SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title: **INTERFACING**

Code No.: **CET – 302**   Semester: **6**

Program: **COMPUTER ENGINEERING TECHNOLOGY**

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Date: **MAY 1, 1993**   **Previous Outline Dated: JAN 1990**

APPROVED: _____   93-04-13
              Dean   Date

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CODE NO.

TOTAL CREDIT HOURS: 80 hrs

PREREQUISITES: CET-228

I.   PHILOSOPHY/GOALS:

This course develops the students ability to design and maintain interfaces to peripheral devices in microcomputer systems, by expanding upon the fundamentals learned in CET-228 ("Microcomputer Circuits and Applications") and to carry out practical lab exercises with a variety of microcomputer systems.

Students will apply theory by designing and building an IBM PC interface card and writing device driver software. A variety of computer buses will be studied including ISA (8 & 16 bit), EISA, MCA and QBUS and peripheral buses such as SCSI, ESDI, IDE, ST506 and IEEE-488 buses.

In addition, students will learn to use test equipment such as logic analyzers and signature analyzers in troubleshooting and development.

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II. STUDENT PERFORMANCE OBJECTIVES:

Upon successful completion of this course the student will:

1. Be proficient in the use of a logic analyzer as a troubleshooting tool, and in the interpretation of digital electronic schematics.

2. Be able to describe the nature of a computer bus and its functions including DMA and interrupt operations.

3. Have the ability to program TSR's (terminate and stay resident programs), device drivers, interrupt and DMA routines.

4. Be able to describe the operation of and write programs to control video, magnetic storage device, and memory subsytems.

5. Describe the IBM-PC I/O channel and how to interface to it.

6. Describe the characteristics of major system buses such as MCA, EISA, QBUS, VESA, etc...

7. Understand and have practical ability in connecting and programming systems utilizing IEEE-488 compatible equipment.

III. TOPICS TO BE COVERED:

1. Logic analysis and troubleshooting.

2. Microcomputer busses.

3. Peripheral busses.

4. Bus cycles and operations.

5. Video, Disk and Memory subsystems.

6. Device drivers and TSR's.

7. Shielding and grounding issues.

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IV. LEARNING ACTIVITIES

REQUIRED RESOURCES

NOTE**   These learning activities will not necessarily be covered in the order shown below. Some minor objectives may be omitted if time does not allow.

BLOCK 1- COMPUTER BUSES

TEXT:

1. Describe the nature of a computer bus and its functions. In particular, the XT and AT ISA busses will be studied with emphasis on various subsystems.

"HANDBOOK OF SOFTWARE AND H A R D W A R E INTERFACING FOR IBM PC'S"

2. Describe the memory read, memory write and I/O read, I/O write cycles of the IBM PC I/O channel.

by Jeffrey P. Royer

3. Describe DMA and interrupt operations

Chap 1, 2, 14 and instructors notes

4. Make a comparative study of different computer system buses including the ISA, EISA, MCA and QBUS.

5. Utilize the LA-3200 or other logic analyzer to study system timing and operation and be able to analyze major events such as memory refresh and keyboard scans.

"HANDBOOK OF SOFTWARE AND H A R D W A R E INTERFACING FOR IBM PC'S"

BLOCK 2- MEMORY SYSTEMS AND DMA

by Jeffrey P. Royer

1. Given circuit diagrams, decribe the organization and operation of the IBM-PC memory subsystem.

Chap 10, 17, 18 and instructors notes

2. Describe and analyze the DMA and interrupt cycles of the IBM PC's, ISA bus.

3. Describe the operation and protocols of the 8237A DMA controller and the 8259 PIC in the IBM PC.

4. Describe the memory management and executive functions of the IBM PC and write programs using them.

BLOCK 3- PARALLEL INTERFACING AND THE IEEE-

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488 BUS

1. Describe the IEEE-488 bus signals and the
    protocol used to transfer information on   Handouts   and
    this bus.   User Manuals.

2. Write programs using the "C" or BASIC
    programming languages to control the
    operation of frequency counters, digital
    multimeters and frequency synthesizers
    using the IEEE-488 bus in an ATE system.

3. Describe the nature of parallel ports on
    a PC and be able to program them in "C"
    or   Assembler   to   control   external
    peripherals.

BLOCK 4- MAGNETIC STORAGE DEVICES

1. Describe   the   operation   of   phased   lock
    loops in digital recording.   INTEL Handbooks

2. Discuss the various methods of encoding
    digital information magnetically on disk   "HANDBOOK   OF
    and tapes.   SOFTWARE   AND
                                                      H A R D W A R E
3. Given   circuit   diagrams,   describe   the   INTERFACING FOR
    operation of a floppy disk interface, and   IBM PC'S"
    a floppy disk drive. In particular, the
    ST506, SCSI, IDE, and ESDI interfaces   by Jeffrey P.
    will be covered.   Royer
                                                      Chap 8

4. Describe   the   operation   of   and   write   i n s t r u c t o r s
    programs   for   a   typical   floppy   disk   notes
    controller chip.

BLOCK 5- DISPLAY TECHNIQUES

1. Describe the methods of displaying data
    on   color   and   monochrome   raster   scan   "HANDBOOK   OF
    CRT's.   SOFTWARE   AND
                                                      H A R D W A R E
2. Describe the typical components of a CRT   INTERFACING FOR
    display interface.   IBM PC'S"

                                                      by Jeffrey P.
                                                      Royer
3. Describe   and   program   the   6845   CRT   Chap 12

controller chip (on the CGA display adapter).

4. Describe the features of the various graphic adapter standards in use in personal computer systems.

instructors notes.

BLOCK 6- INTERFACE SOFTWARE

1. Discuss the use of device drivers on the IBM PC.

2. Describe the operation of a typical device driver on the IBM PC.

3. Describe the requirements of a device driver, and the steps required to write one.

4. Write a device driver for an IBM PC peripheral.

"HANDBOOK OF SOFTWARE AND H A R D W A R E INTERFACING FOR IBM PC'S"

by Jeffrey P. Royer Chap 11

instructor notes

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V.   METHOD OF EVALUATION:

           3 THEORY TESTS (20 % each)

           LAB PROJECTS/ASSIGNMENTS (35 %)

           QUIZZES AND PRACTICAL TESTS   (5 %)

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

GRADING SCHEME

A+	90	–	100%
A	80	–	89%
B	70	–	79%
C	55	–	69%
I	Incomplete		
R	Repeat		

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 the following criteria:

1.   The students attendance has been satisfactory.
2.   An overall average of at least 40% 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.

LABS:

Lab activities represent a very important component of this course
in which practical 'hands-on' skills will be developed. 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.

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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, so that remedial activities can be scheduled.

VI. REQUIRED STUDENT RESOURCES:

TEXT BOOKS: HANDBOOK OF SOFTWARE AND HARDWARE INTERFACING FOR IBM PC's, Jeffrey P. Royer, Prentice Hall.

NOTE** text is out of print but 4 are available in the bookstore and we have copyright permission to photocopy manuals as necessary.

VII. ADDITIONAL RESOURCE MATERIALS AVAILABLE:

INTEL LITERATURE, HANDBOOK SET
BYTE MAGAZINE
PC MAGAZINE

VIII. SPECIAL NOTES:

Students with special needs (eg. physical limitations, visual or hearing impairments, or learning disabilities) are encouraged to discuss any required accomodations confidentially with the instructor.

Your instructor reserves the right to modify the course as deemed necessary to meet the needs of students or take advantage of new or different learning opportunities.