

# Today

- What have we accomplished this quarter?
- How does CSE351 fit into the new curriculum?
- What about 400-level courses?

From 1<sup>st</sup> lecture

## The Big Theme

- THE HARDWARE/SOFTWARE INTERFACE
- How does the hardware (0s and 1s, processor executing instructions) relate to the software (Java programs)?
- Computing is about abstractions (but don't forget reality)
- What are the abstractions that we use?
- What do YOU need to know about them?
  - When do they break down and you have to peek under the hood?
  - What assumptions are being made that may or may not hold in a new context or for a new technology?
  - What bugs can they cause and how do you find them?
- Become a better programmer and begin to understand the thought processes that go into building computer systems

## Little Theme 1: Representation

- **All digital systems represent everything as 0s and 1s**
- **Everything includes:**
  - Numbers – integers and floating point
  - Characters – the building blocks of strings
  - Instructions – the directives to the CPU that make up a program
  - Pointers – addresses of data objects in memory
- **These encodings are stored in registers, caches, memories, disks, etc.**
- **They all need addresses**
  - A way to find them
  - Find a new place to put a new item
  - Reclaim the place in memory when data no longer needed

## Little Theme 2: Translation

- **There is a big gap between how we think about programs and data and the 0s and 1s of computers**
- **Need languages to describe what we mean**
- **Languages need to be translated one step at a time**
  - Word-by-word
  - Phrase structures
  - Grammar
- **We know Java as a programming language**
  - Have to work our way down to the 0s and 1s of computers
  - Try not to lose anything in translation!
  - We'll encounter Java byte-codes, C language, assembly language, and machine code (for the X86 family of CPU architectures)

## Little Theme 3: Control Flow

- How do computers orchestrate the many things they are doing – seemingly in parallel
- What do we have to keep track of when we call a method, and then another, and then another, and so on
- How do we know what to do upon “return”
- User programs and operating systems
  - Multiple user programs
  - Operating system has to orchestrate them all
    - Each gets a share of computing cycles
    - They may need to share system resources (memory, I/O, disks)
  - Yielding and taking control of the processor
    - Voluntary or by force?

## Course Outcomes

- Foundation: basics of high-level programming (Java)
- Understanding of some of the abstractions that exist between programs and the hardware they run on, why they exist, and how they build upon each other
- Knowledge of some of the details of underlying implementations
- Become more effective programmers
  - More efficient at finding and eliminating bugs
  - Understand the many factors that influence program performance
  - Facility with some of the many languages that we use to describe programs and data
- Prepare for later classes in CSE

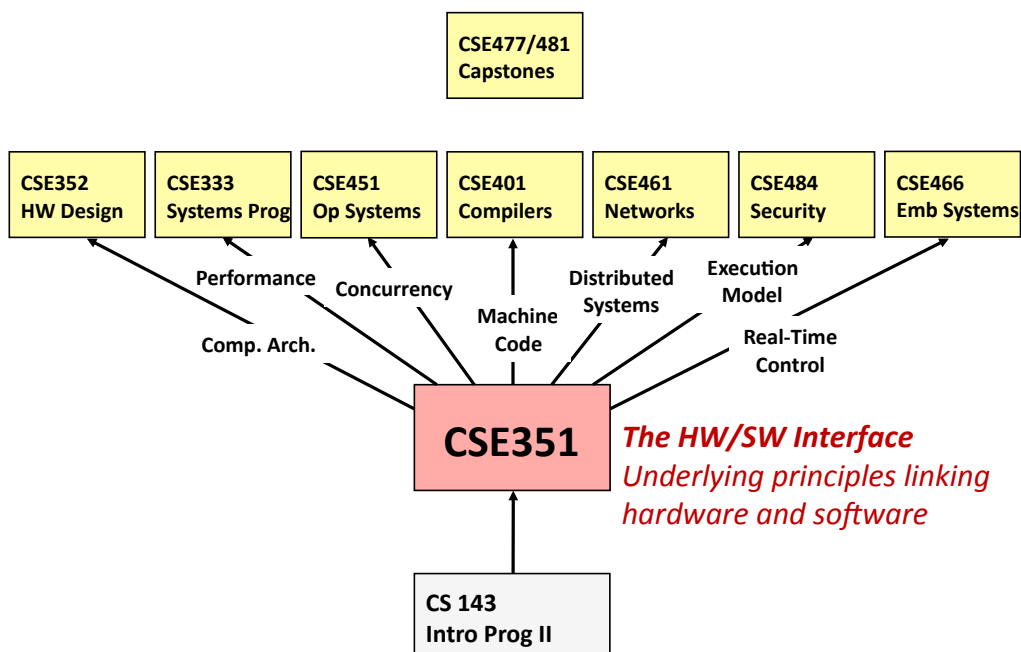
From 1<sup>st</sup> lecture

## CSE351's role in new CSE Curriculum

- **Pre-requisites**
  - 142 and 143: Intro Programming I and II
- **One of 6 core courses**
  - 311: Foundations I
  - 312: Foundations II
  - 331: SW Design and Implementation
  - 332: Data Abstractions
  - 351: HW/SW Interface
  - 352: HW Design and Implementation
- **351 sets the context for many follow-on courses**

From 1<sup>st</sup> lecture

## CSE351's place in new CSE Curriculum



## The Hard Things to Evaluate

- What will you remember in going on to next core courses?
- What will you remember in senior year, for later courses?
- Will this have an impact on ability to get internships/jobs?
- Will this enable deeper participation in range of research?
  
- This will take several years to assess
- CSE351 will likely evolve over time – moving target
- Negotiation of content with follow-on courses
  - e.g., use of X86/Y86 for implementation in 352
  - e.g., overlap with topics in 333 (systems programming), 390A (unix)
  - e.g., different background entering 401, 484, 451, others
  - e.g., sufficiency of background from 142/143

## Acknowledgments

- Thanks for the privilege of being your instructor this quarter
  - It's been a lot of fun & you've been a great group
- Thanks for your patience as we learned about the class
  - This is the second CSE 351, but it's the first time this crew has done it
  - Thanks for not getting too grumpy at the speed bumps, scheduling crunches, and other improvisations
- Thanks for the great service of your super TAs
  - Fran (for the sections)
  - Saptarshi (for all the grading)
  - And both for the support they provided to all of you and to me