Specific course information

**Catalog description:** The course concentrates on the design and functions of the operating systems of multi-user computers. Its topics include time sharing methods of memory allocation and protection, files, CPU scheduling, input-output management, interrupt handling, deadlocking and recovery and design principles. The course discusses one or more operating systems for small computers, such as UNIX.

**Prerequisites:** CS 04222 Data Structures and Algorithms and CS 06205 Computer Organization

**Type of Course:** ☒ Required ☐ Elective ☐ Selected Elective

Specific goals for the course

1. **context switching.** The student has been able to accurately explain the role of context switching in an operating system and how/when the operating system decides to which process to switch
   - ABET (c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs

2. **deadlocks.** The student has demonstrated an understanding on how to detect, prevent, and solve (using multiple methods) deadlocks that occur in an operating system
   - ABET (b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution
   - ABET (c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs
3. **memory management.** The student has explained multiple ways that an operating system can allocate an address space to a process and how virtual memory is managed via page eviction algorithms.

   - ABET (c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs

4. **OS theory.** The students should have an understanding of operating systems theory and implementation. They will understand OS internals to the level that they can design and implement significant architectural changes to an existing OS.

   - ABET (c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs

5. **hardware.** The students have described the hardware components of modern computing environments and their individual functions.

   - ABET (c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs

6. **OS functionality.** The students have described the role and basic functions of an operating system, and how operating systems interact with hardware and software applications.

   - ABET (c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs

7. **OS security.** The students have identified and described basic security issues of operating systems.

   - ABET (c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs

**Required list of topics to be covered**

1. Processes and threads
   - Race conditions
   - Semaphores
   - Scheduling algorithms
2. Memory management
   - Bitmaps
   - Memblocks
   - Virtual memory
   - Page eviction algorithms
3. File management
a. inode
b. FAT
c. Journaling systems
d. File construction

4. Input/output
   a. Device independent OS layer
   b. DMA systems
   c. Programmed I/O
   d. Synchronous vs. asynchronous

5. Deadlocks
   a. Detection
   b. Recovery
   c. Dynamic avoidance

Optional list of topics that could be covered

6. Programming of a simple boot loader
7. Virtual OS design
8. Attacking four conditions of deadlocks
9. BIOS communication
10. Security