CAMOSUN COLLEGE
School of Trade and Technology
Mechanical Engineering Department

MECH 147- Mechanical Theory
Winter 2020

COURSE OUTLINE

The calendar description is available on the web @
https://online.camosun.ca/d2l/le/content/162838/Home

This course provides the foundation for the application of mechanical theory by WEng System Maintainer. Topics include principles of stress analysis, journal and anti-friction bearings, shaft arrangements, gearing and machine construction.

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	Sam Behfarshad		
(b) Office hours	Tue and Thur. 11:30am-12:30pm		
(c) Location	TEC 264		
(d) Phone	250-370-4445	**Alternative:**	
(e) E-mail	behfarshadg@camosun.bc.ca		
(f) Website			

2. Intended Learning Outcomes

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

Describe components of the machine design process.
Explain the principles of the application of stress analysis (including safety factors).
Calculate stress and strain in shafts and other mechanical systems.
Explain the principles of journal bearings.
Select journal bearings based on system requirements.
Explain the principles of anti-friction (roller element) bearings.
Compare the aspects of anti-friction and journal bearings.
Explain the principles of various shaft arrangements.
Explain the principles of gearing.
Explain the principles of machine construction.
Compare belt and chain drives.
Compare various fasteners.

3. Required Materials

No textbook required but the following texts would be beneficial:

a) Machine Elements in Mechanical Design, 6th Ed.
Robert L. Mott, Edward M. Vavrek, Jyhwen Wang,
2018, Pearson.

b) Shigley's Mechanical Engineering Design, Richard G. Budynas, and J. Keith Nisbett, 10th Ed, 2015, McGraw-Hill.

4. Course Content and Schedule

Course Content (subject to modification if necessary):

The Machine Design Process
- Machine Design Process
- Stresses – Normal and Shear

Stresses and Strains
- Stresses on Inclined Planes
- Normal and Shear Strain
- Poisson's Ratio

Principal Stresses
- Safety Factors
- Geometric Stress-Concentration Factors
- Maximum Normal and Shear Stresses

Welded Connections
- Determining Weld Size – Length and Depth
- Stresses and Strains Due to Thermal Expansion

Torsion
- Interference Fits and Transferred Torque
- Torsional Shear Stress
- Transverse Shear Stress
- Angle of Twist
- Polar Moment of Inertia

Torsion (Continued)
- Power Transmission in Shafts
- Keys, Splines and Couplings

Journal Bearings
- Journal Bearing Construction
- Journal Bearing Materials
- Bearing Types and Specification
- Lubrication

Roller Element Bearings
- Types of Roller Element Bearings
- Lifetime, Loading, Lubrication, Failure

Introduction to Cam / Follower Systems

Design of Gears
- Gear Trains
- Gear Teeth – Design and Failure
- Lifetime of a Gear Tooth, Gear, or Mating Pair of Gear

Belt and Chain Drives
- 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

Clutches and Brakes
- 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

Schedule:

- **Lectures :**
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  - Mon- 10:30-11:20 am, Rm TEC-110
  - Wed- 10:30am– 12:20 pm, Rm TEC-174

- **Lab/Tutorials:**
  - Wed- 4:00– 5:00 pm, Rm TEC-151

5. Basis of Student Assessment (Weighting)

Lab reports	10%
Assignments	15%
Midterm	35%
Final Exam	40%

6. Grading System

[X] Standard Grading System (GPA)

[ ] Competency Based Grading System

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

N/A

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://camosun.ca/about/policies/index.html for information on conversion to final grades, and for additional information on student record and transcript notations.

Temporary Grade	Description
I	*Incomplete*: 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	*In progress*: 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	*Compulsory Withdrawal*: 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.