

## **ME 4193 Tribological Design (Elective)**

**Catalog Description:** ME 4193 Tribological Design (3-0-3)

Prerequisites: COE 3001 Mechanics of Deformable Bodies and ME 3340 Fluid Mechanics

Analysis of tribological aspects of machine components, including friction, lubrication, and wear. Group design project to optimize system tribological performance.

**Textbook:** John A. Williams, *Engineering Tribology*, Cambridge University Press, 2005.

### **Topics Covered:**

1. Introduction
2. Surface topography
3. Hertzian contact
4. Friction
5. Wear
6. Hydrodynamic lubrication
7. Hydrostatic lubrication
8. Elasto-hydrodynamic lubrication
9. Boundary lubrication
10. Lubricants
11. Surface modification

### **Course Outcomes:**

Outcome 1: To introduce students to the field of tribology.

- 1.1 Students will demonstrate basic understanding of friction, lubrication, and wear processes.
- 1.2 Students will become familiar with mathematical tools used to analyze tribological processes.

Outcome 2: To enhance students' awareness of tribological issues in the design of machine components, such as rolling element bearings, journal bearings, thrust bearings, seals, and braking systems.

- 2.1 Students will become familiar with common anti-friction and anti-wear components and the lubricants used therein.
- 2.2 Students will be able to describe the detailed operation of selected anti-friction or anti-wear components.
- 2.3 Students will be able to design a tribological system for optimal performance.
- 2.4 Students will be able to develop technical project reports and technical presentations.

**Correlation between Course Outcomes and Student Outcomes:**

<b>ME 4193</b>											
	Mechanical Engineering Student Outcomes										
Course Outcomes	a	b	c	d	e	f	g	h	i	j	k
Course Outcome 1.1	X				X						X
Course Outcome 1.2	X				X						X
Course Outcome 2.1	X				X						X
Course Outcome 2.2	X				X		X				X
Course Outcome 2.3	X		X		X		X				X
Course Outcome 2.4	X		X		X		X				X

**GWW School of Mechanical Engineering Student Outcomes:**

- (a) an ability to apply knowledge of mathematics, science and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- (d) an ability to function on multidisciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- (i) a recognition of the need for, and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

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