# ITSC 205 - Operating Systems Internals

**Course Description:**
Operating systems form the support structure used by all computing resources. Topics include: memory management, interrupt handling, systems call structure, file systems, process management, and sockets. The labs will focus on not only the basic algorithms but also the vulnerabilities caused by implementation specific issues and best defensive practices.

3 credits

**Time Guidelines:**
The standard instructional time for this course is 90 hours.

**Effective Year**
2017/2018

**Prerequisite(s):**

- ITSC 200
- ITSC 202

**Course Assessment:**

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|---|---|
| Labs | 15% |
| Assignments | 15% |
| Quizzes | 20% |
| Midterm Exam | 25% |
| Final Exam | 25% |
| Total: | 100% |

**SAIT Policies and Procedures:**
For information on the SAIT Grading Scale, please visit policy AC 3.1.1 Grading Progression Procedure: http://www.sait.ca/Documents/About SAIT/Administration/Policies and Procedures/AC.3.1.1 Grading and Progression Procedure.pdf

For information on SAIT Academic Policies, please visit: www.sait.ca/about-sait/administration/policies-and-procedures/academic-student

**Required Course Publication(s):**
Silberschatz, A., Galvin, P.B. & Gagne, G. (2012). *Operating Systems Concepts* (9th ed.). Wiley. ISBN: 9781118063330.

**Course Learning Outcome(s):**

1. Describe computer operating system components.

    Objectives:

        1.1 Define key operating system terms.

        1.2 Outline the historical development of general purpose computer systems.

        1.3 Describe computer system architectures.

        1.4 Describe computer system environments.

        1.5 Describe the general operation of computer systems, including interrupt structure.

2. Outline the general structure and services of computer operating systems.

    Objectives:

        2.1 Describe operating system components.

        2.2 Analyze the system boot-up process.

        2.3 Describe operating system services.

        2.4 Describe mechanisms to access operating system services.

        2.5 Explain how operating systems may be structured.

        2.6 Discuss the attack surface presented by modern operating systems.

3. Explain the management of processes and threads.

    Objectives:

        3.1 Describe process states and state transitions.

        3.2 Analyze process creation and termination mechanisms.

        3.3 Explain operations performed on processes.

        3.4 Describe how a process can be divided into threads.

        3.5 Explain thread implementations.

4. Evaluate process scheduling policies and mechanisms.

    Objectives:

        4.1 Describe scheduling objectives and criteria.

        4.2 Compare and contrast scheduling algorithms.

        4.3 Evaluate the performance of process scheduling mechanisms and policies.

        4.4 Describe quantitative techniques used to evaluate the performance of process scheduling algorithms.

5. Summarize methods used for process synchronization, communication and deadlocks.

    Objectives:

        5.1 Define cooperating processes.

        5.2 Explain interprocess communication mechanisms (IPC).

5.3 Analyze the structure of shared libraries/DLL.

5.4 Explain process synchronization mechanisms.

5.5 Confirm the presence of deadlocks.

5.6 Evaluate techniques used to handle deadlock.

6. Summarize memory management techniques.

Objectives:

6.1 Explain fundamental terms used to describe memory management.

6.2 Describe physical memory management techniques.

6.3 Explain paging and segmentation.

6.4 Explain demand paging, page replacement and allocation algorithms.

7. Outline I/O control and services provided by the operating system.

Objectives:

7.1 Describe input/output hardware control.

7.2 Describe the kernel input/output subsystem.

7.3 Explain the input/output interface, which provides services to applications.

8. Evaluate the methods used to implement, access and manage the file system interface.

Objectives:

8.1 Evaluate file access and organization mechanisms.

8.2 Describe the file system structure.

8.3 Evaluate space allocation and file management methods.

9. Evaluate secondary and tertiary storage management techniques.

Objectives:

9.1 Describe mass storage devices.

9.2 Explain disk access optimization.

9.3 Evaluate disk management performance and reliability.

9.4 Evaluate tertiary storage performance and reliability.