

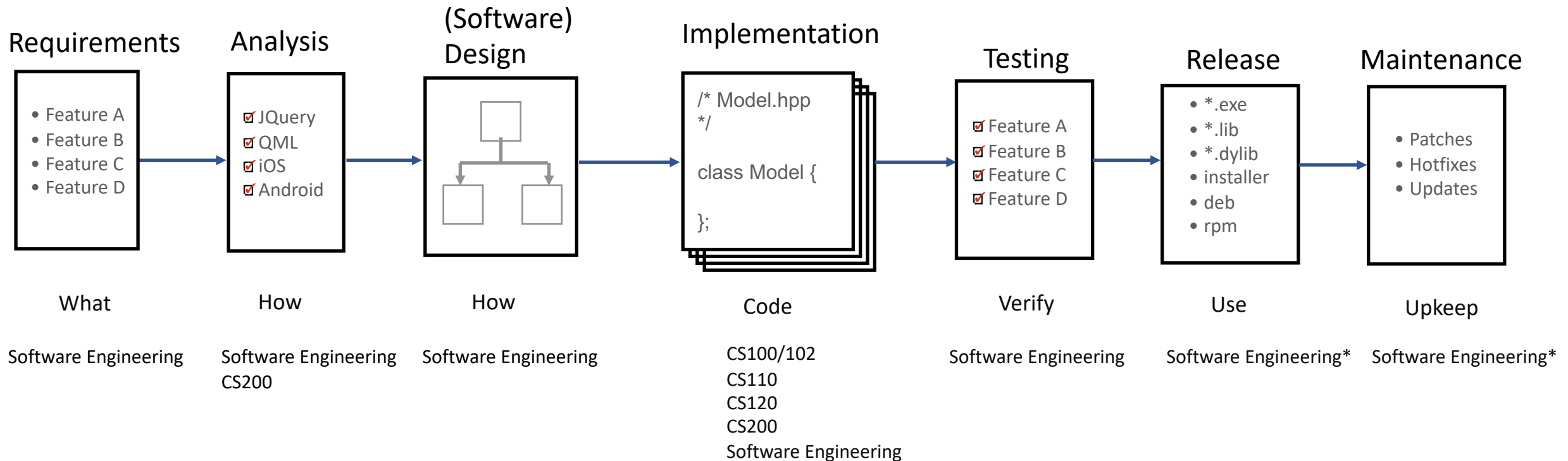
Welcome to CS232

Software Engineering - Database

Let's Talk Software Engineering

Software Engineering?! Wait....I
already know how to write code?

Yes, you do...but there's more to it



*We will discuss these phases conceptually, but specific techniques will be mostly out of the scope of this class.

The Problem with Scale

	Class	
Total Development Time	Days	
Life Span of the Project	Days	
Number of Developers*	1-3	
Number of Programming Languages Used	1	

The Problem with Scale

	Class	Industry
Total Development Time	Days	Months-Years
Life Span of the Project	Days	Months-Years
Number of Developers*	1-3	3-hundreds
Number of Programming Languages Used	1	> 1

The size of the software grows too!

<https://www.informationisbeautiful.net/visualizations/million-lines-of-code/>

Software isn't the only thing that has scaled up.

Let's play guess the numbers

- World Population:
- U.S. Population:
- Apple Watch Total:
- PC Total:
 - Installed Base:
 - Yearly sales:
 - Windows 10:
- Mobile Phones Active:
 - Active Smartphones:
- iOS: iPhone, iPad Total:
 - Active iPhones:
 - Yearly sales:

Let's play a game

- World Population: **7.8 Billion**
- U.S. Population: **330 Million**
- Apple Watch Total: **54 Million**
- PC Total: **4.5 Billion**
 - Installed Base: **1.5 Billion**
 - Yearly sales: **280 Million/year**
 - Windows 10: **900 Million**
- Mobile Phones Active: **7 Billion**
 - Active Smartphones: **3.5 Billion**
- iOS: iPhone, iPad Total: **2.2 Billion**
 - Active iPhones: **1.4 Billion**
 - Yearly sales: **185 Million**

Expectations for Software

- As technology and software become more intertwined in our lives, the expectations have changed
- Stakeholders:
 - Reliability
 - Resilience to unusual or unintended use
 - Transparency
 - New features
 - Rapid rate of improvements

Impact on the Development Process

- These demands from stakeholders mean that we need to:
 - Fix bugs quickly and safely
 - Introduce features quickly and safely
 - Get users what **they need**
 - Keep our applications current in the changing software environment
- “Success” tends to be measured in
 - Improvements to quality
 - New features
 - Reduction in resources
 - Faster time-to-market
- Nothing happens in a bubble

Why didn't you tell me all this
sooner?!

Sorry... 😞

What's the good news?

- There has never been a better time to develop software
- Free and easy access to tools
- Advanced programming languages with high level abstractions to improve productivity
- Plentiful documentation (usually...)
- Easy to share and post information/resources
- Low overhead for distribution and sales
- Better tools and supporting applications for collaboration
- New development process methodologies to increase the likelihood of a successful product

Go on...

- The job “Software Developer” is ranked #2 on the list of top 100 jobs by [U.S. News](#)
- Minimally requires a Bachelor’s Degree
 - higher starting salary for higher degree
- The occupation is (mostly) resilient to automation
- Nearly everything that draws electrical power runs on software



Now that's what
I'm talking about!

So, what now?

- That's where the class comes in...
- We need to:
 - examine the processes we use to develop software
 - be able to identify trouble areas
 - learn how to work with fellow developers AND stakeholders
 - be flexible enough to deal with change
- All while:
 - Delivering robust and reliable software
 - Meeting time and budget constraints

Software Engineering Topics

- Software development processes and methodologies
- Object oriented programming concepts
- Common software design patterns
- Software refactoring
- Software testing

Let's Talk Databases

A world without databases...

- We would be limited to “file system” storage
- “Flat” files, binary data files, or hierarchical/semi-structured data
- Basic operations like accessing, updating, removing information are more complicated
- How do we share access, provide consistency, enforce standards?

Databases in Everyday Use

- Databases provide a critical persistent storage mechanism for programs
- Most of the services you use have some form of backing database
 - ScotWeb
 - Social Media
 - Spotify
 - Banking
 - ...
- Databases don't even need to exist on a server or the cloud
 - Databases are useful options for efficient storage and retrieval of data for desktop and smart phone applications (SQLite)

Database Topics

- How to design a database?
- How can we effectively perform operations and answer questions with our data?
- How do we parse and utilize common data formats?
 - Delimited files (CSV, TSV)
 - JSON
 - XML
- How do we integrate the use of a database into an application?

What tools/technologies will we use?

- Python
 - The third most popular programming/scripting language*
 - Software testing libraries
- MySQL
 - The most popular relational database management system*
 - Interacting with the database using SQL (the fourth most popular programming/scripting language)
- Flask
 - A lightweight Python web service framework
 - Some HTML/JS/CSS (the first and second most popular programming/scripting/markup languages*)
- Git
 - The most popular version control system*

How do I get the most out of this class?

1. Attend class
2. Take notes
3. Ask questions
4. **Start EARLY on the assignments**
 - Read the assignment description the day it is assigned
 - Do your **OWN** work
 - Turn assignments in on time
5. Study