Software Engineering

CSCI 201
Principles of Software Development

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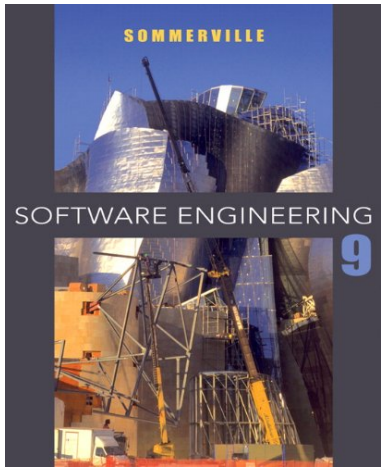
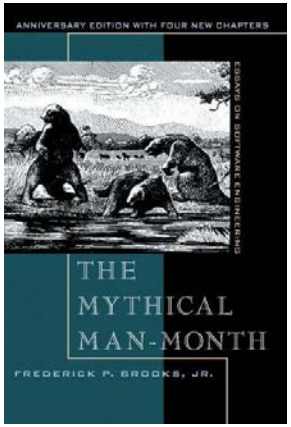
Outline

- Software Engineering
  - Sommerville, Ian. Software Engineering, 9th Edition. Addison Wesley, 2010. ISBN 978-0137035151



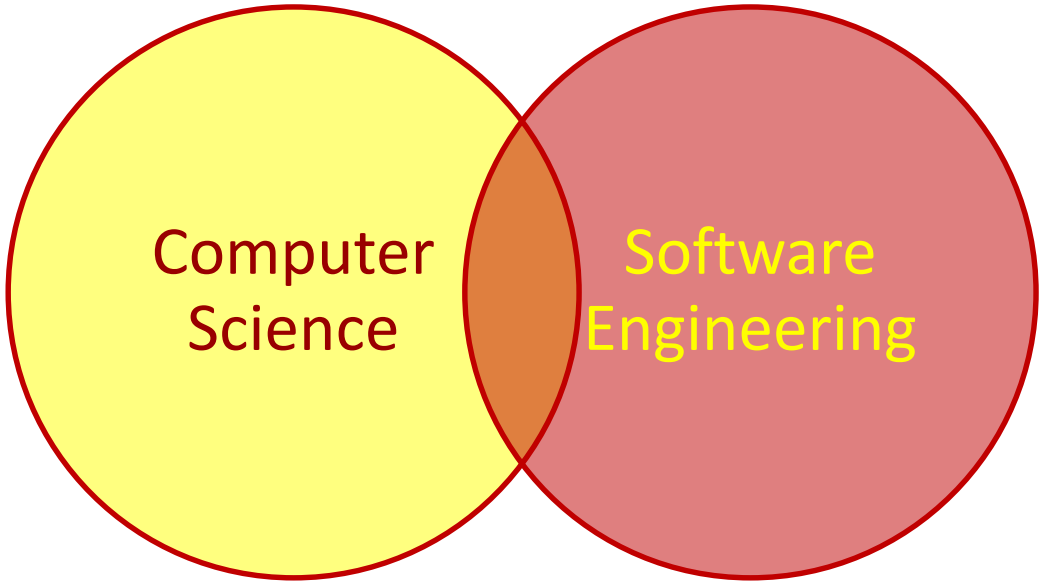
Software Engineering

- 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
  - How much longer does it take to create a software product system compared to creating a program?
    - **Approximately 9 times as long!** (from The Mythical Man-Month by Fred Brooks)



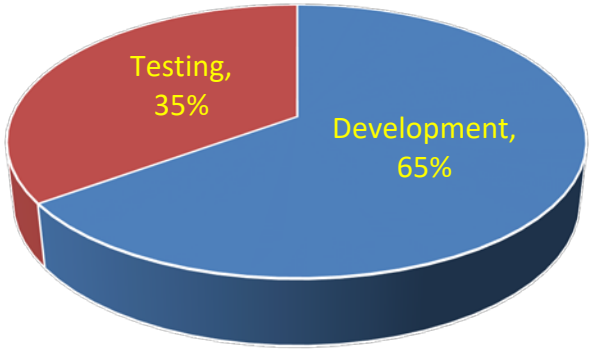
Software Engineering vs Computer Science

- Software engineering is an engineering discipline that is concerned with the practical aspects of developing and delivering software
- Computer science focuses on theory and fundamentals



Reducing Bugs

- People 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 in 2015?



Software Failures

- What would make a manager say that a software project has failed?
  - Not functional or buggy
  - Missing critical features
  - Over schedule
  - Over budget

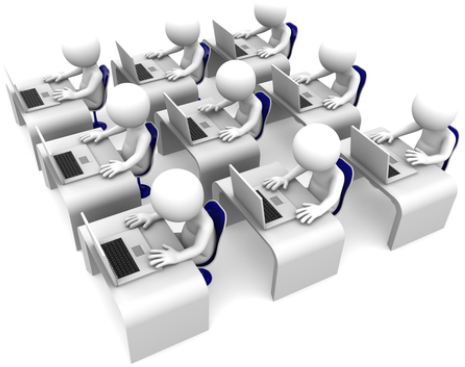
- What percentage of projects are either over schedule or over budget?
  - A 2004 study concluded nearly 3/4 of all IT projects were over budget
  - The B-2 stealth bombers had an original estimate of $929M per aircraft, but they actually cost $2.13B to build (in 1997 figures)

Software Failures

- Why does software engineering fail?
  - Each project is different in some way
  - Larger systems are being created
  - Technology changes rapidly
  - More complex systems that may need capabilities that are not handled by existing software engineering techniques
  - They don't necessarily use formal software engineering
  - Communication may suffer within the team because of this

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 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)
  - 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 as 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