

## Cmpt 276 - TOPIC 1

### Intro to Software Engineering

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- Course Introduction
- Introduction (1.1)
- Why software Engineering?
- Processes
- types of software
- Why Web Apps
- Ethics (1.2)
- Case Studies (1.3)

## Course Information

- Lectures  
MWF 10:30am – 11:20am
- Assignments:
  - ~ 2 individual assignments (15%)
  - Group Project (40%)
- In-class Midterm
  - Fri, March 3<sup>rd</sup> 10:30-11:20am (20%)
- Final:
  - TBA (25%)

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## Course Information

- Contacts:
  - Instructor:  
Bobby Chan (bobbyc@sfu.ca)
  - Teaching Assistants:  
Anant Sunilam Awasthy (asa404@sfu.ca)  
Hemang Bhanushali (hba42@sfu.ca)
- Office hours:
  - Available on the course calendar

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## Introduction

Week	
1	Intro to course, Heroku, and HTML/CSS
2	Processes, Models, and JavaScript
3	Change and coping, JavaScript/NodeJS
4	Agile, Databases
5	Agile project management, Git
6	Requirements Engineering
7	Requirements Processes, <b>Midterm</b>
8	System Modeling
9	System Patterns
10	System Architecture, Patterns
11	Object Oriented Design
12	Software Testing
13	Guest Speaker and Demos

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## Introduction

- Learning outcomes

Goals:

- Go over the basics of developing software in a professional environment.
- Learn to be part of a development team.
- Two main components:
  1. Methodologies
  2. Tools

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## Introduction to Software Engineering Ch1.1

### Introduction

- Survey

What is the greatest piece of software ever written?

What are some epic fails in software development?

## Why Software Engineering?

### - Definition

Software Engineer – A person who researches, designs, develops, and maintains software for a specific industry or individual.

Programmer – A person who lists instructions for a computer to compute or process data in a logical manner.

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## Why Software Engineering?

16	Telecommunication Manager	\$84,572.80	6%	21%	↗
17	Mining & Quarrying Supervisor	\$80,600.00	25%	19%	↗
18	Specialized Engineer (Eg. Agricultural or Naval Engineer)	\$85,342.40	12%	32%	↗
19	Computer Systems Manager	\$102,856.00	11%	40%	→
20	Construction Manager	\$79,996.80	10%	29%	↗
21	Aerospace Engineer	\$89,918.40	20%	-12%	↗
22	Economic Development Director	\$113,068.80	13%	-22%	→
23	Software Engineer	\$90,001.60	12%	22%	→

Canadian Business Top Jobs 2019

<https://www.canadianbusiness.com/lists-and-rankings/best-jobs/canadas-best-jobs-2019-the-top-100-jobs/>

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## Why Software Engineering?

40	Social, Community & Correctional Services Manager	\$73,132.80	14%	46%	→
41	School Principal & Administrator	\$94,993.60	6%	-17%	↗
42	Mechanical Engineer	\$81,494.40	12%	11%	→
43	Database Analyst	\$72,529.60	10%	63%	↗
44	Oil & Gas Drilling Supervisor	\$83,324.80	11%	-10%	↗
45	University Professor	\$98,404.80	21%	-9%	→

Canadian Business Top Jobs 2019:

<http://www.canadianbusiness.com/lists-and-rankings/best-jobs/2019-top-100-jobs-in-canada/>

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## Software Engineering

- Processes

- Specification
- Development
- Validation / Testing
- Evolution / Maintenance

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# Software Engineering

- Processes

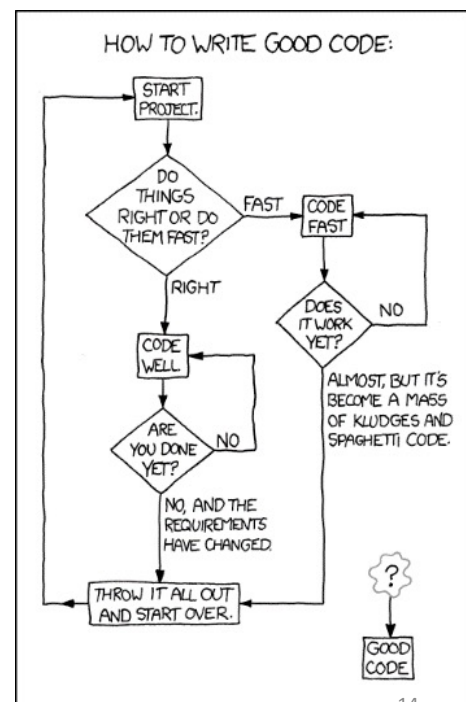
- What is the most expensive part of the Software Engineering Process?
  1. Requirements Analysis
  2. Development
  3. Testing
  4. Maintenance

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## Software Engineering

- Processes

- **Legacy Code:** source code that relates to a no longer supported computer technology or software (source: Wikipedia)
- **Elegant (Beautiful) Code**



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# Software Engineering

## - Attributes

- Maintainability
- Dependability and Security
- Efficiency
- Acceptability

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# Software

## - General Types

- **Generic Software** – Stand alone systems marketed to the general public
- **Custom Software** – A system developed for a particular customer to meet their needs

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## Software

### - Specific Types

- Stand alone applications
  - Typically for a single client
- Interactive transaction-based application
  - User interacts with an application layer running on a remote computer
- Embedded control systems
- Entertainment systems

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## Software

### - Specific Types (continued)

- Batch Processing Systems
  - Typically, business specific systems which process data in large batches
- Modelling and simulation systems
  - Developed for specified research
- Data Collection systems
  - Collect data from environment using sensors to be communicated to other systems for processing
- Systems of Systems
  - Composed of a number of other software systems

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## Software

### - Other Issues

- Diverse Types of Systems
- Business and Social Change
  - Software has to keep up with rapidly changing business and society.
  - Must change existing software and rapidly develop new software.
- Security and Trust
- Scale

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## Software

### - Diversity

- Common needs:
  - professionally managed and developed
- Different needs:
  - Different types of systems require different techniques of development

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## Why Web apps?

- SAA vs SaaS

- SAA
  - Client Specific Software

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## Why Web apps?

- SAA vs SaaS

- SaaS
  - Became popular due to the advancement of the web browser
  - Often involves cloud computing
  - Advantages:
    1. No install worries
    2. No need to check HW compatibilities
    3. Co-authoring
    4. Security
    5. Beta testing
    6. Simplifies upgrades

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## Why Web apps?

- Service Orientated

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## Why Web apps?

- General Workflow

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## Ethics (1.2)

### Ethics

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- Software Engineer must be
  - Competent with technical skills
  - Honest and Ethical while developing the software
- Professional Responsibility issues include:
  - Confidentiality
    - Abiding by non-disclosure agreement
  - Competence
  - Intellectual Property Rights
  - Computer Misuse

## Ethics

- ACM code of ethics

- ACM / IEEE Code of Ethics ([www.acm.org](http://www.acm.org)) pertains specifically to:
  1. Public
  2. Employer / Client
  3. Product
  4. Judgment
  5. Management
  6. Profession
  7. Colleagues
  8. Self
- Generally:

“To ensure, as much as possible, that their efforts will be used for good, software engineers must commit themselves to making software engineering a beneficial and respected profession.”

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## Ethics

- Software Engineering Dilemmas

- **Ethical Dilemmas:** disagreements in principle. A conflict between two equally (un)desirable alternatives.
  - Application of code of ethics

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## Case Studies (1.3)

### Case Studies

#### - Insulin Pump Control System

- Personal Insulin Pump: An *embedded* system for diabetics to maintain blood sugar level.
- Features:
  - Collecting/Calculate Data
- Safety-critical system:
  - low-blood sugar can lead to coma & death
  - high-blood sugar can lead to eye & kidney
- Requirements:
  - The system shall be available to deliver insulin when required
  - shall perform reliably and deliver the correct amount of insulin for current blood sugar level.

## Case Studies

### - Insulin Pump Control System

- Hardware Architecture:

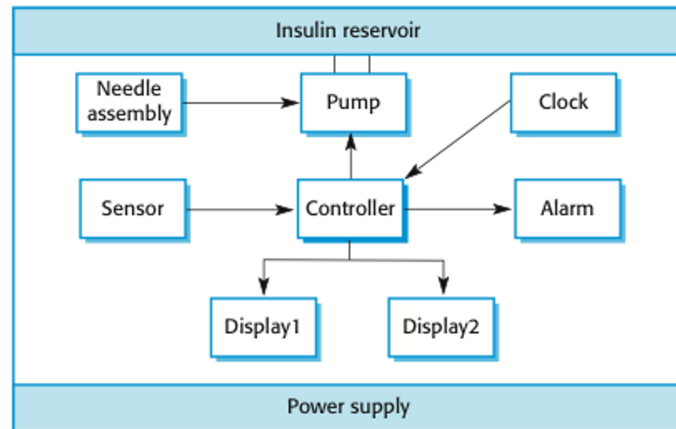


Figure 1.3 – Sommerville (10<sup>th</sup> edition)

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## Case Studies

### - Mental Health Care-Patient Management System (MHC-PMS)

- Mental Health Care-Patient Management System - maintains informational database

- Database:
  - centralized patient information database when connected to secure network
  - free-standing when disconnected from network.

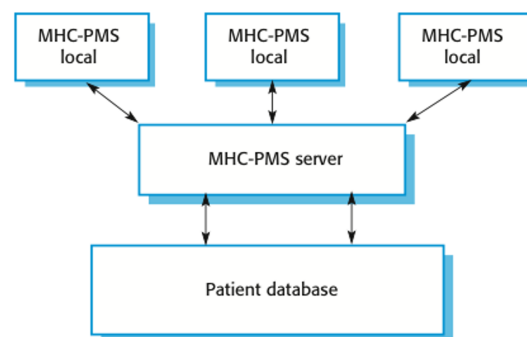


Figure 1.6 – Sommerville (10<sup>th</sup> edition)

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## Case Studies

### - Mental Health Care-Patient Management System (MHC-PMS)

- Features:
  - Individual care management
  - Patient Monitoring
  - Monthly Administrative Reports
  - Privacy

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## Case Studies

### - Wilderness Weather Station

- Weather Station:
  - Collecting weather data
  - performs initial data processing,
  - transmitting to data management system
- Data Management/ Archiving:
  - Collects data from all of the wilderness weather stations
  - performs data processing and analysis
  - archives the data.

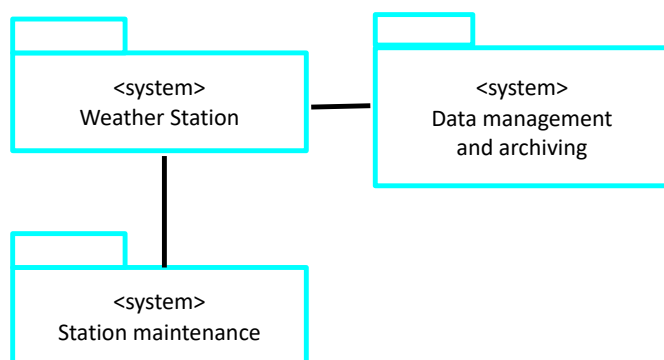


Figure 1.7 – Sommerville (10<sup>th</sup> edition)

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## Case Studies

### - Wilderness Weather Station

- Station Maintenance:
  - Communicates by satellite with all wilderness weather stations
  - monitors the health of these systems
  - provides problem reports.

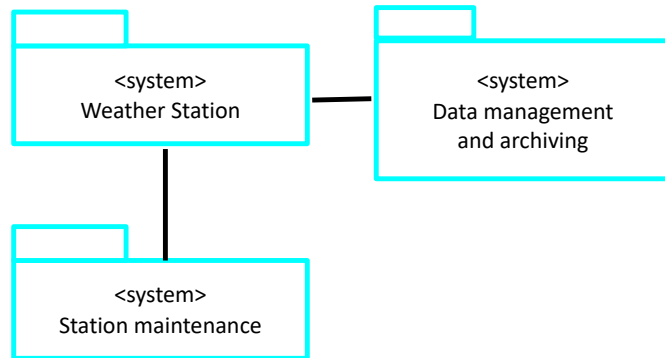


Figure 1.7 – Sommerville (10<sup>th</sup> edition)

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## Case Studies

### - Wilderness Weather Station

- Additional Features:
  - Monitor the instruments, power and communication hardware and report faults to the management system
  - Manage local system power
  - Allow dynamic reconfiguration

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