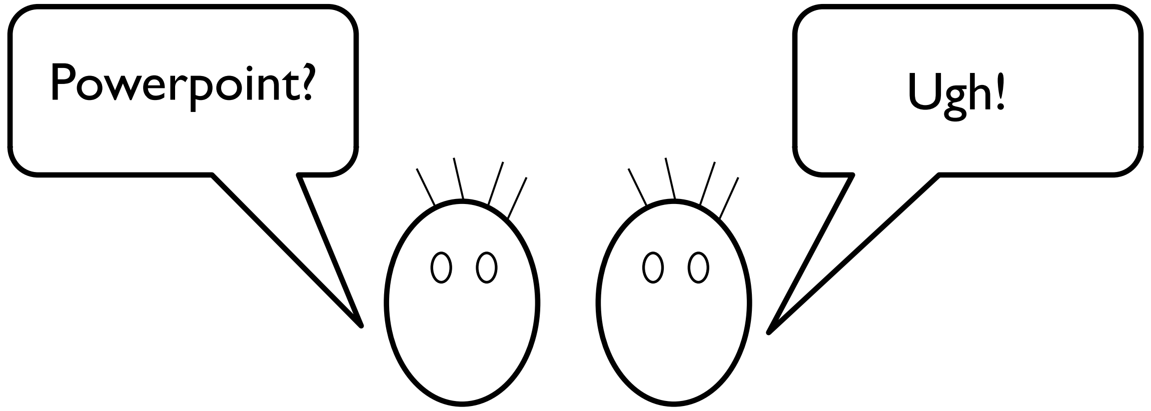
While you wait

- https://cs110.students.cs.ubc.cs/lectures/110-intro.pdf <<< Slides!
- https://cs110.students.cs.ubc.ca/admin/links.html
- Follow Setup link
  - skip to installing DrRacket
    - but stop when you get to "setup test file"
    - that will let you type at DrRacket for class
    - go back after class and do skipped setup page steps IN ORDER
- Or, do all this after class and just use pen and paper during class!

CPSC 110
Systematic Program Design

- Who, Why, What and How
- Start working on the first module
- Don't worry – this is not a powerpoint course



Who?

Foundation for SPD is How to Design Programs (aka HtDP)

1st and 2nd editions

Matthias Felleisen, Robert Bruce Findler, Matthew Flatt, Shriram Krishnamurthi

Racket-lang.org

Racket, DrRacket, and many embedded tools

Above individuals plus many more

Who?

Ronald Garcia (he/him/his)
Professor of Computer Science

Research in programming languages theory
Metaprogramming
Gradual Type Systems
End-User Programming Languages
Program Verification

Who?

Nick Bradley (he/him/his)
Professor of Computer Science

Research in software engineering
Developer Productivity
Developer-Tool Interaction
Workflow Automation

Who?

Emily Fuchs (she/they)
Course Coordinator

cpsc110-admin@cs.ubc.ca

<<< administrative questions go here
Technical questions go to Piazza
only sensitive personal issues go to instructor email

+ 50 TAs who work on labs, office hours, Piazza, and grading

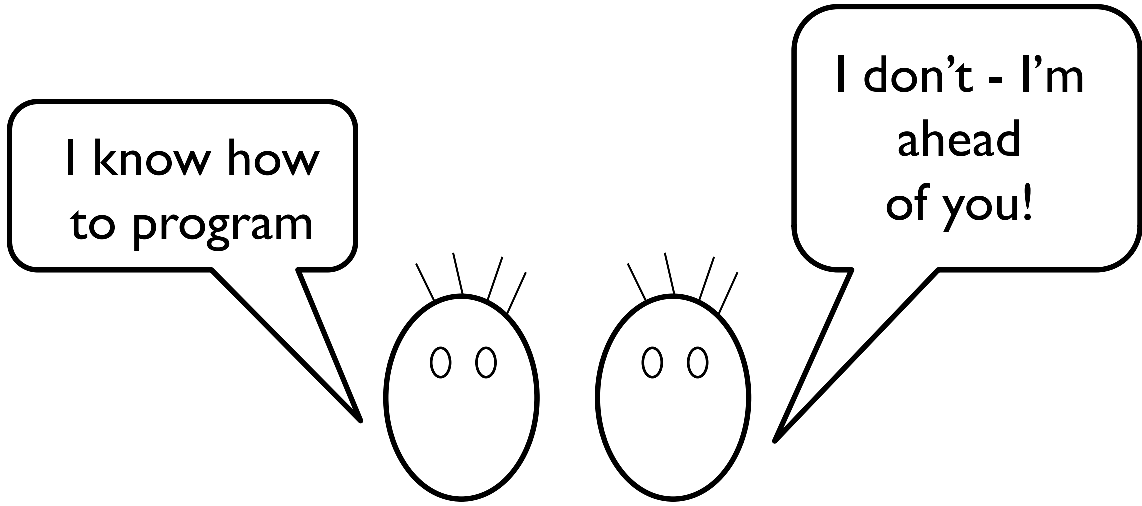
Who? (you)

From a couple years ago

- By year:
  - 1st ~60%
  - 2nd ~20%
  - 3rd ~15%
  - 4th ~5%

- By program
  - BSC 50-60%
  - BA ~30%
  - BCOM ~5%

- No programming experience required
  - people with programming experience usually catch up to people with no programming experience in 3-4 weeks



What?

Margaret Hamilton accepting US
Presidential Medal of Freedom

- Apollo moon mission software development lead
  - “How can I be sure the software will work so that people don’t die?”
- Foundations of software engineering
  - more than just programming

Key ideas (1/5)

quickly today
but you will hear these
throughout the course

- Code that works properly is not nearly good enough
  - Need to be able to explain how you developed it
  - Need to be able to explain why you are confident it works properly
  - Need to be able to reliably produce similar programs
- Software development is a team activity
- How we work determines what we produce
- Representing information as data
- Programs have structure

Key ideas (2/5)

- Code that works properly is not nearly good enough
- Software development is a team activity
  - useful programs always have to be modified by other programmers later
  - being kind to other developers is essential to success
  - applies to the code we produce, the questions we ask, the answers we give
- How we work determines what we produce
- Representing information as data
- Programs have structure

kindness starts on Piazza!

Key ideas (3/5)

- Code that works properly is not nearly good enough
- Software development is a team activity
- How we work determines what we produce
  - we can't rely on jolts of brilliance
  - ACM Code of Ethics 2.1
    Strive to achieve high quality in both the processes and products of professional work.
- Representing information as data
- Programs have structure

Key ideas (4/5)

- Code that works properly is not nearly good enough
- Software development is a team activity
- How we work determines what we produce
- Representing information as data
    - information is out there in the world
    - programs operate on data inside the computer that represents that information
- Programs have structure

Key ideas (5/5)

- Code that works properly is not nearly good enough
- Software development is a team activity
- How we work determines what we produce
- Representing information as data
- Programs have structure
  - of different kinds
  - local and crosscutting
  - being able to design in terms of that structure is powerful

Systematic Program Design (SPD)

- Working systematically can reliably produce well written, consistent, and well tested programs.
- Based on research and practice in programming languages and software engineering.
- Provides a foundation for professional software development
- Also relevant if you are NOT intending to be a software developer
  - helpful for programs of all sizes, including 2 page quick programs
  - underlying ideas help with all kinds of problem solving and design

What about ChatGPT (generative AI)?

What happens if you copy code from ChatGPT?

- Generative AI is going to end up playing a big role, but can you:
  - explain how you developed it?
  - explain why you are confident it works properly?
  - reliably produce similar programs?

- From someone who worked at Tesla: you would be fired
  - do you want (your) life critical code copied out of ChatGPT?
- In 110 it is academic misconduct – aka cheating

Beginning Student Language (BSL)

- Programs are written in different languages
  - There are 10s of thousands of languages; thousands in active use. Hundreds are popular.
  - No one language is the most useful, best etc.
- BSL is the core of most other languages (lambda calculus)
  - allows us to focus on learning systematic program design
  - prepares you for learning other languages quickly
  - never say a university course taught a language
- Puts all students on level playing field

Learning by solving design problems

- In lecture/lab/problem-sets/homework you will be working through program design problems
  - The goal is NOT to simply handin a working solution to the problems.
  - It is to learn to solve the problem on your own.
  - If we help you too much, if you look at the solution too soon, if you get help from a friend, then you won’t learn how to solve them on your own.
  - It will be difficult, you will get stuck, your head will hurt – that’s called learning.
  - Watching your friend lift weights doesn’t make you stronger.

Academic Misconduct (Cheating)

- Cheating is stealing from other students and we won’t tolerate it.
- Zoom poll right now!

A. I have already read and understood the syllabus and I know the rules of academic conduct in this course.

B. I will read the syllabus carefully tonight, learn the rules, and if I have any questions will ask on Piazza.

C. I will not check the syllabus, so I will risk breaking the rules – I know that not knowing the rules is not an excuse, so I could get into real trouble this way.

Course Components - Lecture

- Before lecture you will work through videos and problems on edge.edx.org
  - 10% of course grade is iClicker questions based on this material
- Lecture will mix presentation of new material with you working on problems
  - “priming” enables situated learning of new topics
  - expect lecture to be difficult and tiring – experience doing real design
- After lecture you will review material from lecture and work through additional videos and problems on edge.edx.org

Course Components – Lecture Starters

- Working in DrRacket on in-class lecture problems
  - work during lecture
  - submit several times for each problem
  - you submit to autograder to get feedback
    - based on whether you are working systematically
    - can submit as often as you like (within reason)
    - this is formative assessment (lecture starter grades don’t count)

Course Components - Labs

- Designing programs to solve more challenging problems
- Lab number n covers lecture module n; so does problem set n
- Answering design review questions from TAs
  - about your lab work
  - about the prior week's problem set

Course Components - Problem Sets

- Close out each module with a problem set that assesses your mastery of all the material to date
- THE PROBLEM SETS PREPARE YOU FOR THE EXAMS
- Must be your own individual work

  READ the Academic Integrity policy in the syllabus!
  Again, cheating is stealing from other students and we won’t tolerate it.

- Combined assessment:
  - automatic grading (autograder)
  - during lab a TA will ask you questions about how you designed the program

Course Components - Other

- Office hours - instructor and TAs (See Piazza)
- Midterms and final
  - assessment of your mastery of systematic program design
  - on campus
- Unweighted average of all three exams must be >= 50% to pass the course

  (MT1-grade + MT2-grade + final-grade)/3 must be >= 50%
- There is no textbook, everything you need is on edge.edx.org
- https://cs110.students.cs.ubc.ca/admin/links.html

Grading Scheme

Item	% of total course grade
Problem Sets	15%
Labs	10%
Lecture questions (usually at start)	10%
edX questions	0% - These are a good for your learning though, so do not skip them!
Midterm 1	15%
Midterm 2	20%
Final	30%

see https://cs110.students.cs.ubc.ca/admin/syllabus.html for critical additional points

110 vs. 103+107

- 110 is all of Systematic Program Design, in one term
  - best and fastest foundation for being a major or taking CPSC 210 (Software Engineering in Java).
- 103 is based on first 4-5 weeks of 110, working in Python
  - 103 is a non-major course, less rigour, less depth
  - 107 is the last 7 weeks of 110
    - intended for 103 students who decide they want to major in CS
    - in the teaching languages, using 110 edX modules.
    - 107 students take the 110 final exam

What it takes to do well

- Don’t need math, STEM, etc.
- Must have:
  - attention to detail because a one character error can break a program
  - patience because it takes time to solve hard design problems
  - humility because simple looking problems can still be hard
- Many of you have attention to detail, patience, humility
  - athletes, musicians, gamers, artists, …

Course Contract

- Course staff will provide
  - state of the art content based on research and practice in programming and software engineering
  - delivered using state of the art pedagogy in active and online learning
  - supported by significant investment in materials and resources
  - 50+ person team, extensive office hours, rapid response to questions on Piazza
- You will:
  - work hard (8 + hours/week outside of scheduled lab & lecture times) and stay up to date – not get behind by even a day
  - trust the design recipes to get you to a solution
  - follow course rules of decorum and academic honesty

After Class

- https://cs110.students.cs.ubc.ca/admin/links.html
  - do Setup
  - read Syllabus
  - lectures page, lecture 01