Educational information systems and networks

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**Description:** From a foundation of computer networks and systems, this course expands to cover instructional technology infrastructure: file systems, users, wired and wireless networks, email, web servers, computer labs, and common educational software services. This course focuses on Free Software; where the source code is free to use, study, or modify. Students will work through a series of systems challenges, using their own (virtual) Linux installation

**Keywords:** linux, bash, systems, networks, lamp, free software, trouble shooting, technical project management

## GOALS & OBJECTIVES

The Educational Technology Specialist certification track must prepare graduates to be school-based technology leaders. One of their main duties will be to install and maintain local computer networks, workstations, and school servers. Other graduates will be developing networked learning solutions, requiring the fundamental knowledge and skills covered in this course.

Students in this course develop a basic understanding of computer operating systems and digital networks. Upon completing this course they will be able to:

* set up a secure, network computing environment
* effectively use the basic tools of Unix/Linux computing environments
* implement techniques for administering group and user permissions
* install and troubleshoot hardware and software infrastructure for networked and internet computing
* configure various server-side applications to support teaching and learning
* identify the ethical and legal concerns surrounding school information systems

## Required Books

*None*

## BIBLIOGRAPHY

Adelstein, Tom. 2007. *Linux System Administration.* O’Reilly Media. ISBN 0596009526.

Esteve, J. 2009. [*The GNU/Linux Operating System.\*Free Technology Academy*](http://ftacademy.org/materials/fsm/2#1). Barcelona.

Gift, Noah. 2008. *Python for Unix and Linux System Administration.*O’Reilly Media. ISBN 0596515820.

Kurose, J. (2010). *Computer networking : a top-down approach* (5th ed.). Boston: Addison-Wesley. ISBN 0136079679.

Peterson, Larry L. 2011. *Computer Networks, Fifth Edition: A Systems Approach.* Morgan Kaufmann. ISBN 0123850592.

Tanenbaum, Andrew S. 2002. *Computer Networks.* Prentice Hall. ISBN 0130661023.

## Class sessions

|  |  |  |
| --- | --- | --- |
| Session | Date | Topic |
| 1 | Tue May 26 | Computers and Operating Systems |
| 2 | Thu May 28 | File System and Unix Basic |
| 3 | Tue Jun 2 | Media Files |
| 4 | Thu Jun 4 | Networks |
| 5 | Tue Jun 9 | Ethics & Security |
| 6 | Thu Jun 11 | Midpoint Exam |
| 7 | Tue Jun 16 | Database Servers |
| 8 | Thu Jun 18 | Web Servers |
| 9 | Tue Jun 23 | Web Applications |
| 10 | Thu Jun 25 | DIY |

### Tues. 5/26: Computers and Operating Systems

In this session, students will set up their own installation of [Ubuntu GNU/Linux](http://www.ubuntu.com) and will learn about the basic operations of computer hardware and operating system software.

### Thurs 5/28: File System and Unix Basic

Students will learn about how information is stored on a computer, and learn the basics of file permissions, backups, managing data, and working with linux users and groups.

### Tues 6/2: Media Files

In this session students will learn the basic principles of representing and working with digital images, audio, and video. They will learn the relative advantages and uses of different media formats and codecs, and work with a variety of tools for managing and working with media files.

### Thurs 6/4: Networks & Web Servers

During this session, students will be introduced to the principles of computer networks, including the network protocols of the internet (IP/TCP, DNS, HTTP, HTTPS). They will also install and configure the Apache HTTP Server to run static web sites.

### Tues 6/9: Ethics & Security

Reviewing several cases of controversies in school systems, students will consider the ethical and legal considerations of administering computer systems in a school setting, including maintaining the privacy of sensitive data, equitable distribution of computing resources, design for universal access, and more.

In addition, they will gain proficiency and understanding of computer and network security practices, protocols, and tools.

### Thurs 6/11: Midpoint Exam

This session will not meet in person. Students will individually complete a timed exam on Moodle.

### Thurs 6/16: Database Servers

Students will gain a basic understanding of the uses and operations of database servers. They will install MySql as well as the tools for managing the database. They will be given a basic introduction to SQL, as well as the tools for copying, backing-up, and moving databases.

### Thurs 6/18: Web Servers

### Thurs 6/23: Web Applications

During this session students will install and configure full web applications, typically running on the Linux Apache MySQL PHP (LAMP) stack. Possible applications include:

* Moodle
* WordPress
* Canvas
* MediaWiki
* edX

### Tues 6/25: Do-it-yourself

For our last class we will run a DIY fix-it workshop where students will propose and complete their own projects.

Example project might include:

* jailbreaking an iPhone or rooting an Android device
* creating a dual boot linux laptop
* setting up an AWS server on Amazon for a public web application
* replacing the screen on a cracked phone
* backing up and re-installing Windows to remove viruses

## Grades & Assignments

|  |  |  |
| --- | --- | --- |
| Assignment | Pct | Due |
| Systems Game | 40% | ongoing |
| Flash Cards | 20% | 6/7 (end of day on Sunday) |
| Midpoint Exam | 30% | 6/11 |
| DIY Project | 10% | 6/25 |

### Systems Game

During the hands-on portion of each class meeting, students will be paired with a random classmate. The class will be presented with a list of tasks related to the topic, and each task will have an associated point value. Pairs will work together to complete as many tasks as possible, earning points for each task they complete. Pairs will receive the same number of points for the session they work together. Points are cumulative for the duration of the course, and the final grade will be calculated on the total points you earn. The grade for this assignment will be on a curve, from A+ to B. If you miss class you will not be able to earn points for that session.

### Flash Cards

Each student will be responsible for creating a deck of study flash cards to be shared by everyone for the midpoint exam. Students must choose one of the following topics:

1. Computer hardware
2. Operating Systems (and bootloaders)
3. Computer laws, privacy, and educational policies
4. File systems
5. Media files
6. Computer Networks (wired, wifi, cellular, etc)
7. Computer Security
8. Mobile computing (hardware, networks, software/OSs)

### Midpoint exam

The midpoint exam will be a multiple choice and short answer exam on the 8 topics listed above under “flashcards”. Students will be responsible for logging into Moodle to complete the timed exam individually. The exam will be “open book”, but students must not work together, share information regarding the exam, or consult other people outside of the class for help during the exam.

### DIY Project

Students will be given a grade for their DIY project:

* 3 points, risk/difficulty of the proposed project
* 3 points, achievement in completing their project
* 4 points, skill in approaching their project