CIS 405 Software Engineering

Dr. Laura Grabowski

Spring 2024

Contact Information:		
SUNY Potsdam CS Discord: https://discord.gg/raZaTRJ		
E-mail: grabowlm@potsdam.edu		
Office Hours (Dunn 303):		
MWF 11:00 AM – 11:50 AM	Tue 9:00 AM –10:30 AM	and by appointment or drop in
Class Meeting Information:		
MWF 12:00 PM – 12:50 PM, Dunn 208		

Catalog Description

An introduction to the creation of large, reliable software systems. Topics include: development methodologies; application of software standards and testing; using state-of-the-art software engineering tools; teamwork practices and skills; importance of software process in developing quality software; professional ethics in software engineering. Spring. Prerequisite(s): CIS 310 or CIS 356 or CIS 410 or CIS 443.

About the Course

Software Engineering is about the *process* of **efficiently** building **correct** computer programs. Development *process* involves using **methodologies** or ways of working through the various phases of developing software, from specification to delivery. Open source tools have been created to support best software engineering practices at every phase of development. Working in a team, students will learn several industry-standard tools to build, test, and deploy a moderately-sized client-server program.

Coding is telling the *computer* what to do. Programmers spend only a fraction of their time coding and much more of their time telling other *human beings* **why** the program is structured the way it is. The human beings are customers for the software, accountants paying for the software, and future programmers who will patch and extend the software.

Efficient and *correct* development are related: knowing what needs to be done means code only need be written once and testing that the code actually meets its requirements improves development velocity. The tests *document* what the requirements are, *support* changes in code by signaling when expectations are broken, and *communicate* to future programmers where changes in requirements (there are **always** changes in requirements) become changes in the code.

This is not a programming course *per se*. That is to say, the goal of the course is not to teach you programming skills; the course is about learning and applying software engineering concepts, methods, and practices. Doing so involves a lot of programming. Students are expected to have a certain "programming maturity". Students are expected to be very familiar with Java. Specific skills required for the project must be learned independently. There is no laboratory section for this course. Students must, with a spirit of independence and experimentation, continue their learning outside the classroom.

Student Learning Outcomes

Potsdam Pathways: Connecting Theory to Practice

In addition to Departmental ooutcomes, this course also fulfills the Potsdam Pathways *Connecting Theory to Practice through Applied Learning* (CT) requirement for Computer Science majors. The Pathways CT requirement text reads:

> Connecting Theory to Practice through Applied Learning, which counts in the major, is a credit-bearing experience in which students learn by engaging in direct application of skills, theories, and models. Students apply knowledge and skills gained from traditional classroom learning to hands-on and/or real-world settings, creative projects or research, and then apply what they gained from their applied experience to their academic learning. The activity can be embedded as part of a course or can occur outside of the classroom.

Course Student Learning Outcomes

The course has the following Student Learning Outcomes. Students will:

1. Identify the links between skills/theories/models of the discipline [of Computer Science] and practice [of software development]. (Applying) **CT SLO**

2. Explain how they grew personally, professionally, and intellectually as a result of the applied experience. (Evaluating) **CT SLO**

3. Apply team-based, modern software development methodologies. (Applying)

4. Learn and employ new technical software development tools *independently*. (Understanding)

5. Specify, design, and implement a moderately complex software system that meets the requirements of a client. (Designing)

6. Discuss *ethical* dimensions of software engineering. (Applying)

Program Student Learning Outcomes

The Computer Science department has adopted five Student Learning Outcomes for students completing an undergraduate major or minor in the department. These learning outcomes map to the undergraduate computer science curricula outlined by the Association for Computing Machinery (ACM) and the Computing Accreditation Commission (CAC) of the Accreditation Board for Engineering and Technology (ABET). Each course in the curriculum is designed to address particular

outcomes so that the overall curriculum fulfills our goal of producing capable computer scientists. The outcomes serve as a rubric for evaluating the learning that happens in this class.

The course addresses the following Program Student Learning Outcomes for Computer Science.

- Evaluate ethical outcomes of professional policies, practices, and products at societal, organizational, and personal scales.

- Apply, alone and in teams, responsible software engineering methodology, tools, and practices.

Required Materials

- Textbooks:
  - Required:
    * Rubin, K. S. (2013). Essential Scrum: A Practical Guide to the Most Popular Agile Process. Addison-Wesley.
  - Additional text:
    * Freeman, S. and Pryce, N. (2010). Growing Object-oriented Software, Guided by Tests. Addison-Wesley.

- Additional videos, slides, assignment materials, and other helpful materials are available in Brightspace.

General Course Information

- Class meeting time: MWF 12:00 PM – 12:45 PM, Dunn 208.

- Final Exam Date: Wednesday May 15, 2:45 – 4:45 PM. The final exam time will be used for final team project presentation. The take-home written final will be due outside of class, at a time to be determined.

- Lecture topics, activities, and assignment due dates: See the Tentative Schedule (posted in Brightspace and included later in this syllabus) and the weekly checklist for lecture topics, activities, and assignments. Please note that this schedule is tentative and is subject to change. Students will be informed of schedule changes in lecture and through Brightspace.

- Other important dates
  1. Last day to withdraw or elect S/U/P: Friday, March 29.
  2. See the university website for additional calendar information, http://www.potsdam.edu/academics/calendar.

Course Requirements and Grading Procedure

Technical Requirements Summary

Here is a summary of the various software you will need for the course, in addition to the basics of a browser and typical software. The focus of this course is the team software project. To support that project, we will use the following software:

- Git. We will use a Gitea repository on our cs-devel server. for the software project work. If you plan to develop on your own computer, you will need to install Git. Git downloads are available at https://www.git-scm.com/downloads

- p5.js. We will use p5.js to implement our software, for ease of delivery to our outside client and beta-testers. Information, tutorials, downloads, and other information about p5.js may be found here: https://p5js.org/

- Trello. We will use Trello primarily as a virtual Scrum board. I will create a course Trello page and invite you to it (with your Potsdam email). The project team will create a team board as well. You can find more about Trello here: https://trello.com/ . If you happen to already have a Trello account with another email, it's easy to manage boards linked to different emails under the same user account.

- Productivity software, including LaTeX, slides, and spreadsheets. You may also use online resources such as Overleaf and Google, as you prefer.

- **Important note:** I will not instruct you on how to use the software tools. This is an advanced course and I expect that you can learn on your own. I will provide information and tutorials to help get you started with some of the tools. Some of your grade will relate to your independent learning and use of the software tools.

Course Requirements

- Distribution of your grade: I will grade your course work using the distribution shown below.

    - 20% — Individual Assignments
    - 40% — Team Software Development Project
    - 20% — Evaluations
        * 65% — Peer Evaluations
        * 35% — Evaluations by Team
    - 20% — Exams
    - Grades will be visible to you in the grade tool in Brightspace. Please be aware that Brightspace shows only the grade based on completed work and so can be somewhat misleading about your ultimate performance in the course.

- Reading: Each week, you are assigned reading from the textbook and other sources. Reading the assigned material ahead of class discussion will help you understand the concepts and examples and will prepare you for applying the concepts and practices in the team project and other assignments. Background information related to the software project must be prepared in advance so that class time is used efficiently.

- Brief explanation of graded assessments:

    - **Individual Assignments.** You will be assigned several individual assignments. Individual assignments expand your knowledge of software engineering and enhance foundational skills for the team software projects. Individual assignments will include programming projects, technical presentation/demos, and discussion of software engineering ethics case studies.

- **Team Software Development Project.** A large, group programming project, to be developed iteratively using Scrum. The team project will have many milestones. The grade for the team project will have many components, including such areas as weekly sprint review summaries, weekly sprint review presentations, and periodic evaluation of team process and artifacts.

- **Evaluations**.
  * **Peer Evaluations.** Part of your job as a team member is holding each of your team members accountable for their contributions to the team?s work. Honest feedback is a critical tool for improving performance. You will evaluate the performance of your team members frequently throughout the semester. Your completed evaluations may be aggregated with those of the rest of your team and shared with the individual team member. I will assess your evaluation on its thoroughness and objectivity.
  * **Evaluations by Team**. You are accountable to your team. As noted above, your team will collectively hold you responsible for completing your tasks during each sprint. Your team members' evaluations will be averaged and counted as shown above, totaling 7% of your overall course grade.

- **Exams**. There will be two take-home exams, a midterm and a final. The exams will address primarily SLOs 1, 2, and 6 and provide opportunities to synthesize concepts across the many aspects of the course work, Exams must be typeset using LaTeX. Questions will be released 1 – 2 weeks in advance of the due date of the exam and solutions will be turned in through Brightspace.

Grading Procedure

Within each grading area shown in the breakdown above, the overall grade for that area will be computed as the "simple mean" in Brightspace. That means that the relative weight of an assignment is determined by the point value of the assignment. Generally speaking, an assignment worth 25 points carries less weight than one worth 35 points in the same grading area. Point values for assignments are intended to reflect the relative difficulty, importance, or effort of an assignment.

Your course-grade average (on a scale of 0 — 100%) will be then calculated as the weighted average of your averages on each area using the weight distribution that is listed above. Final grades are determined according to the scale shown following, subject to scaling at the discretion of the professor.

4.0: 95 — 100%	2.7: 77 — 79%	1.7: 67 — 69%
3.7: 90 — 94%	2.3: 73 — 76%	1.3: 63 — 66%
3.3: 85 — 89%	2.0: 70 — 72%	1.0: 60 — 62%
3.0: 80 — 84%		0.0: < 60%

NOTE: The actual scale used may be adjusted according to the performance of the class a whole, again at the professor's discretion. In borderline cases, attendance, class participation, and completion of assigned work will be used to make a decision on the course grade.

Grades will be visible to you in the grades tool in Brightspace. Please be aware that Brightspace shows only the grade based on completed work and so can be somewhat misleading about your ultimate performance in the course.

Course Policies

Attendance

This course has a firm focus on best practices and behaviors in the professional Computer Science workplace. Preparation, individual responsibility, and engagement with colleagues are important aspects of best practices and professional behavior. To help foster those behaviors and practices, your participation in class and team meetings is expected and critical to your learning.

My expectation is that you will prepare for and attend class. I am generally flexible when circumstances dictate that you must miss class (illness, emergency). Should such a circumstance arise, you need to contact me as soon as possible. Please note that class absence does not automatically change any due date.

Missing sprint reviews. If an emergency situation or illness compels you to be absent for a weekly sprint review, you must notify both me and your team in advance, with as much advance notice as possible. A minimum acceptable interval is 2 hours in advance of class time.

More on class engagement. In this course, you must think of yourself as a computing professional in a professional community. As professionals, we are expected to:

- show up on time;
- be prepared for our collective work;
- take responsibility for the completion and quality of your work product;
- be appropriately attired; and
- limit distractions during class and team meetings.

Accommodation of Religious Observances

I will make reasonable accommodation for a student's religious beliefs. Please notify me within the first week of classes about any scheduled class date that conflicts with a religious observance.

Course Withdrawal

The last day to drop a semester course without receiving a grade or elect S/P/U is Friday, April 14. For other important dates, see the Academic Calendar,
http://www.potsdam.edu/academics/calendar.

Brightspace Page

All the information and content for the course will be distributed through the course Brightspace page. I expect that you will check the page daily for updates and announcements. Announcements posted in Announcements in Brightspace will automatically be sent to your Potsdam email, so you must also check your email daily. If you have schedule questions, please look in Brightspace first, before you send me an email or Discord message. Brightspace is where all class materials, assignments, *etc.* will be posted. Discord is for communication. Software will be handed in through Gitea.

Grading Policies

Extra Credit

There is none. No special arrangements will be made for extra credit for improving grades.

Grading Questions

If you have a question about a grade, you must (1) wait 24 hours after receiving the grade before contacting me, and (2) email me me within one week of the day the graded work is returned to you with your questions and a justification for why the grade should be revisited. You lose the right to re-grading after that time.

Missed Assignments

Completing all assignments is critical to your understanding and success in this course. Failure to submit assignments will both hamper your overall performance and have a severe negative impact on your course grade.

Late Assignments

Because of the highly collaborative nature of the majority of the work in this course and the emphasis on professional behavior and practice, **no late assignments will be accepted**. If an emergency arises that interferes with your completion of work by a given deadline, or you become ill or need to care for someone who is ill, please contact me as soon as possible, preferably well before the deadline, so that we can work out an arrangement that suits the particular situation. This policy applies to both group and individual assignments.

Incomplete Grades

Incomplete grades (Inc) are granted rarely. Incompletes are not to be used as a shelter from potentially low grades or as a remedy for poor time management. An incomplete grade may be reported for you only when the following conditions are satisfied (SUNY Potsdam Undergraduate Catalog):

1. The student has requested an incomplete.

2. Course requirements have not been completed for reasons beyond the student's control (e.g., illness or family emergency).

3. The student has completed the majority of the work for the class, and the student can accomplish the remaining requirements without further registration.

Please note also that you must be passing the course in order to request an Incomplete.

Academic Integrity and Honesty

Academic Integrity

You are expected to follow the "SUNY Potsdam Academic Honor Code" (SUNY Potsdam Undergraduate Catalog) by doing your own work on all required work for the course unless specifically directed otherwise by the professor, such as in lab assignments. Copying is strictly forbidden.

Students caught cheating will receive a grade of 0 for that evaluation. More than one offense will result in dismissal from the course and possible disciplinary sanctions by the university. Academic Misconduct definitions, procedures, due process, and student rights are described in the SUNY Potsdam Undergraduate Catalog.

You are expressly forbidden from submitting any work you find online for credit in assignments. This includes code, essays, and other assignment solutions. Any violation will be considered cheating and dealt with as described in the preceding paragraph.

Use of AI tools for class work

Please see the separate document, "Appropriate use of AI in the Computer Science Classroom", for the CS Department policy on use of AI tools in Computer Science courses.

Accommodative Services

If you have special needs that must be accommodated to fulfill the course requirements, you must notify the professor and Accommodative Services, 111 Sisson Hall, 267-3267 (more information at https://www.potsdam.edu/studentlife/support/accommodative-services). The university has resources available to assist qualified students with their academic studies. Please note that the professor is not able or qualified to determine what accommodations are necessary and appropriate. That task must be accomplished by the Accommodative Services staff. **It is up to the student to initiate the process with Accommodative Services**.

SUNY Potsdam Department of Computer Science Code of Professional Conduct

All members of the Potsdam Computer Science community are governed by the ACM Code of Ethics and Professional Conduct, https://www.acm.org/about-acm/acm-code-of-ethics-and-professional-conduct, which we have distilled into our SUNY Potsdam Department of Computer Science Code of Professional Conduct (see below). The department faculty are committed to modeling and promoting ethical and professional behavior for all our students.

1 Preamble

All members of the ACM, including the Computer Science faculty of SUNY Potsdam, are committed to ethical professional conduct as specified in the ACM Code of Ethics and Professional Conduct. Students, taking courses from the faculty, are bound by our commitment.

All members of the Department are obliged to remind one another to behave professionally. Violations should be reported promptly; however, capricious or malicious reporting of violations is, itself, a violation. When reporting, bring all relevant aspects of the incident to the faculty's attention. sectionMoral Imperatives As a Computer Science student I will...

1.1 Respect all members of the Department.

1. Be professional in face-to-face and electronic interactions.

2. Be fair so everyone is free to work and learn.

3. Be active in preventing discrimination in physical and electronic spaces frequented by Department members.

1.2 Accept and provide appropriate feedback.

1. Avoid starting or spreading rumors.

2. Respect confidentiality.

1.3 Be honest, trustworthy, and respect intellectual property.

1. Only take credit for my own work.

2. Respect the privacy of others.

3. Access computing resources only when authorized and report any access risks discovered.

1.4 Contribute to society and human well-being.

1. Improve public understanding of computing and its consequences.

2. Consider both the direct and indirect impacts of my actions.

Student Support

Caring Community

I recognize that this is an incredibly stressful time for you, your peers, and our community. Please know that there are resources available to you, both on and off campus, to support you during these very uncertain times. Our excellent Counseling Center staff are available to meet with you; more information can be found on their FAQ page accessed at: https://www.potsdam.edu/studentlife/wellness/counseling-center/coping-covid-19-pandemic/counseling-center-faqs. In addition, information on a variety of on- and off-campus resources can be found our Bear Care site: https://www.potsdam.edu/studentlife/wellness/bear-care. You are an incredibly important member of our Potsdam community; please take care of yourself, and each other.

Professor's Note: The Provost has requested that the following information be included in course syllabi. The following information is presented without modification except to format it for LaTeX. Even though nearly everyone is no longer on campus, I include this information for completeness.

Every student in this class is a valued individual. If you are struggling with issues outside of the classroom, please know that there are professionals both on and off campus who can assist you. If you need immediate assistance, please contact our campus Counseling Center (with free counseling) at (315) 267-2330 or visit their website. Links to other resources are provided below:

Andrea Waters, Title IX Support Staff & Title IX Core Team

- Sisson 244. (315) 267-2350

- http://www.potsdam.edu/offices/hr/titleix

Bias Incident Reporting

- http://www.potsdam.edu/about/diversity/biasincident

Center for Diversity

- 223 Sisson Hall

- (315) 267-2184

- http://www.potsdam.edu/studentlife/diversity

University Police

- Van Housen Extension

- (315) 267-2222 (number for non-emergencies; for an emergency please dial 911)

Student Conduct and Community Standards

- 208 Barrington Student Union

- http://www.potsdam.edu/studentlife/studentconduct/codeofconduct

Reachout (24-hour crisis hotline)

- (315) 265-2422

Renewal House (for victims of domestic violence)

- SUNY Potsdam Campus Office: Sisson 217 (open Wednesdays, 9-5:00)

- (315) 379-9845 (24-hour crisis hotline)

- Email: renewalhouse@verizon.net

And please: if you see something, say something. If you see that someone that you care about is struggling, please encourage them to seek help. If they are unwilling to do so, Care Enough to Call has guidelines on whom to contact. Everyone has the responsibility of creating a college climate of compassion.

Course Schedule

The schedule shown below is tentative and subject to change. Changes will be announced in class and through the course Brightspace page. Please note that not all deliverables are shown in this schedule. Details will be given through Brightspace and in class meetings.

Note: The schedule later in the semester is deliberately sparse so that we can deal with topics and issues that need addressing. Day to day class activities will be updated in class and on Brightspace. Unless otherwise specified, class will continue to meet on all class days throughout the semester.

CIS 405 Tentative Schedule:

Week starting	Week	Topics	Deliverables
22-Jan	1	• Course Introduction • What is Software Engineering? • Agile principles	
29-Jan	2	• Scrum Framework • Project Introduction • Planning team meetings	• Team meeting plan
5-Feb	3	• Test Driven Development (TDD); Acceptance Tests; Walking Skeleton • Software Engineering Code of Ethics	• Team meetings begin • Team starter questions for product owner interview • Processing (individual assignment)
12-Feb	4	• Product Owner Interview (day TBD) • Tech talks	• Tech talk (presentation and outline)
19-Feb	5	• Sprint Planning; Sprint R&R • *Winter Recess: No classes Thu-Fri*	• Team code standards; walking skeleton; acceptance tests • Sprint 1 plan
26-Feb	6	• Sprint 1 R & R (Friday)	• Sprint 1 R&R Report • Peer Eval. #1
4-Mar	7	• Product Owner Interview (day TBD) • Sprint 2 R&R (Friday)	• Sprint 2 R&R Report; Sprint 3 Plan • Midterm exam
11-Mar	8	• Velocity • Technical debt • Sprint 3 R&R (Friday)	• Sprint 3 R&R Report; Sprint 4 Plan • Peer Eval. #2
18-Mar	9	• Sprint 4 R&R (Friday)	• Sprint 4 R&R Report; Sprint 5 Plan
25-Mar	10	• Product Owner Interview (day TBD) • Sprint 5 R&R (Friday)	• Sprint 5 R&R Report; Sprint 6 Plan • Peer Eval. #3
		Spring Break	
8-Apr	11	• Sprint 6 R&R (Friday)	• SE Ethics Case Study Discussion Plan (individual assignment) • Sprint 6 R&R Report; Sprint 7 Plan
15-Apr	12	• SE Ethics Case Studies Discussions • Sprint 7 R&R (Friday)	• SE Ethics Case Studies Discussions • Sprint 7 R&R Report; Sprint 8 Plan
22-Apr	13	• Product Owner Interview (day TBD) • Sprint 8 R&R (Friday)	• Sprint 8 R&R Report; Sprint 9 Plan • Peer Eval. #4
29-Apr	14	• Sprint 9 R&R (Friday)	• Sprint 9 R&R Report; Sprint 10 Plan
6-May	15	• Sprint 10 R&R (Friday)	• Sprint 10 R&R Report
13-May		**Final Exam (Software Project Presentation): Wed May 15, 2:45-4:45 PM**	• Final code repo • Final Sprint Report • Final Peer Eval. • Final Exam

Team assignments   Individual assignments   See Brightspace for reading and video assignments