
CSE 331

Software Design & Implementation

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Fall 2016
Course Wrapup

Today

- Reminder: Do your course evaluations (!)
- Project demos
- Final exam information

- A look back at CSE 331
 - High-level overview of main ideas and goals
 - Connection to homeworks
 - Context

- Also:
 - Thank-yous

Final exam information

- Monday, 8:30-10:20 AM
- Comprehensive but strongly weighted towards the 2nd half of the course
- Old exams on the web
 - Some questions won't apply if we didn't do similar things this quarter
- Last-minute Q&A review Sunday, noon, EEB 037

CSE 331

What was it all about?

But first....

Huge thanks to the folks who made it work

Course staff: Chris, Mike, Chandra, Erin, Matt and Lucy

*This course is itself a sophisticated
(or at least really, really complicated) system
requiring savvy design and implementation*

3 slides from Lecture 1...

10 weeks ago: Welcome!

We have 10 weeks to move well beyond novice *programmer*:

- Larger programs
 - Small programs are easy: “code it up”
 - Complexity changes everything: “design an artifact”
 - Analogy: using hammers and saws vs. making cabinets (but not yet building houses)
- Principled, systematic software: What does “it’s right” mean? How do we know “it’s right”? What are best practices for “getting it right”?
- Effective use of languages and tools: Java, IDEs, debuggers, JUnit, JavaDoc, git, ...
 - Principles are ultimately more important than details
 - You will forever learn details of new tools/versions

10 weeks ago: Goals

- CSE 331 will teach you to how to write correct programs
- What does it mean for a program to be **correct**?
 - Specifications
- What are ways to **achieve correctness**?
 - Principled design and development
 - Abstraction and modularity
 - Documentation
- What are ways to **verify correctness**?
 - Testing
 - Reasoning and verification

10 weeks ago: Managing complexity

- Abstraction and specification
 - Procedural, data, and control flow abstractions
 - Why they are useful and how to use them
- Writing, understanding, and reasoning about code
 - Will use Java, but the issues apply in all languages
 - Some focus on object-oriented programming
- Program design and documentation
 - What makes a design good or bad (example: modularity)
 - Design processes and tools
- Pragmatic considerations
 - Testing
 - Debugging and defensive programming
 - [more in CSE403: Managing software projects]

Some new slides to tie the pieces together...

Divide and conquer: Modularity, abstraction, specs

No one person can understand all of a realistic system

- **Modularity** permits focusing on just one part
- **Abstraction** enables ignoring detail
- **Specifications** (and **documentation**) formally describe behavior
- **Reasoning** relies on all three to understand/fix errors
 - Or avoid them in the first place
 - **Proving, testing, debugging**: all are intellectually challenging

How CSE 331 fits together

Lectures: ideas	⇒ Assignments: get practice
Specifications	⇒ Design classes
Testing	⇒ Write tests
Subtyping	⇒ Write subclasses
Equality & identity	⇒ Override equals, use collections
Generics	⇒ Write generic classes
Design patterns	⇒ Larger designs; MVC
Reasoning, debugging	⇒ Correctness, testing
Events	⇒ GUIs
Systems integration	⇒ N/A

What you have learned in CSE 331

Compare your skills today to 10 weeks ago

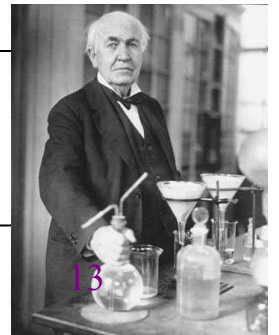
- Theory: abstraction, specification, design
- Practice: implementation, testing
- Theory & practice: correctness

Bottom line aspiration: Much of what we've done would be *easy* for you today

This is a measure of how much you have learned

There is no such thing as a “born” programmer!

Genius is 1% inspiration and 99% perspiration.
Thomas A. Edison



What you will learn later

- Your next project can be much more ambitious
 - But beware of “second system” effect
- Know your limits
 - Be humble (reality helps you with this)
- You will continue to learn
 - Building interesting systems is never easy
 - Like any worthwhile endeavor
 - Practice is a good teacher
 - Requires thoughtful introspection
 - Don't learn *only* by trial and error!
 - Voraciously consume ideas *and* tools

What comes next?

Courses

- CSE 403 Software Engineering
 - Focuses more on requirements, software lifecycle, teamwork
- Capstone projects
- Any class that requires software design and implementation

Research

- In software engineering & programming systems
- In any topic that involves software

Having an impact on the world

- Jobs (and job interviews)
- Larger programming projects

Last slide

- System building is fun!
 - It's even more fun when you're successful
- Pay attention to what matters
 - Take advantage of the techniques and tools you've learned (and will learn!)
- On a personal note:
 - Don't be a stranger: I love to hear how you do in CSE and beyond as alumni
- Closing thoughts?