CSE 403

Software Engineering

Spring 2023

#1: Course Introduction

Today

- **The teaching team**
- Logistics and resources
- What is Software Engineering
- Course overview and expectations

The CSE 403 team

Instructor

- Nigini Oliveira (nigini @ cs)
- Office hours: After class and by appointment

Teaching assistants / project managers

- Reshabh K Sharma
- Vinay Reddy Varadha Pally
- Sahil Verma
- Mingyuan Zhong
- Apollo Zhu

Email us at: **cse403-staff @ cs** (Priority response!)

Today

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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)

Logistics: resources

- **Course website**:

  https://nigini.github.io/SWEng/offers/CSE403-SP23/ (cs.uw.edu/403)
- Submission of assignments via **Canvas**:
  https://canvas.uw.edu (course 1633262)
- Discussions on **Slack**:
  https://cse403-sp23.slack.com

Logistics: communication

Communication guidelines

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

Resources

- All relevant information is on the website, or linked from it.
- Canvas for assignments and non-public materials.
- And, remember: The Calendar page is your friend!

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- The teaching team
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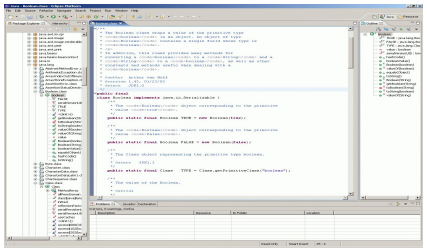
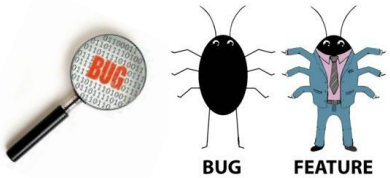
- **What is Software Engineering**
- Course overview and expectations

What is Software Engineering?

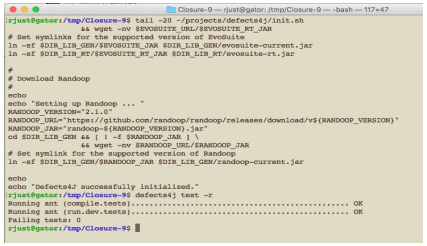
- Developing in an IDE
  and software ecosystem?



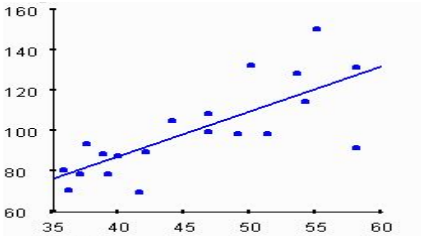
- Debugging and maintaining a software system?



- Deploying and running
  a software system?



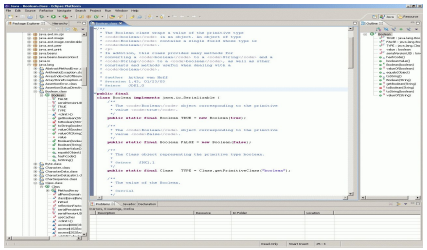
- Empirically evaluating a software system?



- Writing (design) docs?

What is Software Engineering?

- Developing in an IDE and software ecosystem?



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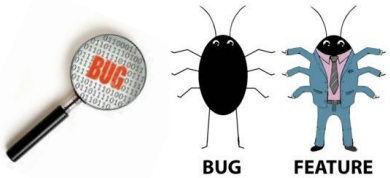

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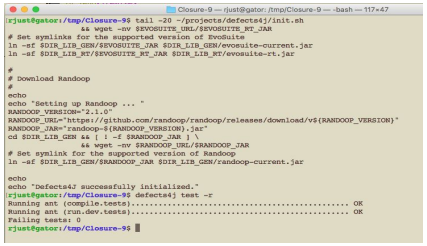

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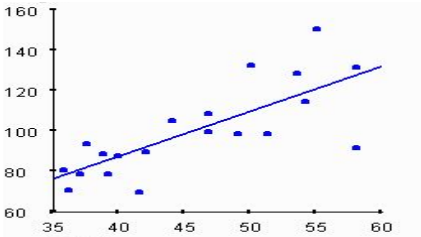


- Writing (design) docs?

All of the above are part of SW-E and much more!

What is Software Engineering?

“An **engineering discipline** (hence, uses science to improve applicability and efficiency) that is concerned with all aspects of **software production**.” — Ian Sommerville

- i.e.: specifying, designing, developing, analyzing, deploying, and maintaining a software system.

What is Software Engineering?

"An **engineering discipline** (hence, uses science to improve applicability and efficiency) that is concerned with all aspects of **software production**." — Ian Sommerville

- i.e.: 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!!! (Just one out of many important tasks! 🤯)
- Software testing and debugging
- Maintenance and refactoring

Why is Software Engineering important?

Software is eating the world!

CBS SF Bay Area + Follow View Profile

Tesla in fatal crash with firetruck was using automated driving system

Nation state hackers exploited years-old bug to breach a US federal agency

TechCrunch on MSN.com | 1 day ago

Twitter users report glitches as links and images fail to

MSN.com | 11 days ago

Boeing acknowledges flaws in its 7 lator software

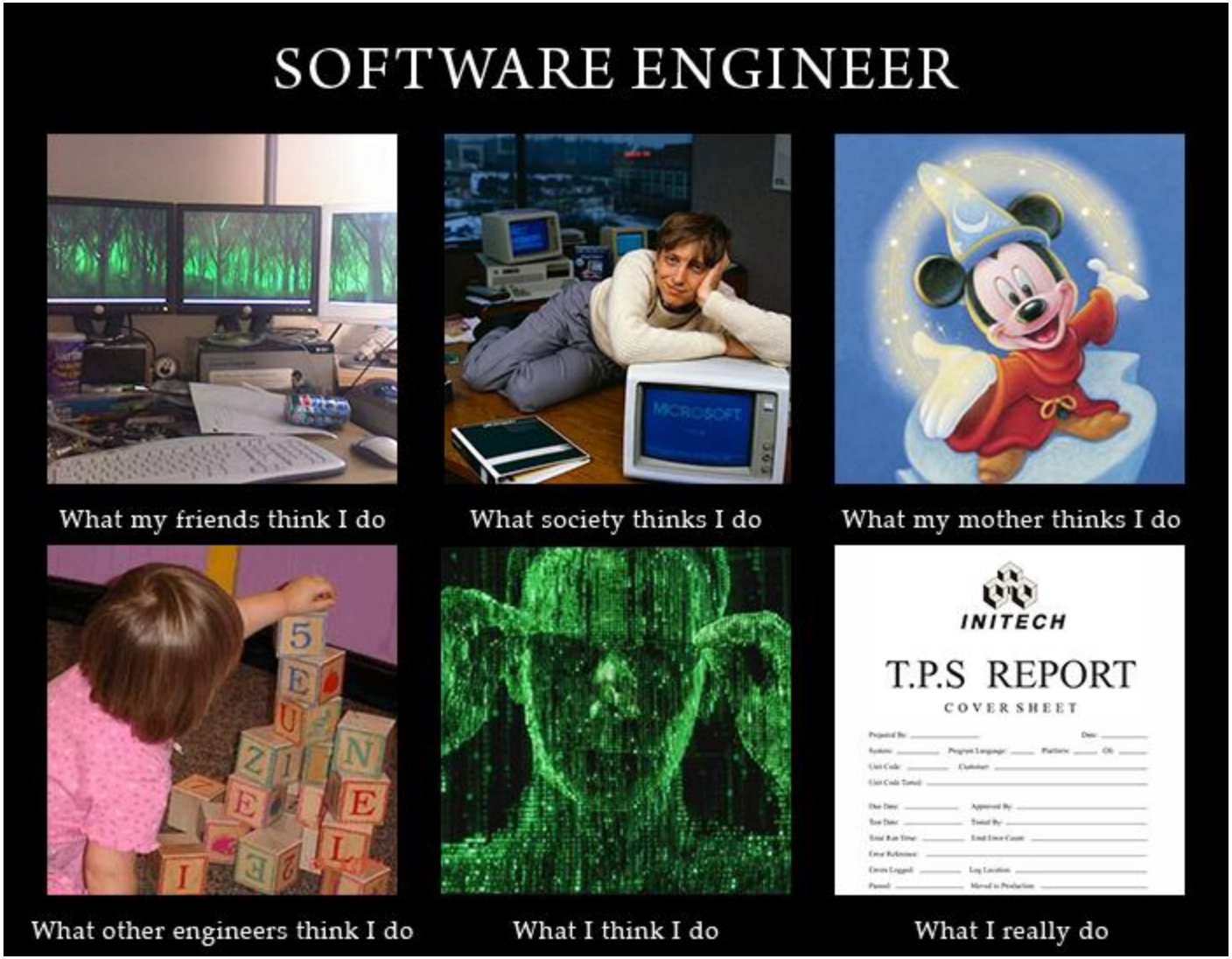
MercoPress | 4 days ago

Security experts warn Android users as 'dangerous' new bug leaves user

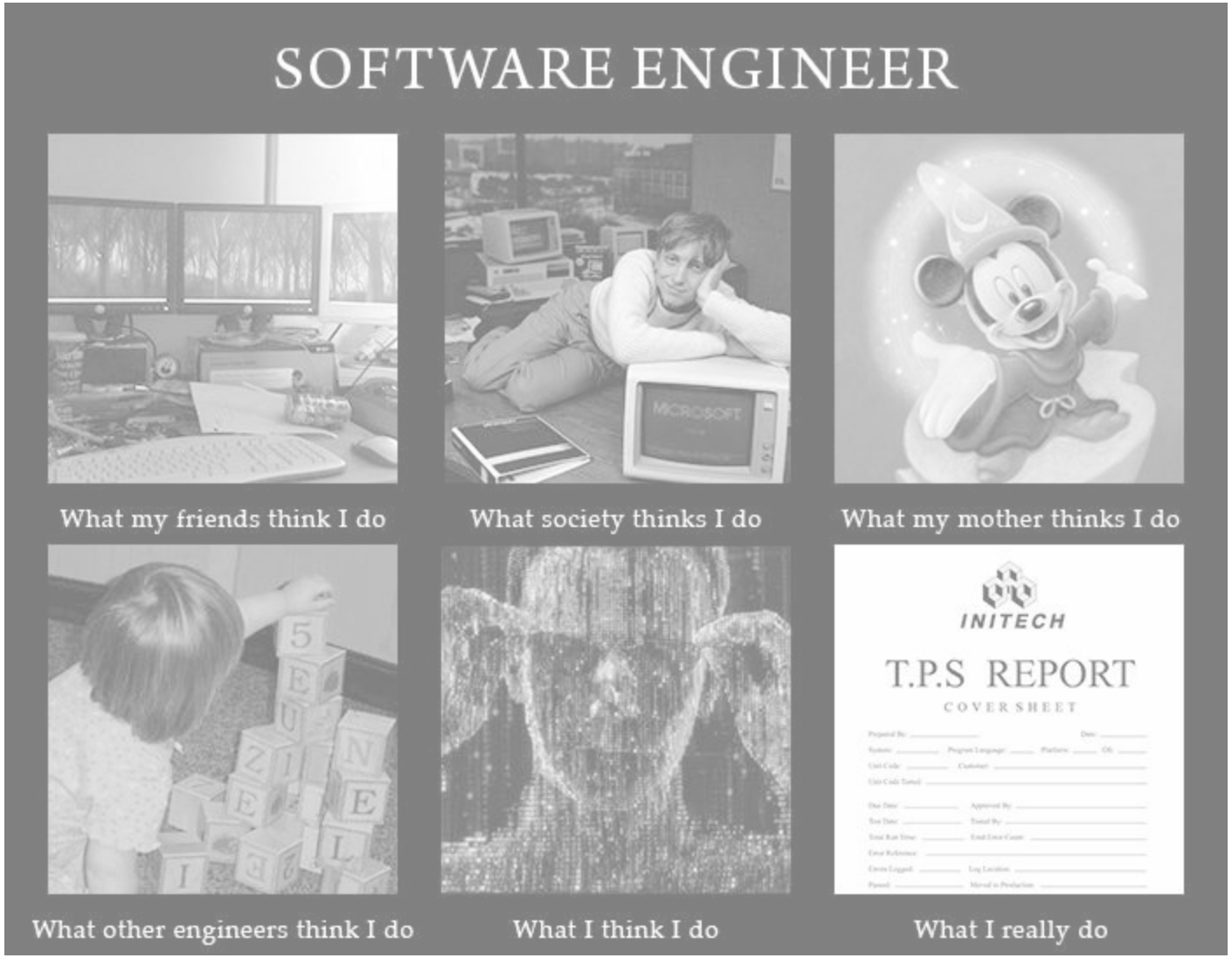
Evening Chronicle on MSN.com | 2 days

Facebook Patches Access Token Leak

Users should change their passwords to mitigate threats posed by the accidental leak of perhaps millions of account identity details.

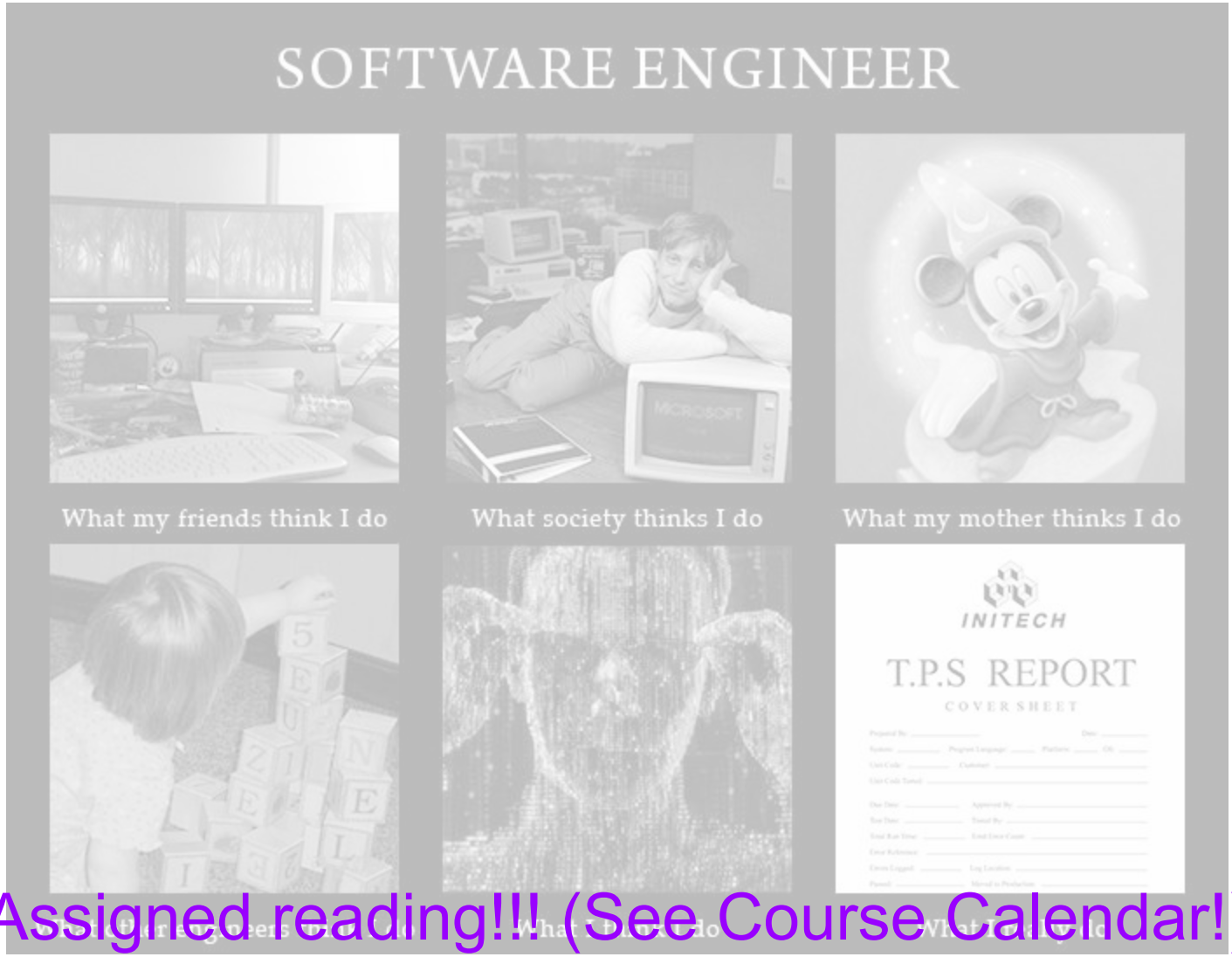


Source: https://www.deviantart.com/rydain/art/What-I-Do-Software-Engineer-285663308



1.03. "Approve software only if they have a well-founded belief that it is safe, meets specifications, passes appropriate tests, and does not diminish quality of life, diminish privacy or harm the environment. The ultimate ***effect of the work should be to the public good****."* – Joint ACM & IEEE professional code of ethics

Source: https://ethics.acm.org/code-of-ethics/software-engineering-code/



Assigned reading!!! (See Course Calendar!)

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Source: https://ethics.acm.org/code-of-ethics/software-engineering-code/

Summary: Software Engineering

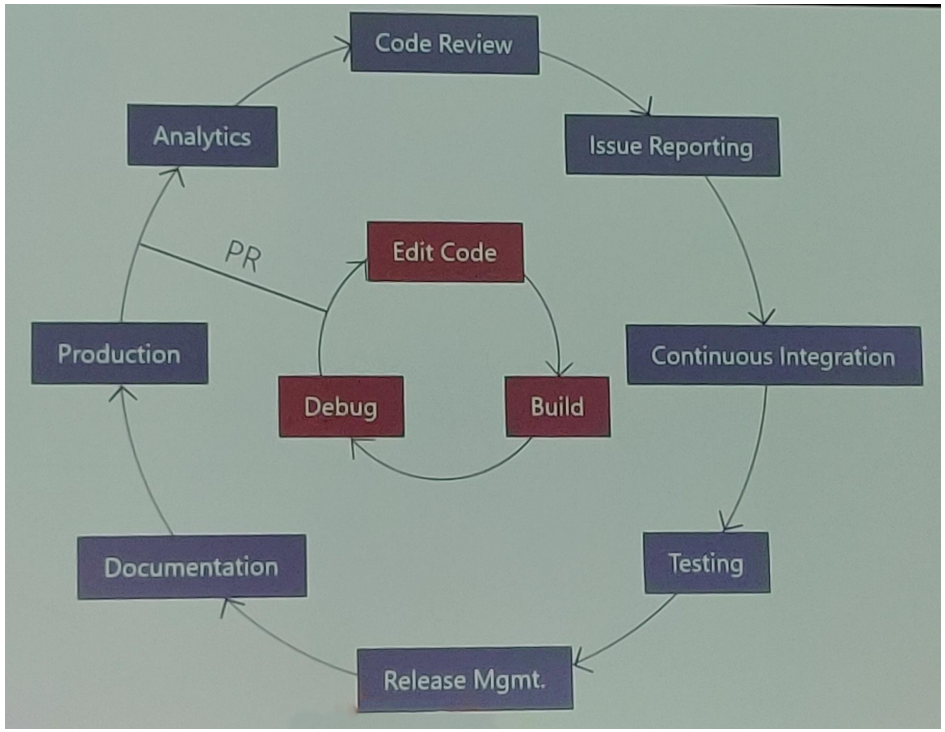
What is Software Engineering?

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

Why is it important?

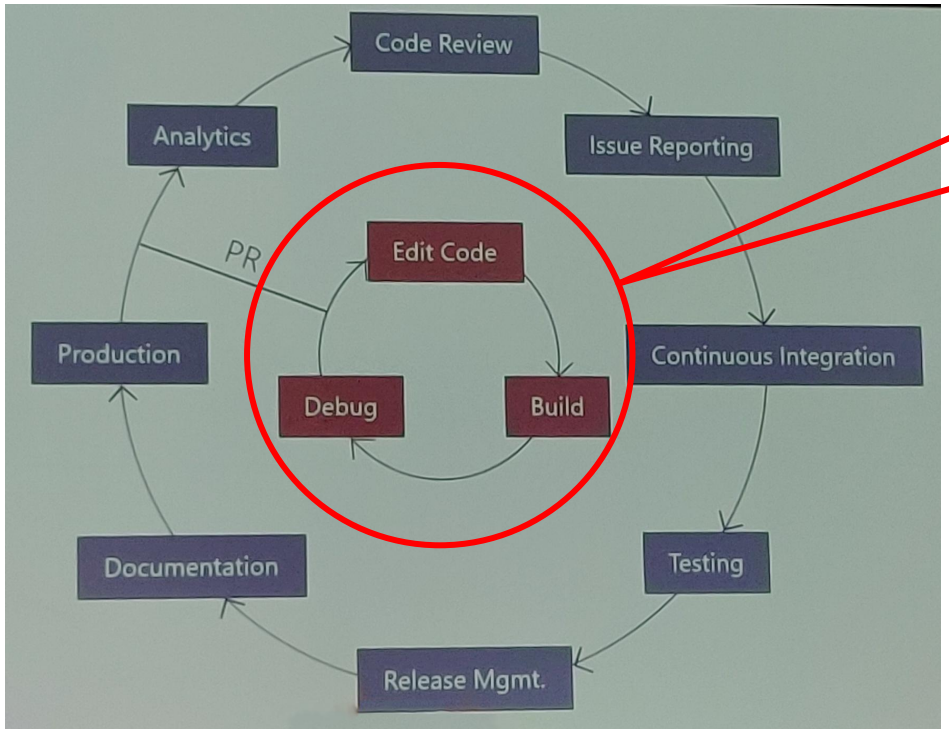
- Decomposes a complex engineering problem.
- Organizes processes and effort.
- Improves software reliability.
- Improves developer productivity.

The Role of Software Engineering in Practice



(Engineering workflow at Microsoft, Big Code summit 2019)

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.

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- Logistics and resources
- What is Software Engineering
- **Course overview and expectations**

Course overview: grading

55%: Course project

- 70% project milestones
- 30% final project review

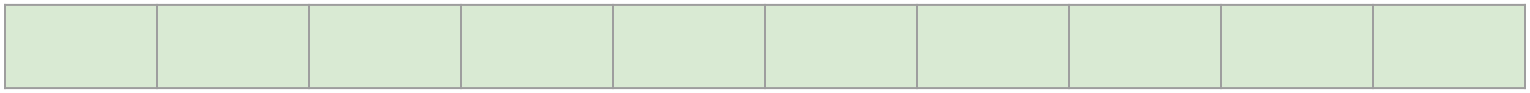
35%: In-class exercises and individual assignments

10%: Participation

- Engagement in project meetings
- In-class discussions and activities (polls, small-group activities, etc.)
- Slack contributions

No final exam!

Course overview: workload



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

		!			!	!	!	!	!

Grading

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

Workload

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

Course overview: workload

		!			!	**! ***	!	**! ***	!

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

- **Software processes, requirements, and specification**
  - Different software development processes.
  - Precise writing (requirements and specifications).
- **Software development practice**
  - 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 it all in a group project.

W1: Setup & Tuning-in

WEEK 1		
03/27	L: Intro	
03/28	T: Peers meetup	
03/29	L: Projects	Project Proposal (PP)
03/30	P: Proposals	
03/31	L: Joel-Test	

W2: Engineering 101

WEEK 2

04/03	L: Dev. Cycle	DUE: PP_1.1!!!
04/04	T: Proposals	DUE: PP_1.2!!!
04/05	L: Requirements	Project Requirements (PR)
04/06	P: Requirements	
04/07	L: Use-Cases	

W3: Tooling & Teaming

WEEK 3		
04/10	L: SCRUM	
04/11	T:	DUE: PR!!!
04/12	L: Version Control	GitHub Project Setup (GPS)
04/13	P:	
04/14	LX: GIT	

W4: Engineering 201

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WEEK 4

04/17        L: Data modeling

04/18        T:                                          DUE: GPS!!!

04/19        L: Architecture                             Design & Architecture (DnA)

04/20        P:

04/21        L: Design
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W5: Tooling reloaded

WEEK 5		
04/24	L: Build Systems	
04/25	T:	DUE: DnA!!!
04/26	L: Testing	Testing & CI/CD (TCC)
04/27	P:	
04/28	L: CI/CD	

W6: Testing, testing, and testing

WEEK 6		
05/01	L: Test Coverage	
05/02	T:	DUE: TCC!!!
05/03	L: Mutation Testing	Alpha Release (R1)
05/04	P:	
05/05	LX: Code Defenders	

W7: Hack & Reflect (have a talked about testing?)

WEEK 7		
05/08	L: Hack Day	
05/09	T:	DUE: R1!!!
05/10	L: Course Reflection	Beta Release (R2)
05/11	P:	
05/12	LX: Testing	

W8: Advanced Techniques #1

WEEK 8		
05/15	L: Code Review	
05/16	T:	DUE: R2!!!
05/17	L: Debugging	Release Peer-Review (RPR)
05/18	P:	
05/19	LX: Debbuging	

W9: Advanced Techniques #2

WEEK 9		
05/22	L: Hack Day	
05/23	T:	DUE: RPR!!!
05/24	L: Fault Location	Final Release (R3)
05/25	P:	
05/26	LX: Fault Location	

W10: Advanced Techniques #3

WEEK 10		
05/29	*H: MEM-DAY*	
05/30	T:	DUE: R3!!!
05/31	L: Program Analysis	Individual Reflexion (IR)
06/01	P:	
06/02	LX: PA (extra-cred)	

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
- Trade-offs, decisions, and justifications

CSE 403: challenges for staff

Teaching

- 90 students
- ~ 18 projects
- 3 lectures to prep / week

Pace

- Grade & Feedback in two days
- Every week

Uncertainty

- No simple check-box grading
- Trade-offs, decisions, and justifications

CSE 403: challenges for students and staff

The Week-1 rush

Lecture time (12:30)

What’s next?

WEEK 1		
03/27	L: Intro	
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Question, please!