THE UNIVERSITY OF WINNIPEG

APPLIED COMPUTER SCIENCE

Course Number: ACS-3931-001
Course Name: Principles of Operating Systems
Course Webpage: https://nexus.uwinnipeg.ca/d2l/home/67040

Instructor Information

Instructor: Sergio G. Camorlinga **Office:** 3D29
E-mail: s.camorlinga@uwinnipeg.ca
Office Hours: Wednesday 4:00 – 5:00 pm

Class meeting time: Mondays/Wednesdays 11:30 am – 12:45 pm 3C13

Important Dates

1. First Class: Monday, January 6, 2025
2. Reading Week (no classes): February 16-22, 2025
3. Midterm Exam: Monday, February 24, 2025
4. Final Withdrawal Date w/o academic penalty*: Friday, March 14, 2025
5. Last Class: Wednesday, April 2, 2025
6. Final Exam: *TBD*
7. University closures: Louis Riel Day Monday, February 17, 2025
   Good Friday Friday, April 18, 2025

*A minimum of 20% of the work on which the final grade is based will be evaluated and available to the student before the voluntary withdrawal date.

Course Objectives / Learning Outcomes

This course covers the principles and design of operating systems with a hands-on component focused on the Linux Operating System. An Operating System is system software that manages resources (hardware & software) and provide common services to computer programs. Students are introduced to principles in process management, memory management, I/O device management, file systems, and operating system security. After each principle topic, we discuss how the respective principle is applied into the Linux Operating System. Linux is a family of open-source Unix-like OS based on the Linux kernel. We will review simple code in 'C' language to get a good understanding of principles and design aspects.

Evaluation Criteria

- Assignment Labs: 15%
    - All assignment labs are to be completed in teams of 2 students.
    - There are 3 assignment labs
        - Each can include theory, programming, testing and/or analysis exercises
    - Each assignment lab is worth 5%
    - Assignment lab work results are submitted via Nexus in one zip file by one of the team students. Only one submission per team is needed.
    - Due at 23:59:00 pm (Nexus clock) sharp on due dates, which are posted in Nexus
    - No late assignment will be accepted, or under special circumstances accepted with 20% off for each late day
    - Assignment lab reports are only submitted as PDF (Portable Document Format) files and code in the format requested in the assignment lab description. All together in one zip file is submitted.
    - The details of submission procedure will be stated in each assignment lab
    - Multiple submissions are not permitted. Teams may submit a partially completed assignment lab, and will receive credit for those attempted problems
    - Combination of functionality, quality of design, programming style and documentations are considered for programming parts of the assignment labs
    - Problem solving, and programming parts of the assignment labs are time consuming. Start early.
    - Team students are responsible for maintaining backups and protecting their work
    - Team students are responsible to review their assignments before submission to make sure the correct files are attached to the submission
- Midterm: 35%
    - The midterm is during class time
- Final Exam: 50%
    - Cumulative, i.e. it includes all material discussed in the course including classes

Test / Exam Requirements

- Exams will be delivered in person.
- Photo ID is required for the final exam.
- The use of computers, calculators, phones, or other electronic devices is not permitted during exams.
- Midterm and final exams are closed-book.

Students should contact the instructor as soon as possible if extenuating circumstances require missing a lab, assignment, test or examination. A medical certificate from a practicing physician may be required before any adjustments are considered.

Students with documented disabilities, temporary or chronic medical conditions, requiring academic accommodations for tests/exams (e.g., private space) or during lectures/laboratories (e.g., note-takers) are encouraged to contact Accessibility Services (AS) at 204-786-9771 or accessibilityservices@uwinnipeg.ca to discuss appropriate options. All information about a student's disability or medical condition remains confidential.
https://www.uwinnipeg.ca/accessibility-services/

Students may choose not to attend classes or write examinations on holy days of their religion, but they must notify their instructors at least two weeks in advance. Instructors will then provide opportunity for students to make up work examinations without penalty. A list of religious holidays can be found in the 2024-25 Undergraduate Academic Calendar online at http://uwinnipeg.ca/academics/calendar/docs/important-notes.pdf

Final Letter Grade Assignment

Historically, numerical percentages have been converted to letter grades using the following scale. However, instructors can deviate from these values based on pedagogical nuances of a particular class, and final grades are subject to approval by the Department Review Committee.

A+	95+ – 100%	B+	80 – 84%	C	65 – 69%
A	90 – 95 %	B	75 – 79%	D	60 – 64%
A-	85 – 89%	C+	70 – 74%	F	below 60%

Required Text Book / Reading List

The following textbook is required for this class.

- Operating Systems, Internals and Design Principles
  Stallings, William
  Pearson, 9th Edition 2017
  ISBN 978-0-1346-7095-9

We will use the following book as recommended complementary books, supplemented with some readings.

- Linux with Operating Systems Concepts
  Fox, Richard
  CRC Press, Taylor & Francis Group, 2nd Edition 2022
  ISBN 978-1-0320-6345-4

- Class Notes will be available on Nexus

Prerequisite Information

(This information can be found in the UW Undergraduate Academic Calendar)

- Requisite courses: ACS-2906 and ACS-2947 with a minimum grade of C

Regulations, Policies, and Academic Integrity

Students are encouraged to familiarize themselves with the Academic Regulations and Policies found in the University Academic Calendar at:
https://uwinnipeg.ca/academics/calendar/docs/regulationsandpolicies.pdf
Particular attention should be given to subsections 8 (Student Discipline), 9 (Senate Appeals) and 10 (Grade Appeals).

Avoiding Academic Misconduct: Academic dishonesty is a very serious offense and will be dealt in accordance with the University's policies.

Detailed information can be found at the following:

- Academic Misconduct Policy and Procedures: https://www.uwinnipeg.ca/policies/docs/policies/academic-misconduct-policy.pdf and https://www.uwinnipeg.ca/policies/docs/procedures/academic-misconduct-procedures.pdf
- About Academic Integrity and Misconduct, Resources and FAQs: https://library.uwinnipeg.ca/use-the-library/help-with-research/academic-integrity.html

Uploading essays and other assignments to essay vendor or trader sites (filesharing sites that are known providers of essays for use by others who submit them to instructors as their own work) involves "aiding and abetting" plagiarism. Students who do this can be charged with Academic Misconduct.

Academic Integrity and AI Text-generating Tools: Students must follow principles of academic integrity (e.g., honesty, respect, fairness, and responsibility) in their use of material obtained through AI text-generating tools (e.g., ChatGPT, Bing, Notion AI). If an instructor prohibits the use of AI tools in a course, students may face an allegation of academic misconduct if using them to do assignments. If AI tools are permitted, students must cite them. According to the MLA (https://style.mla.org/citing-generative-ai/), writers should

- cite a generative AI tool whenever you paraphrase, quote, or incorporate into your own work any content (whether text, image, data, code, or other) that was created by it
- acknowledge all functional uses of the tool (like editing your prose or translating words) in a note, your text, or another suitable location
- take care to vet the secondary sources it cites

In this class ACS-3931-001 students can use AI tools only in assignment labs as long as the student follow MLA guidelines given above, i.e. it's mandatory the MLA citation in the part of the assignment lab where the tool was used. If no AI tools is used, just specify 'No AI tool used for this part'. A submitted assignment lab can have parts (e.g. problems) where it was used and other parts (e.g. questions) where it was not.

Non-academic misconduct: Students are expected to conduct themselves in a respectful manner on campus and in the learning environment irrespective of platform being used.

Behaviour, communication, or acts that are inconsistent with a number of UW policies could be considered "non-academic" misconduct. More detailed information can be found here:

- Respectful Working and Learning Environment Policy https://www.uwinnipeg.ca/respect/respect-policy.html,

- Acceptable Use of Information Technology Policy
- https://www.uwinnipeg.ca/policies/docs/policies/acceptable-use-of-information-technology-policy.pdf
- Non-Academic Misconduct Policy and Procedures: https://www.uwinnipeg.ca/policies/docs/policies/student-non-academic-misconduct-policy.pdf and https://www.uwinnipeg.ca/policies/docs/procedures/student-non-academic-misconduct-procedures.pdf

Copyright and Intellectual Property: Course materials are the property of the instructor who developed them. Examples of such materials are course outlines, assignment descriptions, lecture notes, test questions, and presentation slides—irrespective of format. Students who upload these materials to filesharing sites, or in any other way share these materials with others outside the class without prior permission of the instructor/presenter, are in violation of copyright law and University policy. Students must also seek prior permission of the instructor/presenter before, for example, photographing, recording, or taking screenshots of slides, presentations, lectures, and notes on the board. Students found to be in violation of an instructor's intellectual property rights could face serious consequences pursuant to the Academic Misconduct or Non-Academic Misconduct Policy; such consequences could possibly involve legal sanction under the Copyright Policy: https://copyright.uwinnipeg.ca/basics/copyright-policy.html

Privacy

Students have rights in relation of the collecting of personal data the University of Winnipeg

- Student Privacy: https://www.uwinnipeg.ca/privacy/admissions-privacy-notice.html
- Zoom Privacy: https://www.uwinnipeg.ca/privacy/zoom-privacy-notice.html

Class Cancellation, Correspondence with Students and Withdrawing from Course

When it is necessary to cancel a class due to exceptional circumstances, the course instructor will make every effort to inform students via UWinnipeg email and Nexus.

Students are reminded that they have a responsibility to regularly check their UWinnipeg e-mail addresses to ensure timely receipt of correspondence from the University and/or the course instructor.

Please let the course instructor know if you plan on withdrawing from the course. Note that withdrawing before the VW date does not necessarily result in a fee refund.

Topics to be covered (tentative)

I. Introduction
   a. Hardware overview – self-study
   b. Operating systems overview

II. Processes
   a. Process description and control
   b. Threads
   c. Concurrency – mutual exclusion and synchronization
   d. Concurrency – deadlock and starvation

III. Memory
   a. Memory management
   b. Virtual memory

IV. Scheduling
   a. Uniprocessor scheduling
   b. Multiprocessor, multicore and real-time scheduling

V. Input / Output and Files
   a. I/O management and disk scheduling
   b. File management

VI. Advanced topics
   a. Operating systems security

Note that all topics listed may not be covered and may be offered in a slightly different time order.

A permitted or necessary change in the mode of delivery may require adjustments to important aspects of course outlines, like class schedule and the number, nature, and weighting of assignments and/or exams.