



ENGR-102 – Engineering Design 2

University Arts and Science

Effective Term & Year: Fall 2022
Course Outline Review Date: 2026-04-01

Program Area: Math and Sciences

Description:

This course will cover engineering design as applied to larger, more self-directed projects. Students will work in groups, following a structured process to design a system comprising of electrical, mechanical, and software sub-systems. Students will complete one major group project through several milestone stages with associated technical reporting, including a final written report and oral presentation. This course will introduce students to the concepts of sustainability and engineering ethics and apply this knowledge to case studies and lab exercises.

Program Information:

This course is a requirement for all students completing the Common Engineering Curriculum.

Delivery Methods: On-campus (Face-to-Face)

Credit Type: College of the Rockies Credits

Credits: 3

Course type/s: Sciences, Lab Sciences

Instructional Activity and Hours:

Activity	Hours
Classroom, Directed Studies or Online Instruction	30
Seminar/Tutorials	
Laboratory/Studio	30

Practicum/Field Experience	
Co-op/Work Experience	
Other	
Total	60

Course Requisites:

- Complete all of the following
 - Earned a minimum grade of C (60%) in each of the following:
 - **ENGR101** – Engineering Design 1 (3)
 - **MATH103** – Differential Calculus (3)
 - **COMP105** – Introduction to Programming in the C and C++ Language (3)
 - Completed or concurrently enrolled in:
 - **MATH104** – Integral Calculus (3)
 - **PHYS104** – Introduction to Physics 2 (3)

Flexible Assessment: Yes

In some cases students may be able to apply for recognition of prior learning outside the classroom. This flexible assessment process provides equivalent course credit. It is a rigorous process that may include external evaluation, worksite assessment, demonstration, standardized test, self-assessment, interview, products/portfolio, and challenge exam, or other measures as appropriate. Tuition fees apply. Contact an education advisor for more information.

Course Transfer Credit:

For information about receiving transfer credit for courses taken at either British Columbia or Alberta institutions, please see <https://www.bctransferguide.ca/> or <https://transferalberta.alberta.ca> . For more transfer credit information, please visit <https://www.cotr.bc.ca/Transfer>

All requests for course transfer credit from institutions in British Columbia or elsewhere should go to the College of the Rockies Enrolment Services office.

Textbook Resources:

Textbook selection varies by instructor and may change from year to year. At the Course Outline Effective Date the following textbooks were in use:

No required text. Course materials will be available via the course webpage.

Please see the instructor's syllabus or check COTR's online text calculator <https://textbook.cotr.bc.ca/> for a complete list of the currently required textbooks.

Learning Outcomes:

Upon the successful completion of this course, students will be able to:

Engineering Design

- Apply the engineering design process to open-ended engineering design problems
- Apply mechanical and electrical concepts, modelling tools, and software principles to the understanding and analysis of engineering problems, and the design of potential solutions
- Describe Work Breakdown Structure and Gantt charts
- Identify project scope (function/constraints)
- Integrate design considerations (e.g. environment, safety)
- Identify and Consider risks and hazards
- Use brainstorming and creative tools
- Build/test prototypes

Sustainability

- Understand the three pillars of sustainability
- Compare Traditional vs. Sustainable Design Criteria
- Apply life cycle assessment to a product
- Describe the impact of human activity on health, safety, and environmental systems.

Professionalism/Ethics, Social/Professional Responsibility

- Describe the CEAB core competencies
- Apply continuous improvement
- Describe the engineering code of ethics, and demonstrate ethical behaviour
- Apply ethical conflict resolution
- Describe the contributions that an engineer can make to society as well as the impact (both positive and negative) that an engineering project can have on society

Teamwork

- Give/receive feedback effectively
- Participate equitably as a member of a team, demonstrating initiative, professionalism, and effective intra-team communication

Project work

- Demonstrate progress at several milestone stages with associated technical reporting
- Client-based (e.g. the client prescribes the scope and constraints and verifies delivery)

- Consider regulatory constraints, the business case, stakeholder interests and environmental considerations as part of an iterative project design
- Apply engineering tools, including hand tools, prototyping tools, and software tools to create, test, and analyze physical embodiments of an engineering design
- Prepare and deliver effective technical reports and presentations
- Develop a project consisting of the structure: Sensor ? Processor (Microcontroller) ? Actuator

Course Topics:

- Engineering Design Process
 - Project Management
 - Human Design Factors
 - Risk Management
 - Engineering Fundamentals
- Designing for the Environment
 - Pillars of Sustainability
 - Life Cycle Assessment
 - Impact of human activity on health, safety, and environmental systems
- Engineering Ethics
 - Describe the Engineering Code of Ethics
 - Apply Ethical Conflict Resolution

See instructor's syllabus for the detailed outline of weekly readings, activities and assignments.

Evaluation and Assessments

Assessment Type: On-Campus (face-to-face)

Assessment Type	% of Total Grade
Lecture – Assignments / In-Class Activities	10%
Lecture – Midterm	15%
Lecture – Final Exam	35%
Laboratory – Lab Exercises	10%
Laboratory – Projects	30%
Total	100%

Grade Scheme

A+	A	A-	B+	B	B-	C+	C	C-	D	F
>=90	89-85	84-80	79-76	75-72	71-68	67-64	63-60	59-55	54-50	<50

Pass requirements: A passing average (50% or higher) in both the theory and practical

components.

Evaluation Notes Comments:

A grade of "D" grants credit, but may not be sufficient as a prerequisite for sequential courses. For program credit towards the Engineering Certificate, students must achieve an overall average of C+ in all courses with no course grade lower than a C.

Exam Attendance:

Students must attend all scheduled exams at the appointed time and place. Instructors may approve an alternate exam to accommodate an illness or personal crisis. Department heads will consider other written requests. Any student who misses a scheduled exam without prior approval will receive a "0" on the exam.

Academic Policies:

College of the Rockies policies related to courses can be found at <https://cotr.bc.ca/about-us/college-policies/> and include the following:

- Policy 2.4.3 Students with Documented Disabilities
 - Policy 2.4.4 Student Conduct (plagiarism, other cheating, behavioral misconduct)
 - Policy 2.5.8 Academic Performance
 - Policy 2.5.3 Grade Appeal
 - Policy 2.4.9 Student Concerns Re Faculty
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Course Changes:

The College of the Rockies updates course outlines regularly to meet changing educational, employment and marketing needs. The instructor will notify students in writing of any updates to this outline during the semester. The instructor reserves the right to revise, add or delete material while meeting the learning outcomes of this course outline.