<table>
<tr><td>Course Number</td><td>ME 439</td></tr>
<tr><td>Course Title</td><td>Principles of Tribology</td></tr>
<tr><td>Course Structure</td><td>(3-0-3) (lecture hr/wk - lab hr/wk – course credits)</td></tr>
<tr><td>Course Coordinator</td><td>Dr A. Harnoy</td></tr>
<tr><td>Course Description</td><td>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.</td></tr>
<tr><td>Prerequisite(s)</td><td>Chem 126 – General Chemistry II
Mech 237 – Strength of Materials</td></tr>
<tr><td>Corequisite(s)</td><td>None</td></tr>
<tr><td>Required, elective or selected elective</td><td>Elective</td></tr>
<tr><td>Required Materials</td><td>Harnoy, A. “Bearing Design in Machinery, Engineering Tribology and lubrication”, publisher, Marcel Dekker Inc., 2003</td></tr>
<tr><td>Other supplemental materials (not Required)</td><td>Szeri, A. Z. , 1980, "Tribology; Friction, Lubrication and wear" , Hemisphere co.</td></tr>
<tr><td>Computer Usage</td><td>Computer Computations
Computer graphics</td></tr>
<tr><td>Course Learning Outcomes/ expected performance criteria:</td><td>
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<tr><th>Course Learning Outcomes</th><th>SOs*</th><th>Expected Performance Criteria</th></tr>
<tr><td>1 define the required properties of materials for bearings, and design a sliding bearing with compatible materials based on the mechanism of wear</td><td>a, c, k</td><td>Exam Question (80% of the students will earn a grade of 75% or better on this question)</td></tr>
<tr><td>2. analyze the operation of hydrodynamic bearing to find the maximum load</td><td>a, c, k</td><td>Homework Problem (80% of the students will earn a grade of 75% or better on this problem)</td></tr>
<tr><td>3. draw sketches for explaining the design of hydrodynamic and rolling element bearings in machines</td><td>a, c, k</td><td>Exam Question (80% of the students will earn a grade of 75% or better on this question)</td></tr>
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	4. **apply** the theory of elasticity to estimate the stresses in a point and line contact of rolling bearing	a, c, k	**Homework Problem** (80% of the students will earn a grade of 75% or better on this problem)
	5. **design** a rotating component in a machine, such as a gearbox, using appropriate bearings and materials	a, c, k	**Final Exam Question** (80% of the students will earn a grade of 75% or better on this question)
	6. **analyze** hydrostatic bearing using fluid mechanics, and mathematics for integration of pressure for the load capacity	a, c, k	**Final Exam Question** (80% of the students will earn a grade of 75% or better on this question)
	7. **explain** the operation, and use of materials, in artificial joints, such hip joint and knee joint	a, c	**Final Exam Question** (80% of the students will earn a grade of 75% or better on this question)

Class Topics

1. Introduction to Tribology (surface, adhesion)
2. Classification and selection of bearings
3. Lubricants Characteristics and lubrication
4. Hydrodynamic Lubrication
5. Infinitely long and short bearing
6. Friction Measurement laboratory (journal Bearing) Presentation of friction curves
7. Friction Measurement laboratory (linear motion) Report on friction curves
8. Bearing Material (Metals)
9. The theory of Elastohydrodynamic (EHD) lubrications in Rolling Element Bearings
10. Artificial Joints, Hip Joint and Knee joint
11. Design project of bearing design (e.g. gearbox project)
12. Design presentation of bearing design before class.

Student Outcomes (Scale: 1-3)

a	b	c	d	e	f	g	h	i	j	k
3		3								2

3 – Strongly supported 2 – Supported 1 – Minimally supported

* Student Outcomes