



SYSC 4001

Operating Systems

Calendar description

Introduction to operating system principles. Processes and threads. CPU scheduling. Managing concurrency: mutual exclusion and synchronization, deadlock and starvation. Managing memory and input/output. Concurrent programming, including interprocess communication in distributed systems.

Includes: Experiential Learning Activity.

Lectures three hours a week, laboratory three hours a week.

<http://calendar.carleton.ca/undergrad/courses/SYSC/>

Prerequisites

SYSC 2006 with a minimum grade of C-.

Precludes additional credit for SYSC 3001 and COMP 3000.

Prior knowledge

Students should have:

- Good knowledge of programming (including programming in C).
- Knowledge of data structures.
- Basic knowledge of processor architecture.

Course objectives

The objective of this course is to expose the students to the fundamental concepts underlying operating systems. The topics will include the management of both software processes and hardware devices in a computer system. Students will learn techniques for handling concurrent processes including different synchronization and inter-process communication techniques. Various device management techniques including CPU and I/O scheduling as well as techniques for managing memory including virtual memory systems will be discussed. The course will also include a discussion of different file system management techniques.

List of topics

- Processes and Threads
- Management of Concurrent Processes
- CPU Scheduling

- Deadlock Handling
- Memory Management
- Disk Scheduling
- File System Management

Learning outcomes

By the end of this course, students should be able to:

- Understand the basic concepts and techniques underlying concurrent processing.
- Design and implement systems with concurrent processes and handle inter-process communication, synchronization and mutual exclusion.
- Understand the various techniques and algorithms for memory management.
- Know the various operating system components (hardware and software) related to virtual memory management.
- Know the popular CPU scheduling policies and be able to understand their performance implications.
- Know various disk I/O scheduling policies and how to evaluate them.
- Understand file system management techniques.
- Know about comparative analysis of various operating systems algorithms.
- Know about tools for system design and analysis.

Graduate Attributes (GAs)

The Canadian Engineering Accreditation Board requires graduates of engineering programs to possess 12 attributes at the time of graduation. Activities related to the learning outcomes listed above are measured throughout the course and are part of the department's continual improvement process. Graduate attribute measurements will not be taken into consideration in determining a student's grade in the course. For more information, please visit: <https://engineerscanada.ca/>.

Graduate Attribute	Learning outcome(s)
1.4.S: Knowledge Base: Developed: Programming and algorithms	1, 2
1.5.S: Knowledge Base: Developed: Computer systems	1, 3-7
3.3: Investigation: Introduced: Experimental procedure	8
3.5: Investigation: Introduced: Interpretation of data (synthesis) and discussion	8
4.1: Design: Introduced: Clear design goals	2
4.5: Design: Developed: Design implementation / task(s) definition	2
5.3: Use of Engineering Tools: Applied: Tools for design, experimentation, simulation, visualization, and analysis	9

Accreditation Units (AUs)

For more information about Accreditation Units, please visit:

<https://engineerscanada.ca/>.

The course has a total of 55 AUs, divided into:

- Engineering Science: 75%
- Engineering Design: 25%

Instructor and TA contact

Specific to course offering (tbd)

Textbook (or other resources)

Specific to course offering (tbd)

Evaluation and grading scheme

Specific to course offering (tbd)

Breakdown of course requirements

Specific to course offering (tbd)

Tentative week-by-week breakdown

Specific to course offering (tbd)

General regulations

Specific to course offering (tbd)