



Mechanical Engineering Dept. Department

Syllabus

ME 467: Tribology in Design (3-0-3)

Course Catalog Description:

Fundamentals of tribology: Contact mechanics, surface energy, elastic and elastoplastic deformation, surface interactions at the macro- and micro-scale, friction theories and wear mechanisms. Temperatures in sliding contacts, hydrodynamics and boundary lubrication. Friction and wear control through lubrication, materials selection, and coatings; case studies of tribology applied in components design.

Course Pre-requisites:

- ME 301: Machine Design I
- ME 322: Manufacturing Processes

Course Objectives:

1. Teach the fundamentals of Tribology which is the study of friction, wear and lubrication and how to use tribological principles to diagnose failure modes and design reliable products
2. Describe surface topography, physico-chemical aspects of solid surfaces, and surface interactions and explain the mechanics of solid elastic and elastoplastic contacts.
3. Describe the various modes of wear: adhesive, delamination, fretting, abrasive, erosive, corrosive, oxidational (mild and severe) and melt and identify types of lubrication: boundary, solid-film, hydrodynamic, and hydrostatic lubrication.
4. Examine applications/case studies: sliding contacts, rolling contacts, bearing design, coating selection, and lubrication and explore the design of tribological surfaces and how to troubleshoot tribology problems.

Course Learning Outcomes:

- CLO1. Understand the impact of tribology on the society, environment and global economy
- CLO2. Characterize the surfaces of components
- CLO3. Identify the different components, mechanisms and reasons of friction
- CLO4. Identify, describe and differentiate between various modes of wear in components
- CLO5. Identify the various lubrication regimes and types of lubricants
- CLO6. Design tribological components for reducing friction and wear
- CLO7. Relate tribological principles to product design

Learning Resources:

- Tribology: Friction & Wear of Materials (2nd edition) – by Ian Hutchings
- Blackboard Lecture Slides

Lecture Assessment Plan:

Assessment Task	Week Due	Weight
Major-2	10	25.0%
Final Exam	15	30.0%
Home works	3,5,6,7,9	10.0%
Quizzes	3,5,6,7,9	15.0%
Major-1	5	20.0%

Lecture Weekly Schedule:

Week#	Topics
1	Introduction to tribology
	Solid surface characterization
2	Solid surface characterization (Continue)
3	Solid surface characterization (Continue)
	Contact between solid surfaces
4	Contact between solid surfaces (Continue)
5	Friction
6	Friction (Continue)
7	Wear
8	Wear (Continue)
9	Lubrication
10	Lubrication (Continue)
11	Lubrication (Continue)
	Designing for wear life and frictional performance
12	Designing for wear life and frictional performance (Continue)
13	Designing for wear life and frictional performance (Continue)
	Tribological components and applications
14	Tribological components and applications (Continue)
15	Introduction to Micro / Nano and Bio Tribology