

# COURSE SYLLABUS



COURSE TITLE: MENG 253– Dynamics and Mechanisms

CLASS SECTION: X01A/B/C

TERM: F 2023

COURSE CREDITS: 3

DELIVERY METHOD(S): In person

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 [Territorial Acknowledgement](#).

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## INSTRUCTOR DETAILS

NAME: Sam Behfarshad, PhD, P.Eng

EMAIL: [behfarshads@camosun.ca](mailto:behfarshads@camosun.ca)

OFFICE: TEC 264

HOURS: Wed: 10:30- 11:20am, Fri: 9.30-10:20am

*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.*

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## CALENDAR DESCRIPTION

Students will study the kinematics and dynamics of particles and rigid body in two and three dimensions. The kinematics and dynamics analysis will be used for mechanisms to determine the position, velocity, acceleration, and forces acting on each component. Analyzed mechanisms include four-bar-links, piston-sliders, cams and gear trains.

Only open to students in the Mechanical Engineering Technology program.

PREREQUISITE(S): C in [MATH 193](#)  
C in [MENG 172](#)

CO-REQUISITE(S): -

EQUIVALENCIES: -

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## COURSE LEARNING OUTCOMES / OBJECTIVES

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

- Analyze mechanisms, graphically and analytically, to determine velocity, acceleration and force.
- Calculate the angular velocities of gears in simple, compound, and planetary gear trains.

- 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.
- Analyze one and two-degree of freedom, free and forced, damped and undamped, vibrating systems to determine natural frequencies and amplitude ratios:
  - using Coulomb, hysteresis, and viscous damping models
  - for steady-state and transient responses.
- Select vibration isolation and transmission devices to produce the desired transmission ratios.
- Calculate the balance of systems of reciprocating and rotating masses.

#### REQUIRED MATERIALS & RECOMMENDED PREPARATION / INFORMATION

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Textbook(s):

For Dynamics part: ENGINEERING MECHANICS Statics and Dynamics 14th edition By: R. C. HIBBELER

For Mechanisms part: No textbook is required.

This course is fully supported by D2L ©.

#### 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.

ACTIVITY or TOPIC	Week	OTHER NOTES
<b>Dynamics</b>	<b>1</b>	Vector analysis of dynamic systems, algebraic methods.
	<b>2</b>	Kinematics of a particle, position, velocity and acceleration analysis of particles and rigid bodies
	<b>3</b>	Curvilinear motion in different co-ordinates systems, absolute and relative motions of particles.
	<b>4</b>	Kinetics of a particle: Force and acceleration.
	<b>5</b>	Kinetics of a particle: Work and energy.
	<b>6</b>	Planar kinematics of a rigid body.
	<b>7</b>	Planar kinetics of a rigid body: Force and Acceleration

ACTIVITY or TOPIC	Week	OTHER NOTES
<b>Mechanisms</b>	<b>8</b>	Introduction to mechanisms, complex numbers, degrees of freedom, review of vectors, position analysis, velocity analysis.
	<b>9</b>	Relative velocities in mechanisms, relative sliding velocity, instantaneous centers of zero velocity.
	<b>10</b>	Linear and angular acceleration analysis in mechanisms, relative acceleration examples.
	<b>11</b>	Coriolis and sliding acceleration analysis.
	<b>12</b>	Static forces in machines, inertial forces in machines.
	<b>13</b>	Combined static and inertial force examples.
	<b>14</b>	Gears and gear trains, planetary gear trains, analysis of cams and cam design.

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](https://camosun.ca/services/academic-supports/accessible-learning/academic-accommodations-exams). <https://camosun.ca/services/academic-supports/accessible-learning/academic-accommodations-exams>

#### EVALUATION OF LEARNING

(Subject to slight change)

DESCRIPTION	WEIGHTING
<b>Assignments</b>	<b>10%</b>
<b>Quizzes</b>	<b>15%</b>
<b>Midterm Exam</b>	<b>35%</b>
<b>Final Exam</b>	<b>35%</b>
<b>Attendance</b>	<b>5%</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](https://camosun.ca/sites/default/files/2021-05/e-1.14.pdf) policy for more information. <https://camosun.ca/sites/default/files/2021-05/e-1.14.pdf>

#### COURSE GUIDELINES & EXPECTATIONS

Lab sessions MAY consist of simple experiments, tutorials and in-class exercises using AutoCAD, MS Excel, and MATLAB software, where required. **No late lab reports, exercises or assignments are accepted for grading.**

Assignments are to be handed in when due. No late assignments will be accepted. Assignments must be submitted during the lecture times of the due day to Instructor, or at other time specified by the instructor. Assignments must be submitted in hard copies ONLY.

All tests (Quizzes, Midterm Exam and Final Exam) in this course will be closed-book tests.

The final exam must be successfully completed (mark  $\geq 50\%$ ) for a passing grade in the course.

## 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 [camosun.ca/services](https://camosun.ca/services).

Support Service	Website
Academic Advising	<a href="https://camosun.ca/services/academic-supports/academic-advising">camosun.ca/services/academic-supports/academic-advising</a>
Accessible Learning	<a href="https://camosun.ca/services/academic-supports/accessible-learning">camosun.ca/services/academic-supports/accessible-learning</a>
Counselling	<a href="https://camosun.ca/services/health-and-wellness/counselling-centre">camosun.ca/services/health-and-wellness/counselling-centre</a>
Career Services	<a href="https://camosun.ca/services/co-operative-education-and-career-services">camosun.ca/services/co-operative-education-and-career-services</a>
Financial Aid and Awards	<a href="https://camosun.ca/registration-records/financial-aid-awards">camosun.ca/registration-records/financial-aid-awards</a>
Help Centres (Math/English/Science)	<a href="https://camosun.ca/services/academic-supports/help-centres">camosun.ca/services/academic-supports/help-centres</a>
Indigenous Student Support	<a href="https://camosun.ca/programs-courses/iecc/indigenous-student-services">camosun.ca/programs-courses/iecc/indigenous-student-services</a>
International Student Support	<a href="https://camosun.ca/international">camosun.ca/international</a>
Learning Skills	<a href="https://camosun.ca/services/academic-supports/help-centres/writing-centre-learning-skills">camosun.ca/services/academic-supports/help-centres/writing-centre-learning-skills</a>
Library	<a href="https://camosun.ca/services/library">camosun.ca/services/library</a>
Office of Student Support	<a href="https://camosun.ca/services/office-student-support">camosun.ca/services/office-student-support</a>
Ombudsperson	<a href="https://camosun.ca/services/ombudsperson">camosun.ca/services/ombudsperson</a>
Registration	<a href="https://camosun.ca/registration-records/registration">camosun.ca/registration-records/registration</a>

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Support Service	Website
Technology Support	<a href="https://camosun.ca/services/its">camosun.ca/services/its</a>
Writing Centre	<a href="https://camosun.ca/services/academic-supports/help-centres/writing-centre-learning-skills">camosun.ca/services/academic-supports/help-centres/writing-centre-learning-skills</a>

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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.

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

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### Academic Integrity

Students are expected to comply with all College policy regarding academic integrity; which is about honest and ethical behaviour in your education journey. The following guide is designed to help you understand your responsibilities: <https://camosun.libguides.com/academicintegrity/welcome>  
Please visit <https://camosun.ca/sites/default/files/2021-05/e-1.13.pdf> for Camosun's Academic Integrity policy and details for addressing and resolving matters of academic misconduct.

### Academic Accommodations for Students with Disabilities

Camosun College is committed to achieving full accessibility for persons with disabilities. Part of this commitment includes arranging appropriate academic accommodations for students with disabilities to ensure they have an equitable opportunity to participate in all of their academic activities. If you are a student with a documented disability and think you may need accommodations, you are strongly encouraged to contact the Centre for Accessible Learning (CAL) and register as early as possible. Please visit the CAL website for more information about the process of registering with CAL, including important deadlines:

<https://camosun.ca/cal>

### Academic Progress

Please visit <https://camosun.ca/sites/default/files/2023-02/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 <https://camosun.ca/sites/default/files/2021-05/e-2.2.pdf> for further details about course withdrawals. For deadline for fees, course drop dates, and tuition refund, please visit <https://camosun.ca/registration-records/tuition-fees#deadlines>.

### Grading Policy

Please visit <https://camosun.ca/sites/default/files/2021-05/e-1.5.pdf> for further details about grading.

### Grade Review and Appeals

Please visit <https://camosun.ca/sites/default/files/2021-05/e-1.14.pdf> for policy relating to requests for review and appeal of grades.

### 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 ([see policy](#)). Please visit <https://camosun.ca/services/forms#medical> 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: <https://camosun.ca/sites/default/files/2021-05/e-2.9.pdf> and [camosun.ca/services/sexual-violence-support-and-education](https://camosun.ca/services/sexual-violence-support-and-education). To contact the Office of Student Support: [oss@camosun.ca](mailto:oss@camosun.ca) or by phone: 250-370-3046 or 250-370-3841

### 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 <https://camosun.ca/sites/default/files/2021-05/e-2.5.pdf> to understand the College's expectations of academic integrity and student behavioural conduct.

### Looking for other policies?

The full suite of College policies and directives can be found here: <https://camosun.ca/about/camosun-college-policies-and-directives>

**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.