C S 30A: INTRODUCTION TO LINUX

Foothill College Course Outline of Record

<table>
<thead>
<tr>
<th>Heading</th>
<th>Value</th>
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<tbody>
<tr>
<td>Effective Term:</td>
<td>Summer 2023</td>
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<tr>
<td>Units:</td>
<td>4.5</td>
</tr>
<tr>
<td>Hours:</td>
<td>4 lecture, 2 laboratory per week (72 total per quarter)</td>
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<tr>
<td>Degree &amp; Credit Status:</td>
<td>Degree-Applicable Credit Course</td>
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<tr>
<td>Foothill GE:</td>
<td>Non-GE</td>
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<tr>
<td>Transferable:</td>
<td>CSU/UC</td>
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<tr>
<td>Grade Type:</td>
<td>Letter Grade (Request for Pass/No Pass)</td>
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<tr>
<td>Repeatability:</td>
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Student Learning Outcomes

- A successful student will be able to describe the various aspects of the Unix operating system from a user and administrator perspective.
- A successful student will be able to perform basic sysadmin tasks, write simple shell scripts, make changes to the OS file system and use regular expressions for searching the file system.

Description

Introduction to the Linux operating system primarily focused on command line usage. Covers the history, kernel, file systems, shells, and user utilities. Also introduces students to the fundamentals of shell programming, processes, communications, and basic security.

Course Objectives

The student will be able to:

a. Describe the basic features of the Linux operating system
b. Understand the history and philosophy of Linux systems and standards
c. Discuss the various components of Linux
d. Describe the Linux kernel and its subsystems
e. Create a user account, log on, and get information using commands on a Linux system
f. Compare Linux shell types and use variables in the shell environment
g. Understand a basic shell script and demonstrate the understanding of the shell through the use of an alias and built in commands
h. Use the man pages effectively and show proficiency in using the command line
i. Display, count, sort, and compare files using filter commands
j. Discuss the Linux files system concepts and organization
k. Perform directory and file operations, including changing permissions, creation, deletion, moving, and renaming
l. Demonstrate an understanding of user and system processes and basic process operations
m. Use regular expressions to effectively describe desired search patterns
n. Write code to redirect input and output to and from the user, files, and commands, using redirection and pipe

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Course Content

a. Overview
   i. Brief overview of operating systems
   ii. Overview and features of Linux
   iii. Pros and cons of Linux
b. History and philosophy
   i. Original and current philosophies
   ii. Origin and history of Linux systems and their derivatives
   iii. Overview of Linux standards
c. Components of Linux
   i. Kernel
   ii. Shells
   iii. Utilities
   iv. Shell command line vs. GUI
d. The kernel and its subsystems
   i. System call interface, file subsystem, I/O and device subsystem
   ii. Process control: scheduler, time slicing
   iii. Memory management: paging vs. swapping
e. Getting started with Linux
   i. How to log in and log out
   ii. User accounts
   iii. The superuser
   iv. Account settings and configuration
   v. Commands for getting information
   vi. Stopping a program
f. Introduction to Linux shells
   i. Function of shells
   ii. Comparison of Linux shell types
   iii. Shell environment
   iv. Shell variables and environment variables
   v. Using variables
g. More about the shell
   i. Meta-characters
   ii. Quoting and escaping
   iii. Built in and external commands
   iv. Search path
   v. Aliases
   vi. Basic shell programming functions
h. Overview of commands
   i. Understanding man pages
   ii. Command line syntax
   iii. Arguments and options
   iv. Command line history
   v. Command line completion
   vi. Command line editing
i. Filter commands
   i. Displaying files
   ii. Comparing files
   iii. Counting lines, words, and characters
iv. Sorting data  
v. Selecting lines  
j. The Linux filesystem  
i. Overview of files  
ii. Inode concepts  
iii. Hardware and processes as file abstractions  
iv. Modern Linux filesystem types  
v. Hierarchical organization of filesystems  
vi. Directory organization  
k. Working with directories and files  
i. Absolute and relative pathnames  
ii. Working directory  
iii. Moving about in the filesystem  
iv. Basic directory operations  
vi. Basic file operations  
vi. Permissions  
vii. Links  
viii. Finding files  
l. Processes  
i. Kernel management of processes  
ii. System processes vs. user processes  
iii. Foreground vs. background processes  
iv. Displaying process information  
v. Suspending and killing processes  
m. Regular expressions  
i. Introduction to regular expressions  
ii. Matching lines, words, and characters  
iii. Character classes  
iv. Operators  
v. Introduction to sed and awk  
n. Input and output  
i. Standard input  
ii. Standard output and standard error  
iii. Redirection  
iv. Pipes  
v. File descriptors  
o. Communications  
i. Introduction to basic utilities  
ii. Connecting to remote computers  
iii. Transferring files  
p. Text editors  
i. Comparison of Linux text editors  
ii. Text editor basics  
iii. How to create, open, and save a file  
iv. Editing a text file  
i. Demonstrate the use of commands to display, compare, count, sort, and select files and text  
ii. Use a text editor to incorporate commands into small scripts  
iii. Explore the Linux man pages to gain information on command purpose and use  
iv. Demonstrate the use of command options to alter the behavior of commands  
c. Exploring various environment and shell variables in the Linux operating system  
i. Develop understanding of the numeric and string variable types as well as allowed operations on each  
ii. Gain experience in effectively using the text editor to edit system files  
iii. Use the text editor and command line to alter the value assigned to certain shell and environment variables  
iv. Deduce the effect working with shell and environment variables has on the shell environment  
d. Mastering the command line  
i. Explore command line syntax through reading man pages and trial and error  
ii. Interact with utilities by typing arguments and options on the command line  
iii. Practice the use of the command line history and command line completion while invoking basic commands  
iv. Play the role of user and programmer, alternately, to establish a command line-interaction plan for a program  
e. Files and directories  
i. Become familiar with the history and concepts of the Linux filesystem  
ii. Practice moving about the filesystem to become familiar with the hierarchical organization of files  
iii. Understand the Linux permissions by viewing and changing permissions on both files and directories  
v. Use a variety of commands to perform basic operations on the filesystem including moving, creating, and deleting files and directories  
f. Finding, reading, and writing files  
i. Use utilities to assist in the location of files in the Linux system  
ii. Write a short script which uses redirection to send output to a specified file  
iii. Gain experience with pipes to send output from one command to another command  
iv. Incorporate regular expressions into a grep call to refine search terms  
g. Communicating with remote computers  
i. Demonstrate the use of basic commands to transfer files to and from a remote computer  
ii. Gain experience with file transfer protocols  
iii. Explore the use of a variety of methods to connect, along with the benefits and risks of each  
v. Investigate the need for security in communicating with external machines and develop strategies to lessen security risks  
h. Demonstrating the Linux text editor  
i. Compare the features of two or more text editors in the Linux environment  
ii. Use the basic commands of a text editor to create a new file, write and edit text, and save the file  
Lab Content  
a. Getting started with Linux  
i. Create a new user account with user id and password  
ii. Enter commands, such as whois, which, and whereis, to get basic information  
iii. Run and stop programs from the command line  
v. Alter user account settings  
b. Using basic commands
iii. Edit a script using the text editor's commands for moving around and editing

Special Facilities and/or Equipment
1. Access to a computer laboratory with a Linux operating system.
2. A website or course management system with an assignment posting component (through which all lab assignments are to be submitted) and a forum component (where students can discuss course material and receive help from the instructor). This applies to all sections, including on-campus (i.e., face-to-face) offerings.
3. When taught via Foothill Global Access on the internet, the college will provide a fully functional and maintained course management system through which the instructor and students can interact.
4. When taught via Foothill Global Access on the internet, students must have currently existing email accounts and ongoing access to computers with internet capabilities.

Method(s) of Evaluation
Methods of Evaluation may include but are not limited to the following:

Examinations (quizzes, mid-term)
Homework assignments, projects, and hands-on exercises
Laboratory skill demonstrations
Comprehensive final examination

Method(s) of Instruction
Methods of Instruction may include but are not limited to the following:

Lectures which include history, structure and use of the Linux operating system
Online labs (for all sections, including those meeting face-to-face/on-campus), consisting of:
1. A lab assignment webpage located on a college-hosted course management system or other department-approved internet environment. Here, the students will review the specification of each laboratory assignment and submit their completed work
2. A discussion webpage located on a college-hosted course management system or other department-approved internet environment. Here, students can request assistance from the instructor and interact publicly with other class members
Detailed review of written assignments which includes model solutions and specific comments on the student submissions
In-person or online discussion which engages students and instructor in an ongoing dialog pertaining to all aspects of the Linux operating system
When course is taught fully online:
1. Instructor-authored lecture materials, handouts, syllabus, assignments, tests, and other relevant course material will be delivered through a college-hosted course management system or other department-approved internet environment
2. Additional instructional guidelines for this course are listed in the attached addendum of CS department online practices

Representative Text(s) and Other Materials