

PROGRAM-SPECIFIC COMPETENCIES - SOFTWARE ENGINEERING

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 programspecific competencies. We worked with the Department of Software Engineering to develop this document.

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 projects success

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