

Mechanical Engineering Department
ME 439 – Principles of Tribology
Elective

Catalog Description: **ME 439 (3-0-3)**

An introduction to the principles of wear resistance of machine parts and tribology. Physical understanding of different mechanisms of wear and friction and methods of increasing durability.

Prerequisite(s): Chem 126 – General Chemistry II
 ME 215 – Engineering Materials and Processes

Textbook(s) Materials Required:

Harnoy, A. “Bearing Design in Machinery, Engineering Tribology and lubrication”, published by Marcel Dekker Inc. 2003

References (Not Required):

Szeri, A. Z. , 1980, "Tribology; Friction, Lubrication and wear" , p. 64, *Hemisphere co.*

Pre-requisite by topic

Course Objectives¹:

1. Understanding the principles for selecting compatible materials for minimizing friction and wear in machinery.
2. Understanding the principles of bearing selection and bearing arrangement in machines.
3. Learn the computations required for selecting and designing bearings in machines.
4. Understanding the fundamental principles of lubrication for reduction of friction and wear.
5. Understanding the fundamental principles of high contact stresses (Hertz stresses), fatigue-failure, and Elastohydrodynamic (EHD) lubrication in rolling bearings and gears.

Topics² :

Introduction to Tribology (surface, adhesion)

Classification and selection of bearings

Lubricants Characteristics

Hydrodynamic Lubrication

Basic hydrodynamic equations

Infinitely long and short bearing

Friction Measurement laboratory (Journal Bearing) Presentation of friction curves

Friction Measurement laboratory (linear motion) Report on friction curves

Bearing Material (Metals)

Bearing Material (Plastics and ceramics)

Rolling element Bearings

Principles of Elastohydrodynamic (EHD) lubrications

Design project of bearing design (e.g. gearbox project)

Design presentation of bearing design before class.

Evaluation Method:

Schedule: Lecture/Recitation: 3 hours, per week

Laboratory: none

Professional Component: Engineering Science 40%; Engineering Design 60%

Program Objectives Addressed: 1, 2, 3, 4, 5

Course Outcomes³:

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¹ Capital Letters in parenthesis refer to the Program Objectives of the Mechanical Engineering

Department. Listed in Sec 2 d Tables B-2-9, B-2-12. Table B-2-8 links Program Objectives with the ABET a-k Criterion.

² Topic numbers in parenthesis refer to lecture hours. (three hours is equivalent to 1 week)

³ Outcome numbers in parenthesis refer to evaluation methods used to assess the student performance.

Lower case letters in parenthesis refer to ABET a-k outcomes.