Dawson College

# **Computer Science Technology Program**

**COURSE OUTLINE**

## **Operating Systems I**

### Number: 420-241-DW Hours: 3-2-2 Credits: 2 2/3

**Prerequisites:** Successful completion of all 420.0A courses in Term I

**Domain:** Operating Systems, Networks, and Computer Architecture

**Note:** You must pass this course as well as the Co-requisite courses in order to progress in the Computer Science Technology Program in the fall semester.

### Semester: Winter 2019 Revision 2019-01-16

### Description

Operating Systems I (Linux) explores the concepts, terminology, and fundamental features of operating systems in general and the Linux operating system in detail. The characteristics of a multi-user, multi-tasking, multi-threaded operating system will be examined in detail. Aspects of connectivity using TCP/IP protocols, and application services such as FTP, SSH, and web servers will be introduced. The command-line user interface will be the central focus, allowing the student to use shell commands, the **vi** editor, utilities and bash scripts to construct and use command sequences to manipulate data and perform basic system administration tasks. A Linux graphical user interface will be introduced and explored. Projects will include installation and configuration of the operating system on a host machine

**STATEMENT OF COMPETENCE**

* Maximize the full potential of an operating system (016Q)
* Install hardware and software on a workstation (016R)
* Maximize the full potential of a network environment (0174)
* Install an application (017A)

**Teacher: Office: Local: Section: Email:**

Patricia Campbell 3F.33 4802 01 & 02 MIO

Teachers will respond to students' inquiries in a timely manner.

Teachers' schedules will be posted outside their offices by the end of the first week of classes.

Patricia Campbell’s schedule is available here <http://bit.ly/pmcofficehrs>

**Course Objectives:**

Upon successful completion of the course, the student will be able to:

1. describe in detail the functional components of an operating system, including kernel, shell, file systems, and device drivers
2. distinguish between multitasking operating systems that are cooperative and preemptive
3. identify, describe, and manipulate tasks, processes, and threads in an operating system
4. participate in the selection of an operating system to host a software solution
5. log on to a host and use all essential Linux commands
6. customize startup options, environment variables, and file system features for a user
7. create and manipulate files and directories
8. apply appropriate permissions to files and directories
9. use backup and restore facilities with files and directories
10. demonstrate familiarity with Linux editors, utility programs, and programming language environments available on a Linux system
11. use BASH shell to master a variety of system commands and tools to create system and file manipulation facilities, including shell script programs, customized user environments, and command aliases
12. use graphical desktop interfaces (Gnome and KDE) in the X window environment to run applications, update packages, and use system monitoring tools
13. demonstrate familiarity with common TCP/IP application services such as FTP, Telnet, Secure Shell, and HTTP
14. install and configure Linux on a server, including developing system administration and security procedures, writing system documentation, and describing system maintenance procedures perform basic system administration and security tasks
15. create users and groups with appropriate permissions and security features
16. develop and elucidate firewall rule sets
17. use system monitoring tools to control system security

**Course Methodology:**

The course consists of two 1½-hour lectures and one 2-hour lab session per week. Concepts and techniques will be presented in lectures and practical exercises that apply to the concepts and techniques will be carried out in lab sessions.

**Required Textbook:**

Prentice Hall; 7th edition (Dec 31 2013), A Practical Guide to Fedora and Red Hat Enterprise Linux (7th Edition) , Mark Sobel. ISBN-13: 978-0133477436

**Required Material:**

A minimum of 2G USB stick; students are responsible for keeping copies of all work that they create that must be submitted. To this end a student should have appropriate media for backups.

**Assessment of student performance:**

**Midterm Examination** Worth: 25% (Week 7 or 8)

**Assignments and Project** Worth: 30%

There will be graded assignments given in this course. It is expected that each assignment will involve additional time outside of class and lab time to complete. Students will complete a major project involving installation and administration of the Linux operating system on a server.

**Quizzes** Worth: 5%

There will be 4 quizzes given at various times throughout the semester. The best 3 out of 4 will be used to determine the student’s grade.

**Final Examination** Worth: 40% (Exam period)

This examination will test the knowledge that was acquired by the student during the entirety of the course.

**Course Objectives with their associated learning activities**

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| **Topic** | **Lab Activity** |  |
|  | Explain essential Operating System concepts including:   * Batch vs. interactive processing modes * Multiprogramming * Multitasking, pre-emptive and cooperative * Time sharing * Tasks, processes, and threads * Multiprocessing * Reliability and scalability   Describe and compare the evolution of the OS through the following operating systems:   * Unix and Linux * DOS and Windows | Intro, command review. |
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|  | Describe aspects of the Linux file system structure, including:   * Contrast the ext inode structure with FAT, (NTFS, ReFS) * Types of Files * File System Structure, File Representation and Storage * Review Links * Journaling file systems (ext3, ext4 etc) * Memory management and virtual memory systems * Linux File System Layout | Install Fedora live version to USB |
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| 3 | Plan and Document a Linux System Installation  Perform a Linux system installation, including:   * Identify Hardware components, * Identify and solve hardware compatibility issues (drivers) * Installing and Configuring a Linux System | Full installation of Linux |
| 4 | Effectively employ graphical tools in a Linux environment, including   * Configuring and using a graphical user environment (Gnome, KDE) * Using VI for sysadmin | Install and update packages |

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| 5 | Review typical Linux File Processing tasks, including:   * Viewing * Copying, Moving, & Removing * Appending, Combining, Comparing * Sorting * Searching * Cutting & Pasting * Review Compression and Archiving (tar, gzip) | Create files and directories using the Linux file commands  Create symbolic and hard links |
| 6 | Write Shell Scripts that use   * Environment variables * Shell Variables * Passing of Arguments * Program Control Flow | Write and Test a Simple Shell Script  Customize Features of the User's Operating environment |
| 7 | Write Advanced Shell Scripts that perform   * Numeric data Processing * Functions | Write and test Multiple Scripts using Advanced Scripting Features |
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| 8 | Catch up and  Mid Term Test | Complete lab assignments |
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| 9 | Write Shell Scripts that effectively employ   * Regular Expressions in bash * Look at regex in awk and sed | Write Shell Scripts that use regular expressions |
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| 10 | Describe and explain Networking and Internetworking in terms of:   * Network Models * Client-server/dae mon model * TCP/IP Protocol Suite * DNS and DHCP (client side) | Investigate and evaluate a server’s Network Properties and Features |
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| 11 | Analyze the following Linux file system security features:   * Password based security * Encryption based security * Protection Based on Access Permission * The concept of Access Control Lists with respect to Linux inode table | Assign permissions to Linux files and directories |

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| 12 | Administer a Linux Server by addressing   * Users, Profiles, skel features * Groups * Quotas * Starting/Stopping /Configuring Services * System log archives rotation/evaluati on | Develop an Administration Policy  Create Users / Groups, administer services, use logging in bash |
|  |  |  |
| 13 | Configure Internet Services on a Linux server   * TCP/IP Services * Web Server * FTP * Mail * Using graphical network monitoring tools * Discuss professional behaviour appropriate to the use of packet sniffers. | Configure and Test Internet Services  Demonstrate appropriate use of graphical network monitoring tools |
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|  | Secure a Linux server system by   * Use SSL on a web server * Assessing System Security vulnerabilities * Setting Firewall rules using IPTables | Develop a firewall rule set and secure a server |
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**Program and course rules and regulations:**

***For 420 career program courses, students must receive at least 50% on the assignment component and at least 60% on the examination component in order to obtain a passing grade for the course. Failure to do so will result in a maximum grade of 50 (the lower of 50 or the grade earned). For the purpose of this rule, quizzes are considered exams.***

Assignments are due at the due date specified by the instructor. Assignments received after this time are late. Assignments will not be accepted after due date set by instructor. In exceptional circumstances, such as illness, etc. labs submitted late will be graded provided that the student has received an extension from the instructor in advance.

Each student must submit their own individual answers to assignments, and shared solutions are not acceptable. Students must protect their work from being easily copied by others by introducing uniqueness into their work in the choice of images used, the display styles used in the presentation of documents, the originality of the written descriptive passages, and by placing digital signatures on their original images.

Students are reminded that they are responsible for all material presented in the lecture and during the lab, and are expected to obtain material they have missed.

Students must follow exactly the instructions in the lab exercises about how and where to store all computer files in order for their work to be accepted and properly evaluated.

**DAWSON COLLEGE**

**COMPUTER SCIENCE DEPARTMENT**

**POLICIES**

**1. ACADEMIC INTEGRITY**

The Computer Science Department adheres to the Dawson College Academic Conduct policy. Students have an obligation to inform themselves of all aspects of this policy. According to ISEP, the teacher is required to report to the Sector Dean all cases of cheating and plagiarism affecting a student’s grade. (ISEP Section V-C) Students may appeal any decision of the teacher regarding cheating and plagiarism according to the methods established by the College. The penalty for cheating or plagiarism may range from a zero on the work to a failure in the course.

**2. ATTENDANCE AND LATENESS**

Students are responsible for all material covered in classes and labs, whether or not they are present. Students have an obligation to arrive on time and to remain for the duration of scheduled classes, labs and activities. Students who disregard this obligation may be asked to leave the class, lab or activity. Students should refer to the Institutional Student Evaluation Policy

(ISEP section IV-C) regarding attendance.

**3. RELIGIOUS HOLIDAY OBSERVANCE**

Class period(s) may be cancelled in order that the teacher can observe religious holidays. Any material missed as a result, will be made up during labs, class periods and alternate tutorial sessions.

Students, who intend to observe religious holidays, must inform their teachers in writing as prescribed in the ISEP Policy on Religious Observances (ISEP Section IV-D). Students absent from classes because of observance of religious holidays will not be penalized. It must be emphasized, however, that this College policy should not be interpreted to mean that a student can receive credit for work not performed. It is the student’s responsibility to fulfill the requirements of the alternative arrangement.

**4. SOFTWARE**

The Computer Science Department forbids the use of the computer labs it uses to make any copies of any software without the explicit authorization of the Department. Apart from any legal action that might arise from such unauthorized copying, the Computer Science Department reserves the right to discipline any student involved in such activity.

Students who borrow software from the College and fail to return it will be placed on the defaulter list and be subject to the appropriate penalties.

Viruses are programs that attach themselves to a computer system without the permission of those to whom the system belongs. They are deliberately written to be, at worst, harmful (e.g. destroying the contents of disks) and, at best, bothersome (e.g. disturbing the image shown on the screen). They can cause serious losses of time and effort for students, staff and faculty. Any student involved in the deliberate spreading of viruses is subject to the most severe penalties prescribed by College regulations, apart from any legal action that might arise from such acts.

**5. LITERACY**

The Computer Science Department recognizes that literacy in all its forms (read, written, spoken) is essential to our students in their careers.

Teachers may choose to incorporate a literacy component into the marking scheme for any piece of work. Teachers may use their discretion to insist that any piece of work submitted for credit is revised by the student if it is unsatisfactory with regard to literacy.

Teachers will inform all students in their courses of this policy at the beginning of each semester either by including it in the course description or otherwise.

**6. CELL PHONES**

The use of cell phones in all Computer Science lectures, labs and exams is prohibited.

**7. PORTABLE COMPUTERS**

The use of portable computers in all Computer Science lectures for purposes other than note-taking is prohibited.

**8. STUDENT CONDUCT**

Everyone has the right to a safe and non-violent environment. Students are obliged to conduct themselves as stated in the Student Code of Conduct and in the ISEP section on the roles and responsibilities of students. (ISEP section II-D)

**9. PROFESSIONAL CONDUCT POLICY**

Students who are enrolled in the Computer Science Technology careers program must conduct themselves according to the Professional Conduct Policy as described in the Program Handbook

**10. INTENSIVE COURSE CONFLICTS**

If a student is attending an intensive course, the student must inform the teacher, within the first two weeks of class, of the specific dates of any anticipated absences.

**11. ISEP**

The Institutional Student Evaluation Policy (ISEP) is designed to promote equitable and effective evaluation of student learning and is therefore a crucial policy to read and understand. The policy describes the rights and obligations of students, faculty, departments, programs, and the College administration with regard to evaluation in all your courses, including grade reviews and resolution of academic grievance. The ISEP is available on the Dawson website.