LARGE-SCALE PROGRAMMING & TESTING

F21 CSCI 4460/6460
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Office Hours: TBD
PURPOSE OF THIS COURSE

This course focuses on software development techniques in support of large-scale software projects and maintenance.

Specific topics include various programming paradigms and techniques, approaches to testing and automation, debugging, refactoring, and inheriting code.

Individual and team assignments are required, including programming assignments.

Specific project topics include (low-level) text processing, building a full-scale search engine, and the like.

Prerequisite: CSCI 2300 Introduction to Algorithms

LEARNING OUTCOMES

At the conclusion of this course, you will be able to:

* Efficiently identify defects in software systems, in particular in functions, modules, classes, interfaces, designs, code, etc.
* Demonstrate the ability to scale up, i.e., to refactor and effectively maintain increasingly large-scale code bases.
* Design and implement repeatable test plans that ensure high levels of quality.
* Identify (and avoid) anti-patterns in software design, development, and testing.

In addition, for students registered in CSCI 6460:

* Effectively coordinate one or more software development teams to facilitate successful communication, organization, and progress toward demonstrable goals.
COMMUNICATION-INTENSIVE

For undergraduate students, this course serves as a CSCI in-major communication intensive (CI) course.

Therefore, expect a lot of writing (not just code!), a lot of communication with your classmates, and multiple presentations.

Communication with your classmates will entail both a semester-long team project and smaller in-class mini-assignments.

We will also have class discussions in which participation is important!

COURSE TA AND MENTORS

Graduate TA:
* Megha Singh Rajpoot

Undergraduate mentors:
* Zachary Fernandes
* Graham Misail

TA and mentor office hours will be posted in Submitty.

Our TA and mentors will attend class meetings and participate in our in-class work.

Please do not email Megha, Zachary, or Graham…
* Instead, please communicate using the Discussion Forum in Submitty (or the Grade Inquiry interface).
* (In general, email me directly with any urgent or personal matters.)
RECOMMENDED TEXTBOOKS

The C Programming Language, 2nd ed. by Kernighan and Ritchie, 1988

Programming Rust, 2nd ed. by Blandy, Orendorff, and Tindall, 2021


The Mythical Man-Month, Anniversary ed. by Brooks, 1995

Search Engines: Information Retrieval in Practice by Croft, Metzler, and Strohman, 2009

Algorithms of Oppression: How Search Engines Reinforce Racism by Noble, 2018

REQUIRED “TEXTBOOK”

Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor by Virginia Eubanks, 2018

First reading assignment: https://www.npr.org/sections/alltechconsidered/2018/02/19/586387119/automating-inequality-algorithms-in-public-services-often-fail-the-most-vulnerable

...also look for it on audio!
COURSE LMS

All course materials will be available via Submitty:
- [https://submit.cs.rpi.edu/courses/f21/csci4460](https://submit.cs.rpi.edu/courses/f21/csci4460)
- Log in using your RCS ID (e.g., “goldsd3”)

The course schedule will be posted there (and will likely change)

We will use Submitty’s Discussion Forum
- Watch for course announcements (typically also auto-emailed)
- Post questions; also answer questions

Check your RPI email and the Discussion Forum at least daily for announcements, etc.

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It is your responsibility to stay up-to-date with announcements posted on the Discussion Forum

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REQUIRED SOFTWARE AND OS

We will use numerous programming languages, all of which have compilers, interpreters, and IDEs available for free via the Web

We will focus on C (not C++) and Rust for individual homeworks

We will use Submitty for all assignments, which will include auto-grading to the extent possible
- Therefore, it is highly recommended that you use Ubuntu 20.04.3 LTS (though 18.04 should be fine, too!)

We will also have server space within the CSCI department for implementing and integrating our team-based search engine project
GRADING CRITERIA

Grading breakdown is as follows:

- **Homeworks (3)**: 30%
- **Exam (1)**: 15%
- **Class Participation**: 10%
- **Team Participation**: 10%
- **Team Project Deliverables**: 25%
- **Team Presentations**: 10%

**Late days in Submitty:**
- Only for homeworks, some participation grades, and some team project deliverables
- Late days are intended to cover minor illnesses, hardware malfunctions, inevitable conflicts with other assignments, and other minor (and absurd) mishaps
- Each of you will initially be given **seven** late days for the semester
- No more than **two** late days may be used for any one assignment
- If used on a team assignment, each team member must use a late day...
- Note that auto-graded assignments will have very few penalty-free submissions

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**Individual Work (mostly)**

**Project Team Work**

It is **your responsibility to stay up-to-date with assignments, especially team assignments**

ATTENDANCE AND CLASSROOM POLICIES

Attendance is required

For prescheduled and unforeseen absences for which you would like to obtain an extension on a deadline, see [http://bit.ly/rpiabsence](http://bit.ly/rpiabsence)

Do not ask for an extension without first obtaining an excused absence via the above URL
- If possible, please suggest a new due date for the affected assignment(s)
- Extensions will not be given because you forgot or you had too many other assignments to do, etc.

For every meeting you attend, please silence or turn off cellphones and other non-classroom electronic devices to avoid any distractions

Please adhere to COVID-19 rules (i.e., wearing of masks)
INDIVIDUAL ASSIGNMENTS

There will be three individual homework assignments on C and Rust (30%)
- Homeworks will be submitted and auto-graded via Submitty, which is running Ubuntu 20.04.3 LTS and uses gcc 9.3.0
- Homeworks will also be manually evaluated and graded

There will be one comprehensive exam in November (15%)
- The exam primarily covers programming in C and Rust, software architecture, design approaches, debugging techniques, methodologies for scaling up, etc.
- There is no final exam in this course!

There will be a few smaller assignments that will count as your participation grade (10%)
- Think of these as lecture exercises or hands-on individual/team mini-assignments

There will be a “team participation” grade for your individual contributions toward your team project (10%)

PROJECT TEAM ASSIGNMENTS

Project teams will be formed by the end of Week 3
- Each team will have a designated team coordinator
- Team meetings will occur both during class and outside of our class meetings

For each team, there will be numerous team deliverables (25%) that will cover your design, key architectural divisions, interfaces, test plans, automated testing, coding standards, meeting minutes, etc.

For each team, there will be two team presentations (10%)
- The first presentation will be due by the end of Week 8
- The second presentation will be due by the end of Week 12
GRADING POLICIES AND CSCI 6460

You may appeal a grade by submitting a grade inquiry (via Submitty)

- Grade inquiries must be submitted within seven days of grades being announced
- Smaller assignments will not have grade inquiries enabled (in rare cases, email me)

Course grades are determined by applying the following ranges:

- 93-100 A; 90-92 A-; 87-89 B+; 83-86 B; 80-82 B-; 77-79 C+; 73-76 C;
  70-72 C-; 67-69 D+; 60-66 D; 0-59 F; (grade cutoffs are reviewed at the end of the semester)
- For students registered for CSCI 6460, the D+ and D grades are replaced with an F

Students registered for CSCI 6460 have the additional responsibilities of coordinating their team

- Both the team and class participation grades will include additional questions/assignments
- There will also be additional questions to answer on some individual homework assignments
INCLUSIVITY

I am committed to ensuring full participation of all students in this course.

I will strive to provide an environment that is equitable and conducive to achievement and learning for all students.

I ask that we all be respectful of one another’s diverse backgrounds and of all class members, regardless of those personal attributes that make each of us unique.

I ask that we all use respectful and inclusive language in our written and oral communication (e.g., during class and office hours, on the Discussion Forum, etc.).

If you have individual learning needs, please let me know.

Also, if you want to make me aware of an issue (e.g., from a team meeting or a class discussion or etc.), please email me directly.

ACCESSIBILITY

From http://studenthealth.rpi.edu/disabilityservices:

* “The Office of Disability Services for Students (DSS) assists Rensselaer students with disabilities in gaining equal access to academic programs, extracurricular activities, and physical facilities on campus. DSS is the designated office at Rensselaer that obtains and files disability-related documentation, assesses for eligibility of services, and determines reasonable accommodations in consultation with students.”

Contact: dss@rpi.edu or 518-276-8197 or Academy Hall 4226

Please take care of your accommodations by Friday 9/10

* (You must renew your accommodations each academic year)
ACADEMIC INTEGRITY

Rensselaer Handbook of Student Rights and Responsibilities:

* "Intellectual integrity and credibility are the foundation of all academic work. A violation of the Academic Integrity policy is, by definition, considered a flagrant offense to the educational process. It is taken seriously by students, faculty, and Rensselaer and will be addressed in an effective manner."

* "If found responsible for committing academic dishonesty, a student may be subject to one or both types of penalties: an academic (grade) penalty administered by the professor and/or disciplinary action through the Rensselaer judicial process described in this handbook."

https://info.rpi.edu/dean-students/student-rights-responsibilities-and-judicial-affairs

ACADEMIC INTEGRITY POLICY

Individual assignments in this course must be the sole work of each individual student; for group projects, submitted work must be the sole work of the team members

If found in violation of the academic dishonesty policy:

* You will receive a grade of zero on the given assignment
* For a second offense, you will receive an F in the course
* Team offenses will follow the above policy for all team members
* Each incident will be reported to the Dean of Students or Graduate Dean, as applicable, as well as the Department Head
* Cheating may cause you to be ineligible to mentor for the department, participate in departmental organizations, etc.
QUESTIONS?

Welcome to Rensselaer's Submitty
Student Information System