COLLEGE OF THE ROCKIES

Analytical Mechanics – PHYS 201

University Studies Program

Course Outline

COURSE IMPLEMENTATION DATE:	**April 2001**
OUTLINE EFFECTIVE DATE:	**January 2021**
COURSE OUTLINE REVIEW DATE:	**September 2026**

GENERAL COURSE DESCRIPTION:

Analytical Mechanics involves advanced applications of Newton's Laws and rotational motion. This course also covers non-inertial reference frames, central forces, and Kepler's Laws of Motion.

Program Information: This course is required for Physics, Engineering and Math Majors. This course is usable for Associate of Arts and Associate of Science degrees.

Delivery: This course is delivered face to face in a classroom and lab setting.

COTR Credits: 3

Hours for this course: 90 hours

Typical Structure of Instructional Hours:

Instructional Activity	Duration
Lecture Hours	45
Seminars / Tutorials	
Laboratory / Studio Hours	45
Practicum / Field Experience Hours	
Other Contact Hours	
Total	90

Practicum Hours (if applicable):

Type of Practicum	Duration
On-the-job Experience	N/A
Formal Work Experience	N/A
Other	N/A
Total	

Course Outline Author or Contact:
Benjamin Tippett, Phd

Signature

APPROVAL SIGNATURES:

Department Head
Erin Aasland Hall
E-mail: aaslandhall@cotr.bc.ca

Department Head Signature

Dean of Business and University Studies
Darrell Bethune
E-mail: bethune@cotr.bc.ca

Dean Signature

EDCO

Valid from: January 2021-September 2026

Education Council Approval Date

COURSE PREREQUISITES AND TRANSFER CREDIT:

Prerequisites: PHYS 104 and MATH 104

Corequisites: MATH 201

Flexible Assessment (FA):

Credit can be awarded for this course through FA ☑ Yes ☐ No

Learners may request formal recognition for flexible assessment at the College of the Rockies through one or more of the following processes: External Evaluation, Worksite Assessment, Demonstration, Standardized Test, Self-assessment, Interview, Products/Portfolio or Challenge Exam. Contact an Education Advisor for more information.

Transfer Credit: For transfer information within British Columbia, Alberta and other institutions, please visit http://www.cotr.bc.ca/Transfer.

Students should also contact an academic advisor at the institution where they want transfer credit.

Prior Course Number: N/A

Textbooks and Required 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:

Taylor, *Classical Mechanics*, University Science Books (2005)

Please see the instructor's syllabus or check COTR's online text calculator http://go.cotr.bc.ca/tuition/tCalc.asp for a complete list of the currently required textbooks.

LEARNING OUTCOMES:

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

- model the acceleration of a system of interconnected parts involving lateral or rotational motion;
- calculate the moment of inertia for an extended object around a given axis of rotation;
- describe the use of differential equations and initial conditions as it relates to modelling dynamic systems;
- use complex functions to solve the differential equations relating to damped and/or driven harmonic oscillators;
- describe the different ways a damped and/or driven harmonic oscillator will behave depending on its specific physical parameters;
- recognize and use conserved quantities to simplify the analysis of a dynamic system;
- derive the conservation of angular momentum in a dynamic system involving a single central force;
- convert the description of motion from a Cartesian coordinate system to a Polar coordinate system;
- list the three Kepler's laws, and describe how they are related to Newton's Universal law of gravitation;
- use conservation laws and Newton's Universal law of gravitation to classify orbits according to the total energy of the system; and
- define a pseudo-force and recognize two pseudo-forces from a rotating reference frame.

COURSE TOPICS:

- Newton's laws and rotational motion
- Analyzing systems relating more than one type of motion
- Universal Gravitation
- Using differential equations to describe dynamic systems
- Driven and damped simple harmonic motion
- Conservative Forces
- Central Forces
- Motion in Polar coordinates

- Coordinate transformations
- Noninertial reference frames and pseudo forces

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

EVALUATION AND ASSESSMENT:

Assignments	% Of Total Grade
Assignments	20%
Laboratory	20%
Midterms	20%
Final Exam	40%
Total	100%

Please see the instructor's syllabus for specific classroom policies related to this course, such as details of evaluation, penalties for late assignments and use of electronic aids.

Note: Satisfactory completion of Laboratory is necessary to receive a grade in this course.

EXAM POLICY:

Students must attend all required scheduled exams that make up a final grade at the appointed time and place.

Individual instructors may accommodate for illness or personal crisis. Additional accommodation will not be made unless a written request is sent to and approved by the appropriate Department Head prior to the scheduled exam.

Any student who misses a scheduled exam without approval will be given a grade of "0" for the exam.

COURSE GRADE:

Course grades are assigned as follows:

Grade	A+	A	A-	B+	B	B-	C+	C	C-	D	F
Mark (Percent)	≥ 90	89-85	84-80	79-76	75-72	71-68	67-64	63-60	59-55	54-50	< 50

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

ACADEMIC POLICIES:

See www.cotr.bc.ca/policies for general college policies related to course activities, including grade appeals, cheating and plagiarism.

COURSE CHANGES:

Information contained in course outlines is correct at the time of publication. Content of the courses is revised on an ongoing basis to ensure relevance to changing educational, employment and marketing needs. The instructor will endeavour to provide notice of changes to students as soon as possible. The instructor reserves the right to add or delete material from courses.