Outline

- Software Engineering (Sommerville 1)
Software Engineering

- Software engineering deals with the process of creating software
  - This includes more than just writing code, which is the main focus you have had in all of your programs so far
  - There is a difference between creating a program, working on a project, or building a product
  - To create a software product system compared to creating a program takes approximately 9 times as long (from *The Mythical Man-Month* by Fred Brooks)
Software Engineering

- Software engineering is an engineering discipline that is concerned with all aspects of software development.
- Computer science focuses on theory and fundamentals, whereas software engineering is concerned with the practicalities of developing and delivering software.
- Critics like to criticize software engineering as being a failure because of all the buggy software in the world.
  ‣ However, how many pieces of software work quite reliably?
- There are so many different types of software, and each type may require a different type of engineering.
- What percentage of software costs are for development compared to testing?
Software Failures

- Why does software engineering fail?
  - Demands for software continue to increase
  - New systems are being created
  - Larger systems are being created
  - More complex systems that may need capabilities that are not handled by existing software engineering techniques
  - Many companies didn’t used to have programmers at all, but now nearly every company has some sort of need for programming
    - They don’t necessarily use formal software engineering
Software Engineering Intent

- The intent of software engineering is to support professional software development, not individual programming.

- Four fundamental activities common to all software:
  - Specification – define what is needed
  - Development – program what is needed
  - Validation – ensure the program is what is needed
  - Evolution – modify the program based on new requirements
Software Diversity

- Types of software
  - Stand-alone applications
  - Interactive transaction-based applications
  - Embedded control systems
  - Batch processing systems
  - Entertainment systems
  - Systems for modeling and simulation
  - Data collection systems
  - Systems of systems

- Web-based and mobile systems overlap many areas above and have developed some unique attributes
  - Software reuse has become key
  - Delivered incrementally
  - Constrained by another application – web browser
Software Engineering Ethics

- Software engineers have the ability to cause harm
- ACM has a Code of Ethics and Professional Conduct ([http://www.acm.org/about/code-of-ethics](http://www.acm.org/about/code-of-ethics))
  - Here are a few imperatives from the code
    - Section 1 – General Moral Imperatives
      - 1.2 Avoid harm to others
      - 1.3 Be honest and trustworthy
    - Section 2 – More Specific Professional Responsibilities
      - 2.2 Acquire and maintain professional competence
      - 2.3 Know and respect existing laws pertaining to professional work
    - Section 3 – Organizational Leadership Imperatives
      - 3.1 Articulate social responsibilities of members of an organizational unit and encourage full acceptance of those responsibilities
      - 3.5 Articulate and support policies that protect the dignity of users and others affected by a computing system
    - Section 4 – Compliance with the Code
      - 4.1 Uphold and promote the principles of this Code