ENGR-141 – Engineering Statics and Dynamics

University Arts and Science

Effective Term & Year: Fall 2026
Course Outline Review Date: 2031-04-01

Program Area: Math and Sciences

Description:

An introductory mechanics course covering the statics and dynamics of particles and rigid bodies, using vector analysis and differential/integral calculus to solve problems related to forces, motion, work, and energy. Students will be introduced to Free Body Diagrams and techniques for resolving contributions of forces to different physical systems.

Program Information:

This course is an optional course required for admission into Engineering Degrees at many receiving institutions. 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

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)

Prior Learning and Recognition: Yes

Students are able to request formal recognition of their prior learning or experience outside the classroom. Challenge examination, portfolio-assisted assessment, work-based assessment or a combination of assessments that is appropriate to identify, assess, and recognize prior skills, competencies, and knowledge to achieve course credit. Tuition fees apply, refer to Policy 2.5.5 Prior Learning Assessment and Recognition (PLAR) or 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:

Osgood, L., Cameron, G., Christensen, E., Benny, A., Hutchison, M., & Areoye, D. (n.d.). *Engineering mechanics: Statics*.

UPEI Pressbooks. https://pressbooks.library.upei.ca/statics/

Kirkey, J. (n.d.). *Mechanics for applied science*. BCcampus. https://collection.bccampus.ca/resource/VygiUCeX

Moore, J., Chatsaz, M., d'Entremont, A., Kowalski, J., & Miller, D. (n.d.). *Mechanics map: Digital textbook*. Pennsylvania State University.

https://mechanicsmap.psu.edu/index.html

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;
- utilize Free Body Diagrams to analyze force systems in two and three dimensions;
- analyze the forces acting on the members of frames composed of pin-connected members;
- relate statics and dynamics to concepts related to the First Law of Thermodynamics and heat engines;
- formulate equations which describe the internal stress and moment throughout a member;
- analyze the kinematics of a moving particle exhibiting both continuous and erratic motion; and
- perform calculations using the equations of motion in both rectangular and cylindrical coordinates.

Course Topics:

General Principles:

- Units of Measurement
- Calculations; Significant Figures

Vectors:

- Vector Operations – addition, subtraction and scalar multiplication
- 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	40%
Midterm	30%
Final Exam	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

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 2.1.4 Course Audit
- Policy 2.4.1 Credential Framework
- Policy 2.4.3 Students with Documented Disabilities
- Policy 2.4.4 Student Rights, Responsibilities and Conduct
- Policy 2.4.8 Academic Performance
- Policy 2.4.9 Student Feedback and Concerns
- Policy 2.4.11 Storage of Academic Works
- Policy 2.5.3 Student Appeal
- Policy 2.5.5 Prior Learning Assessment and Recognition (PLAR)

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.