



CAMOSUN COLLEGE
Trades and Technology
Mechanical Engineering Technology

MENG 254
Machine Design
Winter 2018

COURSE OUTLINE

The calendar description is available on the web @ <http://camosun.ca/learn/calendar/current/web/meng.html#MENG254>

Ω Please note: This outline will not be kept indefinitely. It is recommended students keep this outline for their records, especially to assist in transfer credit to post-secondary institutions.

1. Instructor Information

(a) Instructor	Derek Wakefield
(b) Office hours	M. Th. 12:30 – 1:20 PM, W. 9:30 – 11:20 AM 1:30 – 3:20 PM, Th. 10:30 AM – 12:20 PM, F. 11:30 AM – 12:20 PM
(c) Location	TEC 111
(d) Phone	250-370-4505 Alternative:
(e) E-mail	derekw@camosun.bc.ca
(f) Website	

2. Intended Learning Outcomes

Upon successful completion of this course, the student should be able to:

1. Graphically and analytically determine the maximum shear and principal stresses in a plane from the given stresses.
2. Determine the probability of failure according to various failure theories.
3. Understand the principles behind fatigue and be able to estimate the lifetime of a part exposed to steady and alternating stresses.
4. Design shafts to handle the applied loads under a variety of applications.
5. Determine the correct screw thread to use for certain applications requiring pre-tensioning or transmission of power.
6. Determine the correct plain bearing and lubricant for a particular application based on the environment and loading of the bearing.
7. Specify the correct type and number of V-belts to satisfy a particular machine design and estimate the shaft centre distance and lifetime of the belts.

3. Required Materials

(a) Texts

Machine Elements in Mechanical Design
Mott, Vavrek and Wang, 6th Edition, Pearson Publishing

(b) Other

4. Course Content and Schedule

Outline:

	<i>Estimated Hours</i>
1. <i>Principal Stresses and Stress Transformation</i>	5
Mohr's Circle	
Stress Transformation	
Principal Stresses	
Maximum Shear Stress	
2. <i>Static Failure Theories</i>	5
Types of Static Failures	
Static Failure Theories	
Geometric Stress-Concentration Factors	
3. <i>Designing for Fatigue</i>	5
Endurance Limit of Material, S-N Curves	
Cumulative Fatigue	
4. <i>Fatigue Diagrams</i>	5
Steady and Alternating Stresses	
Introduction to Fatigue Diagrams	
Stress-Concentration Factors	
Equivalent Static Stress	
5. <i>Shafting</i>	5
Power Transmitted; Maximum Static Shearing Stress	
ASME Code for Shafting	
Transverse Shear Stress	
Fluctuating Loads on Shafts	
Mises-Hencky Theory for Failure	
Keys and Couplings	
<i>Midterm #1 – Covers Sections 1, 2, 3 and 4</i>	2
6. <i>Screwed Fasteners</i>	8
Standard Threads, Tolerancing	
Effect of Initial Tensioning and Fluctuating Loading	
Power Screw; Torque and Efficiency	
Stress Due to Impact Loading	

7.	<i>Belt Drives</i>	5
	Prime mover Size and Service Factor	
	Selection of Correct Size and Number of V-Belts	
	Selection of Appropriate Sheave Size	
	Belt Tension and Lifetime	
8.	<i>Springs</i>	5
	Spring Materials and Wire Sizes	
	Torsion Bar Design	
	Helical Compression and Tension Spring Design	
	Helical Torsion Springs	
	<i>Midterm #2 – Covers Sections 5, 6 and 7</i>	2
9.	<i>Plain Bearings</i>	5
	Viscous Shearing Stresses; Petroff's Bearing Equation	
	Hydrodynamic Lubrication, Bearing Characteristic Curves	
	Temperature Rise in Plain Bearings	
	Zn/P curve; Bearing Materials	
	Construction of Bearing	
10.	<i>Design of Gears</i>	5
	Forces on Gear Teeth	
	Stresses in Gear Teeth	
	Gear Materials and Manufacture	
	Selection of Gear Material	
	Lifetime of a Gear Tooth, Gear, or Mating Pair of Gears	
11.	<i>Clutches and Brakes</i>	8
	Introduction to Common Types of Bakes and Clutches	
	Plate Clutches and Brakes	
	Disc Clutches	
	Cone Clutches and Brakes	
	Drum Clutches and Brakes	
	Band Clutches and Brakes	
	Energy Absorption and Heat Dissipation	
	Design Examples Involving Translation and Rotation	

	Total Hours:	65

5. Basis of Student Assessment (Weighting)

(Should be directly linked to learning outcomes.)

- (a) Assignments 20%
- Laboratories 10%

- (b) Quizzes

- (c) Midterm #1 20%
- Midterm #2 20%
- Final Exam 30%

- (d) Other (e.g. Project, Attendance, Group Work)

6. Grading System

(If any changes are made to this part, then the Approved Course description must also be changed and sent through the approval process.)

(Mark with "X" in box below to show appropriate approved grading system – see last page of this template.)

Standard Grading System (GPA)

Competency Based Grading System

7. Recommended Materials to Assist Students to Succeed Throughout the Course

8. College Supports, Services and Policies



Immediate, Urgent, or Emergency Support

If you or someone you know requires immediate, urgent, or emergency support (e.g. illness, injury, thoughts of suicide, sexual assault, etc.), **SEEK HELP**. Resource contacts @

<http://camosun.ca/about/mental-health/emergency.html> or <http://camosun.ca/services/sexual-violence/get-support.html#urgent>

College Services

Camosun offers a variety of health and academic support services, including counselling, dental, disability resource centre, help centre, learning skills, sexual violence support & education, library, and writing centre. For more information on each of these services, visit the **STUDENT SERVICES** link on the College website at <http://camosun.ca/>

College Policies

Camosun strives to provide clear, transparent, and easily accessible policies that exemplify the college's commitment to life-changing learning. It is the student's responsibility to become familiar with the content of College policies. Policies are available on the College website at <http://camosun.ca/about/policies/>. Education and academic policies include, but are not limited to, Academic Progress, Admission, Course Withdrawals, Standards for Awarding Credentials, Involuntary Health and Safety Leave of Absence, Prior Learning Assessment, Medical/Compassionate Withdrawal, Sexual Violence and Misconduct, Student Ancillary Fees, Student Appeals, Student Conduct, and Student Penalties and Fines.

A. GRADING SYSTEMS <http://camosun.ca/about/policies/index.html> The

following two grading systems are used at Camosun College:

1. Standard Grading System (GPA)

Percentage	Grade	Description	Grade Point Equivalency
90-100	A+		9
85-89	A		8
80-84	A-		7
77-79	B+		6
73-76	B		5
70-72	B-		4
65-69	C+		3
60-64	C		2
50-59	D		1
0-49	F	Minimum level has not been achieved.	0

2. Competency Based Grading System (Non GPA)

This grading system is based on satisfactory acquisition of defined skills or successful completion of the course learning outcomes

Grade	Description
COM	The student has met the goals, criteria, or competencies established for this course, practicum or field placement.
DST	The student has met and exceeded, above and beyond expectation, the goals, criteria, or competencies established for this course, practicum or field placement.
NC	The student has not met the goals, criteria or competencies established for this course, practicum or field placement.

B. Temporary Grades

Temporary grades are assigned for specific circumstances and will convert to a final grade according to the grading scheme being used in the course. See Grading Policy at <http://www.camosun.bc.ca/policies/E-1.5.pdf> for information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	<i>Incomplete:</i> A temporary grade assigned when the requirements of a course have not yet been completed due to hardship or extenuating circumstances, such as illness or death in the family.
IP	<i>In progress:</i> A temporary grade assigned for courses that are designed to have an anticipated enrollment that extends beyond one term. No more than two IP grades will be assigned for the same course.
CW	<i>Compulsory Withdrawal:</i> A temporary grade assigned by a Dean when an instructor, after documenting the prescriptive strategies applied and consulting with peers, deems that a student is unsafe to self or others and must be removed from the lab, practicum, worksite, or field placement.