COLLEGE OF
THE ROCKIES

ENGR-141 – Engineering Statics and Dynamics

University Arts and Science

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

Program Area: Math and Sciences

Description:

This course includes the topics: vector operations, dot and scalar products, conditions for equilibrium in two- and three-dimensions, free body diagrams, moments about an axis, couples, friction, wedges, screws, trusses, methods of joints, method of sections, shear and moment equations and diagrams, relations between distributed load, shear, and moment, kinematics, rectilinear and curvilinear motion in rectangular, normal, tangential, and cylindrical components, dynamics, Newton's second law, equations of motion in various coordinates, Zeroth law and heat capacity, first law of thermodynamics, heat engines.

Program Information:

This course is required for students pursuing the Engineering Certificate who want to transfer into Engineering at Universities in British Columbia. It can be used for the Associate of Arts and Science Degrees.

Delivery Methods: On-campus (Face-to-Face), Hybrid – On-campus (Face-to-Face) and Online

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	45
Seminar/Tutorials	
Laboratory/Studio	
Practicum/Field Experience	
Co-op/Work Experience	
Other	
Total	45

Course Requisites:

- Completed or concurrently enrolled in:
    - MATH103 – Differential Calculus (3)
    - PHYS103 – Introduction to Physics 1 (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 Columba 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:

Hibbeler, R.C. *Engineering Mechanics: Static and Dynamics*. 14th ed. Prentice-Hall Publishing Company, 2015.

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:

- apply Newton's Laws in a variety of situations;
- manipulate vectors in two- and three-dimensions: addition, subtraction, and scalar multiplication of vectors; calculate the dot and cross products of vectors; calculate the angle between vectors; break a vector into components;
- use Free Body Diagrams to analyze force systems in two- and three dimensions;
- calculate the moment of a force about a line; find a force and moment which is equivalent to a system of forces and moments;
- draw a Free Body Diagram for a rigid body and solve problems using the equations of equilibrium;
- understand the characteristics of dry friction; solve problems involving frictional forces in wedges and screws;
- determine the forces in the members of a truss using the methods of joints and sections;
- analyze the forces acting on the members of frames composed of pin-connected members;
- apply the method of sections to determine the internal loadings in a member;
- formulate equations which describe the internal stress and moment throughout a member;
- use calculus to analyze the kinematics of a moving particle exhibiting both continuous and erratic motion; the relationship between position, velocity, and acceleration;
- describe curvilinear motion in rectangular and in cylindrical coordinates; understand and apply the normal and tangential components;
- analyze relative motion using a translating axis;
- use Newton's second law to derive the equation of motion for a system of particles;
- perform calculations using the equations of motion in both rectangular and cylindrical coordinates;
- Zeroth law and heat capacity;
- kinetic theory, first law of thermodynamics; and
- heat engines.

Course Topics:

General Principles:

- Units of Measurement
- Calculations; Significant Figures

Vectors:

- Vector Operations
- Dot Product; Angles Between Vectors; Components

Force Systems:

- Moment of a Force About an Axis; Cross Products
- Principle of Moments
- Simplification of a Force and Couple

Equilibrium of a Rigid Body:

- Free Body Diagrams
- Equations of Equilibrium

Friction:

- Dry Friction
- Wedges and Screws

Structural Analysis:

- Trusses
- Method of Joints
- Method of Sections

Internal Forces:

- Shear and Moment Equations and Diagrams
- Distributed Load, Shear, and Moment

Kinematics:

- Rectilinear Kinematics
- Curvilinear Motion; Normal and Tangential Components
- Projectile Motion
- Cylindrical Coordinates

Force and Acceleration:

- Newton's Second Law
- Equations of Motion:
    - Rectilinear Coordinates
    - Normal and Tangential Coordinates
    - Cylindrical Coordinates

Thermodynamics:

- Zeroth Law and Heat Capacity
- Kinetic Theory, First Law of Thermodynamics

- Heat Engines

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

Evaluation and Assessments

Assessment Type: On-Campus (face-to-face) and Online, or Hybrid

Assessment Type	% of Total Grade
Assignments/Quizzes	20%
Midterms	30%
Final Exam	50%
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: None

Evaluation Notes: A grade of "D" grants credit, but may not be sufficient as a prerequisite for sequential courses.

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

Equivalent Course(s) and Course Code Changes

Prior Course Code: PHYS141 and PHYS170 APSC 141

Date Changed: September 2021

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.