Course Outline

School:	Eng. Tech. & Applied Science
Department:	Information and Communication Engineering Technology (ICET)
Course Title:	Unix/Linux Operating Systems
Course Code:	COMP 301
Course Hours/Credits:	56
Prerequisites:	COMP 100
Co-requisites:	N/A
Eligible for Prior Learning, Assessment and Recognition:	N/A
Originated by:	Ilia Nika
Creation Date:	Fall 2004
Revised by:	Narendra Pershad
Revision Date:	Summer 2025
Current Semester:	Summer 2025
Approved by:	

Clarence Cheung, Associate Dean/Dean
Eng. Tech. & Applied Science

Acknowledgement of Traditional Lands

Centennial is proud to be a part of a rich history of education in this province and in this city. We acknowledge that we are on the treaty lands and territory of the Mississaugas of the Credit First Nation and pay tribute to their legacy and the legacy of all First Peoples of Canada, as we strengthen ties with the communities we serve and build the future through learning and through our graduates. Today the traditional meeting place of Toronto is still home to many Indigenous People from across Turtle Island and we are grateful to have the opportunity to work in the communities that have grown in the treaty lands of the Mississaugas. We acknowledge that we are all treaty people and accept our responsibility to honor all our relations.

Course Description

This course covers basic operating system concepts using Linux. Coursework emphasizes file management and permissions, UNIX utilities, the shell environment and basic networking and security. Students will be introduced to basic system administration, shell scripting and C programming, installing and maintaining server applications and networking using a Linux operating system.

External Standard Information (ESI)

N/A

Program Outcomes

Successful completion of this and other courses in the program culminates in the achievement of the Vocational Learning Outcomes (program outcomes) set by the Ministry of Colleges and Universities in the Program Standard. The VLOs express the learning a student must reliably demonstrate before graduation. To ensure a meaningful learning experience and to better understand how this course and program prepare graduates for success, students are encouraged to review the Program Standard by visiting http://www.tcu.gov.on.ca/pepg/audiences/colleges/progstan/. For apprenticeship-based programs, visit https://www.skilledtradesontario.ca/about-trades/trades-information/.

Course Learning Outcomes

The student will reliably demonstrate the ability to:

1. Have a good understanding of operating system functions.
2. Have a good understanding of UNIX-like operating systems.
3. Use file management, file processing and basic system administration Linux commands.
4. Manage ownership and permissions in a UNIX-like system.
5. Design, code and test shell scripts in a Unix/Linux environment.
6. Understand and configure network settings in a Unix/Linux environment.
7. Install and test open source software development tools in a Unix/Linux environment.
8. Install, configure and run services in a Unix/Linux environment.

Essential Employability Skills (EES)

The student will reliably demonstrate the ability to*:

1. Communicate clearly, concisely and correctly in the written, spoken, and visual form that fulfills the purpose and meets the needs of the audience.
2. Respond to written, spoken, or visual messages in a manner that ensures effective communication.
3. Execute mathematical operations accurately.
4. Apply a systematic approach to solve problems.
5. Use a variety of thinking skills to anticipate and solve problems.
6. Locate, select, organize, and document information using appropriate technology and information systems.
7. Analyze, evaluate, and apply relevant information from a variety of sources.
8. Show respect for diverse opinions, values belief systems, and contributions of others.
9. Interact with others in groups or teams in ways that contribute to effective working relationships and the achievement of goals.
10. Manage the use of time and other resources to complete projects.
11. Take responsibility for one's own actions, decisions, and consequences.

**There are 11 Essential Employability Skills outcomes as per the Ministry Program Standard. Of these 11 outcomes, the following will be assessed in this course.*

New Essential Skills (NES)

1. N/A

Global Citizenship and Equity (GC&E) Outcomes

1. N/A

Text and Other Instructional/Learning Materials

The costs of textbooks or other learning material are available through the Centennial College Bookstore https://www.bkstr.com/centennialprogressstore/shop/textbooks-and-course-materials.

Text Book(s):

Hausenblas Micheal. Learning Modern Linux. O'Reilly, 2022.ISBN 13: 978-1-098-10894-6Sobell, Mark G. and Helmke Matthew. A Practical Guide to Linux Commands, Editors, and Shell Programming, Fourth Edition. Prentice-Hall, 2017.ISBN-13: 978-0-13-477460-2ISBN-10: 0-13-477460-4

Online Resource(s):

fedoraproject.orgcentos.orgvirtualbox.orgapache.orggithub.com

Please see the weekly topical outline for any Additional Learning Resources required for your section of this course.

Evaluation Scheme

- Lab exercises: Shell Scripting
- Project Presentation: Final Project

Evaluation Name	CLO(s)	EES Outcome(s)	NES Outcome(s)	GCE Outcome(s)	Weight/ 100
Lab exercises	1, 2, 3, 4, 5, 6, 7, 8	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11			70
Project Presentation	6, 7, 8	3, 4, 5			30
Total					100%

If students are unable to write a test they should immediately contact their professor or program Associate Dean for advice. In exceptional and well documented circumstances (e.g. unforeseen family problems, serious illness, or death of a close family member), students may be able to write a make-up test.All submitted work may be reviewed for authenticity and originality utilizing College approved plagiarism prevention software. Students who do not wish to have their work submitted to College approved plagiarism prevention software must, by the end of the second week of class, communicate this in writing to the instructor and make mutually agreeable alternate arrangements.When writing tests, students must be able to produce official Centennial College photo identification or they may be refused the right to take the test or test results will be void.Tests or assignments conducted remotely may require the use of online proctoring technology where the student’s identification is verified and their activity is monitored and/or recorded, both audibly and visually through remote access to the student's computer and web camera. Students must communicate in writing to the instructor as soon as possible and prior to the test or assignment due date if they require an alternate assessment format to explore mutually agreeable alternatives.

Student Accommodation

The Centre for Accessible Learning and Counselling Services (CALCS) (http://centennialcollege.ca/calcs) provides programs and services which empower students in meeting their wellness goals, accommodation and disability-related needs. Our team of professional psychotherapists, social workers, educators, and staff offer brief, solution-focused psychotherapy, accommodation planning, health and wellness education, group counselling, psycho-educational workshops, adaptive technology, and peer support. Walk in for your first intake session at one of our service locations (Ashtonbee Room L1-04, Morningside Room 190, Progress Room C1-03, The Story Arts Centre Room 285, Downsview Room 105) or contact us at calcs@centennialcollege.ca, 416-289-5000 ext. 3850 to learn more about accessing CALCS services.

Use of Dictionaries

Program or School Policies

N/A

Course Policies

N/A

College Policies

Students should familiarize themselves with all College Policies that cover academic matters and student

conduct.All students and employees have the right to study and work in an environment that is free from discrimination and harassment and promotes respect and equity. Centennial policies ensure all incidents of harassment, discrimination, bullying and violence will be addressed and responded to accordingly.Academic HonestyAcademic honesty is integral to the learning process and a necessary ingredient of academic integrity. Forms of academic dishonesty include cheating, plagiarism, and impersonation, among others. Breaches of academic honesty may result in a failing grade on the assignment or course, suspension, or expulsion from the college. Students are bound to the College's AC100-11 Academic Honesty and Plagiarism policy. To learn more, please visit the Libraries information page about Academic Integrity https://libraryguides.centennialcollege.ca/academicintegrity and review Centennial College's Academic Honesty Module: https://myappform.centennialcollege.ca/ecentennial/articulate/Centennial_College_Academic_Integrity_Module_%202/story.htmlUse of Lecture/Course MaterialsMaterials used in Centennial College courses are subject to Intellectual Property and Copyright protection, and as such cannot be used and posted for public dissemination without prior permission from the original creator or copyright holder (e.g., student/professor/the College/or third-party source). This includes class/lecture recordings, course materials, and third-party copyright-protected materials (such as images, book chapters and articles). Copyright protections are automatic once an original work is created, and applies whether or not a copyright statement appears on the material. Students and employees are bound by College policies, including AC100-22 Intellectual Property, and SL100-02 Student Code of Conduct, and any student or employee found to be using or posting course materials or recordings for public dissemination without permission and/or inappropriately is in breach of these policies and may be sanctioned.For more information on these and other policies, please visit www.centennialcollege.ca/about-centennial/college-overview/college-policies.Students enrolled in a joint or collaborative program are subject to the partner institution's academic policies.

PLAR Process

This course provide concepts that uniquely supports our programs.

Topical Outline (subject to change):

ORIGINAL TOPICAL

Week	Topics	Readings/Materials	Weekly Learning Outcome(s)	Instructional Strategies	Evaluation Name and	Evaluation Date
1	Overview of Operating System concepts Introduction to Unix. Operating System	Instructor handouts and online resources	Upon completion of this module, learners will be able to: • Explain the fundamental concepts of an operating system. • Compare and contrast different types of Os's (Windows, macOS, Linux). • Describe the history and philosophy of Unix and Linux. • Analyze the key functions, and evaluate the elements of UNIX architecture: o Kernel, o Shell, o Utilities and Applications • Differentiate between Linux distribution and assess their strengths, features and use cases. • Demonstrate how to login in to a command line and desktop interface. • Navigating the Linux file system (pwd, ls, cd) and interpret relative vs. absolute paths. • Interpret the meaning of the symbols: ., .., ~ and /.	Lecture Demonstration Lab Session		
2	Desktop and CLI Interface Text Editors	Instructor handouts and online resources	• After completion of this module, learners will be able to: • Using cli as well as graphical text editors to create and edit text files. • Creating files by cp, touch, zip, tar and redirection. • Text manipulation using tools like cat, less, more, head and tail. • Learn how to access help resources in Linux: man, help and online resources.	Lecture Demonstration Lab	Lab 1	
3	Linux Filesystem and File Management	Instructor handouts and online resources	• Explore the Linux directory and filesystem hierarchy. • Classify the purpose of the various system folders: /, /boot • Modify file and directory permission using	Lecture Demonstration Lab Session	Lab 2	

Week	Topics	Readings/Materials	Weekly Learning Outcome(s)	Instructional Strategies	Evaluation Name and	Evaluation Date
			chmod, chown and chgrp. • Perform file maintenance tasks using command like cp, rm, mv, mkdir and rmdir.			
4	Linux Utilities and Text manipulation	Instructor handouts and online resources	• Employ Linux utilities such as wc, tr, cut, tee, grep, sort, find, od, cal, date, and regular expression for efficient file processing and content manipulation. • Construct regular expressions to filter and manipulate text. • Perform text manipulation tasks using command like touch, tar zip and understanding their functionalities and applications. • Manipulate input/output (>, >>, << and |).	Lecture Demonstration Lab Session	Lab 3	
5	Bash Scripting (Introduction)	Instructor handouts and online resources	• Compare and contrast the features of the shell and the different types of shells. • Switch between shell environments. • Inspect and modify the shell/environment variables. • Develop a simple shell script that: o Produce output (echo, printf) o Includes documentation (comments) o Adjust permission o Executes via multiple methods (./script, bash script source) • Declare and utilize variable (local, global).	Lecture Demonstration Lab Session	Lab 4	
6	Bash Scripting (Intermediate)	Instructor handouts and online resources	• Design interactive scripts that: o Capture user input o Display forma output • Perform arithmetic ($(()), let) and string operations (${var#pattern}). • Evaluate relational operations (numeric -eq, -lt; string ==. !=) • Implement conditional logic: o Construct if-then-else-fi branches o Test conditionals (test, [], [[]])	Lecture Demonstration Lab Session	Lab 5	
7	Bash Scripting (Advanced)	Instructor handouts and online resources	• Build iterative loops: o For, while, until with control (break/continue). • Process files (check existence). • Organize code into functions (parameters,	Lecture Demonstration Lab Session	Lab 6	

Week	Topics	Readings/Materials	Weekly Learning Outcome(s)	Instructional Strategies	Evaluation Name and	Evaluation Date
			return values). • Manage arrays (indexed, associative). • Handle command-line arguments ($1, $#, shift) • Interpret exit codes ($?) for error handling • Integrate scripting components to automate complex tasks.			
8	System Administration	Instructor handouts and online resources	• Administer user and group accounts using o useradd/usermod o groupadd/gpasswd. • Audit account permission (/etc/passwd, /etc/group) • Compare tradition init vs. system architectures. • Diagnose disk usage (df. du, ncdu). • Use system status utilities. • Monitor system resources: o Processes: ps, top, htop o Services: systemctl status, journalctl. • Modify file ownership (chown, chgrp) • Execute admin tasks with utilities: o grep logs, find files o awk/sed for batch processing • Retrieve system info: o Hardware: lshw, lscpu o Network: ip a, nmcli	Lecture Demonstration Lab Session	Lab 7	
9	Software Installation, customization and maintenance. Linux and C	Instructor handouts and online resources	• Manage packages: o Install/remove/list: apt, yum, dnf. o Troubleshoot dependencies. • Install code from source files, understanding the process of compiling and configuring software manually. • Use the system installer to query, download, install, repair and remove software • Updating and removing software • Understand basic elements of a traditional programming language such as C, C++, C#, java or python • Debug simple C programs • Develop, compile, and test source from the above languages. • Use the make utility to revise and maintain source files.	Lecture Demonstration Lab Session	Lab 8	

Week	Topics	Readings/Materials	Weekly Learning Outcome(s)	Instructional Strategies	Evaluation Name and	Evaluation Date
10	Network Fundamentals OSI Layers Networking in Linux	Instructor handouts and online resources	• Explain core networking concepts: o IP addressing, DNS, DHCP. • Compare the OSI model vs. TCP/IP layers. • Configure network interfaces using: o Ifconfig/ip addr o nmcli (NetworkManager) • Diagnose connectivity issues with: o ping, traceroute, netstat/ss • Query DNS records (dig, nslookup) to identify nameservers. • Describe distributed computing principles (e.g. client-server, cloud). • Justify the benefits of IPv6 over IPV4	Lecture Demonstration Lab Session	Lab 9	
11 - 13	Installing Servers and Clients File Sharing and Firewalls	Instructor handouts and online resources	Deploy and secure services: • SSH (sshd_config, key-based auth). • FTP (vsftpd/proftpd). • Web server (Apache/Nginx). • Samba (file sharing with Windows). • Media server (Plex/JellyFin). • Audit log files (/var/log/) to troubleshoot issues. • Implement firewall rules: • Ufw (simple) /iptables (advanced).	Lecture Lab	Lab 10	
14	Final Presentation	Review	Review and Final Test	Final Presentation	Final Presentation	