New Course, Spring 2017
ME4853 Applied Tribology Lab

Relative motion between a solid surface and a contacting substance is essential for the function of various mechanisms, both natural and artificial. The topics associated with this motion are studied in the frame of Tribology, the science and technology of contact mechanics, friction, lubrication and wear.

30% of the world energy consumption is through friction losses

85% of mechanical components end their service life due to wear

The economic gain of reducing friction and wear losses is huge;
a number of official investigations performed in several industrially developed countries
estimate that tribology-based savings can achieve up to 1.6% of the GNP

Interested to learn more about tribology?

Take ME4853 Applied Tribology Lab!

The course will cover fundamentals of science and technology of interacting surfaces
through lectures and hands-on experience in laboratory investigations.
Experimental exercises will take place in a state-of-the-art laboratory,
in which surfaces, their interactions and damage mechanisms
can be studied in carefully controlled conditions.

George W. Woodruff School of Mechanical Engineering
Georgia Institute of Technology

ME4853 **Special Topics – Applied Tribology Lab** **Spring 2017**

Class: Mo, We, 3:05 pm – 3:55 pm, Instructional Center 117
Lab: schedule is shown below, Bunger Henry 225

Outcomes: 1) To learn the principles underlying the interaction between surfaces in relative motion.

2) To practice basic experimental methods and techniques used to characterize surfaces, their interactions and damage mechanisms.

3) To become acquainted with the problems of friction-related energy loss, wear-related reduction in service life, and possible increase in reliability of mechanical systems.

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Assistants: Chuchu Zhang, office: MRDC 2340, office hours: by prior (email) arrangement, email: zhcc09@gatech.edu

Pre-reqs: COE 3001 and, preferably, senior standing

Syllabus:

	Topic	Textbook
1	Introduction: tribology in a machine's life cycle and its economic impact	Ch. 1
2	Surfaces: roughness, residual stresses, surface energy	Ch. 2
3	Contact: types, real contact, contact mechanics, adhesion	Ch. 2, 3
4	Friction: laws, types and components, energy dissipation, effects of different parameters	Ch. 3
5	Lubrication: types, functions, regimes	Ch. 4
6	Wear: oxidative, abrasive, adhesive, surface fatigue, fretting, erosion	Ch. 5, 6
7	Methods: problem diagnostics, experimental means, reduction of friction and wear as a means of energy conservation and increase in mechanical components' lifetime	Ch. 7, 8

Textbook: *Tribology: Friction and Wear of Engineering Materials*, Ian Hutchings, Butterworth-Heinemann, 1992

References: *Friction and Wear of Materials (2nd ed.)*, Ernest Rabinowicz, John Willey & Sons, 1995

Tribology: A System Approach to the Science and Technology of Friction, Lubrication and Wear, Horst Czichos, Elsevier, 1978

Friction and Wear Testing: Source Book of Selected References from ASTM Standards and ASM Handbooks, ASM International, 1997

Grading:

Lab workshops	36pt
1st Midterm Exam, Wed, Feb 15	16pt
2nd Midterm Exam, Mon, Mar 6	16pt
3rd Midterm Exam, Mon, Apr 3	16pt
4th Midterm Exam, Wed, Apr 19	16pt
Project (optional), Mon, Apr 24	scoring policy will be announced in due course
Final Exam (optional), Fri, Apr 28	32pt, total score will be scaled down

Policies: Course materials - will be posted on T-square.

All 6 lab workshops are obligatory. Student that fails fulfilling this requirement will receive a grade "I" (Incomplete). Safety instructions form must be brought signed to the first lab workshop. Lab reports are to be submitted on the next workshop.

Exams - will be open notes, closed books and no electronic devices.

Absence from any exam without prior approval from the instructor will result in a zero point for that test. Each missed (with prior approval) exam will have a make-up. Personal travel plan will not form a permissible reason for rescheduling an exam. Exam solutions will be available during the office hours, but not be posted on the website. All grading questions must be brought up within one week after the grades are posted.

Project (optional) – will be detailed no later than the 7th week of the semester.

Final exam (optional) – will be given on request only; should be scheduled no later than 2 weeks before the exam date.

All acts of cheating will be reported to the VP/Dean of students.

Lab Schedule:

	Thu, noon-3pm				Thu, 3pm-6pm				Fri, noon-3pm				Fri, 3pm-6pm			
Group / Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Jan 9 - Jan 13	Lab tour (obligatory)															
Jan 16 - Jan 20	L1	L1	-		L1	L1	-		L1	L1	-		L1	L1	-	
Jan 23 - Jan 27	-		L1	L1	-		L1	L1	-		L1	L1	-		L1	L1
Jan 30 - Feb 3	L2	L2	-		L2	L2	-		L2	L2	-		L2	L2	-	
Feb 6 - Feb 10	-		L2	L2	-		L2	L2	-		L2	L2	-		L2	L2
Feb 13 - Feb 17	L3	L3	-		L3	L3	-		L3	L3	-		L3	L3	-	
Feb 20 - Feb 24	-		L3	L3	-		L3	L3	-		L3	L3	-		L3	L3
Feb 27 - Mar 3	L4	L4	-		L4	L4	-		L4	L4	-		L4	L4	-	
Mar 6 - Mar 10	-		L4	L4	-		L4	L4	-		L4	L4	-		L4	L4
Mar 13 - Mar 17	L5	L5	-		L5	L5	-		L5	L5	-		L5	L5	-	
Mar 20 - Mar 24	Spring break															
Mar 27 - Mar 31	-		L5	L5	-		L5	L5	-		L5	L5	-		L5	L5
Apr 3 - Apr 7	L6	L6	-		L6	L6	-		L6	L6	-		L6	L6	-	
Apr 10 - Apr 14	-		L6	L6	-		L6	L6	-		L6	L6	-		L6	L6
Apr 17 - Apr 21	Lab make-ups															

Lab codes: L1 – micro hardness, L2 – surface roughness, L3 – parameters affecting coefficient of friction, L4 – abrasive wear, L5 – adhesive wear, L6 – fretting wear.