Syllabus

CMPT 432/832 Syllabus
COURSE GOALS AND REQUIREMENTS

Course Goals

The purpose of CMPT 432/832 is to provide a deep understanding of operating systems principles: the parts of an operating system, how they are structured, the important policies governing their operation, and the implementation issues. Although examples will be drawn from several operating systems throughout the course, it is not the purpose of this course to provide training in any particular operating system.

This course will have a significant project component. Lecture time will be used primarily for:

- coverage of basic OS implementation issues from material in the texts,
- covering supplementary material as required,
- project design meetings and reviews, and
- answering student questions.

Course Objectives

After completing this course, students should be able to do the following tasks:

- Implement system calls in the Linux operating system.
- Explain design principles influencing the structure of different OS paradigms.
- Design the components of a simple, but complete operating system.
- Design and implement an API for user processes to access OS facilities.
- Implement, integrate and document operating system components in a small- team environment.
- Integrate device drivers and bootloaders into the operating system for communication with peripheral devices.
- Compare and evaluate design alternatives for processes/threads, schedulers and/or memory manage- ment.
- Evaluate research literature in operating systems design and implementation and explain open issues and potential solutions.

Course Requirements

Note: Requirements and expectations differ slightly between the undergrad course and the grad course.

There will be 1 or 2 assignments (due approximately in late January and mid-

March, respectively), a course implementation project (due in early April), a mid-term exam (held in-class in the beginning part of March), and a final examination during the regular examination period. Exact dates will be announced as the course progresses. The approximate weightings for the assignments and examinations are as follows:

Component	432	832
Assignments	5%	5%
Implementation project	35%	35%
Research Project	15%	20%
Paper Presentation		5%
mid-term exam	15%	10%
final exam	30%	25%

RESOURCES

Textbooks

Title: Modern Operating Systems
Author: Andrew S. Tanenbaum
Publisher: Pearson/Prentice Hall
Edition/Year: 3rd Edition/2008
ISBN: 0-13-601919-6
Additional information: none
Type: Required resource

Title: Linux Kernel Development
Author: Robert Love
Publisher: Addison Wesley
Edition/Year: Third Edition/2010
ISBN: 978-0-6723-2946-3
Additional information: available as a free E-book.
Type: Recommended resource

Title: Advanced Programming in the UNIX Environment
Author: W. Richard Stevens, Stephen A. Rago
Publisher: Addison Wesley
Edition/Year: 3rd Edition/ 2013
ISBN: 978-0-321-63773-4
Additional information: none
Type: Recommended resource

Title: Operating Systems Design and Implementation
Author: Andrew S. Tanenbaum and Albert S. Woodhull
Publisher: Pearson/Prentice Hall
Edition/Year: 3rd Edition/2006
ISBN: 0-13-0-13-142938-8
Type: Recommended resource

COURSE INFORMATION AND POLICIES

Instructor Contact Information

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Use of Class Time

This course will be pragmatic and hands-on. In addition to the theoretical material, a significant amount of class time will be spent on design, programming and debugging the implementation project.

Policies

Facilities: Students will be using the UNIX time-sharing facilities of the Spinks Lab to do most of their work, and are expected to be familiar with the use of these facilities. Virtual machine environments will be created on a subset of the machines for your kernel programming pleasure.

Other: A few miscellaneous points:

- This course will be administered with Blackboard. The Discussion Forum will be used to disseminate answers to questions regarding assignments, lecture material, etc. Many important things may happen there that will not be repeated in class, so reading of the bulletin board is required.
- The course will make regular use of the World Wide Web and other Internet facilities. Locations will be given during lectures and on Blackboard.
- Assignment descriptions will be made available in electronic form only. Submissions will be in electronic form only.
- Additional information:
  All students must be properly registered in order to attend lectures and receive credit for this course.

  Failure to write the final exam will result in failure of the course.

  Plagiarism is strongly forbidden (as in all courses). We will be checking assignments/projects for plagiarism using nifty cheating detection software and penalties will be enforced. Refer to the University of Saskatchewan's policy on academic honesty for further details.

LESSONS

Introduction and Overview

Introduction
Objectives: Overview
Topics: Review of 332 in a nutshell, with a little more

January 7, 2014
01:00 PM - 02:30 PM
Process Description and Control

Process Description and Control
Topics:

Duration: 1.5 weeks.

January 9, 2014
01:00 PM - 02:30 PM
Booting and Boot loaders

Examining source code of the bootloader for real operating systems to review and understand the architecture and memory structure of the Intel Processor. Possible discussion of ARM assembly language and process for booting on ARM processors.

Duration: 1.5 weeks.

January 21, 2014
01:00 PM - 02:30 PM
Interrupts/Traps

Interrupts/Traps
Topics: Low level handling of external events

Duration: 1.5 weeks

January 30, 2014
01:00 PM - 02:30 PM
Device Drivers

Device Drivers
Topics: Interfacing with objects in the real world

Duration: 1 week

February 11, 2014
01:00 PM - 02:30 PM
I/O and File Systems

I/O and File Systems
Topics: file organization; secondary storage management; examples.

Duration: 2 weeks

February 25, 2014
01:00 PM - 02:30 PM
IPC and friends

IPC and friends
Topics: Communicating between processes, shared memory, etc.

Duration: 1.5 weeks

March 11, 2014
01:00 PM - 02:30 PM

Memory Management

Memory Management
Topics: Support for virtual memory and other memory management strategies.

1.5 weeks

March 20, 2014
01:00 PM - 02:30 PM
Naming/Security/Other Issues

Naming/Security/Other Issues
Topics: Duration: whatever might be left

March 27, 2014
01:00 PM - 02:30 PM
Distributed Systems

Distributed Systems
Topics: client-server paradigm; Remote Procedure Call; clusters; process migration; distributed file systems.

Duration: if time permits

April 1, 2014
01:00 PM - 02:30 PM
Presentations

Class Research Presentations

April 3, 2014
01:00 PM - 02:30 PM
Presentations

Class Implementation Project Presentations

April 8, 2014
01:00 PM - 02:30 PM