

# UNI CS 3430 (Spring 2018)

## Operating Systems

### Course Syllabus (Version 1.0)

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#### Contact Information

##### Instructor

Sarah Diesburg (diesburg@cs.uni.edu)

Office: 311 ITTC

Office hours: MWTh 1:00pm-3:00pm and by appointment

Lecture: MWF 11:00am-11:50am in ITTC 328

Class website: [http://www.cs.uni.edu/~diesburg/courses/cs3430\\_sp18/index.htm](http://www.cs.uni.edu/~diesburg/courses/cs3430_sp18/index.htm) and [UNI eLearning](#)

#### Objectives

- Define, explain, and apply introductory operating systems concepts: process management, inter-process communication, memory management, I/O systems, file systems, and the like
- Use the UNIX operating system interface to implement a user-level shell in the C language
- Design and implement a correct concurrent program requiring synchronization
- Gain experience in implementing and debugging operating system components, including the kernel module, system call, synchronization primitives, and the file system

#### Prerequisites

- CS 1410 Computer Organization
- CS 1520 Data Structures
- CS 1800 Discrete Structures
- Junior standing or above
- Proficiency in C or other high-level programming language

#### Course Material

- Lecture notes (posted on the class Web site)
- UNI eLearning website for all other materials
- *Optional* textbooks:
  - Silberschatz, Galvin, and Gagne, *Operating System Concepts Essentials*, 2<sup>nd</sup> Edition (ISBN 978-1-118-80492-6)

#### Class Grading

The following coursework components contribute to your final grade, and to the degree shown:

|                  |     |
|------------------|-----|
| Projects         | 50% |
| Weekly Exercises | 5%  |
| Attendance       | 5%  |
| Exam 1           | 10% |
| Exam 2           | 10% |
| Final Exam       | 20% |

There will be three to four increasingly challenging projects due during this course. For many projects, you have the option of working in teams of two people or by yourself.

Weekly exercises will consist of short-answer questions, essays, or problems. The purpose of these exercises is to prepare you for exams. The exercises are primarily for practice and will be graded on a combination of effort and correctness. For example, a grade of 2 = high effort/mostly correct, 1 = medium to low effort, 0 = did not turn in or very little effort. However, when you see these problems on exams, they will be graded on correctness at that time.

For the projects, if you receive help from others, or if you find helpful information from various sources, please include appropriate acknowledgements. However, copying code from another classmate is never ok (see section below on scholastic conduct).

The final exam will be comprehensive.

The grading scale is as follows:

|           |    |           |    |
|-----------|----|-----------|----|
| 100 – 92  | A  | 69.9 – 68 | D+ |
| 91.9 – 90 | A- | 67.9 – 62 | D  |
| 89.9 – 88 | B+ | 61.9 – 60 | D- |
| 87.9 – 82 | B  | 59.9 – 0  | F  |
| 81.9 – 80 | B- |           |    |
| 79.9 – 78 | C+ |           |    |
| 77.9 – 72 | C  |           |    |
| 71.9 – 70 | C- |           |    |

### **Late Submission Policy**

Late projects solutions will incur a 10-point deduction each day the project is late. Project solutions received after two days from the original due date will receive 0 points. For example, a project solution submitted anytime on the Monday after the original due date of Friday will receive 0 points.

### **Computer Accounts**

You will need CatID credentials to access the eLearning website.

Make sure you are checking your UNI emails. Important class announcements will be sent frequently from the eLearning interface to your UNI email account.

In this class, you will be required to run a virtual machine. If you do not own your own computer, you may use the computers in the Wright Hall labs (WRT 112 and WRT 338) provided that you use a thumb drive of your own to store the virtual machine image. The thumb drive should be empty prior to class and be at least be 8GB in size, but 16GB is preferred.

### **Your Responsibilities**

- Understand the lecture slides and reading exercises
- Attend office hours for extra help, as needed
- Uphold academic honesty in completing your exercises, projects, and exams
- Turn in your projects on time
- Check the class webpage and your UNI email account regularly

## Course Calendar (Tentative)

| Date | Readings and pre-class assignments               | Session Links and Announcements  |
|------|--|--|
| 1/8  | Chapter 1.1 -1.9                                 | Session One - Introduction and History   |
| 1/10 | Section 15.1                                     | Session Two - Class Projects and Environment   |
| 1/12 |  | Session Three - Concurrency  |
| 1/15 | No Class   |  |
| 1/17 | Chapter 2.1 and 2.10                             | Discussion over C and pointers<br>Answer questions about Project 0                       |
| 1/19 |  | Session Four - From Raw Hardware to Processes  |
| 1/22 |  | Project 0 Quiz<br>Discuss Suggested Exercise #1<br>Review Project 0                      |
| 1/24 |  | Session Six [programming] - Shell Parsing and Exec                                       |
| 1/26 | Chapter 6.1 - 6.3                                | Session Seven - CPU Scheduling   |
| 1/29 |  | Session Eight - Cooperating Threads and Synchronization                                  |
| 1/31 |  | Session Nine [programming] - cd command and shell variables                              |
| 2/2  | Sections 5.1-5.2                                 | Too Much Milk presentation   |
| 2/5  |  | Session Ten - Implementing Mutual Exclusion  |
| 2/7  | Sections 5.3-5.4                                 | Session Eleven - Semaphores and Bounded Buffer   |
| 2/9  | Sections 5.5-5.9                                 | Session Twelve - More on Semaphores<br>Discuss Suggested Exercises 3-4                   |
| 2/12 |  | Session Thirteen - Exam 1 Review<br>Project Quiz   |
| 2/14 |  | Exam 1   |
| 2/16 |  | Test review  |
| 2/19 | Section 18.3                                     | Session Fourteen - Monitors, Condition Variables, Readers-Writers                        |
| 2/21 | Gone to SIGCSE - watch class video               | Session Fifteen [programming] - Intro to Linux Kernels                                   |
| 2/23 | Gone to SIGCSE - watch class video               | Continuation of previous session   |
| 2/26 | Chapter 7  | Session Sixteen - Deadlocks  |
| 2/28 |  | Session Seventeen [programming] - Intro to Kernel Modules and /proc                      |
| 3/2  | Sections 8.1-8.6                                 | Session Eighteen - Concurrency Conclusion, Memory Protection                             |
| 3/5  |  | Session Nineteen [programming] - Locking and kthreads                                    |
| 3/7  |  | Finish Session Eighteen Memory Protection<br>Go over Exercise #6<br>Project Questions    |
| 3/9  |  | Class Period will answer Project 2 Questions   |
| 3/19 |  | Session Twenty - Address Translation   |
| 3/21 |  | Session Twenty One - Caching and TLBs  |
| 3/23 | Sections 9.1-9.6<br>Gone to WiCSyS - watch video | Session Twenty Two - Virtual Memory<br>Review of Suggested Exercise 7                    |
| 3/26 | Sections 10.1-10.4, 13.1-13.3.2                  | Session Twenty Three - Device Management and Disk Management                             |
| 3/28 |  | Session Twenty Four - Exam 2 Review<br>Project 2 Quiz and Review of Suggested Exercise 8 |
| 3/30 |  | Exam 2   |
| 4/2  |  | Session Twenty Five - File Systems   |

|      |                                |  |
|------|--------------------------------|--|
| 4/4  | Chapter 10                     | Session Twenty Six - Naming and Directories                          |
| 4/6  |                                | Session Twenty Seven - Boot Sectors, Files and Directories, File I/O |
| 4/9  |                                | Session Twenty Eight - More about Project 3                          |
| 4/11 | Section 9.7                    | Session Twenty Nine - File Systems, FAT32, Endianness                |
| 4/13 |                                | Session Thirty - Transactions and Reliability                        |
| 4/16 |                                | Session Thirty One - FAT32 Directory Entries, Project Operations     |
| 4/18 | Chapter 14, Sections 13.4-13.7 | Session Thirty Two - Protection and Security                         |
| 4/20 |                                | Finish previous session, project 3 questions                         |
| 4/23 |                                | Session Thirty Three - Networks and Distributed Systems              |
| 4/25 |                                | Session Thirty Four - Distributed File Systems                       |
| 4/27 |                                | Project 3 Quiz and Final Review<br>Review of Homework 10             |
| 5/1  | Final Exam at 10:00-11:50am    |  |

## Course Policies

**Attendance:** The University requires attendance in all classes. I will be taking role randomly throughout the course as part of your attendance grade.

**Missed exams:** A missed exam will be recorded as a grade of zero. I will follow the university rules regarding all missed exams.

**Scholastic Conduct:** You are responsible for being familiar with UNI's Academic Ethics Policies (<http://www.uni.edu/pres/policies/301.shtml>). Remember, discussing assignments is good. Copying code or answers is not. Any copied code from a current or previous class member may result in a zero grade for the assignment up to an F for the course. All code will be checked with a plagiarism checker.

**Accessibility:** In compliance with the University of Northern Iowa policy and equal access laws, I am available to discuss appropriate academic accommodations that may be required for students with disabilities. Requests for academic accommodations are to be made during the first three weeks of the semester, except for unusual circumstances, so arrangements can be made. Students should register with Student Disability Services, 103 Student Health Center, to verify their eligibility for appropriate accommodations.