

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. **The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.**

College: CITE _____

Dept/Division: Engineering _____

Alpha Designator/Number: ME/625 _____

 Graded CR/NC

Contact Person: Dr. Asad A. Salem _____

Phone: 304-696-3207 _____

NEW COURSE DATA:

New Course Title: Tribology _____

Alpha Designator/Number:

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Title Abbreviation:

T	R	I	B	O	L	O	G	Y											
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(Limit of 25 characters and spaces)

Course Catalog Description:
(Limit of 30 words)

Detailed coverage of the mechanisms of friction, material wear, and major lubrication techniques - liquids, solids, and gases - with traditional and modern applications. Coverage of micro/nanotribology, MEMS, and magnetic surface storage applications.

Co-requisite(s): _____

First Term to be Offered: Spring 2016 _____

Prerequisite(s): Graduate status _____

Credit Hours: 3 _____

Course(s) being deleted in place of this addition (*must submit course deletion form*): _____

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head _____

Date _____

Registrar _____

Date _____

College Curriculum Chair _____

Date _____

Graduate Council Chair _____

Date _____

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College: CITE

Department/Division: Engineering

Alpha Designator/Number: ME/625

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Dr. Iyad Hijazi

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "**Not Applicable**" if not applicable.

Not Applicable

3. REQUIRED COURSE: If this course will be required by another department(s), identify it/them by name. Enter "**Not Applicable**" if not applicable.

Not Applicable

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "**Not Applicable**" if not applicable.

Not Applicable

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "**Not Applicable**" if not applicable.

Not Applicable

6. COURSE OBJECTIVES: (May be submitted as a separate document)

Please refer to the attached syllabus

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7. COURSE OUTLINE (May be submitted as a separate document)

Please refer to the attached syllabus

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

- Introduction to Tribology, Bharat Bhushan, Wiley and Sons, second edition, 2013, ISBN-13: 978-0471158936.

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Lecture

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10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

Mid-Term 20%

Project 20%

Final Exam 20%

Homework, quizzes, attendance 40%

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

None

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

- Introduction to Tribology, Bharat Bhushan, Wiley and Sons, second edition, 2013, ISBN-13: 978-0471158936.
- Engineering Tribology, Gwidon Stachowiak and Andrew W Batchelor, Butterworth-Heinemann, third edition, 2005 , ISBN-13: 978-0750678360

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Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:

Course Number and Title:

Catalog Description:

Prerequisites:

First Term Offered:

Credit Hours:

Department: Weisberg Division of Engineering

Course Number and Title: ME 625 Tribology

Catalog Description:

Detailed coverage of the mechanisms of friction, material wear, and major lubrication techniques - liquids, solids, and gases - with traditional and modern applications. Coverage of micro/nanotribology, MEMS, and magnetic surface storage applications.

Prerequisites: Graduate Status

First Term Offered: Spring 2016

Credit Hours: 3

ME 625 – Tribology

College of Information Technology & Engineering
Weisberg Division of Engineering and Computer Science

Course Title/Number	Tribology-ME 625
Semester/Year	
Days/Time	
Location	
Instructor	
Office	
Phone	
E-Mail	
Office/Hours	
University Policies	<p>By enrolling in this course, you agree to the University Policies listed below. Please read the full text of each policy by going to www.marshall.edu/academic-affairs and clicking on “Marshall University Policies.” Or, you can access the policies directly by going to http://www.marshall.edu/academic-affairs/?page_id=802</p> <p>Academic Dishonesty/ Excused Absence Policy for Undergraduates/ Computing Services Acceptable Use/ Inclement Weather/ Dead Week/ Students with Disabilities/ Academic Forgiveness/ Academic Probation and Suspension/ Academic Rights and Responsibilities of Students/ Affirmative Action/ Sexual Harassment</p>

Course Description: From Catalog

Detailed coverage of the mechanisms of friction, material wear, and major lubrication techniques - liquids, solids, and gases - with traditional and modern applications. Coverage of micro/nanotribology, MEMS, and magnetic surface storage applications.

Required Text: Additional Reading and Other Materials

- **Introduction to Tribology, Bharat Bhushan, Wiley and Sons, second edition, 2013, ISBN-13: 978-0471158936.**
- **Engineering Tribology, Gwidon Stachowiak and Andrew W Batchelor, Butterworth-Heinemann, third edition, 2005 , ISBN-13: 978-0750678360**

Course Objectives:

- Learn the basics of tribology and related sciences.
- Describe friction/lubrication mechanisms and know how to apply them to the practical engineering problem.
- Learn the methods to reduce friction for engineering surface.

Course Requirements / Due Dates

Prerequisites: Graduate Status

Grade Policy:

Exams	40%
Projects	20%
Homework	30%
Quizzes	5%
Attendance	5%

Attendance Policy

Students are expected to attend all class sessions. Attendance will be taken and will influence the overall grade in the course (see below). The MU policy on absences will be followed; students should read and understand this policy.

Learning Outcomes:

Course Student Learning Outcomes	How students will practice each outcome in this Course	How student achievement of each outcome will be assessed in this Course	ABET Outcome (letter) & Level (number)
Describe surface topography and know how to model a rough engineering surface	Homework assignment And projects	Homework, Quiz, Tests and projects	a,e,k
Explain the basics of tribology and related sciences, theoretical background about processes in tribological system, mechanisms and forms of interaction of friction surfaces;	Homework assignment and Projects	Homework, Quiz, Tests and projects	a,d,k
Describe Hertz contact and rough surface contact.	Homework assignment and projects	Homework, Quiz, Tests and projects	a,e,k
Discuss adhesion theories and the effect of adhesion on friction and wear	Homework assignment	Homework, Quiz, Tests and projects	a,e,k

	And projects		
Describe friction/lubrication mechanisms and know how to apply them to the practical engineering problem	Homework assignment and Projects	Homework, Quiz, Tests and projects	a,d,k
Describe the methods to reduce the friction for engineering surface	Homework assignment and projects	Homework, Quiz, Tests and projects	a,e,k

Course Schedule

No of Weeks	Topic	Chapter
1	Introduction , Definition and History of Tribology, Industrial Significance of Tribology, Origins and Significance of Micro/Nanotribology.	1
1	Solid Surface Characterization , The Nature of Surfaces, Physico-Chemical Characteristics of Surface Layers, Analysis of Surface Roughness, and Measurement of Surface Roughness.	2
1	Contact Between Solid Surfaces , Analysis of the Contacts, and Measurement of the Real Area of Contact	3
1	Adhesion , Solid–Solid Contact and Liquid-Mediated Contact	4
1	Friction , Solid–Solid Contact, Liquid-Mediated Contact and Friction of Materials	5
1	Interface Temperature of Sliding Surfaces , Thermal Analysis, Interface Temperature Measurements.	6
1	Wear , Types of Wear Mechanism, Types of Particles Present in Wear Debris and Wear of Materials.	7
1	Fluid Film , Regimes of Fluid Film Lubrication, Viscous Flow and Reynolds Equation, Hydrostatic Lubrication, Hydrodynamic Lubrication, and Elastohydrodynamic Lubrication.	8
1	Boundary Lubrication and Lubricants , Boundary Lubrication, Liquid Lubricants, and Greases.	9
1	Nanotribology , SFA Studies, AFM/FFM Studies, and Atomic-Scale Computer Simulations.	10
1	Friction and Wear Screening Test Methods , Design Methodology, Typical Test Geometries.	11
1	Tribological Components and Applications , Common Tribological Components, MEMS/NEMS, Material Processing, Industrial Applications.	12
1	Green Tribology and Biomimetics , Green Tribology, and Biomimetics	13

Prepared by Dr. Iyad Hijazi