Introduction to CSE 331
Software Design & Implementation

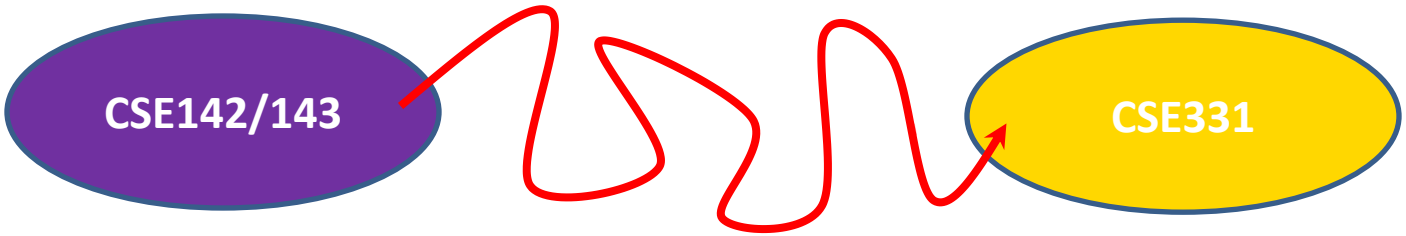
Autumn 2010

ASAP: Answer initial questionnaire on Catalyst
https://catalysttools.washington.edu/webq/survey/notkin/107233

Course staff

- Instructor: David Notkin (notkin@cs, CSE 542)
- Office hours
  - Monday 1-2PM; Thursday 12:30-1:30PM
  - and by appointment
  - and when my door is open
- Teaching assistants
  - Matthew Kay (mjskay@cs)
  - Nicholas Brekhus (gu13@cs)
- TA office hours TBA, held in the CSE 002 lab

The Tao (道) of CSE331



Programming (in Java)

- Control (loops, conditionals, methods, parameter passing, recursion, etc.)
- Variables
- Abstract data types (ADTs):
- Stacks, linked lists, …
- Interfaces, inheritance and encapsulation
- Basics of complexity and performance tradeoffs
- Using off-the-shelf components from Java Collections

Designing and implementing more realistic software: managing complexity

- Abstraction and specification
- Writing, understanding and reasoning about code
- Program design and documentation: process and tools
- What makes a design good or bad?
- Pragmatic considerations
  - Testing
  - Debugging and defensive programming
  - Software management issues

Prerequisites

- We assume you have "mastered" 142 and 143 – your Java programming may need some brushing up, of course!
- Examples of material we will use extensively
  - Sharing
    - Distinction between **`==`** and **`equals()`** – that is, are two objects the same object, or do two objects have equal values (the definition of which can be overridden)?
    - Aliasing – that is, multiple references to the same object
  - Subtyping
    - Varieties: classes, interfaces
    - Inheritance and overriding
  - Object-oriented dispatch
    - Expressions have a compile-time type
    - Objects/values have a run-time type

Learning styles: just two dimensions

Excerpted from
http://serc.carleton.edu/NAGTWorkshops/earlycareer/teaching/learningstyles.html

- "*Active* learners tend to retain and understand information best by doing something active with it – discussing or applying it or explaining it to others. *Reflective* learners prefer to think about it quietly first."
- "*Sequential* learners tend to gain understanding in linear steps, with each step following logically from the previous one. *Global* learners tend to learn in large jumps, absorbing material almost randomly without seeing connections, and then suddenly 'getting it.'"

- Each of you has different learning styles (as do the course staff); with hard work, you'll all get "there"

I found "How to help someone use a computer" interesting: you are at varying points, in varying dimensions, with respect to your knowledge – learn stuff, work hard, but don't beat yourself up! *And definitely don't beat others up!*

Two goals of software system building

(Barry Boehm)

- Building the right system.
- Building the system right.

In CSE331, the second goal is *the* focus – that is, we focus *only* on creating a correctly functioning artifact

- Even this one goal is challenging: to specify, design, implement, test, debug and maintain even a simple program can be surprisingly complicated
- And learning how to do it can be fun and rewarding

Why is building good software hard?

- Large software systems are enormously complex
  - Millions of "moving parts" with very little duplication
- Varied stakeholders
  - Customers (known and unknown), developers, managers, testers, marketers, …
- People expect **soft**ware to be malleable
  - After all, it's "only software" – it may be hard to change, but it's easier to change than anything else!
  - Try changing **hard**ware, for example!
- We are always trying to do new things with software
  - Always pushes past our comfort zones
- ...

Software engineering is …

"The multi-person construction of multi-version software."
–David Parnas

- Must manage product complexity
- Must manage teams of people
- Must manage change over time
- Must cope with potential defects

Some observations

- If you are having trouble, *think* before you type – programming by permutation rarely succeeds
- If you still have trouble, ask for help
  - Do not stay stuck on something for a long time without asking for help – doing this will likely make the course far more time-consuming than it should be
- We strive to create assignments that are reasonable if you apply the techniques taught in lecture (but they may be hard to do in a brute-force manner)

Logistics

- Website http://www.cs.washington.edu/331
  - See it, read it, find our email and office hours, read the handouts, check out the texts, and more. Lots more. Indeed, a huge amount. Keep at it!
- Problem Set 0 is due on Friday @ 8PM
  - Thursday's section will be in CSE 002 with the staff helping you with the initial setup for the course – these are the first couple of parts on PS0
  - The assignment write-up is long and possibly intimidating – the work is far more manageable than the write-up, so get started soon!

Collaboration policy

- Discussion is permitted … indeed, encouraged!
- Representing someone else's work as your own is not permitted
- Please apply the Gilligan's Island (well, now it should be House or Glee, perhaps) rule
  - if you watch mindless TV for 30-60 minutes after a discussion with classmates,
  - and you can still reproduce the materials from memory (no notes, no email, etc.),
  - then you can consider it your work/knowledge
- Familiarize yourselves with the CSE, COE and UW policies on academic honesty – we rely on them heavily.
- If you have a question about what is allowed, ask me!