For your Records.

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY

SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title: COMPUTER SYSTEMS III

Code No.: CET303-6 Semester: 5

Program: COMPUTER ENGINEERING TECHNOLOGY

Author: TYCHO BLACK

Date: JAN., 1994 Previous Outline Dated: JAN.,1993

APPROVED: _____ 94-01-06

Dean Date

COMPUTER SYSTEMS III — COURSE NAME
CET303-6 — CODE NO.

TOTAL CREDIT HOURS: 96

PREREQUISITES: Computer Engineering Technician Graduate or with the permission of the Dean

I. PHILOSOPHY/GOALS:

Computer Systems III follows two years of study in a variety of programming languages and operating systems and is intended to develop the student's skills as proficient users of VAX computers at the system's programming level. Two operating systems will be used: VMS and UNIX. The student will learn terminal and file handling techniques, screen management, process management and interprocess communications. The view of the VAX computer as the host of a single, dedicated system in an environment such as process control engineering will be developed. The concepts will be demonstrated by significant programming exercises in Fortran and C.

II. STUDENT PERFORMANCE OBJECTIVES:

Upon successful completion of this course the student will:

1. Understand the System's Level Programming environment of VMS and UNIX systems and the standard ways of calling system services and functions.

2. Be able to write programs to manage, synchronize, and communicate between processes in multi-process VMS systems.

3. Be able to utilize VMS Screen Management Library routines to manage screens and implement windows.

4. Be able to use available UNIX system calls to manage files and processes.

5. Be able to use UNIX system calls to use signals, pipes and sockets for interprocess communication.

III. TOPICS TO BE COVERED:

1. General capabilities of VMS System Services, Run Time Library and RMS.

2. Screen-management RTL techniques for controlling a terminal.

3. Managing process states and synchronizing processes using event flags and other techniques.

4. Utilization of the Screen Management Library facilities to create windows and manage I/O.

5. Interprocess communication techniques such as mailboxes, global memory and shared files.

6. VAX Input/Output System overview and RMS file organization.

7. C Shell script files basics and C programming tools.

8. UNIX regular file management.

9. UNIX process management system calls and their utilization in C programs.

10. UNIX Interprocess communication techniques including signals, pipes, named pipes and sockets.

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IV. LEARNING ACTIVITIES

REQUIRED RESOURCES

Note: These Learning Activities will not necessarily be covered in the order shown below. Also, some minor objectives may have to be omitted if time does not allow.

TEXT:

BLOCK 1 - MANAGING AND SYNCHRONIZING PROCESSES IN VMS

"PROGRAMMING VMS IN FORTRAN" (notes)

At the end of this block the student will under-stand the nature of the various services available on a VMS system, and the methods used to call them. In particular,

In this block the student will study the VMS process, and how it is scheduled. Techniques of creating processes and controlling and synchronizing their execution will also be studied. Programming will be done in Fortran. In particular students will be able to:

1. Discuss the general capabilities of the VAX Run-time Library, System Services and RMS, and the techniques for calling them.

2. Describe the types of VMS processes and be able to create processes from DCL or a program.

3. Discuss the various states a process may be in. Use DCL and Fortran programs to determine and modify process states, and to hibernate, wake, suspend and resume processes.

4. Use the VMS Monitor utility to monitor the states of processes.

5. Discuss the use of event flags as a process synchronization tool and utilize them in programs.

6. Describe the use of AST's, Asynchronous System Traps.

7. Describe the use of the VMS Lock Manager and write programs that use it.

8. Describe the use of exception and condition handlers in the VMS environment.

BLOCK 2 - INTERPROCESS COMMUNICATION and THE INPUT/OUTPUT SYSTEM IN VMS

In this block the student will study the methods used to pass information between processes. The student will use mailboxes, global memory areas and shared files as methods of communication and study the VAX input-output system including screen management. The student will be able to:

1. Discuss the Screen Management features of the Run-Time Library, and the general windowing environment.

2. Discuss the use of mailboxes and write programs utilizing them.

3. Discuss the concept of global memory, the types of global sections and the services that can be used to call them and then write programs to utilize them.

4. Describe RMS file organization (Sequential, Relative and Indexed files). Discuss file-sharing techniques and use them in programs.

5. Discuss the structure of the VAX I-O system and the process of performing input and output, in particular using QIO directives.

BLOCK 3 - PROGRAMMING C IN A UNIX ENVIRONMENT

In this block the student will study the basic concepts needed to program UNIX from C, will review C Shell concepts and learn to manage files and processes. In particular, students will be able to:

"UNIX FOR PROGRAMMERS AND USERS" by Graham Glass (Prentice- Hall)

1. Write and analyze C shell script files.

2. Use the tools that support C program development including compilation, debugging, maintaining libraries, profiling and source code control.

3. Describe the use of perror() in error handling.

4. Use the UNIX file management system calls and be able to describe their operation. CHAP. 6

CHAP. 9

5. Discuss the UNIX environment from a process point of view and write programs that manage processes with the use of system calls such as: **exec, fork, exit, nice and wait.** CHAP. 10

6. Discuss the use of various system calls for finding and setting process identification values: **getgid, getegid, getpid, getpgrp, getppid, setuid, setgid, and setpgrp.** CHAP. 10

CHAP. 10

BLOCK 4- INTERPROCESS COMMUNICATION IN UNIX

This block involves the study of UNIX interprocess communication techniques including pipes, named pipes, signals, shared memory, and record locking. The student will be able to:

1. Discuss the various types of signals including the use of the **kill, pause and alarm** system calls. Be able to write programs demonstrating their use.

2. Discuss the concepts of pipes and named pipes (or FIFO's) in UNIX and write programs utilizing them.

3. Discuss the various types of sockets and their use in interprocess communication. Write programs using sockets.

V. METHOD OF EVALUATION:

4 THEORY TESTS (@ 16% each)	64%
ASSIGNMENTS/Quizzes	36%

(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.

ASSIGNMENTS:

All assigned work must be completed satisfactorily to pass this course. A penalty of 10% per week will be applied to assignments handed in late unless extenuating circumstances exist.

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.

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VI. REQUIRED STUDENT RESOURCES:

TEXT BOOKS:

1. **"PROGRAMMING VMS IN FORTRAN" (Printed Notes)**

2. **"UNIX FOR PROGRAMMERS AND USERS" by Graham Glass (Prentice-Hall)**

VII. ADDITIONAL RESOURCE MATERIALS AVAILABLE:

DEC VMS and ULTRIX Manuals (to be itemized during the course)

VIII. SPECIAL NOTES:

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. 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.