

**TCSS 422: Machine Organization Master Syllabus**  
**Version: April 2011**  
**(Approved: 27 May 2011)**

**Catalog Description**

Examines the fundamental concepts of operating systems and how they function. Includes process management, file systems, concurrency, interprocess communication, graphical interfaces, and security. Prerequisite: a minimum grade of 2.0 in TCSS 342; a minimum grade of 2.0 in TCSS 372.

**Preconditions**

Prior to taking the class, student must be able to:

- trace the flow of data and control signals through a CPU
- translate between assembly instructions and machine code
- write small to medium programs in C
- explain the instruction execution cycle
- explain how linked list, arrays, and hash tables are used

**Course Objectives**

The objectives of this course are to teach students the:

- relationships between hardware and the inner workings of the OS
- OS security
- basics of concurrency and multiprogramming
- inter-process communications and coordination
- memory management and virtual memory mechanisms
- I/O management, device driver architecture, interrupt processing, kernel services
- basic file system management

**Student Learning Outcomes**

Upon successful completion of the course, students should be able to:

- understand and describe the basic architecture of a modern operating system, including security and kernel-mode processing
- trace function calls from an application program to kernel services and back
- understand and demonstrate the scheduling process in a multi-processing environment
- compare and contrast several scheduling approaches (e.g. round robin and priority)
- solve basic inter-process communications/coordination problems
- understand and describe the fundamental problem of deadlock and mitigation
- understand and describe the basics of I/O controllers, their operation and interface with the OS
- understand and describe the basic interrupt handling mechanisms associated with timers and I/O
- understand and describe basic file management system (time permitting)

**Relationship of course to CSS student learning outcomes:** This course supports and assesses the achievement of the following elements of the program objectives:

- An ability to apply knowledge of computing and mathematics appropriate to the discipline
- An ability to use current techniques, skills, and tools necessary for computing practice.

**Relationship to UWT student learning goals** (to be added to syllabus handed out to students)

- *Inquiry and Critical Thinking:* Students will acquire skills and familiarity with modes of inquiry and examination from diverse disciplinary perspectives, enabling them to access, interpret, analyze, quantitatively reason, and synthesize information critically.
- *Communication/Self-Expression:* Students will gain experience with oral, written, symbolic and artistic forms of communication and the ability to communicate with diverse audiences. They will also have the opportunity to increase their understanding of communication through collaboration with others to solve problems or advance knowledge.

### **Topics Covered**

- Introduction to Operating Systems
- Processes and Threads
- Real-time OS concepts
- Deadlocks
- Memory Management
- Input/Output processing
- File systems