Instructor: Pradip K Srimani  
116 McAdams Hall  
656-5886, psriman@clemson.edu

Office Hours:  
11 am – 12:30 pm TTh  
(Instructor)  
via email (TA)  
Or by appointments

Teaching Assistant: TBA

Objectives & Outcomes:
The objective in this class is for students to become familiar with Operating Systems concepts. The student who completes this course:

- Will understand the basic components of a computer operating system.
- Will understand the impact of the process-scheduling algorithm used by an operating system.
- Will be able to use synchronization services provided by an operating system in implementing multithreaded application programs.
- Will understand the issues involved in virtual memory support in a modern computer system.

Catalog Description

CPSC 3220 Introduction to Operating Systems 3 (3) Detailed studies of management techniques for the control of computer hardware resources. Topics include interrupt systems, primitive level characteristics of hardware and the management of memory, processor, devices, and data. Credit may not be received for both CPSC 322 and 332. Prerequisites: CPSC 2120 and CPSC 2310 with a C or better; or E 2230 and ECE 2720 with a C or better.


Reading for C & pointers, Beej’s Guide to C, simple Makefiles, and Advanced Linux Programming. Do not skip these materials; you will need them for programming assignments.
Schedule: Click here to view a tentative course schedule (We will update continually; check often)

Tentative Outline of Topics:

- Operating Systems — what is an OS? Why is OS needed and why do we need to learn about OS?
- OS Structure
- Process Management
  - Processes
  - Threads
  - CPU Scheduling
  - Process Synchronization
  - Deadlocks
- Memory Management
  - Main Memory
  - Virtual Memory
- Storage Management
- Protection & Security
- Distributed Systems and Special Purpose Systems

Tentative Grading (subject to change):

The final grade for the course will be computed based upon the following distribution (tentative: may change):

- Projects – 25%
- Homework/In-class quizzes – 20%
- 2 Tests – 30%
- Comprehensive Final Exam – 25%

Class Policy on submission: You cannot turn in work that has been turned in for credit in another course.

Grade Appeal: You must email any grade challenges regarding exams, quizzes, exercises, or programs to the instructor, with detailed justifications, within one week of the date the grades are posted.

Attendance

Attendance is expected, but not required. We may cover material in an order different from the textbook. You are responsible for any material covered in class. You are responsible for any announcements, assignments or assignment modifications announced in class whether you are present or not. This also applies to arriving late to class or leaving early. We will have unannounced quizzes during class; 5 to 10 quizzes are expected during the semester. We will not have any make-ups.
Projects

We will do 3-4 projects during the semester in C on UNIX platforms. Several of these will involve concurrent processes and/or threads.

- Programs must run on School of Computing servers. (Your laptop may have applications and/or libraries not available on the servers; thus, if your program makes use of these, your program cannot be run and graded on the servers.)
- Programs are due just before midnight on the due date.
- Programs that work correctly for a few test cases but not for all reasonable inputs will not be given full points. It is your responsibility to code correctly for reasonable inputs.
- Unless otherwise noted, programming is to be individual work. Do not discuss the solution to an assignment with anyone else (either a class member or someone else). If you have questions, ask the TA or the Instructor in person or by email.

Note: You should be reasonably proficient in using C and pointers on unix platforms; programming help may not be available.

Deadlines

Work is due at the specified deadline. We will not accept late program submissions. If a project (homework, programming assignment, etc.) is only partially completed you should submit what you have by the deadline. You should expect very little to no credit for projects that still generate syntax errors.

Instructor Late: If the instructor is late for class, students are expected to wait for 15 minutes before they leave.

Cancellation of Class: If classes are cancelled by the university on the day of a scheduled test, we will reschedule the test.

Academic Integrity

As members of the Clemson University Community, we have inherited Thomas Green Clemson's vision of this institution as a "high seminary of learning". Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a Clemson degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form. Read the university academic integrity statement. Unless otherwise specified in an assignment, you are expected to work independently on projects and labs. If you are in doubt about the type of help you may give or receive on a project: ASK!
University Accessibility Statement:

Clemson University values the diversity of our student body as a strength and a critical component of our dynamic community. Students with disabilities or temporary injuries/conditions may require accommodations due to barriers in the structure of facilities, course design, technology used for curricular purposes, or other campus resources. Students who experience a barrier to full access to this class should let the professor know, and make an appointment to meet with a staff member in Student Accessibility Services as soon as possible. You can make an appointment by calling 864-656-6848, by emailing mailto:studentaccess@lists.clemson.edu, or by visiting Suite 239 in the Academic Success Center building. Appointments are strongly encouraged – drop-ins will be seen if at all possible, but there could be a significant wait due to scheduled appointments. Students who receive Academic Access Letters are strongly encouraged to request, obtain and present these to their professors as early in the semester as possible so that accommodations can be made in a timely manner. It is the student’s responsibility to follow this process each semester. You can access further information here: http://www.clemson.edu/campus-life/campus-services/sds/.

The Clemson University Title IX (Sexual Harassment) Statement

Clemson University is committed to a policy of equal opportunity for all persons and does not discriminate on the basis of race, color, religion, sex, sexual orientation, gender, pregnancy, national origin, age, disability, veteran’s status, genetic information or protected activity in employment, educational programs and activities, admissions and financial aid. This includes a prohibition against sexual harassment and sexual violence as mandated by Title IX of the Education Amendments of 1972. This policy is located at http://www.clemson.edu/campus-life/campus-services/access/title-ix/. Mr. Jerry Knighton is the Clemson University Title IX Coordinator. He also is the Director of Access and Equity. His office is located at 110 Holtzendorff Hall, 864.656.3184 (voice) or 864.656.0899 (TDD).

Academic Calendar Fall 2019

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
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<tbody>
<tr>
<td>Aug 19, Mon</td>
<td>University Convocation</td>
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<tr>
<td>Aug 19, Mon - Aug 20, Tue</td>
<td>Late enrollment</td>
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<tr>
<td><strong>Aug 21, Wed</strong></td>
<td><strong>Classes begin</strong></td>
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<tr>
<td>Aug 27, Tue</td>
<td>Last day to register or add a class or declare Audit</td>
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<tr>
<td>Aug 29, Thu</td>
<td>e-Learning Day, no in-classroom instruction</td>
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<tr>
<td><strong>Sep 3, Tue</strong></td>
<td><strong>Last day to drop a class or withdraw without a W grade</strong></td>
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<tr>
<td>Sep 10, Tue</td>
<td>Last day to apply for December graduation</td>
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<tr>
<td>Oct 11, Fri</td>
<td>Last day for instructors to issue midterm evaluations</td>
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<tr>
<td><strong>Oct 14, Mon - Oct 15, Tue</strong></td>
<td><strong>Fall break</strong></td>
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<tr>
<td>Oct 29, Tue</td>
<td>Last day to drop a class or withdraw without final grades</td>
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<tr>
<td>Nov 4, Mon</td>
<td>Registration for spring and summer terms begins</td>
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<tr>
<td><strong>Nov 27, Wed - Nov 29, Fri</strong></td>
<td><strong>Thanksgiving holidays</strong></td>
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<tr>
<td>Dec 5, Thu - Dec 6, Fri</td>
<td>Classes meet; exams in labs and one-hour courses only</td>
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<tr>
<td><strong>Dec 9, Mon - Dec 13, Fri</strong></td>
<td><strong>Final Examinations</strong></td>
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<tr>
<td>Dec 16, Mon</td>
<td>9:00 A.M Deadline to submit candidate grades</td>
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<tr>
<td>Dec 18, Wed</td>
<td>9:00 A.M Deadline to submit other grades</td>
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<tr>
<td>Dec 18, Wed</td>
<td>Candidates for graduation may access grades</td>
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<tr>
<td>Dec 18, Wed</td>
<td>Doctoral Hooding at the Brooks Center</td>
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<tr>
<td>Dec 19, Thu</td>
<td>Graduation</td>
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Online Resources for Similar Courses: [from Mark’s course in Fall 2017]

- **CS 140: Operating Systems**, John Ousterhout, Stanford
- **CS 162: Operating Systems and Systems Programming**, Ion Stoica, UC Berkeley
- **CSE 451: Operating Systems**, John Zahorjan, UW
- **CMPT 300 videos**, Introduction to Operating Systems, Arvindh Shriraman, Simon Fraser University
- **pthread library links**
  - Blaise Barney, *POSIX Threads Programming*, Lawrence Livermore National Laboratory, on-line tutorial
  - Alfred Park, *Multithreaded Programming (POSIX pthreads Tutorial)*
  - Oracle, Multithreaded Programming Guide, *Programming with Synchronization Objects*
  - *Helgrind tool for detecting synchronization errors in pthread code* (part of Valgrind tool set)