CSE 403

Software Engineering

Spring 2025

Course introduction

Today

- The CSE 403 team
- Logistics and resources
- What is Software Engineering
- Course overview and expectations

The CSE 403 team

Instructor

- René Just (rjust@cs.washington.edu)
- Office hours: After class and by appointment

Teaching assistants/project managers

- Afuza Afuzarahman
- Arnavi Mahendra Chheda
- Medha Gupta
- Melanie Kneitmix
- Connor Nicholas Reinholdtsen
- David Song

Logistics: meetings

- **Lectures**: M/W/F 12:30pm – 1:20pm (G10)
- **Team meetings**: Tue 1:30pm – 2:20pm (G10)
- **Project meetings**: Thu 1:30pm – 2:20pm (G10)

Until 04/08 use Tue/Thu time to work on your project proposal with your assigned partner.

Logistics: resources

- **Course website**: https://homes.cs.washington.edu/~rjust/courses/CSE403 (cs.uw.edu/403)
- Submission of assignments via **Canvas**: https://canvas.uw.edu
- Project discussions on **Slack**: https://cse403-sp25.slack.com

Logistics: communication

Communication guidelines

- We use Slack for all **non-sensitive** project communication.
- See the Slack guidelines for this course.

Resources

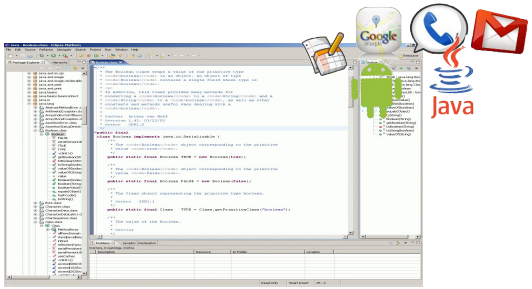
- The go-to page for this course is the course web site.
- All relevant information is on the website, or linked from it.
- Canvas for assignments and non-public materials.

Today

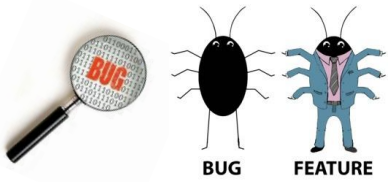
- The CSE 403 team
- Logistics and Background
- What is Software Engineering
- Course overview and expectations

What is Software Engineering?

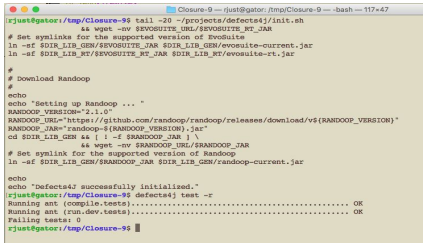
- Developing in an IDE and software ecosystem?



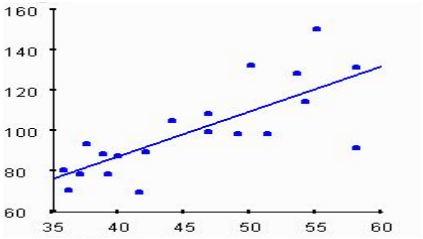
- Debugging and maintaining a software system?



- Deploying and running a software system?



- Empirically evaluating a software system?



- Writing (design) docs?

All of the above and much more!

What is Software Engineering?

More than just writing code

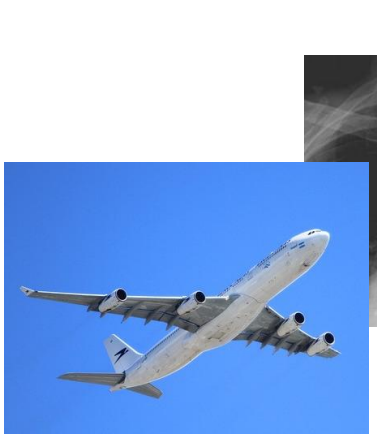
The complete process of specifying, designing, developing, analyzing, deploying, and maintaining a software system.

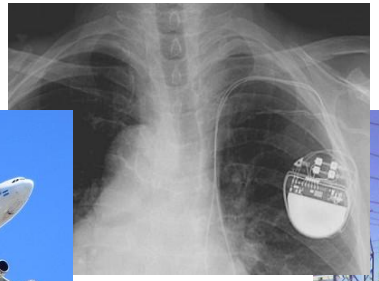
- Common Software Engineering tasks include:
  - Requirements engineering
  - Specification writing and documentation
  - Software architecture and design
  - Programming
  - Software testing and debugging
  - Maintenance and refactoring

Just one out of many important tasks!

Why is Software Engineering important?

Software is eating the world!





Why is Software Engineering important?

Software is eating the world!

Summary: Software Engineering

What is Software Engineering?

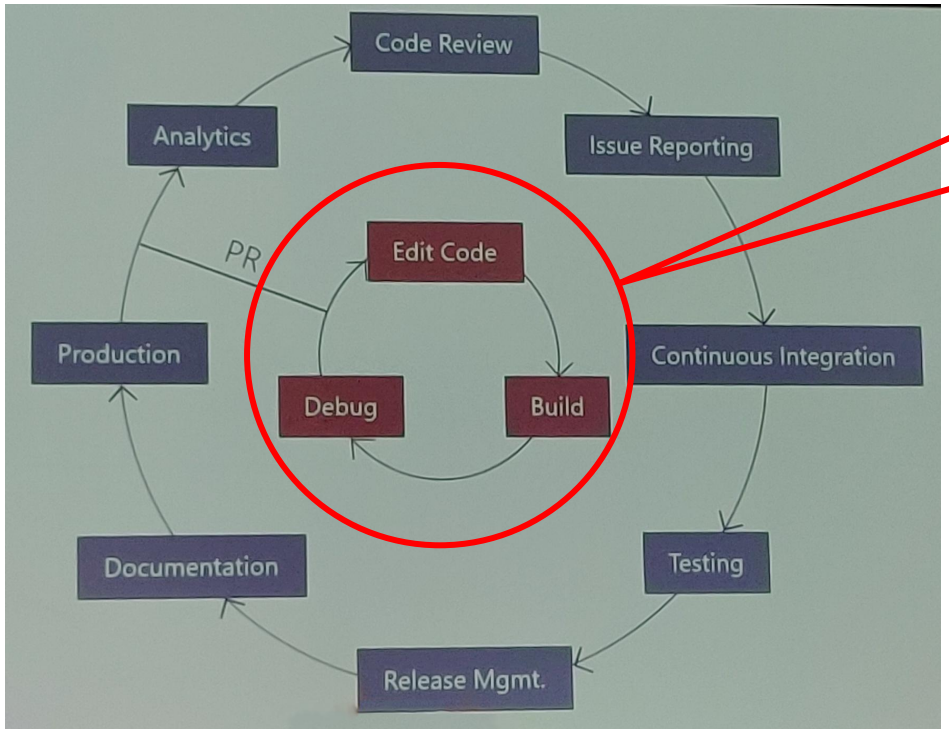
- The complete process of specifying, designing, developing, analyzing, and maintaining a software system.

Why is it important?

- Decomposes a complex engineering problem.
- Organizes processes and effort.
- Improves software reliability.
- Improves developer productivity.

Does GenAI render Software Engineering obsolete?

The Role of Software Engineering in Practice



Intro-level courses focus on the inner loop.

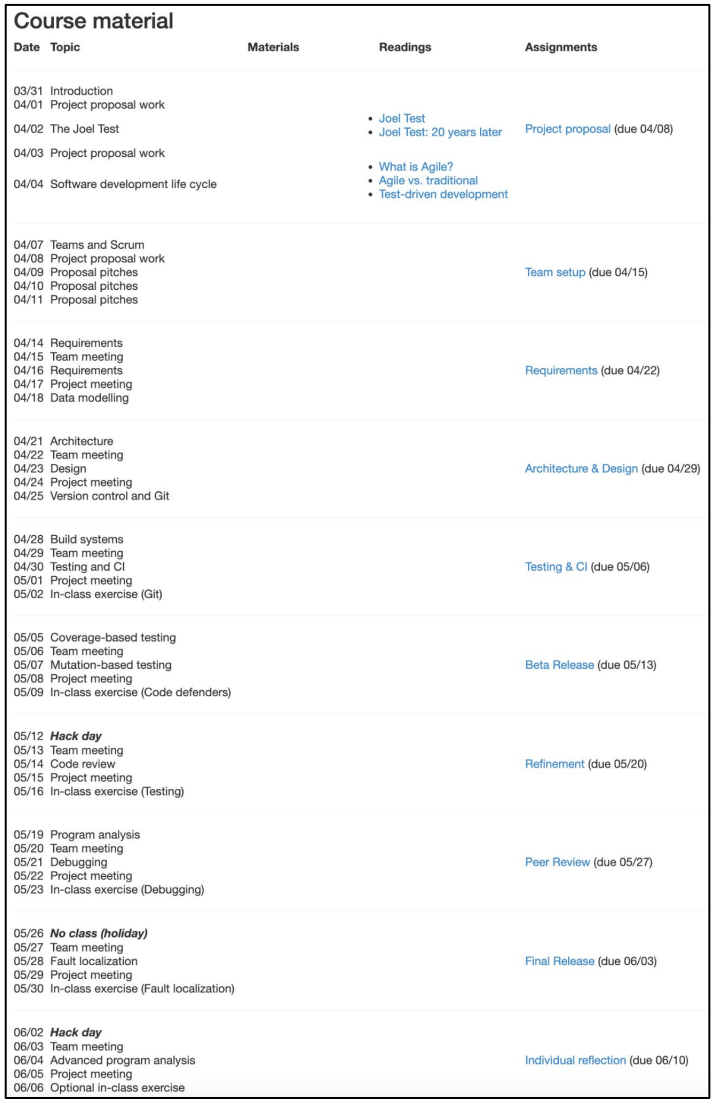
(Engineering workflow at Microsoft, Big Code summit 2019)

CSE 403 largely focuses on the outer loop.

Today

- The CSE 403 team
- Logistics and Background
- What is Software Engineering
- Course overview and expectations

Course overview: grading



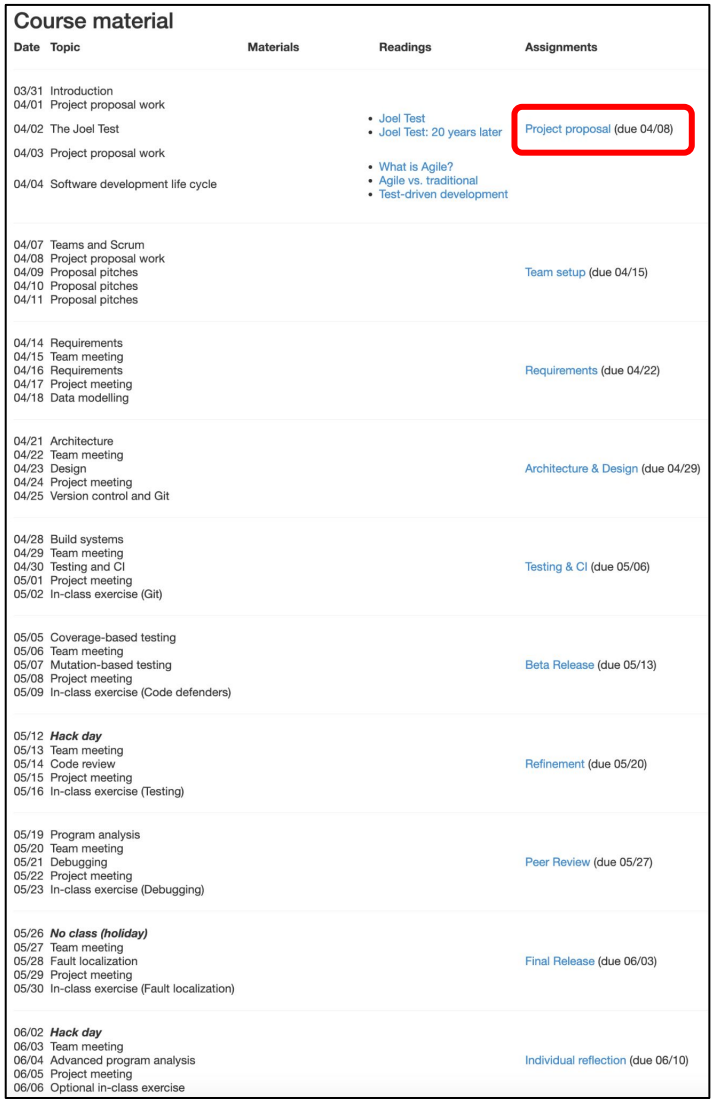
Course material

Date	Topic	Materials	Readings	Assignments
03/31	Introduction			
04/01	Project proposal work			
04/02	The Joel Test		• Joel Test • Joel Test: 20 years later	Project proposal (due 04/08)
04/03	Project proposal work			
04/04	Software development life cycle		• What is Agile? • Agile vs. traditional • Test-driven development	
04/07	Teams and Scrum			
04/08	Project proposal work			
04/09	Proposal pitches			Team setup (due 04/15)
04/10	Proposal pitches			
04/11	Proposal pitches			
04/14	Requirements			
04/15	Team meeting			
04/16	Requirements			Requirements (due 04/22)
04/17	Project meeting			
04/18	Data modelling			
04/21	Architecture			
04/22	Team meeting			
04/23	Design			Architecture & Design (due 04/29)
04/24	Project meeting			
04/25	Version control and Git			
04/28	Build systems			
04/29	Team meeting			
04/30	Testing and CI			Testing & CI (due 05/06)
05/01	Project meeting			
05/02	In-class exercise (Git)			
05/05	Coverage-based testing			
05/06	Team meeting			
05/07	Mutation-based testing			Beta Release (due 05/13)
05/08	Project meeting			
05/09	In-class exercise (Code defenders)			
05/12	***Hack day***			
05/13	Team meeting			
05/14	Code review			Refinement (due 05/20)
05/15	Project meeting			
05/16	In-class exercise (Testing)			
05/19	Program analysis			
05/20	Team meeting			
05/21	Debugging			Peer Review (due 05/27)
05/22	Project meeting			
05/23	In-class exercise (Debugging)			
05/26	***No class (holiday)***			
05/27	Team meeting			
05/28	Fault localization			Final Release (due 06/03)
05/29	Project meeting			
05/30	In-class exercise (Fault localization)			
06/02	***Hack day***			
06/03	Team meeting			
06/04	Advanced program analysis			Individual reflection (due 06/10)
06/05	Project meeting			
06/06	Optional in-class exercise			

Grading

- 55%: Course project
  - 70% project milestones
  - 30% final project review
- 35%: In-class exercises and individual assignments
- 10%: Participation
  - Engagement in project meetings
  - In-class discussions and activities (polls, small-group activities, etc.)
  - Slack contributions
- **No final exam!**

Course overview: workload



Course material

Date	Topic	Materials	Readings	Assignments
03/31	Introduction			
04/01	Project proposal work			
04/02	The Joel Test		• Joel Test • Joel Test: 20 years later	Project proposal (due 04/08)
04/03	Project proposal work			
04/04	Software development life cycle		• What is Agile? • Agile vs. traditional • Test-driven development	
04/07	Teams and Scrum			
04/08	Project proposal work			
04/09	Proposal pitches			Team setup (due 04/15)
04/10	Proposal pitches			
04/11	Proposal pitches			
04/14	Requirements			
04/15	Team meeting			
04/16	Requirements			Requirements (due 04/22)
04/17	Project meeting			
04/18	Data modelling			
04/21	Architecture			
04/22	Team meeting			
04/23	Design			Architecture & Design (due 04/29)
04/24	Project meeting			
04/25	Version control and Git			
04/28	Build systems			
04/29	Team meeting			
04/30	Testing and CI			Testing & CI (due 05/06)
05/01	Project meeting			
05/02	In-class exercise (Git)			
05/05	Coverage-based testing			
05/06	Team meeting			
05/07	Mutation-based testing			Beta Release (due 05/13)
05/08	Project meeting			
05/09	In-class exercise (Code defenders)			
05/12	***Hack day***			
05/13	Team meeting			
05/14	Code review			Refinement (due 05/20)
05/15	Project meeting			
05/16	In-class exercise (Testing)			
05/19	Program analysis			
05/20	Team meeting			
05/21	Debugging			Peer Review (due 05/27)
05/22	Project meeting			
05/23	In-class exercise (Debugging)			
05/26	***No class (holiday)***			
05/27	Team meeting			
05/28	Fault localization			Final Release (due 06/03)
05/29	Project meeting			
05/30	In-class exercise (Fault localization)			
06/02	***Hack day***			
06/03	Team meeting			
06/04	Advanced program analysis			Individual reflection (due 06/10)
06/05	Project meeting			
06/06	Optional in-class exercise			

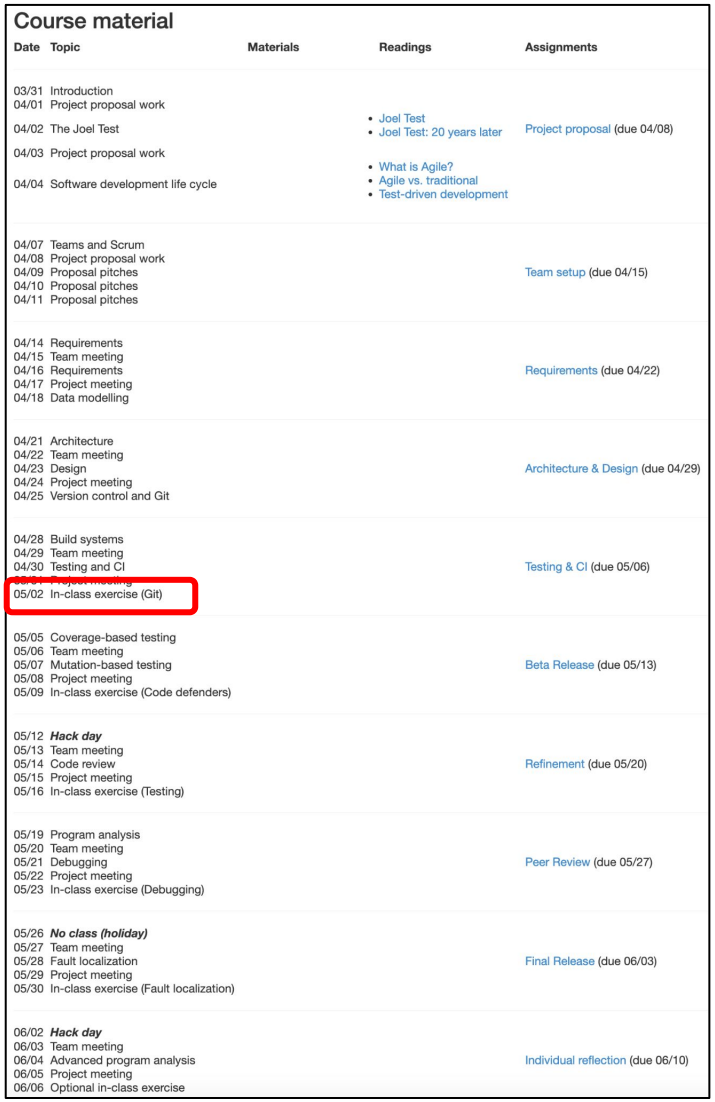
Grading

- 55%: Course project
- 35%: In-class exercises and individual assignments
- 10%: Participation
- **No final exam!**

Workload

- One project assignment each week

Course overview: workload



Course material

Date	Topic	Materials	Readings	Assignments
03/31	Introduction			
04/01	Project proposal work			
04/02	The Joel Test		• Joel Test • Joel Test: 20 years later	Project proposal (due 04/08)
04/03	Project proposal work			
04/04	Software development life cycle		• What is Agile? • Agile vs. traditional • Test-driven development	
04/07	Teams and Scrum			
04/08	Project proposal work			
04/09	Proposal pitches			Team setup (due 04/15)
04/10	Proposal pitches			
04/11	Proposal pitches			
04/14	Requirements			
04/15	Team meeting			
04/16	Requirements			Requirements (due 04/22)
04/17	Project meeting			
04/18	Data modelling			
04/21	Architecture			
04/22	Team meeting			
04/23	Design			Architecture & Design (due 04/29)
04/24	Project meeting			
04/25	Version control and Git			
04/28	Build systems			
04/29	Team meeting			
04/30	Testing and CI			Testing & CI (due 05/06)
[illegible]	[illegible]			
05/02	In-class exercise (Git)			
05/05	Coverage-based testing			
05/06	Team meeting			
05/07	Mutation-based testing			Beta Release (due 05/13)
05/08	Project meeting			
05/09	In-class exercise (Code defenders)			
05/12	***Hack day***			
05/13	Team meeting			
05/14	Code review			Refinement (due 05/20)
05/15	Project meeting			
05/16	In-class exercise (Testing)			
05/19	Program analysis			
05/20	Team meeting			
05/21	Debugging			Peer Review (due 05/27)
05/22	Project meeting			
05/23	In-class exercise (Debugging)			
05/26	***No class (holiday)***			
05/27	Team meeting			
05/28	Fault localization			Final Release (due 06/03)
05/29	Project meeting			
05/30	In-class exercise (Fault localization)			
06/02	***Hack day***			
06/03	Team meeting			
06/04	Advanced program analysis			Individual reflection (due 06/10)
06/05	Project meeting			
06/06	Optional in-class exercise			

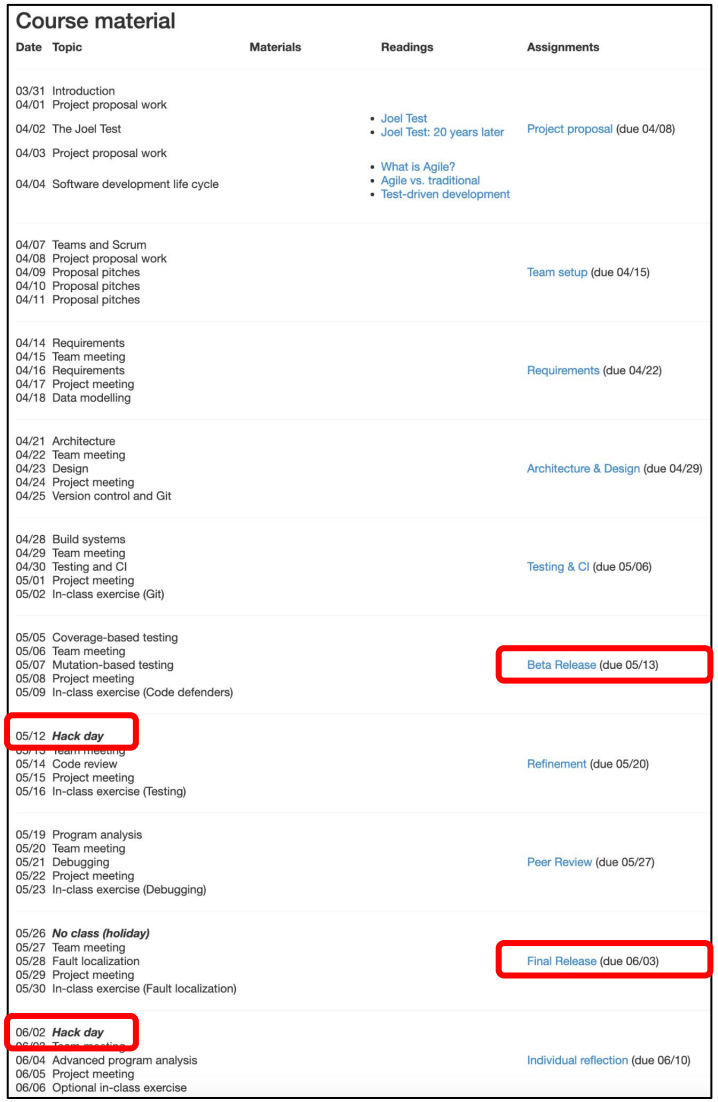
Grading

- 55%: Course project
- 35%: In-class exercises and individual assignments
- 10%: Participation
- **No final exam!**

Workload

- One project assignment each week
- 5 (+1 optional) in-class exercises

Course overview: workload



Course material

Date	Topic	Materials	Readings	Assignments
03/31	Introduction			
04/01	Project proposal work			
04/02	The Joel Test		• Joel Test • Joel Test: 20 years later	Project proposal (due 04/08)
04/03	Project proposal work			
04/04	Software development life cycle		• What is Agile? • Agile vs. traditional • Test-driven development	
04/07	Teams and Scrum			
04/08	Project proposal work			
04/09	Proposal pitches			Team setup (due 04/15)
04/10	Proposal pitches			
04/11	Proposal pitches			
04/14	Requirements			
04/15	Team meeting			
04/16	Requirements			Requirements (due 04/22)
04/17	Project meeting			
04/18	Data modelling			
04/21	Architecture			
04/22	Team meeting			
04/23	Design			Architecture & Design (due 04/29)
04/24	Project meeting			
04/25	Version control and Git			
04/28	Build systems			
04/29	Team meeting			
04/30	Testing and CI			Testing & CI (due 05/06)
05/01	Project meeting			
05/02	In-class exercise (Git)			
05/05	Coverage-based testing			
05/06	Team meeting			
05/07	Mutation-based testing			Beta Release (due 05/13)
05/08	Project meeting			
05/09	In-class exercise (Code defenders)			
05/12	***Hack day***			
05/13	Team meeting			
05/14	Code review			Refinement (due 05/20)
05/15	Project meeting			
05/16	In-class exercise (Testing)			
05/19	Program analysis			
05/20	Team meeting			
05/21	Debugging			Peer Review (due 05/27)
05/22	Project meeting			
05/23	In-class exercise (Debugging)			
05/26	***No class (holiday)***			
05/27	Team meeting			
05/28	Fault localization			Final Release (due 06/03)
05/29	Project meeting			
05/30	In-class exercise (Fault localization)			
06/02	***Hack day***			
06/03	Team meeting			
06/04	Advanced program analysis			Individual reflection (due 06/10)
06/05	Project meeting			
06/06	Optional in-class exercise			

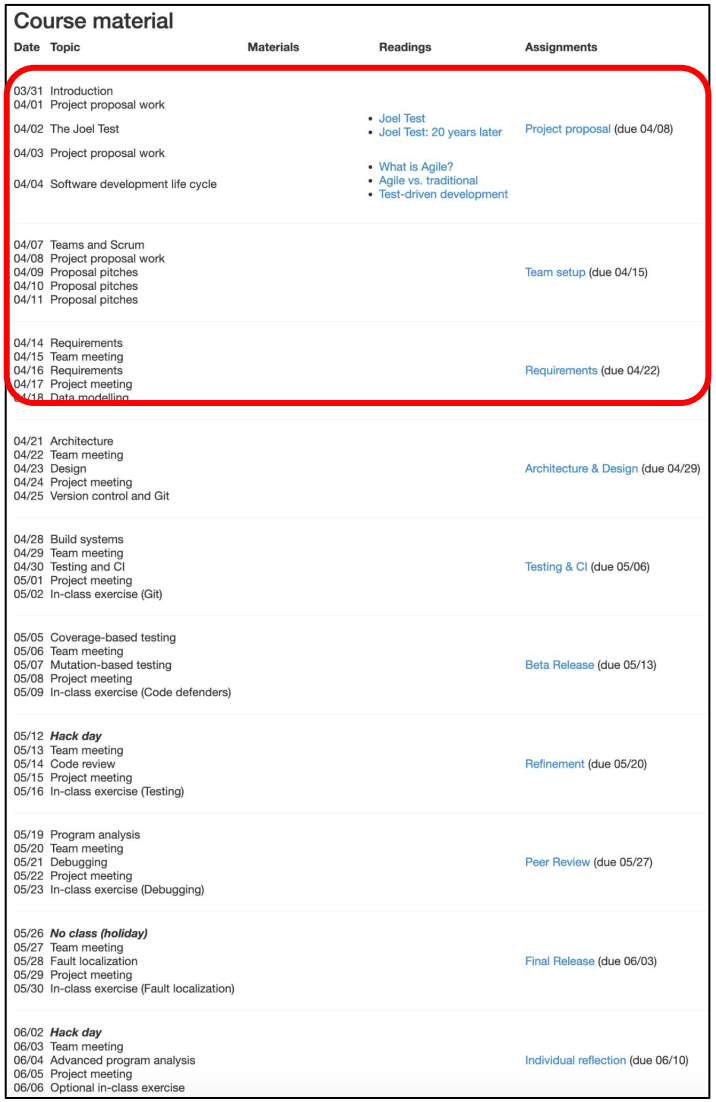
Grading

- 55%: Course project
- 35%: In-class exercises and individual assignments
- 10%: Participation
- **No final exam!**

Workload

- One project assignment each week
- 5 (+1 optional) in-class exercises
- Extra time allocated for crunch time

Course overview: topics

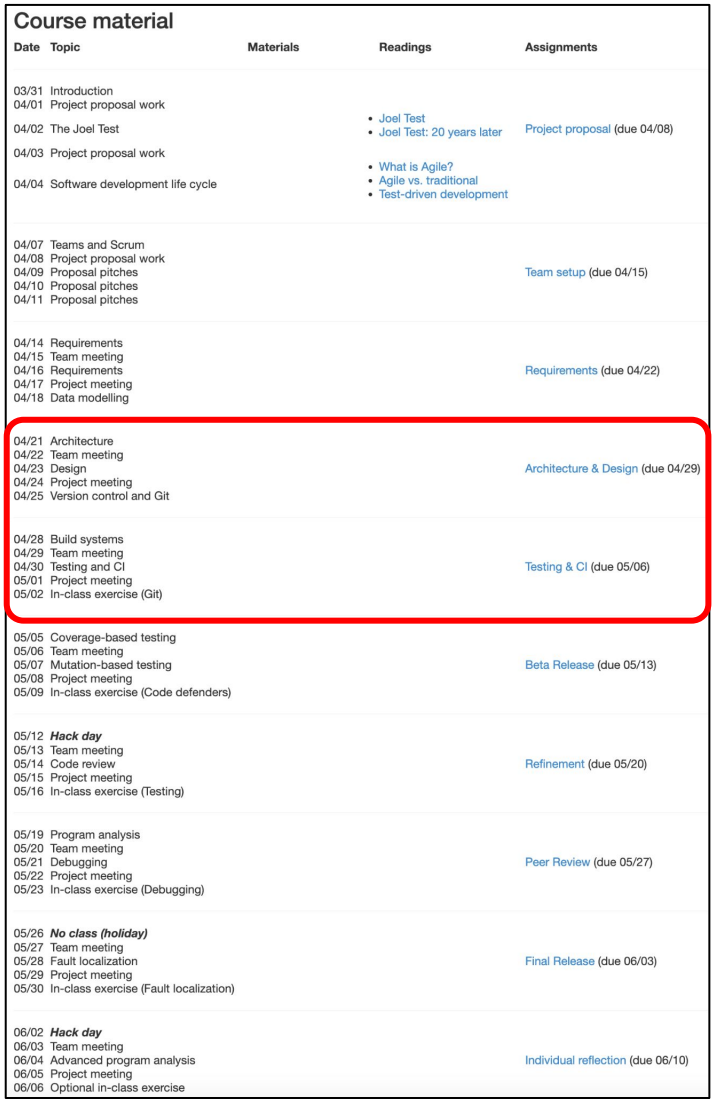


Course material

Date	Topic	Materials	Readings	Assignments
03/31	Introduction			
04/01	Project proposal work			
04/02	The Joel Test		• Joel Test • Joel Test: 20 years later	Project proposal (due 04/08)
04/03	Project proposal work			
04/04	Software development life cycle		• What is Agile? • Agile vs. traditional • Test-driven development	
04/07	Teams and Scrum			
04/08	Project proposal work			
04/09	Proposal pitches			Team setup (due 04/15)
04/10	Proposal pitches			
04/11	Proposal pitches			
04/14	Requirements			
04/15	Team meeting			
04/16	Requirements			Requirements (due 04/22)
04/17	Project meeting			
04/18	Data modelling			
04/21	Architecture			
04/22	Team meeting			
04/23	Design			Architecture & Design (due 04/29)
04/24	Project meeting			
04/25	Version control and Git			
04/28	Build systems			
04/29	Team meeting			
04/30	Testing and CI			Testing & CI (due 05/06)
05/01	Project meeting			
05/02	In-class exercise (Git)			
05/05	Coverage-based testing			
05/06	Team meeting			
05/07	Mutation-based testing			Beta Release (due 05/13)
05/08	Project meeting			
05/09	In-class exercise (Code defenders)			
05/12	***Hack day***			
05/13	Team meeting			
05/14	Code review			Refinement (due 05/20)
05/15	Project meeting			
05/16	In-class exercise (Testing)			
05/19	Program analysis			
05/20	Team meeting			
05/21	Debugging			Peer Review (due 05/27)
05/22	Project meeting			
05/23	In-class exercise (Debugging)			
05/26	***No class (holiday)***			
05/27	Team meeting			
05/28	Fault localization			Final Release (due 06/03)
05/29	Project meeting			
05/30	In-class exercise (Fault localization)			
06/02	***Hack day***			
06/03	Team meeting			
06/04	Advanced program analysis			Individual reflection (due 06/10)
06/05	Project meeting			
06/06	Optional in-class exercise			

- **Software processes, requirements, and specification**
  - Different software development processes.
  - Precise writing (requirements and specifications).

Course overview: topics

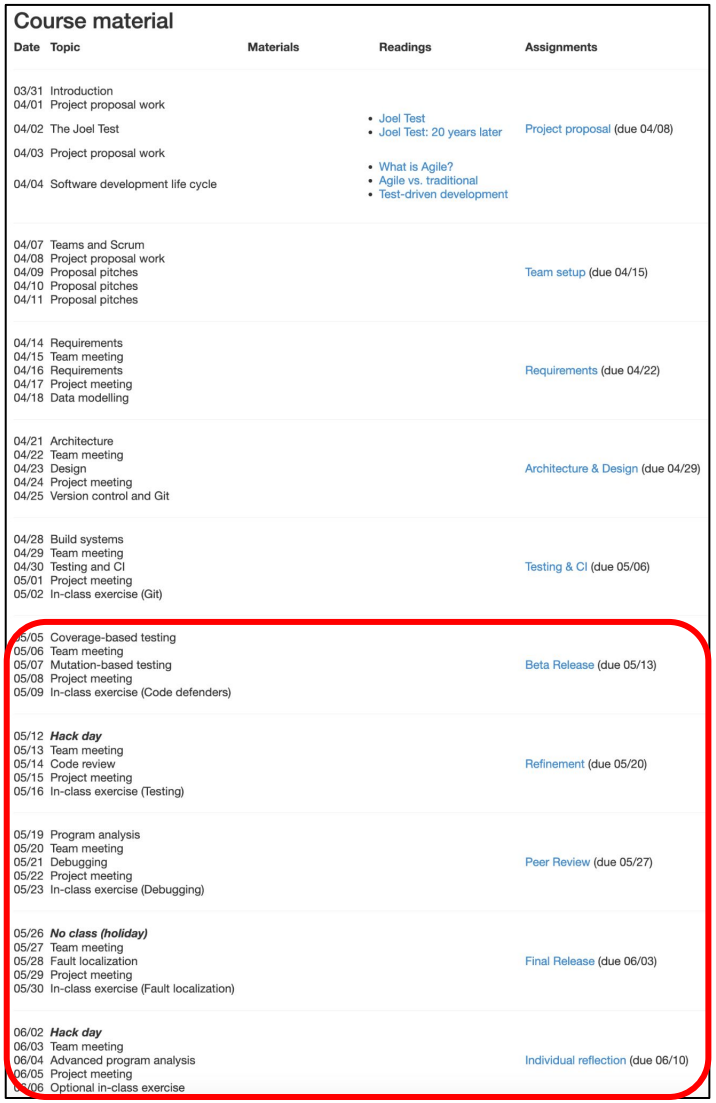


Course material

Date	Topic	Materials	Readings	Assignments
03/31	Introduction			
04/01	Project proposal work			
04/02	The Joel Test		• Joel Test • Joel Test: 20 years later	Project proposal (due 04/08)
04/03	Project proposal work			
04/04	Software development life cycle		• What is Agile? • Agile vs. traditional • Test-driven development	
04/07	Teams and Scrum			
04/08	Project proposal work			
04/09	Proposal pitches			Team setup (due 04/15)
04/10	Proposal pitches			
04/11	Proposal pitches			
04/14	Requirements			
04/15	Team meeting			
04/16	Requirements			Requirements (due 04/22)
04/17	Project meeting			
04/18	Data modelling			
04/21	Architecture			
04/22	Team meeting			
04/23	Design			Architecture & Design (due 04/29)
04/24	Project meeting			
04/25	Version control and Git			
04/28	Build systems			
04/29	Team meeting			
04/30	Testing and CI			Testing & CI (due 05/06)
05/01	Project meeting			
05/02	In-class exercise (Git)			
05/05	Coverage-based testing			
05/06	Team meeting			
05/07	Mutation-based testing			Beta Release (due 05/13)
05/08	Project meeting			
05/09	In-class exercise (Code defenders)			
05/12	***Hack day***			
05/13	Team meeting			
05/14	Code review			Refinement (due 05/20)
05/15	Project meeting			
05/16	In-class exercise (Testing)			
05/19	Program analysis			
05/20	Team meeting			
05/21	Debugging			Peer Review (due 05/27)
05/22	Project meeting			
05/23	In-class exercise (Debugging)			
05/26	***No class (holiday)***			
05/27	Team meeting			
05/28	Fault localization			Final Release (due 06/03)
05/29	Project meeting			
05/30	In-class exercise (Fault localization)			
06/02	***Hack day***			
06/03	Team meeting			
06/04	Advanced program analysis			Individual reflection (due 06/10)
06/05	Project meeting			
06/06	Optional in-class exercise			

- **Software processes, requirements, and specification**
  - Different software development processes.
  - Precise writing (requirements and specifications).
- **Software development**
  - Decompose a complex problem and build abstractions.
  - Improve your coding skills.
  - Effectively use version control, build systems, and code review.
  - Continuous integration (CI).

Course overview: topics



Course material

Date	Topic	Materials	Readings	Assignments
03/31	Introduction			
04/01	Project proposal work			
04/02	The Joel Test		• Joel Test • Joel Test: 20 years later	Project proposal (due 04/08)
04/03	Project proposal work			
04/04	Software development life cycle		• What is Agile? • Agile vs. traditional • Test-driven development	
04/07	Teams and Scrum			
04/08	Project proposal work			
04/09	Proposal pitches			Team setup (due 04/15)
04/10	Proposal pitches			
04/11	Proposal pitches			
04/14	Requirements			
04/15	Team meeting			
04/16	Requirements			Requirements (due 04/22)
04/17	Project meeting			
04/18	Data modelling			
04/21	Architecture			
04/22	Team meeting			
04/23	Design			Architecture & Design (due 04/29)
04/24	Project meeting			
04/25	Version control and Git			
04/28	Build systems			
04/29	Team meeting			
04/30	Testing and CI			Testing & CI (due 05/06)
05/01	Project meeting			
05/02	In-class exercise (Git)			
05/05	Coverage-based testing			
05/06	Team meeting			
05/07	Mutation-based testing			Beta Release (due 05/13)
05/08	Project meeting			
05/09	In-class exercise (Code defenders)			
05/12	***Hack day***			
05/13	Team meeting			
05/14	Code review			Refinement (due 05/20)
05/15	Project meeting			
05/16	In-class exercise (Testing)			
05/19	Program analysis			
05/20	Team meeting			
05/21	Debugging			Peer Review (due 05/27)
05/22	Project meeting			
05/23	In-class exercise (Debugging)			
05/26	***No class (holiday)***			
05/27	Team meeting			
05/28	Fault localization			Final Release (due 06/03)
05/29	Project meeting			
05/30	In-class exercise (Fault localization)			
06/02	***Hack day***			
06/03	Team meeting			
06/04	Advanced program analysis			Individual reflection (due 06/10)
06/05	Project meeting			
06/06	Optional in-class exercise			

- **Software processes, requirements, and specification**
  - Different software development processes.
  - Precise writing (requirements and specifications).
- **Software development**
  - Decompose a complex problem and build abstractions.
  - Improve your coding skills.
  - Effectively use version control, build systems, and code review.
  - Continuous integration (CI).
- **Software testing and debugging**
  - Write effective (unit) tests.
  - Hands-on experience, using testing and debugging techniques.
  - (Advanced) program analysis.

Course overview: course project

Course material

Date	Topic	Materials	Readings	Assignments
03/31	Introduction			
04/01	Project proposal work			
04/02	The Joel Test		• Joel Test • Joel Test: 20 years later	Project proposal (due 04/08)
04/03	Project proposal work			
04/04	Software development life cycle		• What is Agile? • Agile vs. traditional • Test-driven development	
04/07	Teams and Scrum			
04/08	Project proposal work			
04/09	Proposal pitches			Team setup (due 04/15)
04/10	Proposal pitches			
04/11	Proposal pitches			
04/14	Requirements			
04/15	Team meeting			
04/16	Requirements			Requirements (due 04/22)
04/17	Project meeting			
04/18	Data modelling			
04/21	Architecture			
04/22	Team meeting			
04/23	Design			Architecture & Design (due 04/29)
04/24	Project meeting			
04/25	Version control and Git			
04/28	Build systems			
04/29	Team meeting			
04/30	Testing and CI			Testing & CI (due 05/06)
05/01	Project meeting			
05/02	In-class exercise (Git)			
05/05	Coverage-based testing			
05/06	Team meeting			
05/07	Mutation-based testing			Beta Release (due 05/13)
05/08	Project meeting			
05/09	In-class exercise (Code defenders)			
05/12	***Hack day***			
05/13	Team meeting			
05/14	Code review			Refinement (due 05/20)
05/15	Project meeting			
05/16	In-class exercise (Testing)			
05/19	Program analysis			
05/20	Team meeting			
05/21	Debugging			Peer Review (due 05/27)
05/22	Project meeting			
05/23	In-class exercise (Debugging)			
05/26	***No class (holiday)***			
05/27	Team meeting			
05/28	Fault localization			Final Release (due 06/03)
05/29	Project meeting			
05/30	In-class exercise (Fault localization)			
06/02	***Hack day***			
06/03	Team meeting			
06/04	Advanced program analysis			Individual reflection (due 06/10)
06/05	Project meeting			
06/06	Optional in-class exercise			

- **Software processes, requirements, and specification**
  - Different software development processes.
  - Precise writing (requirements and specifications).
- **Software development**
  - Decompose a complex problem and build abstractions.
  - Improve your coding skills.
  - Effectively use version control, build systems, and code review.
  - Continuous integration (CI).
- **Software testing and debugging**
  - Write effective (unit) tests.
  - Hands-on experience, using testing and debugging techniques.
  - (Advanced) program analysis.
- **Course project**
  - Apply all of the above in a group project.

Course project overview

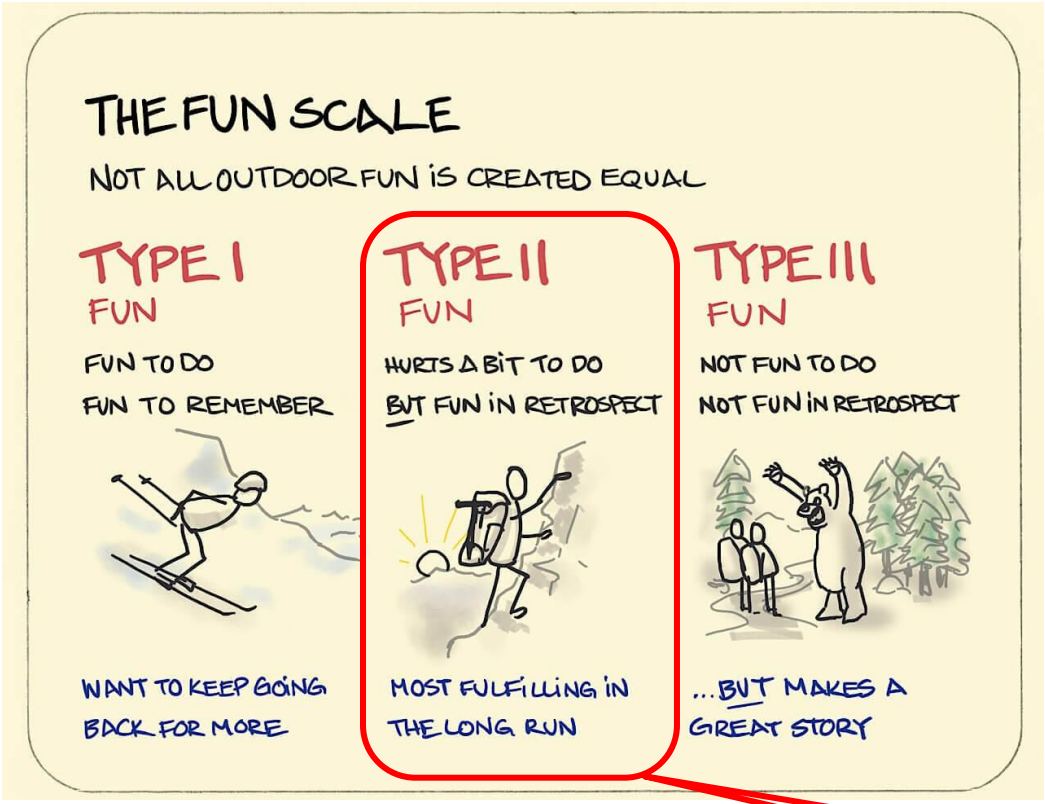
Course project proposals

Course project categories

Example categories

- Productivity and convenience apps
- Optimization problems and data science
- Gaming and making
- Extensions to open-source software
- Software Engineering research (prototypes)

CSE 403 in one picture: mostly type II fun



Sweet spot for teaching

Expectations

- Programming experience and familiarity with one programming language (Java, C++, ...).
- Active participation in discussions.
- Teamwork and communication (Slack).
- Reflecting on and improving submitted materials.

CSE 403: challenges for students

Team work

- Effective communication and coordination
- Different backgrounds, skills, and incentives

Complexity

- Tooling and technology stacks
- Scale of code base

Uncertainty

- No simple check-box grading
- Focus on trade-offs, decisions, and justifications

CSE 403: challenges for students and staff

The Week-1 rush

Lecture time (12:30)

Enrollment

- 2020: 40 students (2 TAs)
- 2021: 85 students (5 TAs)
- 2022: 110 students (6 TAs)
- 2023: 82 students (5 TAs)
- 2025: 100 students (6 TAs)

Time

- Project duration: 9 weeks
- Lecture time: 50 minutes
- Quick turnaround times (milestones and grading)

What's next?

- *Tue: Work on project proposal (pre-assigned groups)*
- Wed: The Joel Test (or why you really should take 403)
- *Thu: Work on project proposal (pre-assigned groups)*
- Fri: SDLC: Software Development Life Cycle