

# COURSE SYLLABUS



**COURSE TITLE:** MENG 253 – Dynamics & Mechanics of Machines  
**CLASS SECTION:** A and B  
**TERM:** Fall 2024  
**COURSE CREDITS:** 4  
**DELIVERY METHOD(S):** Lecture, Tutorial

Camosun College campuses are located on the traditional territories of the Ləkʷəŋən and W̱SÁNEĆ peoples. We acknowledge their welcome and graciousness to the students who seek knowledge here.  
Learn more about Camosun's

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The COVID-19 pandemic has presented many challenges, and Camosun College is committed to helping you safely complete your education. Following guidelines from the Provincial Health Officer, WorkSafe BC, and the B.C. Government to ensure the health and wellbeing of students and employees, Camosun College is providing you with every possible protection to keep you safe. Our measures include COVID Training for students and employees, health checks, infection control protocols including sanitization of spaces, PPE and ensuring physical distancing. For details on these precautions please follow this link: <http://camosun.ca/covid19/faq/covid-fags-students.html>. However, if you're at all uncomfortable being on campus, please share your concerns with your instructor. If needed, alternatives will be discussed.

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*Camosun College requires mandatory attendance for the first class meeting of each course. If you do not attend, and do not provide your instructor with a reasonable explanation in advance, you will be removed from the course and the space offered to the next waitlisted student.*

## INSTRUCTOR DETAILS

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**NAME:** Benj Birch  
**EMAIL:** birchb@camosun.ca  
**OFFICE:** Tech 111  
**HOURS:** See D2L and by appointment

*As your course instructor, I endeavour to provide an inclusive learning environment. However, if you experience barriers to learning in this course, do not hesitate to discuss them with me. Camosun College is committed to identifying and removing institutional and social barriers that prevent access and impede success.*

## CALENDAR DESCRIPTION

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Students will learn about the components of velocity and acceleration, motion analysis, force/acceleration, work/energy, and impulse/momentum principles applied to particles, systems of particles, and rigid bodies. Students will also study the kinematics and dynamics of mechanisms to determine the velocity, acceleration, and forces acting on each component. Analyzed mechanisms include four-bar-links, piston-sliders, cams and gear trains. Systems will be analyzed using analytical, graphical and/or computer-aided methods, with an emphasis on practical applications and case studies.

**PREREQUISITE(S):** C in MATH 193 and MENG 172

## COURSE LEARNING OUTCOMES / OBJECTIVES

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Upon successful completion of this course a student will be able to:

1. Explain the kinematics of particles and groups of particles (how particles move and accelerate relative to a stationary axis and how they move relative to other particles).
2. Explain the kinetics of particles and groups of particles using: force/acceleration, impulse/momentum, and work/energy methods (how particles are influenced by external forces).
3. Analyze mechanisms, graphically and analytically, to determine velocity, acceleration and force.
4. Calculate the angular velocities of gears in simple, compound, and epicyclic gear trains.
5. Select the mass and radius of flywheels to minimize the needed power output of the prime-mover in applications with varying power requirements or to smooth the varying output of a power source.

## COURSE SCHEDULE, TOPICS, AND ASSOCIATED PREPARATION / ACTIVITY / EVALUATION

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The following schedule and course components are subject to change with reasonable advance notice, as deemed appropriate by the instructor.

WEEK	Lab	ACTIVITY or TOPIC	Due
1	A1	Kinematics of particles: Position, velocity and acceleration. Constant Acceleration.	-
2	B1	Visualization, piecewise functions, and projectile motion.	Assign 1
3	A2	Curvilinear coordinate systems, n-t coordinates, cylindrical (polar) coordinates, curvilinear motion of particles.	Assign 2
4	B2	Kinetics of particles: Newton's 2nd Law, forces and accelerations. Newton's Laws applied to systems of particles.	Assign 3
5	A3	Kinetics of particles: Work/Energy principles applied to a single particle, and a system of particles.	Assign 4
6	B3	Kinetics of particles: Linear impulse and momentum applied to a single particle, and a system of particles.	Assign 5
7	A4	<b>Review and Term Test 1.</b>	Assign 6*
8	B4	Introduction to mechanisms, complex numbers, degrees of freedom, review of vectors, position analysis.	-
9	A5	Relative velocities in mechanisms, relative sliding velocity.	Assign 8
10	B5	Linear and angular acceleration analysis in mechanisms, relative acceleration examples.	Assign 9
11	A6	Coriolis and sliding acceleration analysis.	Assign 10
12	B6	Static forces in machines, inertial forces in machines.	Assign 11
13	A7	Combined static and inertial force examples.	Assign 12
14	B7	Gears, gear trains, planetary gears, Analysis of cams and cam design, flywheels.	Assign 13
Exam Week	-	Term Test 2	Assign 14*

\* Not due, solutions provided as the assignment is delivered, therefore used to study for the test that would come before the due date.

Students registered with the Centre for Accessible Learning (CAL) who complete quizzes, tests, and exams with academic accommodations have booking procedures and deadlines with CAL where advanced notice is required. Deadlines can be reviewed on the [CAL exams page](http://camosun.ca/services/accessible-learning/exams.html). <http://camosun.ca/services/accessible-learning/exams.html>

## REQUIRED MATERIALS & RECOMMENDED PREPARATION / INFORMATION

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**Engineering Mechanics: Dynamics or Engineering Mechanics: Statics and Dynamics, R.C. Hibbeler.** Any edition but more recent preferred.

## EVALUATION OF LEARNING

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DESCRIPTION	WEIGHTING
Assignments	15%
Lab/Tutorial	15%
Term Test 1	35%
Term Test 2	35%
<b>TOTAL</b>	<b>100%</b>

If you have a concern about a grade you have received for an evaluation, please come and see me as soon as possible. Refer to the [Grade Review and Appeals](http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf) policy for more information. <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf>

## COURSE GUIDELINES & EXPECTATIONS

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### Lecture Attendance

To get the most out of this course, students are expected to attend all classes and be on time. It is your responsibility to acquire all information given during a class missed, including notes, hand-outs, changed exam dates etc.

### Labs/Tutorials

Lab sessions will consist of tutorials and in-class exercises, potentially using MS Excel, and/or MATLAB software, if required. Late tutorial exercises are not excepted unless arranged with me.

### Assignments

that assignments are due every Friday at 11:59 pm of the week given in the schedule provided unless otherwise posted (Assignment 5 will be due on the Tuesday). Assignments are to be submitted to D2L as a single PDF for each assignment and marks will be awarded for completion. Late assignments will be accepted with a deduction of 25% per day late up to 50%. No marks rewarded after the term test.

### Exam Procedures

You must pass both term tests to achieve a passing mark in the course. All exams must be written at the scheduled times with the exception of students requiring an accommodation by CAL. It is understood that emergency circumstances do occur (e.g. severe illness or family emergency); for such circumstances accommodation may be offered at the discretion of the instructor, provided the student:

- a) notifies the instructor in advance of the exam (not after), and
- b) provides documented evidence of the circumstance (e.g. medical certificate).

If an exam is missed with an excused absence, it is up to the instructor's discretion as to how the mark will be made up. In most cases, a new exam will be scheduled for the student as soon as possible.

Be sure not to make travel plans for the end of semester until the final exam schedules are finalized and posted. Please ask any family members who might make travel plans on your behalf to consult you before booking tickets.

All exams are closed book and notes. Cell phones will be required to be left at your desk during the exam if a washroom break is required.

## STUDENT RESPONSIBILITY

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Enrolment at Camosun assumes that the student will become a responsible member of the College community. As such, each student will display a positive work ethic, assist in the preservation of College property, and assume responsibility for their education by researching academic requirements and policies; demonstrating courtesy and respect toward others; and respecting expectations concerning attendance, assignments, deadlines, and appointments.

## SUPPORTS AND SERVICES FOR STUDENTS

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Camosun College offers a number of services to help you succeed in and out of the classroom. For a detailed overview of the supports and services visit <http://camosun.ca/students/>.

Academic Advising	<a href="http://camosun.ca/advising">http://camosun.ca/advising</a>
Accessible Learning	<a href="http://camosun.ca/accessible-learning">http://camosun.ca/accessible-learning</a>
Counselling	<a href="http://camosun.ca/counselling">http://camosun.ca/counselling</a>
Career Services	<a href="http://camosun.ca/coop">http://camosun.ca/coop</a>
Financial Aid and Awards	<a href="http://camosun.ca/financialaid">http://camosun.ca/financialaid</a>
Help Centres (Math/English/Science)	<a href="http://camosun.ca/help-centres">http://camosun.ca/help-centres</a>
Indigenous Student Support	<a href="http://camosun.ca/indigenous">http://camosun.ca/indigenous</a>
International Student Support	<a href="http://camosun.ca/international/">http://camosun.ca/international/</a>
Learning Skills	<a href="http://camosun.ca/learningskills">http://camosun.ca/learningskills</a>
Library	<a href="http://camosun.ca/services/library/">http://camosun.ca/services/library/</a>
Office of Student Support	<a href="http://camosun.ca/oss">http://camosun.ca/oss</a>
Ombudsperson	<a href="http://camosun.ca/ombuds">http://camosun.ca/ombuds</a>
Registration	<a href="http://camosun.ca/registration">http://camosun.ca/registration</a>

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Technology Support

<http://camosun.ca/its>

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Writing Centre

<http://camosun.ca/writing-centre>

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If you have a mental health concern, please contact Counselling to arrange an appointment as soon as possible. Counselling sessions are available at both campuses during business hours. If you need urgent support after-hours, please contact the Vancouver Island Crisis Line at 1-888-494-3888 or call 911.

## COLLEGE-WIDE POLICIES, PROCEDURES, REQUIREMENTS, AND STANDARDS

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### Academic Accommodations for Students with Disabilities

The College is committed to providing appropriate and reasonable academic accommodations to students with disabilities (i.e. physical, depression, learning, etc). If you have a disability, the [Centre for Accessible Learning](#) (CAL) can help you document your needs, and where disability-related barriers to access in your courses exist, create an accommodation plan. By making a plan through CAL, you can ensure you have the appropriate academic accommodations you need without disclosing your diagnosis or condition to course instructors. Please visit the CAL website for contacts and to learn how to get started:

<http://camosun.ca/services/accessible-learning/>

### Academic Integrity

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.13.pdf> for policy regarding academic expectations and details for addressing and resolving matters of academic misconduct.

### Academic Progress

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.1.pdf> for further details on how Camosun College monitors students' academic progress and what steps can be taken if a student is at risk of not meeting the College's academic progress standards.

### Course Withdrawals Policy

Please visit <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.2.pdf> for further details about course withdrawals. For deadline for fees, course drop dates, and tuition refund, please visit <http://camosun.ca/learn/fees/#deadlines>.

### Grading Policy

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.5.pdf> for further details about grading.

### Grade Review and Appeals

Please visit <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.14.pdf> for policy relating to requests for review and appeal of grades.

### Mandatory Attendance for First Class Meeting of Each Course

Camosun College requires mandatory attendance for the first class meeting of each course. If you do not attend, and do not provide your instructor with a reasonable reason in advance, you will be removed from the course and the space offered to the next waitlisted student. For more information, please see the “Attendance” section under “Registration Policies and Procedures”

(<http://camosun.ca/learn/calendar/current/procedures.html>) and the Grading Policy at <http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.5.pdf>.

### Medical / Compassionate Withdrawals

Students who are incapacitated and unable to complete or succeed in their studies by virtue of serious and demonstrated exceptional circumstances may be eligible for a medical/compassionate withdrawal. Please visit <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.8.pdf> to learn more about the process involved in a medical/compassionate withdrawal.

### Sexual Violence and Misconduct

Camosun is committed to creating a campus culture of safety, respect, and consent. Camosun’s Office of Student Support is responsible for offering support to students impacted by sexual violence. Regardless of when or where the sexual violence or misconduct occurred, students can access support at Camosun. The Office of Student Support will make sure students have a safe and private place to talk and will help them understand what supports are available and their options for next steps. The Office of Student Support respects a student’s right to choose what is right for them. For more information see Camosun’s Sexualized Violence and Misconduct Policy: <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.9.pdf> and [camosun.ca/sexual-violence](http://camosun.ca/sexual-violence). To contact the Office of Student Support: [oss@camosun.ca](mailto:oss@camosun.ca) or by phone: 250-370-3046 or 250-3703841

### Student Misconduct (Non-Academic)

Camosun College is committed to building the academic competency of all students, seeks to empower students to become agents of their own learning, and promotes academic belonging for everyone. Camosun also expects that all students to conduct themselves in a manner that contributes to a positive, supportive, and safe learning environment. Please review Camosun College’s Student Misconduct Policy at <http://camosun.ca/about/policies/education-academic/e-2-student-services-and-support/e-2.5.pdf> to understand the College’s expectations of academic integrity and student behavioural conduct.

**Changes to this syllabus:** Every effort has been made to ensure that information in this syllabus is accurate at the time of publication. The College reserves the right to change courses if it becomes necessary so that course content remains relevant. In such cases, the instructor will give the students clear and timely notice of the changes.