

PROGRAM-SPECIFIC COMPETENCIES - BIOMEDICAL ENGINEERING

Competencies are the skills, knowledge and attributes gained through every work, educational, volunteer and life experience.

UVic students in the [Biomedical Engineering](#) program develop the following program-specific competencies We worked with the Department of Biomedical 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

Develops the following competencies specific to the Biomedical Engineering program:

BIOLOGICAL SYSTEMS

Combines knowledge of biological systems at the cellular and organ system level with quantitative analysis and core aspect of engineering

- + Understands physiology at a molecular and cellular level
- + Demonstrates knowledge of organic chemistry
- + Applies fundamentals of either mechanical or electrical engineering to solve issues in medicine and health care
- + Designs medical instruments, devices and software; integrates data and specifications to develop new medical procedures and conduct innovative research

MATERIALS

Applies knowledge of engineering materials and their properties and behaviours

- + Demonstrates an understanding of the property differences between materials
- + Determines project needs by considering the characteristics of specific materials
- + Estimates requirements based on knowledge and experience
- + Optimizes performance and best practices in material extraction and processing
- + Manages the recovery, reuse, recycling and/or disposal of materials
- + Participates in material research and development

ADVANCED THERMODYNAMICS AND FLUIDS

Solves thermodynamic engineering problems using mathematical formulations

- + Demonstrates knowledge of the fundamental science of fluid dynamics
- + Designs fluid movement systems using the appropriate theory
- + Determines the appropriate pump for the application
- + Designs heat transfer systems from knowledge of different types of heat exchangers
- + Participates in the research and development of new heat transfer

POWER AND ENERGY SYSTEMS

Demonstrates knowledge of power and energy systems fundamentals and their integration within the modern electrical grid and community

- + Applies the fundamental science associated with electricity
- + Understands the generation, transmission, distribution and processing of energy
- + Considers the characteristics of an energy system in requirements gathering
- + Devises improvements in energy usage utilizing alternative systems
- + Outlines the fault tolerant, reliable operation of power systems
- + Plans research and development of new energy systems

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
- + Demonstrates an understanding of processors and microcontrollers