**NORTHEAST IOWA COMMUNITY COLLEGE**

**Calmar/Peosta**

Course Guide for: **OPERATING SYSTEMS**

**1.0 COURSE TITLE:** Operating Systems

**2.0 CATALOG NUMBER:** NET:156

**3.0 SEMESTER HOUR CREDIT:** 3

**4.0 LECTURE HOURS:** 32

**5.0 LAB HOURS:** 32

**Identify if other than in-school lab (i.e. Clinical, Coop, etc.)**

**6.0 COURSE DESCRIPTION:**

This course provides the student with the experiences needed to effectively control the operation and resource allocation of a computer system. It emphasizes effective internal resource management in general and how these principles apply to the mainframe, mid-range (AS/400), and micro computing environments.

6.1 All of the following prerequisite courses need to be passed with a minimum of a C- to progress in the Computer Analyst major. Prerequisite: CIS:122

**7.0 GENERAL COURSE GOAL(S):**

The goal of this course is to assist the student in becoming knowledgeable in the structure and operation of mainframe, mid-range, and microcomputers, including the allocation and manipulation of computer resources.

**8.0 MAJOR UNITS OF INSTRUCTION:**

8.1 Basic System Resources.

8.2 Memory Management.

8.3 System Internals.

8.4 I/O Management.

8.5 Network Management.

**9.0 UNIT OBJECTIVES:**

9.1 Unit One Objectives.

At the end of this unit, the student will be able to:

9.1.1 Define the term operating system.

9.1.2 Understand the basic relationship between the operating system and hardware and software components.

9.1.3 Convert numbers between the binary, decimal, and hexadecimal numbering systems.

9.1.4 Describe the evolution of operating systems.

9.1.5 Install and operating system.

9.1.6 Install an application program.

9.1.7 Schedule a task to run automatically.

9.2 Unit Two Objectives.

At the end of this unit, the student will be able to:

9.2.1 Describe early and recent memory allocation schemes.

9.2.2 Discuss advantages and disadvantages of various memory allocation schemes.

9.2.3 Explain the benefits of and demonstrate multiprogramming.

9.2.4 Describe external and internal fragmentation.

9.2.5 Understand de-allocation algorithms.

9.2.6 Create and format partitions.

9.2.7 Explain compaction.

9.2.8 Name and describe page replacement policies.

9.2.9 Explain the relationship between pages and page frames.

9.2.10 Explain the difference between pages and segments.

9.2.11 Explain demand paging.

9.2.12 Define page fault and thrashing.

9.2.13 Modify the page size in an operating system.

9.2.14 Describe the available page frame queue.

9.2.15 Given a reference string and a number of page frames, calculate the number of page faults generated by various page replacement algorithms.

9.2.16 Define virtual memory.

9.3 Unit Three Objectives.

At the end of this unit, the student will be able to:

9.3.1 Describe the purpose of and the differences between the short term (CPU) and the long term (JOB) schedulers.

9.3.2 Name and describe the states that a process can be in.

9.3.3 Explain the purpose of the Process (or Task) Control Block.

9.3.4 Explain the difference between CPU bound processes and I/O bound processes.

9.3.5 Monitor and make adjustments to maximize CPU performance in the lab.

9.3.6 Explain what a context switch is.

9.3.7 Describe the common process scheduling algorithms.

9.3.8 Given a sample workload, use a deterministic modeling analytic evaluation technique to determine the average wait time for various scheduling algorithms.

9.3.9 Explain cache memory.

9.3.10 Name and describe various types of interrupts that can occur.

9.3.11 Define deadlock and starvation.

9.3.12 Name and describe the four conditions that must hold true simultaneously for a deadlock situation to occur.

9.3.13 Explain the difference between deadlock prevention and deadlock avoidance.

9.3.14 Name and describe the two methods of process termination.

9.3.15 Describe the three issues that need to be addressed when resource preemption is used to eliminate deadlocks.

9.3.16 Given a set of processes and their resource requirements/requests, determine if the system is in a safe state, in an unsafe state but not in deadlock, or in deadlock.

9.3.17 Draw and explain a resource allocation graph.

9.3.18 Draw parallel processing.

9.3.19 Describe typical multiprocessing configurations.

9.3.20 Explain the issues involved in process cooperation and how process synchronization software works.

9.3.21 Define critical region and semaphore.

9.3.22 Explain various applications of concurrent processing.

9.4 Unit Four Objectives.

At the end of this unit, the student will be able to:

9.4.1 Explain the difference between dedicated, shared, and virtual devices.

9.4.2 Install hardware and device driver.

9.4.3 Explain how sequential access storage media works.

9.4.4 Explain how direct access storage devices work, including fixed head, movable head, and optical devices.

9.4.5 Use seek time, search time, and transfer time to calculate access time required for direct access storage devices.

9.4.6 Describe a channel program, a channel command word, a channel address word, and a channel status word and the relationship between them.

9.4.7 Describe all of the steps involved in performing an I/O operation.

9.4.8 Name and describe common seek strategies for the I/O device handler.

9.4.9 Explain rotational ordering.

9.4.10 Briefly describe RAID.

9.4.11 Explain the responsibilities involved in file management.

9.4.12 Create, move, rename, and delete directories and files.

9.4.13 Describe typical volume configuration.

9.4.14 Explain file-naming conventions.

9.4.15 Understand the characteristics of fixed-length and variable-length records.

9.4.16 Explain sequential, direct, and indexed sequential record organization.

9.4.17 Explain contiguous, noncontiguous, and indexed physical storage.

9.4.18 Describe various techniques for data compression.

9.4.19 Explain how the current byte address is updated for both sequential and direct access methods.

9.4.20 Name and describe common methods to control file access.

9.4.21 Set up and maintain local user profile.

10.5 Unit Five Objectives.

At the end of this unit, the student will be able to:

9.5.1 Define a variety of network terms.

9.5.2 Describe a number of network topologies, including star, ring, bus, tree, and hybrid.

9.5.3 Explain the criteria for determining which network topology to use.

9.5.4 Set up a peer-to-peer network.

9.5.5 Set up a server.

9.5.6 Discuss RIP and OSPF routing strategies.

9.5.7 Explain circuits switching and packet switching.

9.5.8 Describe the layers of the OSI Reference model and the TCP/IP model.

9.5.9 Compare network and distributed operating systems.

9.5.10 Explain the differences between processed-based and object-based distributed operating systems.

9.5.11 Describe how operating system functions are performed in distributed operating systems.

9.5.12 Describe the major functions and features of network operating systems.

9.5.13 Discuss levels of protection and means of implementing system security.

9.5.14 Describe various security breaches and methods of handling them.

9.5.15 Discuss ethical issues in the computer industry.

9.5.16 Define various terms used in measuring system performance.

9.5.17 Explain the difference between a negative feedback loop and a positive feedback loop.

**10.0 INSTRUCTIONAL METHODOLOGIES:**

10.1 Classroom lecture.

10.2 Group discussions.

**11.0 GRADING CRITERIA:**

11.1 The instructor will provide the grading criteria to students at the beginning of the course.

11.2 Grades will be assigned for work completed using the letter grades A-F as identified in the college catalog.

Revised 3/00, 2/04, 2/05, 2/09, 1/15

This workforce solution is funded in part by the IHUM Consortium which is 100% financed through a $15,000,000 grant from the U.S. Department of Labor’s Employment and Training Administration.

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