

COURSE SYLLABUS



COURSE TITLE: MENG 254 – Machine Design
CLASS SECTION: DX01
TERM: 2023W
COURSE CREDITS: 4
DELIVERY METHOD(S): 4 Lecture hours and 1 Seminar hour per week

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

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-faqs-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.

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

NAME: Russ Rook
EMAIL: rook@camosun.bc.ca
OFFICE: TEC 113
HOURS: T.B.A.

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

Students will apply failure theories for various types of materials exposed to static and repeated loading to determine component lifetime. Design of machines using fasteners, shafts, bearings, belt-drives, spur gears, clutches and brakes will be considered. Solving of applied design problems is assisted by computer methods. Specification and selection of standard components from appropriate industrial manufacturers is emphasized. Only open to students in the Mechanical Engineering Technology program.

PREREQUISITE(S):	C in MENG 253 and C in MENG 273
CO-REQUISITE(S):	None
EXCLUSION(S):	Open to students in Mechanical Engineering Technology

COURSE LEARNING OUTCOMES / OBJECTIVES

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

- Graphically and analytically determine the maximum shear and principal stresses in a plane from the given stresses.
- Determine the probability of failure according to various failure theories.
- Use the principles of fatigue to estimate the lifetime of a part exposed to steady and alternating stresses.
- Design shafts to handle applied loads for a variety of applications.
- Select the correct screw thread for applications requiring pre-tensioning or transmission power.
- Determine the correct plain bearing and lubricant based on the environment and loading of the bearing.
- Specify the correct type and number of V-belts to satisfy a particular machine design, and estimate the shaft center distance and lifetime of belts.
- Determine the generated torque and required actuating force for a variety of different types of clutches and brakes.
- Perform a force analysis on a spur gear, determine the bending stress, and the dynamic effects, and estimate the tooth and gear lifetime.
- Design torsion, leaf, and helical springs, and determine the suitable wire material and size.

REQUIRED MATERIALS & RECOMMENDED PREPARATION / INFORMATION

***Machine Elements in Mechanical Design*, 6th Ed., R.L. Mott, E.M. Vavrek, J. Wang**

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

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

WEEK	ACTIVITY or TOPIC	SEMINAR	QUIZZES	ASSIGNMENTS
1	Review of types of stresses, stress and strain and their coordinate transformations, stress concentration factors.	-		
2	Introduction to fatigue, steady and alternating stresses, endurance limits, S-N curves, factors affecting fatigue strength.	Stress transformation calculator		
3	Failure theories, the distortion-energy (von Mises) failure theory, the maximum shear stress failure theory.	Fatigue calculator		
4	Fatigue design examples, shaft design, power transmission, keys and couplings, fluctuating loads on shafts.	Tutorial		5.6, 5.11, 5.23, 5.48
5	Shaft design examples.	Shaft design calculator		
6	Plain surface bearings, full-film hydrodynamic bearings, hydrostatic bearings.	Tutorial		12.23, 12.26

WEEK	ACTIVITY or TOPIC	SEMINAR	QUIZZES	ASSIGNMENTS
7	READING BREAK – NO CLASSES OR LABS	-		
8	Rolling contact bearings, bearing types and specification.	Roller bearing calculator		16.16, 14.28, Ex. 12-2 (pg. 525) roller bearing spec.
9	Catch-up (review period), Midterm exam.	Tutorial	Midterm Exam	
10	Belt drive analysis, design, and specification, chain drive analysis, design, and specification.	V-Belt drive calculator		7.18, 7.20, 7.39, 7.41
11	Types of clutches and brakes, system inertia as seen by a clutch/brake, clutch and brake analysis.	Band brake calculator		22.10, 22.15, 22.19, 22.21
12	Gear geometries, forces and stresses on gear teeth, selection of gear material, gear analysis.	Lecture		9.61, 9.64
13	Threaded fasteners, standard thread types, power screws, torque and efficiency, introduction to spring design.	Lecture		19.6, 19.9, 17.5, 17.7
14	Spring materials and wire sizes, helical compression spring design, tolerances and fits.	Tutorial		18.22, 18.24

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>

EVALUATION OF LEARNING

DESCRIPTION	WEIGHTING
Assignments	25
Midterm Exam	35
Final Exam	40
TOTAL	100%

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

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. Tutorials and work periods will be given throughout the semester in the seminar class periods.

Due Dates and Late Assignments

Assignments will be graded based on completion, with solutions posted after the assignment is due. **Assignments are due by 5:30 on the Friday of the weeks indicated** in the above table, and **no late assignments will be accepted for grading**. Assignment solutions will be posted to D2L after the due date. See

<http://camosun.ca/about/policies/education-academic/e-1-programming-and-instruction/e-1.5.pdf> for the Camosun grading policies.

STUDENT RESPONSIBILITY

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

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	http://camosun.ca/advising
Accessible Learning	http://camosun.ca/accessible-learning
Counselling	http://camosun.ca/counselling
Career Services	http://camosun.ca/coop
Financial Aid and Awards	http://camosun.ca/financialaid
Help Centres (Math/English/Science)	http://camosun.ca/help-centres
Indigenous Student Support	http://camosun.ca/indigenous
International Student Support	http://camosun.ca/international/
Learning Skills	http://camosun.ca/learningskills
Library	http://camosun.ca/services/library/
Office of Student Support	http://camosun.ca/oss
Ombudsperson	http://camosun.ca/ombuds
Registration	http://camosun.ca/registration
Technology Support	http://camosun.ca/its
Writing Centre	http://camosun.ca/writing-centre

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.

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. To contact the Office of Student Support: 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.