



**Faculty of Engineering and Applied Science**  
**ENGR 3950U: Operating Systems**  
**COURSE OUTLINE - Fall 2012**

**1. Semester**  
Fall 2012

**2. Instructor**

- Dr. Kamran Sartipi
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- Course Web: <http://faculty.uoit.ca/sartipi/courses/OS/f12/>
- Office hour: Tuesday 3:00pm – 4:00pm

**3. Teaching Assistants:**

- Syed Kazmi                      Email: [Syed.Kazmi@uoit.ca](mailto:Syed.Kazmi@uoit.ca)
- Michael Wrock                Email: [Michael.Wrock@uoit.ca](mailto:Michael.Wrock@uoit.ca)

**4. Course Organization**

Three lecture hours, three-hours lab and two-hours tutorial (biweekly) for one semester.

**5. Lectures**

- Tuesday: 12:40 pm – 2:00 pm              Simcoe Building J127
- Friday: 12:40 pm – 2:00 pm                Simcoe Building J127

**6. Labs**

- Monday: 8:10 am – 11:00 am              University Building A1 (UA-2240)
- Sessions: TBA

**7. Tutorials**

- Monday: 1:10 pm – 3:00pm                University Building A1 (UA-3130)
- Sessions: TBA

**8. Course Objectives**

This course will introduce software engineering and computer science students to the fundamentals and components of modern operating systems and corresponding design trade-offs. The emphasis will be on the organization of the Unix/Linux-based operating systems and their responsibilities using class examples and lab experiments. The course will also provide an overview of the computer hardware components as the foundation for the operating systems to operate. The course includes six lab sections that allow students to experiment with key concepts of the Linux operating system. The lab will use virtual machine environment that is independent of the host operating system (e.g., Unix /

Linux / Windows). The experiments use Linux operating system, which is installed in the virtual machine. The first section of the lab is intended for familiarization with the virtual machine environment. The lab experiments include simulation of the Linux shell operations as well as the design and implementation of a simplified Unix file system using C language. The students will be provided with a bare-structure of the file system to add code to it.

#### 9. **Course Outcomes**

At the end of this course the students will have sufficient knowledge to analyze different aspects of operating systems in terms of functionality, performance and robustness. They should also have the knowledge and expertise to design and implement complex data structures and functionality of simple tasks in an operating system.

#### 10. **Prerequisites**

ENGR1200U: Introduction to Programming for Engineers

#### 11. **Required Course Texts and Other Materials**

Operating System Concepts, 8th Edition.

By: Silberschatz, Galvin, and Gagne, Publisher: Wiley. ISBN 978-0-470-12872-5.

#### 12. **Reference Books and Information Sources**

- Operating Systems Internals and Design Principles, 7<sup>th</sup> Edition, by William Stallings.
- Modern Operating Systems, 3rd Edition, by Andrew S. Tanenbaum.
- Kernel Projects for Linux, by Gary Nutt.
- Design of the UNIX Operating System, by Maurice J. Bach.

#### 13. **Course Content**

- **Overview:** Different types of operating systems.
- **Operating system structures:** OS components and services.
- **Process management:** Processes, Threads, CPU scheduling, Synchronization, Deadlock.
- **Storage management:** Real memory, Virtual memory, File system.
- **Distributed systems:** Computer Networking

#### 14. **Evaluation**

|              |     |                                              |
|--------------|-----|----------------------------------------------|
| Assignments: | 10% | (Assignments will be marked randomly)        |
| Labs:        | 35% |                                              |
| Midterms:    | 15% | (Tuesday October 23, 2012 during class time) |
| Final Exam:  | 40% |                                              |

- **Passing Grades**

To pass the course the students must obtain 50% of the total mark and 50% of the final exam mark.

- **Deferred Midterm Exams**

- Should a student fail to write the midterm test or the final exam, the instructor must be informed ASAP (via Blackboard) and a medical certificate must be sent directly from the Doctor's Office or Hospital within 5 days by mail or preferably by fax to the Academic Advisor of FEAS (fax number 905-721-3370, attention: Academic Advisor). A medical certificate, obtained from the university Website or Blackboard or from the Academic Advisor must clearly state the date, and the names of the student and the doctor/hospital, and their phone number and address.
- In case of absence from the midterm test, there will be no make-up test. Should the absence (for medical reasons or otherwise) prove to be legitimate (i.e., backed by strong evidence), the weight of the missed test is shifted to the final exam, otherwise the student will get a zero on his or her missed test.
- Should the absence from the final exam (for medical reasons or otherwise) prove to be legitimate (i.e., backed by strong evidence), pending the FEAS approval, the student will write a deferred exam which may be a written and/or an oral exam at the discretion of the instructor. A fee for the deferral must be paid by the student if the Medical certificate is valid and arrives on time. Failure to comply with the above will result in a zero on his/her exam.
- The students who write a deferred exam have additional time to study and a less crowded exam schedule compared to their classmates who write the final exam during the tight exam period. As such, it is only fair to expect better performance from these students on the deferred exam than on the final exam.

**15. Midterm Exam:**

Tuesday October 23, 2012 from 12:40 pm to 2:00 pm (during class time). The Room will be announced later.

Lecture materials upto the lecture on Friday October 19, 2012.

**16. Assignments**

There are two assignments in this course. The assignments are combination of descriptive and programming questions and will be marked randomly.

**17. Laboratories, Prelab Reports, Notes and Reports**

The Operating System laboratory consists of two major parts. Part I consists of Labs 1 to 3 which allow students to practice on installation of the required software tools, and to familiarize and practice with smaller projects using C language. Part II consists of Labs 4 to 6 and deals with design, implementation and testing of a simulated Unix File System.

- **Lab 1.** Tutorial and practice on installing a target operating system on a virtual machine environment and installing a target software development environment, including: I) Installing open source virtual machine "Virtual Box" on students' laptops running Windows operating system. II) Installing operating system "Linux" on Virtual Box environment. III) Installing open source Integrated Development Environment (IDE) "Eclipse" on Linux operating system.

- **Lab 2.** Developing a Shell (command line) interpreter for Linux OS that supports the basic Shell commands, such as: change directory; clear screen; show directory contents; echo; help; pause; and quit.
- **Lab 3.** Continuation of Lab 2 and applying “Makefile” to build the projects.
- **Lab 4:** Design of data structure and algorithms for a simulated Unix File System with operations such as: create, delete, open, close, read, and write, of both directories and regular files based on the design of Unix file system.
- **Lab 5.** Implementation of the Simulated Unix File System based on the design of the system in Lab 4, or based on a sample design given to students.
- **Lab 6.** Demonstration of the implemented simulated Unix File System, and evaluation of the student groups based on their knowledge of the file system, and the quality and accuracy of their implemented project.

## 18. Tutorials

Tutorials include exercising on: different operating system subjects discussed in class; working on practice questions of the text book; and solutions of the assignments.

## 19. Computer Experience

Knowledge of programming with C language is required.

## 20. Accreditation Units

(The following categories are defined by the Canadian Engineering Accreditation Board's Accreditation Criteria and Procedures report, available at [CEAB Report](#))

|                               |     |
|-------------------------------|-----|
| <b>Mathematics:</b>           | 0%  |
| <b>Basic Science:</b>         | 0%  |
| <b>Complementary Studies:</b> | 0%  |
| <b>Engineering Science:</b>   | 67% |
| <b>Engineering Design:</b>    | 33% |

## 21. Academic Integrity and Conduct

Students and faculty at UOIT share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aim and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.

Students are expected to be familiar with UOIT's regulations on Academic Conduct (Section 5.15 of the Academic Calendar) which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one's own work to be copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, and other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a written reprimand to permanent expulsion from the university. A lack of familiarity with UOIT's regulations on academic conduct does not constitute a defense against its application.

Further information about academic misconduct can be found in the Academic Integrity link on your laptop.

## **22. Accessibility**

Students with disabilities may request to be considered for formal academic accommodation in accordance with the Ontario Human Rights Code. Students seeking accommodation must make their requests through the Centre for Students with Disabilities in a timely manner, and provide relevant and recent documentation to verify the effect of their disability and to allow the University to determine appropriate accommodations.

Accommodation decisions will be made in accordance with the Ontario Human Rights Code. Accommodations will be consistent with and supportive of the essential requirements of courses and programs, and provided in a way that respects the dignity of students with disabilities and encourages integration and equality of opportunity. Reasonable academic accommodation may require instructors to exercise creativity and flexibility in responding to the needs of students with disabilities while maintaining academic integrity.