UNIVERSITY OF CALIFORNIA
UCMERCED

Syllabus for ME190-02: Special Topics in ME: Tribology

Fall 2018
Instructor: Mehmet Baykara

Designation:	ME 190
Catalog Description:	The goal of this technical elective course is to provide students with an introduction to the field of tribology. In particular, fundamental principles of friction, lubrication, and wear are discussed from a mechanical engineering point of view. Specific subjects include: (a) surface roughness, (b) contact between surfaces, (c) adhesion, (d) friction, (e) wear, (f) fluid film lubrication, (g) boundary lubrication, and (h) nanotribology. In addition to providing students with a fundamental grasp of tribological concepts, the course also exposes students to emerging aspects of tribology via the preparation of term papers and a lab session on atomic force microscopy.
Text Books and Other Required Materials:	Bhushan, B. (2013). Introduction to Tribology, 2nd Edition, Wiley. ISBN: 9781119944539 (available in the campus book store).
Course Objectives/ Student Learning Outcomes:	1. Developing an understanding of the micro-scale structure of surfaces and associated characterization methods 2. Gaining the ability to analytically analyze the mechanical aspects of contact between solid surfaces 3. Understanding the physical fundamentals of adhesion between solid surfaces 4. Learning the macroscopic laws of sliding friction and associated physical mechanisms 5. Acquiring the knowledge required to understand and apply various mechanisms of lubrication 6. Developing an understanding of basic wear mechanisms 7. Acquiring a basic level of familiarity with the fundamental aspects of nanotribology, from a theoretical and experimental point of view 8. Gaining familiarity with emerging aspects of tribology
Program Learning Outcomes:	
Prerequisites by Topic:	ENGR 151: Strength of Materials
Course Policies:	1. Late arrivals to the classroom are not allowed. 2. Cell phone use during the lectures is not allowed. 3. Late assignments will not be accepted, unless there is a documented medical/family emergency.

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	4. No make-up exams, unless there is an official doctor's note regarding a medical emergency. 5. University policy on academic honesty concerning exams and individual work will be strictly enforced.
Academic Dishonesty Statement:	a. Each student in this course is expected to abide by the University of California, Merced's Academic Honesty Policy. Any work submitted by a student in this course for academic credit will be the student's own work. b. You are encouraged to study together and to discuss information and concepts covered in lecture and the sections with other students. You can give "consulting" help to or receive "consulting" help from such students. However, this permissible cooperation should never involve one student having possession of a copy of all or part of work done by someone else, in the form of an e mail, an e mail attachment file, a diskette, or a hard copy. Should copying occur, both the student who copied work from another student and the student who gave material to be copied will both automatically receive a zero for the assignment. Penalty for violation of this Policy can also be extended to include failure of the course and University disciplinary action. c. During examinations, you must do your own work. Talking or discussion is not permitted during the examinations, nor may you compare papers, copy from others, or collaborate in any way. Any collaborative behavior during the examinations will result in failure of the exam, and may lead to failure of the course and University disciplinary action.
Disability Statement:	Accommodations for Students with Disabilities: The University of California Merced is committed to ensuring equal academic opportunities and inclusion for students with disabilities based on the principles of independent living, accessible universal design and diversity. I am available to discuss appropriate academic accommodations that may be required for student with disabilities. Requests for academic accommodations are to be made during the first three weeks of the semester, except for unusual circumstances. Students are encouraged to register with Disability Services Center to verify their eligibility for appropriate accommodations.
Topics:	1. Introduction to Tribology: History and Significance 2. Solid Surfaces and Their Characterization 3. Contact between Solid Surfaces 4. Adhesion 5. Friction 6. Wear 7. Fluid Film Lubrication 8. Boundary Lubrication 9. Nanotribology
Class/laboratory Schedule:	Tuesdays & Thursdays: 9:00-10:15am (GLCR 135)
Midterm/Final Exam Schedule:	Midterm Exam: Oct. 11, 2018; 9:00-10:15am, GLCR 135 Final Exam: Dec. 11, 2018; 3:00-6:00pm; GLCR 135
Course Calendar:	1) Aug. 23: Syllabus and Course Outline 2) Aug. 28: Introduction to Tribology 3) Aug. 30: Solid Surfaces and Their Characterization 4) Sep. 4: Solid Surfaces and Their Characterization 5) Sep. 6: Solid Surfaces and Their Characterization 6) Sep. 11: Contact between Solid Surfaces

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	7) Sep. 13: Contact between Solid Surfaces 8) Sep. 18: Adhesion 9) Sep. 20: Adhesion 10) Sep. 25: TBA 11) Sep. 27: Friction 12) Oct. 2: Friction 13) Oct. 4: Friction 14) Oct. 9: Review for Midterm 15) Oct. 11: Midterm 16) Oct. 16: Midterm Solution 17) Oct. 18: Wear 18) Oct. 23: TBA 19) Oct. 25: Wear 20) Oct. 30: Fluid Film Lubrication 21) Nov. 1: Fluid Film Lubrication 22) Nov. 6: Boundary Lubrication 23) Nov. 8: Nanotribology 24) Nov. 13: AFM Demonstration 25) Nov. 15: AFM Demonstration 26) Nov. 20: AFM Demonstration 27) Nov. 27: AFM Demonstration 28) Nov. 29: Term Paper Preparation 29) Dec. 4: Term Paper Preparation 30) Dec. 6: Term Paper Preparation The schedule is tentative and subject to change during the course of the semester.
Professional Component:	Engineering fundamentals: 75% Engineering applications: 25%
Assessment/Grading Policy:	- Quizzes (25%): A total of five quizzes, based on the content of the lectures, are planned. For each student, the quiz with the lowest score will be disregarded in the calculation of the final letter grade. - Midterm Exam (25%) - Final Exam (25%) - Term Paper (20%): A brief term paper reviewing and discussing an emerging aspect of tribology will be prepared. - In-class Participation (5%): Active participation of students during discussion of course topics in the classroom is expected and rewarded.
Coordinator:	Mehmet Baykara
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Office Hours:	Wednesdays: 3:00-4:00pm (SE2-280)