What competencies do software engineering students gain?

Software Engineering
Program-specific competencies

**Competencies** are the skills, knowledge and attributes gained through every work, educational, volunteer and life experience. UVic students in the Software Engineering program develop the following program-specific competencies.

*Develops the following competencies specific to the Faculty of Engineering:*

**Professional practice**

*Behaves in accordance with the standards and code of ethics of the Association of Professional Engineers and Geoscientists of British Columbia (APEGBC)*

- Prioritizes the safety, health and welfare of public and environmental protection
- Promotes health and safety within the workplace
- Undertakes and is responsible for professional assignments only when qualified
- Maintains confidentiality and avoids a conflict of interest
- Keeps informed to maintain competence
- Acts with fairness, courtesy and good faith towards clients, colleagues and others
- Extends public knowledge and appreciation of engineering

**Reliability, safety and failure analysis**

*Develops systems that are reliable and effective by mitigating risk and reducing failure*

- Maintains an awareness of the quality assurance standards and testing procedures
- Ensures that systems or components perform their required function for the required duration under the stated conditions
- Maintains a current knowledge and awareness of requisite safety standards
- Understands the consequences of failure and reduces their impact
- Establishes the mean time between failures when assessing reliability

**Design**

*Gathers requirements, develops models and creates prototypes in a timely and effective manner to increase a project’s safety and success*

- Gathers full requirements for a project
- Understands the client’s needs
- Models a solution using the appropriate tools
- Relates and justifies the design process to the client
- Implements designs that are safe and effective
- Demonstrates awareness of how the design integrates into its environment
Engineering tools

*Uses a broad range of Engineering tools, applications and software.*

- Designs equipment and systems using a variety of software packages
- Simulates mechanical and electronic systems using the appropriate tools
- Analyses systems, equipment and data using the correct tools
- Operates mechanical equipment in a lab or workshop safely and effectively
- Uses electronics and electrical equipment in a careful and accurate manner
- Develops software and scripts in a variety of environments and languages
- Uses computer software and systems in an appropriate manner
- Understands database concepts and usage and uses them effectively
- Researches and recommends new tools where existing tools are inadequate
- Chooses tools based on their comparative strengths and weaknesses

Engineering knowledge

*Understands the broad scope of disciplines that support engineering theory and practice*

- Demonstrates knowledge of the mathematical fundamentals of engineering
- Applies the correct statistical methods to analyze and investigate data
- Understands the supporting natural sciences for their discipline of engineering
- Maintains a comprehensive knowledge of the engineering fundamentals
- Demonstrates an understanding of engineering economics
- Comprehends how engineering specifics integrate into a larger project
- Studies companion subjects to aid a project's success

*Develops the following competencies specific to the Software Engineering program:*

Control theory and systems

*Understands how control systems function and their use*

- Applies the fundamentals of control theory in the design of dynamic systems
- Demonstrates an understanding of feedback control systems
- Identifies design specifications
- Evaluates system performance
- Identifies components of a dc servo system and its use in motion control
- Implements a control system using feedback circuits

Networks, hardware and communications

*Understands computer networking principles and engineering*

- Understands layered network architecture
- Uses different digital communication networks to transmit data
- Works with LANs and WANs
- Applies different network protocols at different layers
- Protects networks from unauthorized access using the appropriate policies in conjunction with the underlying computer network infrastructure
- Identifies mobile wireless communications techniques and issues affecting multimedia quality of service
- Implements different types of buses, interrupts, families of processors and instruction sets
Software development, practice and theory

*Employs knowledge of software life cycles and developmental phases*

- Works within the different software development lifecycle stages
- Takes business, product and process requirements into consideration
- Applies different software development methodologies
- Implements process improvement models, such as ISO 9000
- Solves software development problems using formal methods
- Considers software evolution issues during development

Computer hardware and systems

*Demonstrates knowledge of the architecture of computer systems and the interrelationship between the OS and the architecture*

- Utilizes the necessary tools to improve system performance
- Understands the transfer of information from one system component to another
- Compares performance of similar systems using common metrics
- Identifies the optimal system for given problem
- Works with different CPU architectures
- Uses different operating systems
- Utilizes different memory management methods

Computer information processing and algorithms

*Understands the theoretical foundations of computer science and the practice of abstracting known methods to new problems*

- Designs automated software test tools
- Displays an ability to manipulate information
- Creates solutions from user specifications, given known system constraints
- Optimizes solutions to improve performance using coding best practices
- Acknowledges the practical limits of a system for problem solving

*UVic Co-op and Career worked with the UVic Faculty of Engineering of to develop this competency document.*