ME 55600
LUBRICATION, FRICTION, AND WEAR

Course Outcomes

1. Understand the fundamental science, technology and application of interacting lubricated surfaces in relative motion.
2. Learn how to use the latest analysis techniques to model lubrication problems in tribology.
3. Provide practical hands-on experience with modern measurement techniques used in tribology.

Fundamentals (2 wks)
1. History of lubrication, friction, and wear
2. Defns (conformal and non-conformal)
3. Regimes of lubrication
4. Lubricants (Newtonian and non-Newtonian)
5. Units, grades, pressure & temperature dependence
6. Mineral/synthetic lubricants, greases, viscometry

Surface Effects (1 wk)
   - Contacting
   - Non-contacting
2. Surface Parameters of interest

Bearings (6 wks)
1. Types of Bearings
   (journal, thrust, rolling,).
2. Bearing mats
3. Fund.of lubrication
   (Reynolds eqn)
4. Hydrodynamic lubrication
5. Journal, Thrust & Hydrostatic Bearings

Non-Conformal Contacts (2.5 wks)
1. Line and point contacts
2. Hertz Stress Theory
3. Elastohydrodynamic lubrication
4. Film thickness equations

Friction and Wear (2 wk)
1. Internal stresses and fatigue
2. Friction definition, models and measurements techniques
3. Wear models and measurement techniques

Laboratory Projects (1.5 wks)
1. Optical surface profilometry
2. Optical interferometry
3. Pin-on-disk contact
4. Ball on flat apparatus contact
5. Numerical modeling

Revision Date: 6/18/2013
1. **COURSE NUMBER AND NAME:** ME 55600 Lubrication, Friction, and Wear

2. **CREDITS AND CONTACT HOURS:** 3 credits
   - Lecture – 3 days per week at 50 minutes for 16 weeks

3. **COURSE COORDINATOR OR INSTRUCTOR:**
   F. Sadeghi

4. **TEXTBOOK:**

5. **SPECIFIC COURSE INFORMATION:**
   - **a. Catalog Description:** Science, technology, and application of lubricated interacting surfaces in relative motion. Advanced analysis techniques and hands-on exposure to modern experimental methods provide an enhanced understanding of fundamental principles of lubrication, friction, and wear. Basics of design and analysis of machine components operating in the presence of air and liquid lubricants. Rolling fatigue, friction and wear models, and measurement techniques. Typically offered in the spring (alternate years).
   - **b. Prerequisites:** First Semester Senior Standing or Higher
   - **c. Status:** Elective

6. **SPECIFIC GOALS FOR THE COURSE:**
   - **a. Course Outcomes:**
     1. Understand the fundamental science, technology and application of interacting lubricated surfaces in relative motion.
     2. Learn the use of analysis techniques to model lubrication problems in tribology.
     3. Provide practical hands-on experience with modern measurement techniques used in tribology.
   - **b. Related ME Program Outcomes:**
     - A1. Engineering Fundamentals; B3. Prof/Ethical Responsibility;
     - A3. Experimental Skills; B5. Life-Long Learning;
     - A4. Modern Engr Tools; C1. Leadership;
     - A5. Design Skills; C2. Global Engineering Skills;
     - A6. Impact of Engr Solns; C3. Innovation;
     - B1. Communication Skills; C4. Entrepreneurship
     - B2. Teamwork Skills

7. **LIST OF TOPICS:** See following page.

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**PREPARED BY:** F. Sadeghi

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