Unix and Linux Operating Systems

School of Advanced Technology

Course Number:
NET2003

Contribution to Program:
Core

Educator(s):
Ian D. Allen

Applicable Program(s):
Bachelor of Information Technology - Network Technology

AAL:
04

Approved For:
Winter 2005

Course Hours:
4 contact hours per week

Prerequisites:
NET2002

Corequisites:
None

Approved By:

Signature Not Verified
Claude Brule
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Date: 2005.01.24 15:34:30 -05'00'

Claude Brulé, Chair
Computer Studies Department

Approved for Academic Year:
2004-2005

COURSE DESCRIPTION

Introduction to Unix and Linux operating environments. Students study Unix/Linux servers, including operating system installation, administration and configuration of services such as NIS, DNS, SAMBA, sendmail, Apache web server, pppd and DHCP. Basic server security is also emphasized, including the creation of firewalls.

COURSE CURRICULUM

I. Learning Requirements / Embedded Knowledge and Skills

To earn credit for this course, you must reliably demonstrate your ability to:

Course Learning Requirements	Knowledge and Skills
Understand the network structure of the modern Internet.	• Understand the concepts of platform agnostic network services. • Know who is "in charge" of major Internet functions. • Be aware of the history and importance of Open Source in the development of the Internet and its protocols (e.g. RFP). • Open Source Motto: "Rough consensus and running code."
Use basic Unix/Linux commands and utilities from the shell command line.	• Understand the Unix/Linux file system: hard links, symbolic links, permissions, owners, groups. • Know the basic components and directory layout of a standard Unix/Linux file system. • Write and modify basic Bourne-style shell scripts. • Use the VI/VIM text editor.
Install, configure, administer, and maintain a Unix/Linux server.	• Choose an appropriate Unix/Linux network server distribution. • Use a Linux ISO installation CDROM. • Manage partitions on a hard drive. • Configure the Unix/Linux boot load process. • Understand journaling vs. non-journaling file systems. • Answer basic Unix/Linux installation questions. • Choose basic system services: **chkconfig** • Set up loadable kernel modules: **modprobe, lsmod** • Monitor system logs: **syslog** • Download and update packages: **rpm, apt-get** • Set up remote text-mode system administration.
Install, configure, administer, and maintain Unix/Linux networking infrastructure.	• Install and configure network software and drivers: **ifconfig** • Perform network configuration: **route, iproute2** • Use Unix/Linux network monitoring and diagnostic tools: **ping, tcpdump, traceroute, mtr, ethereal, netcat, telnet, nmap, dmesg, syslog, netstat, arp, ttcp**

Course Learning Requirements	Knowledge and Skills
Install, configure, administer, and maintain major Unix/Linux network services, and ...	• DHCP client and server • secure shell: OpenSSH, **sshd** • DNS (**named**) • network time: NTP • Mail Transfer Agents: SMTP (**sendmail)** • Mail User Agents: POP3, IMAP • HTTP and HTTPS (Apache) • Microsoft Windows network shares (Server Message Block): SMB client and server (Samba)
... other network services and protocols as time permits.	• NFS, NIS, PPP, NNTP, OSPF, BGP, LDAP • FTP, TFTP, telnet, finger, Instant Messaging • Virtual Private Networks (VPN)
Enhance Unix/Linux server security.	• Use security tools: **nmap, dsniff** • Install and manage **tcpwrappers.** • Enable and configure a basic firewall.
Enable and configure Unix/Linux firewall/router features.	• Understand the **iptables** and **iproute2** functions. • Install and configure more features of **shorewall.** • Use tools to verify and debug firewall. • Understand Network Address Translation (NAT). • Create and configure a DMZ sub-network.
Stay informed regarding the current state of the Internet.	• Select and read relevant security news groups and mailing lists: BUGTRAQ, Incidents, CERT, SANS

II. Learning Resources

Course Home Page and Web Site for Winter 2005:

`http://teaching.idallen.com/net2003/05w/`

A link to the above site is also available via the Algonquin Blackboard system.

Required Textbook:

Advanced Linux Networking
Author: Roderick W. Smith, ISBN: 0-201-77423-2, Publisher: Addison Wesley Professional, Copyright: 2002, Format: Paper; 784 pp, Published: 2002-06-11

Required Equipment and Infrastructure:

1. Keep one hard disk drive (4 gigabyte minimum) installed in an Algonquin-compatible hard disk caddy (available from the Algonquin Book Store). If you keep a Microsoft operating system on this disk, the College requires that you keep it updatd and clean of viruses. (This course does not require any Microsoft software – feel free to wipe the drive clean).

2. You must maintain a lab notebook/binder to record anything you may need to repeat or recall in the future. Some lab exercises may instruct you to record certain things in your lab notebook for future reference in follow-on labs. Tests and quizzes may require you retrieve this information. If you are involved in a troubleshooting exercise, the lab book will be particularly valuable for recording your actions and the ensuing results. Proper documentation is a critical aspect of an effective problem solving methodology.

3. Have one or two diskettes on hand to hold any PC configuration information that you may wish to preserve between lab sessions. Connectivity to the College network and/or the Internet is not always possible when configuring or modifying a network server.

4. You will create and maintain CDROM media containing software for use in the computer labs - the labs have no installed hard disk drives. See the course web page for details on how to obtain the current software. You are responsible for keeping backup copies of all your media.

5. A working Algonquin user-id and password is necessary for reading course-related EMail and having access to Algonquin network resources. At minimum you must forward your Algonquin EMail to an account that you read at least daily.

III. Teaching/Learning Methods

The course consists of 2 hours of lectures and 2 hours of lab per week. It is anticipated that you will need to spend an additional 5 hours per week, on average, of your own time for reading, practice, assignments, finishing exercises, and study.

This course is presented using Lectures, Labs, and on-line notes. Basic notes for the course will be posted on-line through the Course Home Page. Not all course material is available in on-line form - students are expected

to attend the lectures and labs and take supplementary in-class notes as needed. Students are responsible for all course material, even if they miss a lecture or a lab.

Students are encouraged to ask questions during class and to consult with the professors on topics which they do not clearly understand. The instructor is available for consultation outside of class times via on-line News Groups and office appointments. See the Course Web Page for details.

Lectures:

Lectures are oral presentations supplemented with various audio/visual aids, including chalkboard/whiteboard and overhead data projector. Students do not have access to laboratory computers during lectures. Note-taking in both labs and lectures is strongly encouraged.

Labs:

Labs take place in computer laboratory rooms containing computers without hard disks. Students must bring both their hard drive caddies and appropriate CDROM media to make use of these rooms. Students must keep back-up copies of their media.

Students are expected to perform initial analysis and design **before** their scheduled lab, in order to take advantage of the limited lab time. Laboratory exercises will be closely integrated with the lecture material.

The students' ability to successfully complete the assigned exercises will directly correlate with their level of success on tests and the final exam.

IV. Learning Activities

Samples of learning activities include:

1. taking notes during lectures and lab sessions
2. participation in problem solving during in-class demonstrations
3. homework exercises
4. hands-on lab work, following the examples demonstrated by the instructor
5. practical and reading assignments (from textbook and on-line materials)
6. assigned laboratory work

V. Course Content

It is anticipated that course topics will be covered according to the following schedule, though the professor reserves the right to make adjustments as deemed necessary:

Week	***Topics***
1	course overview, plagiarism, using Usenet news groups, communicating with instructor, structure of the Internet, Linux demo, Virtual Network Sandbox demo
2-5	the Unix file system, using commands via the shell, shell scripting
6	Unix/Linux server installation, configuration, administration, and maintenance

Week	*Topics*
7-9	major Unix/Linux network services: installation, configuration, administration, and maintenance [BIT/NET Winter Break February 21-25]
10	other Unix/Linux network services: installation, configuration, administration, and maintenance (as time permits)
11-12	enhancing server security and configuring firewalls
13	April 6 - Course Review (lecture only)
14-16	BIT/NET Final Exam Period – see Course Home Page for date of Final Exam

VI. Evaluation/Earning Credit

The following will provide evidence of your learning achievement:

Assessment of student learning will be done by means of term tests, weekly assignments and quizzes, and a final exam.

Laboratory attendance is recorded and strongly recommended; but, it is not compulsory. Where a student is in a borderline situation with regard to marks, regular attendance may become a factor in determining the final outcome.

Assessment evaluation points must be completed on time to obtain course credit. Late evaluations will be penalized up to 100%. Missed evaluation points will receive a mark of zero. In the case of a documented emergency, the professor, in consultation with the Chair, will determine how the marks will be made up and/or the final grade adjusted.

Student submissions that do not meet the published submission standards for the course may not be marked, and will incur a penalty of up to 100%. See the Course Home Page for details.

The factors determining the final grade are:

Term Test #1	15%
Term Test #2	25%
Assignments and Quizzes	30%
Final Examination	30%

All material covered in this course, including the Assignments, is examinable during tests and/or the final exam. Assignments and Quizzes will not be included in the final grade unless the student achieves at least a grade of 50% or **D-** on the combined term tests and final exam. (Students who have a failing grade on the combined term tests and final exam will receive a grade of **F** .)

All students are required to write the final exam. There are no provisions for making up a missed final exam. If, as a result of being off-track in your program or some unforeseen circumstance, you note that there is a scheduling conflict in your final exam schedule, it is your responsibility to alert your course professor no later than one week before final exams start, to allow for any special arrangements.

VII. Related Information

Retention of course material. It is your responsibility to retain copies of all assignments, labs and mid-term tests (returned from the professor), and any other evaluations and pertinent records (except for final exams, which are not returned) in case you become involved in an appeal hearing at a later date.

It is also your responsibility to retain course outlines for possible future use to support applications for transfer of credit to other educational institutions.

College email account. Algonquin College provides all full-time students with an email account. This is the address that will be used when the College, your professors, or your fellow students communicate important information about your program or course events. It is your responsibility to ensure that you know how to send and receive email using your Algonquin College account, and to check it regularly.

Harassment/Discrimination/Violence will not be tolerated. Any form of harassment (sexual, racial, gender or disability-related), discrimination (direct or indirect), or violence, whether involving a professor and a student or amongst students, will not be tolerated on the college premises.

Harassment means one or a series of vexatious comment(s) (whether done verbally or through electronic means), or conduct related to one or more of the prohibited grounds that is known, or ought reasonably to be known, to be unwelcome/unwanted, offensive, intimidating, derogatory or hostile.

This may include, but is not limited to: gestures, remarks, jokes, taunting, innuendo, display of offensive materials, offensive graffiti, threats, verbal or physical assault, stalking, slurs, shunning or exclusion related to the prohibited grounds.

Bachelor of Information Technology students are bound by the "Academic Regulations of the University – Student Conduct", "15. Offences of Conduct: Discrimination and Harassment" detailed within Carleton University's Undergraduate Calendar, and on-line at:
`http://www.carleton.ca/cuuc/regulations/acadregs15.html`

The School of Advanced Technology's Standard Operating Procedure on Plagiarism and Academic Honesty defines plagiarism as an attempt to use or pass off as one's own idea or product, work of another without giving credit. Plagiarism has occurred in instances where a student either directly copies another person's work without acknowledgement; or, closely paraphrases the equivalent of a short paragraph or more without acknowledgement; or, borrows, without acknowledgement, any ideas in a clear and recognizable form in such a way as to present them as one's own thought, where such ideas, if they were the student's own would contribute to the merit of his or her own work.

Plagiarism is one of the most serious academic offences a student can commit.

Bachelor of Information Technology students are bound by the "Academic Regulations of the University – Student Conduct", "14. Instructional Offences" detailed within Carleton University's Undergraduate Calendar, and on-line at: **`http://www.carleton.ca/cuuc/regulations/acadregs14.html`**

Violation of the Copyright Act.

- **General** – The Copyright Act makes it an offence to reproduce or distribute, in whatever format, any part of a publication without the prior written permission of the publisher. For complete details, see the Government of Canada website at **`http://www.cb-cda.gc.ca/info/act-e.html`**. Make sure you give it due consideration, before deciding not to purchase a textbook or material required for your course.

- **Software Piracy** - The Copyright Act has been updated to include software products. Be sure to carefully read the licensing agreement of any product you purchase or download, and understand the term and conditions covering its use, installation and distribution (where applicable). Any infringement of licensing agreement makes you liable under the law.

The Use of Electronic Devices, with the sound turned on, during classes is strictly prohibited. In particular, cell phones are not to be used to communicate during a class. The use of any electronic devices during exams and mid-term tests, other than those sanctioned by the faculty in charge of the examination is strictly prohibited.

Anyone caught using a prohibited device will be considered to have plagiarized, and will be treated as such in accordance with College Plagiarism Policy. For further details on this directive, consult the Algonquin College Directive E39 on the use of Electronic Devices in Class and Exams.

Disruptive Behaviour is any conduct, or threatened conduct, that is disruptive to the learning process or that interferes with the well being of other members of the College community. It will not be tolerated.

Members of the College community, both students and staff, have the right to learn and work in a secure and productive environment. The College will make every effort to protect that right.

Incidents of disruptive behaviour must be reported in writing to the departmental Chair as quickly as possible. The Chair will hold a hearing to review available information and determine any sanctions that will be imposed. Disciplinary hearings can result in penalties ranging from a written warning to expulsion.

For further details, consult the Algonquin College Directive – E27 Instaguide.

Students with Disabilities requiring academic accommodations in this course are encouraged to contact a coordinator at the Paul Menton Centre (PMC) for Students with Disabilities to complete the necessary *letters of accommodation*. After registering with the PMC, make an appointment to meet and discuss your needs with the professor at least two weeks prior to the first in-class test or instructional television midterm exam. This is necessary to ensure sufficient time for making any needed arrangements. Please note the deadline for submitting completed forms to the PMC as published in Carleton University's "Academic Year" calendar.

Prior Learning Assessment (PLA)

See Algonquin College Directive E35 for details on eligibility and process.

For this course, evidence of learning achievement for PLA candidates will include the successful completion of:

- A challenge exam with a breadth of coverage and level of difficulty equivalent to the final examination in the course;

- A hands-on or practical component to ensure that the requisite skill level has been achieved.