COMP 421/ELEC 421, COMP 521/ELEC 552
Operating Systems and Concurrent Programming
Course Syllabus

Course Description

This course provides a basic understanding of the software that manages a computer’s hardware resources to provide a powerful abstract interface on which user programs execute. The course focuses on the control and utilization of processor, memory, storage, and network resources. The concepts in this course include operating system structure, process management and scheduling, interprocess communication, synchronization of concurrent processes, deadlock, main and secondary storage management, virtual memory, file systems, protection and security, and some introduction to networking.

The course content is structured into two parts, a principles part and a projects part. The lectures and projects have been sequenced so that by the time you are working on a project, we have covered the concepts involved in that project in the lectures. Your implementation work in the projects will help make those concepts “real” and anchor these ideas in your understanding.

There are two versions of this course: COMP 421/ELEC 421, intended for undergraduate students, and COMP 521/ELEC 552, intended for graduate students. The lectures for both versions meet together, and the projects and exams for both are the same. However, for students taking the graduate version of the course, COMP 521/ELEC 552, there will be an additional emphasis as part of each of the projects on performance and efficiency issues related to the project.

Class Meetings

Tuesday and Thursday, 2:30–3:45, Herring Hall 100.

Instructor

Dave Johnson, dbj@cs.rice.edu, DCH 3007, x3063.

Office hours: Tuesdays, 3:45–4:45 PM, HRG 100 and/or DCH 3007. Specifically, class ends at 3:45, and I will remain in the classroom Tuesdays as long as students remain with questions or until we get thrown out of the room for some other event, after which I will be in my office for the remainder of my office hours.

TAs (sorted in order of office hours schedule)

Peter Elmers, pe4@rice.edu.
Office hours: Mondays 2:00-3:00 PM (Martel College Commons).

Nicholas Kwon, nhk3@rice.edu.
Office hours: Tuesdays 7:00-8:00 PM (Martel College Commons).

Robin Liu, wl22@rice.edu.
Office hours: Wednesdays 1:00-2:00 PM (DCH 3063).
Prerequisites

Students taking this course should have already taken the Rice courses COMP 215 and COMP 321 (or COMP 221), or equivalent. In particular, you must be familiar with data structures and basic computer architecture concepts. You must also be proficient in programming in the C programming language on UNIX/Linux systems.

Most importantly, all programming projects in this course must be done in C, and the projects will require a significant amount of programming. If you need to review your programming skills, pay special attention to studying data structures with pointers. Operating systems, in general, use more pointers (and sometimes in more confusing ways) than “normal” types of programs commonly do.

Be sure you understand exactly what a pointer actually is and how to make it point to something; there is a very important difference between declaring a pointer variable and making that pointer point to something (including allocating what you make it point to). Also be sure you understand the difference between a “static” or “global” variable, an “automatic” variable, and a variable allocated with “malloc” (or “calloc” and related calls).

Text


The textbook should be available in Rice’s bookstore and is available (much less expensively) at various on-line retailers such as Amazon.com. Note that we will cover topics in more depth than in the book, and will also cover some in a slightly different order. There may also be a few additional reading assignments, to be handed out in class during the semester.

Assignments

The assignments in this course will include three programming projects, plus a midterm exam and a final exam. The midterm exam will be take-home; the final exam will be scheduled by the Registrar.
The exams may cover any material covered in the course. This includes the material from the lectures, from the assigned sections of the textbook, from any additional reading assignments handed out, or from the programming projects.

The first programming project must be done individually, and the latter two projects will be done in groups of two students. The projects must be done on the Rice CLEAR system running Linux. For the programming projects done in groups, both partners in a project group must fully understand and participate in designing and programming the solution to the project. For example, there might be a question on an exam that can only be answered well if you have done the projects and really understand them.

As noted above, for each of the three projects, for students taking the graduate version of the course, there will be an additional emphasis on performance and efficiency issues related to the project. In particular, for each of the projects, students taking COMP 521 or ELEC 552 must also write a report addressing issues including the factors affecting the performance of the design in their solution to the project and the issues involved in scaling the project to larger sizes (e.g., more processes, larger memory or disk sizes, etc.). This report must be done individually, even for the second and third projects, where the other aspects of the project are done in groups of two students; within a project group, each student taking COMP 521 or ELEC 552 must write their own report individually, not jointly with your group partner on that project.

Grading

Your final grade for the course will be computed based on the following tentative weights for the individual assignments:

- 10% First programming project
- 20% Second programming project
- 20% Third programming project
- 25% Midterm exam
- 25% Final exam

In addition, your weighted project average and weighted exam average must each be a passing grade in order to pass the course.

Questions about grading on any assignment should first be directed to the person who graded that specific assignment or question. If you are still not happy after that, see the instructor.

Work Load

This course requires a substantial amount of work, particularly in the projects. My best advice to you is to start each assignment early; don’t wait until the last few days to try to do all the work. You will need to start on the programming projects early in order to make good use of your time during the assignment; for example, it may take some time while working on the project to pause and understand why something may not be working correctly before proceeding with the next part of the project. I also recommend you work on each project incrementally, implementing and testing each part of the project before proceeding with the next part of the project. The projects can be enriching if you stay on top of them; they can be impossible if you don’t.
Course Web Site

The course web site is located at

http://www.clear.rice.edu/comp421/

This course syllabus as well as other up-to-date information about the course will be available via this web site. Online versions of handouts distributed in class will also be available there. Course announcements, such as schedule changes, clarifications to the assignments, and reading assignments will also be posted to the course web site. Please check the web site regularly for announcements.

We will also be using Piazza for class discussion. Piazza is a web-based platform that will allow you to post questions about the course material, including the course projects, and to quickly receive answers from me, from the TAs, and from your fellow classmates.

_Please register now for the course on Piazza_ by going to

https://piazza.com/rice/spring2017/comp421

Throughout the semester, beyond regularly checking the course web site, you should also check Piazza regularly for new information. In addition to finding answers to your own questions, reading other questions and answers on Piazza can help you find additional valuable information including project assistance and clarifications and schedule updates.

Honor Code Policy

The Honor Code is a special privilege and responsibility at Rice University. As stated in a January 20, 2016 editorial in _The Rice Thresher:_ “As incoming students enter Rice, many are surprised by the degree to which the university’s Honor Code extends trust to the student body. ... The privileges of the Honor Code stem from the idea that Rice’s aim is not just to instill knowledge in its students, but [to] also help them develop moral character. This idea is fundamental to Rice’s identity: Students can and should be held to a high moral character standard.”

Specifically, all assignments in this course are conducted under the Rice Honor System, and you are expected to behave in all aspects of your work in this course according to the Rice Honor Code. When in doubt as to whether a specific behavior is acceptable, ask the instructor for a written clarification. Suspected Honor Code violations in this course will be reported in complete detail to the Rice Honor Council. For more information on the Rice Honor System, see http://honor.rice.edu/.

For the programming assignments in this course, students are encouraged to talk to each other, to the TAs, to the instructor, or to anyone else about the assignment. This assistance, however, is limited to general discussion of the problem; _each student or project group must produce their own solution to each programming project_. Consulting or copying, in any manner, another student’s or project group’s solution (even from a previous class or previous year) is prohibited, and submitted solutions may not be copied from any source.

Also, for students taking COMP 521 or ELEC 552, for each project, each student must write their _own_ report on performance and efficiency issues related to the project, _not_ for example jointly with your group partner on that project. Submitted reports must not be copied from any source, and you must fully cite any references you use in preparing your report.
Policy on Late Work

Take project deadlines seriously. Late assignments will not be accepted, except when there are extenuating circumstances. If you are aware of unusual circumstances that preclude a timely submission (e.g., you have to be out of town for a wedding or job interview on the submission date) submit the assignment early or contact the instructor in advance to arrange for delayed submission if warranted. After-the-fact explanations will not be treated favorably. Sometimes, of course, unusual circumstances may arise without prior notice, but even in those cases, you should try to alert the instructor (e.g., by email) before the submission deadline.

Students with Disabilities

If you have a documented disability that may affect your academic performance in this class, you should make sure this documentation is on file with Rice’s Disability Support Services (located in Allen Center room 111, adarice@rice.edu, x5841) to determine the accommodations you need. You should also meet with me to discuss your accommodation needs.