A POLYTECHNIC INSTITUTION

*Course Outline*

*School of Computing and Academic Studies*
*Program: Computer Systems Technology*
*Option: N/A*

***Course Number: Comp 4735***
***Course Name: Operating Systems***

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Start Date:** | January 5, 2009 | | | | **End Date:** | April 24, 2009 | |
| **Total Hours:** 75 | **Total Weeks:** | 15 | | | **Term/Level:** 4 | **Course Credits:** | 4 |
| **Hours/Week:** 5 | **Lecture:** | 3 | **Lab:** | 2 | **Shop:** | **Seminar:** | **Other:** |

**Prerequisites**

| Course No. | Course Name |
|---|---|
| COMP 2510 | Procedural Programming in C |
| COMP 2721 | Computer Organization/Architecture |

**Course Number is a Prerequisite for:**

| Course No. | Course Name |
|---|---|

### Course Description

This course is a focused on basic concepts in Operating Systems: structure, mechanism, concurrency, services and how these services are used and implemented. The course starts with an overview of operating systems concepts. The next topics include processor management, processes and threads, microkernel architecture, inter-process communication, synchronization and mutual exclusion, deadlock and starvation, and memory and device management strategies.

Implementation details for Windows and UNIX operating systems will be included.

### Evaluation

| | |
|---|---|
| Final Examination | 40% |
| Weekly Quizzes | 30% |
| Weekly Assignments | 30% |
| TOTAL | 100% |

Note: students must pass the final to pass the course.

Students who score less than 50% on the final exam will be assigned a grade of "U" for the course.

### Course Learning Outcomes/Competencies

Upon successful completion, the student will be able to:

- Describe what operating systems do.
- Describe how the operating system is structured (layers and components).
- Describe the operating system interface (system calls, shells).
- Decide what functions should be implemented for a typical operating system and explain how to implement these functions.
- Explain and contrast processor scheduling algorithms such as FIFO, RR, SPF, HRRN, SRT, Multilevel Feedback and Fair Share.
- Discuss the differences between uni-, multi and real time scheduling.
- Describe process management concepts such as processes, threads, CPU scheduling, process synchronization, deadlock and starvation.
- Explain inter-process communication concepts such as message passing and the different IPC patterns.
- Implement mutual exclusive primitives.
- Write concurrent algorithms.

### Verification

I verify that the content of this course outline is current.

| Rob Neilson | January 5, 2009 |
|---|---|
| Authoring Instructor | Date |

I verify that this course outline has been reviewed.

| | |
|---|---|
| Program Head/Chief Instructor | Date |

I verify that this course outline complies with BCIT policy.

| | |
|---|---|
| Dean/Associate Dean | Date |

### Instructors


| | | | | |
|---|---|---|---|---|
| Rob Neilson | Office Location: | SW2-125 | Office Phone: | 604-432-8852 |
| | Office Hrs.: | as posted | E-mail Address: | rneilson@bcit.ca |
| Bill Klug | Office Location: | SW2-321 | Office Phone: | 604-432-8461 |
| | Office Hours: | as posted | E-mail Address: | bklug@bcit.ca |


### Learning Resources

*Required*:

***Modern Operating Systems***, Andrew S. Tanenbaum, 3rd Edition, 2008, Pearson Education
ISBN-13: 978-0-13-600663-3

*Recommended*:

***It is strongly recommended that you bring a laptop computer with you to the lab as many of the in-class assignments involve research. The choice however, is for the student to make.***

***Note: you must bring your textbook to your scheduled lab.***

### Information for Students

The following statements are in accordance with the BCIT Student Regulations Policy 5002. To review the full policy, please refer to: http://www.bcit.ca/~presoff/5002.pdf.

**Assignments:**

- Late assignments, lab reports or projects will **not** be accepted for marking unless otherwise indicated by the instructor.

**Makeup Tests, Exams or Quizzes:**

- There will be **no** makeup tests, exams or quizzes. If you miss a test, exam or quiz, you will receive zero marks. Exceptions may be made for **documented** medical reasons or extenuating circumstances. In such a case, it is the responsibility of the student to inform the instructor **immediately**.

**Ethics:**

- BCIT assumes that all students attending the Institute will follow a high standard of ethics. Incidents of cheating or plagiarism may, therefore, result in a grade of zero for the assignment, quiz, test, exam, or project for all parties involved and/or expulsion from the course.

**Attendance:**

- **Attendance is mandatory**. The attendance policy as outlined on the BCIT Web Site will be enforced.

**Illness:**

- A doctor's note is required for any illness causing you to miss assignments, quizzes, or the final exam.

**Attempts:**

- Students must successfully complete a course within a maximum of three attempts at the course. Students with two attempts in a single course will be allowed to repeat the course only upon special written permission from the Associate Dean. Students who have not successfully completed a course within three attempts will not be eligible to graduate from the appropriate program.

**Course Outline Changes:**

- The material or schedule specified in this course outline may be changed by the instructor. If changes are required, they will be announced in class and posted on the course WebCT site.

**I.D. Required in Examination Centres:**

- Effective December 2000, in order to write exams, students will be required to produce photo-identification at examination centres. Photo I.D. must be placed on the desk before an exam will be issued to the student. The I.D. must remain in view on the desk while writing the exam, for inspection by invigilators. Students should bring a BCIT OneCard or alternatively two pieces of identification, one of which must be government photo I.D. such as a driver's licence. Please see BCIT Policy #5300, Formal Invigilation Procedures.

**Computer Use Policy:**

- BCIT has an Institute-wide policy (#3501) pertaining to information technology and services and to the resources available in support of the Institute mission. Computer Systems Technology students are expected to exercise the highest degree of professionalism and ethical behaviour related to information technology. Violations of BCIT Policy #3501 will result in disciplinary action which may include suspension or expulsion of students. Also refer to the Computer Systems Technology Student Conduct Guidelines.

### CST Student Conduct Guidelines

The School of Computing and Academic Studies expects the highest level of professional conduct and ethical behaviour from all students enrolled in Computer Systems Technology (CST) programs.

All students are reminded of the following BCIT policies related to student conduct:

- Policy 5250 Cheating and Plagiarism
- Policy 5251 Student Conduct
- Policy 3501 Responsible Use of Information Technology at BCIT

Policy 3501 will be strictly enforced. The Computing and IT knowledge and skills acquired by CST students in the course of their studies confers upon them, as with all IT professionals, a special responsibility to use this knowledge in a responsible, professional and ethical manner.

Further, given that misuse of computer facilities at BCIT can have significant legal and/or economic impacts, upon evidence of any such misconduct, the School may recommend immediate suspension, even for first offences.

### Course Work

*Readings:*

- There are **required weekly readings** from the textbook.
- Additional supplemental material may be provided.
- Readings will be announced in lecture and/or posted on the course WebCT site.
- A typical reading assignment is about 30 pages. It is the responsibility of the student to do the reading in advance of his/her scheduled lab, and to come prepared to work during the lab.

*Assignments:*

- There is **one assignment each week**, to be **completed in class** (during the scheduled lab).
- Assignments are based on the assigned readings as well as the lecture material.
- Most assignments include questions from the textbook, however some may involve small programming exercises. Other assignments may involve the use of the internet for research.
- It is strongly recommended that students bring their laptop computers to their lab, however this is not mandatory.
- Some assignments will be done in groups and some individually - at the discretion of the instructor.
- In most cases assignments will be graded during the lab period.

*Quizzes:*

- There are **weekly quizzes** based on the lecture material, assignments, and readings from the previous week.
- Quizzes will be held during the first lecture of each week, unless otherwise indicated.
- Students will receive a grade of zero if they miss a quiz without documented medical reason.
- There are no make-up quizzes. If you miss a quiz for medical reason, the quiz component of your grade will be prorated, based on the quizzes you wrote.

*Exams:*

- There is **one exam** in this course, a final exam. There is no midterm exam.
- Students must pass the final exam to pass the course.
- The final exam covers material from the entire course.
- Exam questions are drawn from a standardized test bank and cover the material from the textbook, lectures, and homework.
- Questions will be multiple choice, true/false, and/or fill-in-the-blanks.
- The quizzes serve as "sample exams", in other words: the questions on the quizzes are similar in style, format, and level of difficulty to the questions on the final exam.

*Course Website:*

- The instructor maintains a course website using the WebCT system.
- Lecture notes, assignments, handouts, and other course materials will be posted.
- All announcements related to the course will be posted on WebCT.
- It is the responsibility of the student to **regularly check the WebCT site** for announcements.

### Course Schedule

Following is a brief schedule of topics. A more detailed schedule will be distributed in class.

The following information is subject to change.

| Week # | Week Starting | Topic |
|---|---|---|
| 1 | Jan 5 | Introduction |
| 2 | Jan 12 | Operating System Organization |
| 3 | Jan 19 | Processes and Threads |
| 4 | Jan 26 | Interprocess Communications |
| 5 | Feb 2 | Process Synchronization |
| 6 | Feb 9 | Process Scheduling |
| 7 | Feb 16 | Address Spaces |
| 8 | Feb 23 | Virtual Memory |
| 9 | Mar 2 | Files and Directories |
| - | *Mar 9* | *Spring Break* |
| 10 | Mar 16 | File Systems |
| 11 | Mar 23 | I/O Strategies |
| 12 | Mar 30 | Device Drivers |
| 13 | Apr 6 | Deadlock |
| 14 | Apr 13 | To Be Determined |
| ***15*** | ***Apr 20*** | ***Final Exam*** |