## CSC 501 Course Syllabus

### CSC 501 – Operating Systems Principles
**Section 002**
**Fall 2019**
**3 Credit Hours**

### Course Description

This class prepares students to understand advanced issues in operating systems. Students will be introduced to multi-threading, synchronization, scheduling, virtual memory, file systems, and distributed systems including clusters. The material will be covered in terms of operating systems internals rather than the operating systems interface. Current research will be discussed to give an understanding of open issues in operating systems.

### Learning Outcomes

By the end of the course, students should be able to do the following:

- **Multi-Threading** Students will be able to reiterate states and transitions of threads; to explain non-local transfers of control; to determine context switching details; to analyze thread performance; to design and implement core threading functionalities; to critique different implementation choices.

- **Synchronization** Students will be able to list different synchronization models; to explain the operational characteristics of these models; to use these facilities in concurrent programming models; to contrast these models; to realize synchronization for contemporary architectures; to select a suitable synchronization paradigm for a given problem.

- **Scheduling** Students will be able to recite different scheduling paradigms; to paraphrase qualitative and quantitative properties of these paradigms; to derive a schedule for given parameters; to model quantitative properties of scheduling paradigms; to incorporate protocol extensions into existing scheduling models; to contrast different scheduling approaches.

- **Virtual Memory** Students will be able to reiterate the principles of hardware and software support for virtual memory; to express operational properties of address translation; to perform the calculations of address translation; to predict the impact on TLB misses; to apply virtual addresses in runtime systems; to judge the merits and shortcomings of virtual memory usage.

- **File Systems** Students will be able to reiterate the principles of hardware and software support for file systems; to explain performance behavior of single disk drives and arrays of drives (RAID); to design and implement file system components.

- **Distributed Systems** Students will be able to characterize the impact of distributed systems on operating systems and runtime support; to explain operational characteristics of distributed protocols and services; to algorithmically solve a problem within a distributed environment; to analyze the performance of a solution;

to design and implement selective operating system and runtime services for distributed computing; to optimize the performance of distributed problem solutions.

## Course Structure

Instruction will involve lectures, programming assignments, assigned papers, written reviews of papers, discussions, a midterm exam, and a final exam.

Lecture sessions will cover the sections of the textbook listed on the schedule for each lecture date, provide opportunities for class discussions of assigned papers, give project advice, and address student questions.

There will be four required programming assignments, and one optional programming assignment.

In addition to the textbook, a selection of classic and current research papers will be assigned. Each student will write a two paragraph summary for each assigned paper.

## Instructors

**Dr Patrick Morrison** (pjmorris) - *Instructor*
**Email:** pjmorris@ncsu.edu
**Phone:** 9544017768
**Office Location:** Engineering Building II (EB2)
**Office Hours:** 5pm-6pm, Tuesday

## Course Meetings

### Lecture
**Days:** TH
**Time:** 6:00pm - 7:15pm
**Campus:** Centennial
**Location:** EB3, Room 2201
*This meeting is required.*

## Course Materials

### Textbooks
**Operating Systems: Three Easy Pieces** - *Remzi H. Arpaci-Dusseau Andrea C. Arpaci-Dusseau*
**Edition:** 1.00
**ISBN:** 978-1985086593
**Web Link:** http://pages.cs.wisc.edu/~remzi/OSTEP/
**Cost:** Free
*This textbook is required.*

### Expenses
None.

## Materials

None.

# Requisites and Restrictions

## Prerequisites

CSC 244 or 246 (OS),
CSC 314 (data structures), and
Programming competence in C (not C++) and Unix.

## Co-requisites

None.

## Restrictions

None.

# General Education Program (GEP) Information

## GEP Category

**This course does not fulfill a General Education Program category.**

## GEP Co-requisites

**This course does not fulfill a General Education Program co-requisite.**

# Transportation

This course will not require students to provide their own transportation. Non-scheduled class time for field trips or out-of-class activities is NOT required for this class.

# Safety & Risk Assumptions

None.

# Grading

## Grade Components

| Component | Weight | Details |
|---|---|---|
| Programming Assignments | 40 | |
| Midterm | 20 | |
| Final | 25 | |
| Class Participation - paper reviews, quizzes, discussion | 15 | |

## Letter Grades

**This Course uses Standard NCSU Letter Grading Scale**

97 ≤ A+ ≤ 100
93 ≤ A < 97

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90  ≤  A-  <  93
87  ≤  B+  <  90
83  ≤  B   <  87
80  ≤  B-  <  83
77  ≤  C+  <  80
73  ≤  C   <  77
70  ≤  C-  <  73
67  ≤  D   <  70
63  ≤  Đ   <  67
60  ≤  D-  <  63
0   ≤  F   <  60
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### Requirements for Credit-Only (S/U) Grading

Performance in research, seminar and independent study types of courses (6xx and 8xx) is evaluated as either "S" (Satisfactory) or "U" (Unsatisfactory), and these grades are not used in computing the grade point average. For credit only courses (S/U) the requirements necessary to obtain the grade of "S" must be clearly outlined.

### Requirements for Auditors (AU)

Information about and requirements for auditing a course can be found at http://policies.ncsu.edu/regulation/reg-02-20-04.

### Policies on Incomplete Grades

If an extended deadline is not authorized by the Graduate School, an unfinished incomplete grade will automatically change to an F after either (a) the end of the next regular semester in which the student is enrolled (not including summer sessions), or (b) by the end of 12 months if the student is not enrolled, whichever is shorter. Incompletes that change to F will count as an attempted course on transcripts. The burden of fulfilling an incomplete grade is the responsibility of the student. The university policy on incomplete grades is located at http://policies.ncsu.edu/regulation/reg-02-50-03. Additional information relative to incomplete grades for graduate students can be found in the Graduate Administrative Handbook in Section 3.18.F at http://www.fis.ncsu.edu/grad_publicns/handbook/

### Late Assignments

Assignments must be submitted prior to the due date and time announced in advance. Late submissions will not be accepted apart from absences excused according to the University attendance policy. Incomplete grades will not be assigned except in cases of absences excused according to the University attendance policy.

### Attendance Policy

For complete attendance and excused absence policies, please see http://policies.ncsu.edu/regulation/reg-02-20-03

| Attendance Policy |
|---|

This course follows the University Attendance Regulation (REG02.20.03), available at http://policies.ncsu.edu/regulation/reg-02-20-03.

The instructor imposes no formal limits on absences from lecture, but attendance in lecture is strongly encouraged because the discussions may involve material not in any textbook. Students are responsible for all material presented or discussed in lecture.

**Absences Policy**
None.

**Makeup Work Policy**
None.

**Additional Excuses Policy**
None.

## Academic Integrity

**Academic Integrity**
Students are required to comply with the university policy on academic integrity found in the Code of Student Conduct found at http://policies.ncsu.edu/policy/pol-11-35-01

**Academic Honesty**
See http://policies.ncsu.edu/policy/pol-11-35-01 for a detailed explanation of academic honesty.

**Honor Pledge**
Your signature on any test or assignment indicates "I have neither given nor received unauthorized aid on this test or assignment."

## Electronically-Hosted Course Components

Students may be required to disclose personally identifiable information to other students in the course, via electronic tools like email or web-postings, where relevant to the course. Examples include online discussions of class topics, and posting of student coursework. All students are expected to respect the privacy of each other by not sharing or using such information outside the course.

## Accommodations for Disabilities

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Resource Office at Holmes Hall, Suite 304, Campus Box 7509, 919-515-7653. For more information on NC State's policy on working with students with disabilities, please see the Academic Accommodations for Students with Disabilities Regulation (REG02.20.01) (https://policies.ncsu.edu/regulation/reg-02-20-01/).

## Non-Discrimination Policy

NC State provides equal opportunity and affirmative action efforts, and prohibits all forms of unlawful discrimination, harassment, and retaliation ("Prohibited Conduct") that are based upon a person's race, color, religion, sex (including pregnancy), national origin, age (40 or older), disability, gender identity, genetic information, sexual orientation, or veteran status (individually and collectively, "Protected Status"). Additional information as to each Protected Status is included in NCSU REG 04.25.02 (Discrimination, Harassment and Retaliation Complaint Procedure). NC State's policies and regulations covering discrimination, harassment, and retaliation may be accessed at http://policies.ncsu.edu/policy/pol-04-25-05 or https://oied.ncsu.edu/divweb/. Any person who feels that he or she has been the subject of prohibited discrimination, harassment, or retaliation should contact the Office for Equal Opportunity (OEO) at 919-515-3148.

## Course Schedule

**NOTE:** The course schedule is subject to change.

### Lecture TH 6:00pm - 7:15pm — Online Schedule — 08/22/2019 - 08/22/2019

Schedule is posted at https://github.com/pjmorris/CSC501/blob/master/Schedule.md