT
U		UNSATISFACTORY GIVEN AT MIDTERM ONLY
S		SATISFACTORY GIVEN AT MIDTERM ONLY
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 HAVE THE DEAN'S APPROVAL AND HAS A MAXIMUM TIME LIMIT OF 120 DAYS.

COURSE NAME:

CODE NO.:

MICROPROCESSOR PROGRAMMING

CET 205 - 5

3. 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 "REPEAT" GRADE ON ALL TESTS WILL REMOVE THE OPTION OF ANY UPGRADING AND AN "R" GRADE WILL RESULT. THE HIGHEST ON A REWRITTEN TEST OR ASSIGNMENT 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  
WRITING OF COMPREHENSIVE SUPPLEMENTAL EXAMINATION

COURSE NAME:

CODE NO.:

MICROPROCESSOR PROGRAMMING

CET 205 - 5

VI. REQUIRED STUDENT RESOURCES

THE TEXT REQUIRED TO BE PURCHASED BY STUDENTS ARE:

1.  
IBM PC ASSEMBLY LANGUAGE AND PROGRAMMING  
BY PETER ABEL, PRENTICE-HALL, 2ND EDITION.

2.

COURSE NOTES FOR CET 205 PREPARED BY PETER SAVICH

3.

THE STUDENTS WILL ALSO BE EXPECTED TO PURCHASE APPROXIMATELY 10  
FLOPPY DISKS 5 AND ONE QUARTER INCH, DOUBLE SIDED, DOUBLE DENSITY.

VII. ADDITIONAL RESOURCE MATERIALS ( AVAILABLE IN COLLEGE LIBRARY)

IBM PC 8088 ASSEMBLY LANGUAGE PROGRAMMING  
BY AVTAR SINGH AND WALTER TRIEBEL  
PUBLISHER: PRENTICE-HALL

THERE ARE MANY OTHER BOOKS ON ASSEMBLER LANGUAGE FOR THE 8086/8088  
MICROPROCESSOR FAMILY.

ADVANCED MICROPROCESSORS, BY HEATHKIT EDUCATIONAL SYSTEMS  
THERE ARE 3 BOOKS: BOOK I, BOOK II , AND STUDENT WORKBOOK.

VIDEO TAPES: THE ONTARIO TV SERIES: THE EDUCATION OF MIKE  
MACMANNIS. THE 13 PART SERIES COMPUTERS AND  
COMPUTER LITERACY.

PERIODICALS: THERE ARE PC MAG, BYTE MAG, COMPUTING CANADA

COURSE NAME:

CODE NO.:

MICROPROCESSOR PROGRAMMING

CET 205 - 5

VIII. SPECIAL NOTES

FOR THE ELECTRICAL & ELECTRONIC STUDENTS THE CET205 COURSE IS BEING OFFERED THIS YEAR (1989) AND FOR THE FUTURE, USING THE 8088 MICROPROCESSOR. FOR ANY REPEATING STUDENTS OR STUDENTS WITH PAST CREDIT IN CET205, THE COURSE WAS OFFERED BEFORE USING THE 6800, "HEATHKITS" AS THE MICROPROCESSOR. THE COLLEGE HAS UPGRADED TO THE MORE POWERFUL 8088 FAMILY OF MICROPROCESSORS. THIS WILL PROVIDE THE STUDENT WITH THE NECESSARY PRE-REQUISITES FOR THE CET228 AND CET315 COURSES OFFERED IN THE FOURTH AND FIFTH SEMESTERS OF THEIR PROGRAM. THE CET315 "INTERFACING" COURSE OF THE FIFTH SEMESTER COMPLETES THE 8088 MPU STUDIES AND INTRODUCES THE 68000 MPU. THE CET306 "PDP-11" COURSE OF THE SIXTH SEMESTER COMPLETES ALL THE COMPUTER RELATED COURSE MATERIAL OF THE ELECTRICAL/ ELECTRONIC PROGRAM. THUS THE 8088 MICROPROCESSOR, AND 8088 ASSEMBLER LANGUAGE OF THE IBM PC MICROCOMPUTER IS WELL STUDIED, AND KNOWLEDGE GAINED IN MICROPROCESSOR TECHNOLOGY INCORPORABLE INTO THE STUDENT "RESEARCH PROJECTS"

INSTRUCTORS (PROFESSORS) RESERVE THE RIGHT TO MAKE CHANGES TO THE COURSE OUTLINES WHERE NECESSARY.

COURSE CODE: CET. 205 - 5

COURSE NAME: MICROPROCESSOR PROGRAMMING

#### POLICY ON SOFTWARE

STUDENTS WILL RECEIVE A TEMPORARY LOAN OF A 5 AND 1/4 INCH DISK THAT CONTAINS LICENSED SOFTWARE NEEDED FOR THE CET205 COURSE.

THE COPYRIGHT LAWS OF CANADA SHALL BE OBEYED. NO UNNECESSARY COPIES OF THE LICENSED SOFTWARE WILL BE PRODUCED DURING THE SEMESTER, AND ALL COPIES WILL BE DESTROYED AT THE END OF THE SEMESTER.

THE STUDENTS WILL TAKE CARE OF THE DISK FOR THE SEMESTER. EVERY STUDENT MUST RETURN THE DISK WHEN ASKED AND BRING THE DISK TO EVERY LAB CLASS.

STUDENTS SHOULD READ AND ADHERE TO THE OFFICIAL SCHOOL POLICY ON ACADEMIC SOFTWARE.

STUDENTS SHOULD COME TO THEORY AND LAB CLASS PREPARED. THIS MEANS BRINGING THE TEXT BOOKS AND SUPPLEMENTAL NOTES, AND THE SOFTWARE PROVIDED.

THANK YOU FOR YOUR CO-OPERATION.

#### POLICY ON LAB CLASS ATTENDANCE

STUDENTS WILL NOW BE SPLIT INTO MORE EVENLY DIVIDED LAB CLASSES. STUDENTS MAY NOT UNILATERALLY SWITCH LAB TIMES.

PROFESSOR: PETER SAVICH





## ACADEMIC SOFTWARE POLICY

1. Software will be loaned to Sault College students, faculty and teachers during the hours software staff are scheduled to work. Software must be returned daily, by the end of the last software person's shift. Other College staff may use software for professional development purposes during times when it is not required for student teaching/learning activities.
2. Students borrowing software will be required to leave their student cards in exchange for software packages. When packages are returned, student cards will be returned.
3. Borrowers are responsible for replacing lost or damaged software. Replacement costs at educational prices will be charged.
4. Users not returning software on time will have their names, student numbers (if applicable) and description of offence(s) entered in log book kept by the software person. Users returning software late must initial the log book and receive another copy of the Software Policy.
5. After a second offence of failing to return software on time, users will be given a verbal warning by the software person that a third offence will result in their being reported to their department Dean. This could mean suspension of their software borrowing privileges for the rest of the semester.
6. Users who have lost their software borrowing privileges will be reinstated at the beginning of the next semester, providing cost of any lost or damaged software has been reimbursed to the College.
7. Students who have not returned software by the end of a current semester will have their marks withheld until the software is returned.
8. The hours the software person is scheduled to work and copies of this policy will be posted at all times in the student and faculty workrooms. At the beginning of each academic year, copies will also be given to all new Computer Programmer and Computer Engineering Technology students and faculty, as well as those in other programs as required.
9. It is against the law to copy software protected by copyright. Users who copy or use software in Sault College for which they cannot provide written authorization to copy from the company are subject to prosecution under the copyright laws of the land. Violators' Deans will also be informed.

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