Winter 2021

Camosun College

Mechanical Engineering Technology Department

MECH 147 – Mechanical Theory

Course Outline

Calendar Description:

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.

Offered:	Winter Semester
Credit:	4
In-Class Workload:	4 hours Lecture, 1 hour Laboratory
Out-of-Class Workload:	5 hours

Objectives:

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

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

Outline: *Estimated Hours*

1. The Machine Design Process *5*
- Machine Design Process
- Stresses – Normal and Shear

2. Stresses and Strains *5*
- Stresses on Inclined Planes
- Normal and Shear Strain
- Poisson's Ratio

3. Principal Stresses *5*
- Safety Factors
- Geometric Stress-Concentration Factors
- Maximum Normal and Shear Stresses

4. Welded Connections *5*
- Determining Weld Size – Length and Depth
- Stresses and Strains Due to Thermal Expansion

5. Torsion *5*
- Interference Fits and Transferred Torque
- Torsional Shear Stress
- Transverse Shear Stress
- Angle of Twist
- Polar Moment of Inertia

Midterm #1 – Covers Sections 1, 2, 3 and 4 *2*

6. Torsion (Continued) *3*
- Power Transmission in Shafts
- Keys, Splines and Couplings

7. Journal Bearings *5*
- Journal Bearing Construction
- Journal Bearing Materials
- Bearing Types and Specification
- Lubrication

8. Roller Element Bearings *5*
- Types of Roller Element Bearings
- Lifetime, Loading, Lubrication, Failure

9. Introduction to Cam / Follower Systems *5*

Midterm #2 – Covers Sections 5, 6, 7 and 8 *2*

10.	*Design of Gears* Gear Trains Gear Teeth – Design and Failure Lifetime of a Gear Tooth, Gear, or Mating Pair of Gear	*8*
11.	*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	*5*
11.	*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	*5*
	Total Hours:	*65*

Distribution of Marks:

Assignments	25%
Midterm #1	25%
Midterm #2	25%
Final Exam	25%
	100%

All assignments must be submitted before sitting the final exam.

Grading:

A+	90 -> 100%	B-	70 -> 72%
A	85 -> 89%	C+	65 -> 69%
A-	80 -> 84%	C	60 -> 64%
B+	77 -> 79%	D	50 -> 59%
B	73 -> 76%	F	< 50%

The weighted average of all exams must be over 50% or an I or F will be awarded.

Reference Text:

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

Instructor:

R. Derek C. Wakefield, P.Eng.

Email: derekw@camosun.bc.ca

Reference Website:

http://online.camosun.ca This course is fully supported by Desire2Learn

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Assignments and Laboratories:

No late assignments will be accepted.

Assignments will be reviewed in class shortly after the due date. If identical assignments are handed in, the marks will be divided up equally between the students.
