



**Faculty of Engineering – Assiut University  
Bachelor Degree**

**Design and Production Engineering Program**

Dept. of Mechanical Engineering

**Course specification**

**Tribology MD 421**

**1. Course Aim**

<b>Main Aim</b>	Tribology course is concerned with understanding the action of the many common engineering components which move when in contact with each other or with other materials. More specifically tribology deals with a technological knowledge into friction, wear, and Lubrication..
<b>Sub-Aims</b>	A study of this course will enable the student to: <ul style="list-style-type: none"><li>• Describe the nature of surfaces and contact-surface topography.</li><li>• Interpret the friction mechanisms.</li><li>• Understand the mechanisms of wear.</li><li>• Discuss the lubrication effects on both friction and wear.</li><li>• Aware of causes of failure, and methods of repair of common engineering components.</li></ul>

**2. Course Content**

Surface topography– Nature of Surfaces and contact Friction mechanisms – Mechanisms of wear – Lubricant Properties and methods of application – seals – Failure and repair of common mechanical components.

**3. Course Topics**

	<b>Topic</b>	<b>Hours</b>
<b>1<sup>st</sup>topic</b>	<b>1. Nature of surfaces and contact.</b> <b>1.1 Estimate of contact area</b> <b>1.2. Elastic and plastic contact</b> <b>1.3 Asperity deformation.</b> <b>1.4 Plasticity index.</b>	<b>4</b>

<b>2<sup>nd</sup> topic</b>	<b>2. Surface topography</b> 2.1 Surface profiles 2.2 Surface textures 2.3 Bearing area 2.4 Surface measurement.	4
<b>3<sup>rd</sup> topic</b>	<b>3. Friction mechanisms:</b> 3.1 Surface interaction and the cause of friction. 3.2 The laws of dry friction. 3.3 Effect of lubricants and surface films.	8
<b>4<sup>th</sup> topic</b>	<b>4. Mechanisms of wear and wear reduction:</b> 4.1 Adhesive wear 4.2 Abrasion wear 4.3 Contact fatigue wear 4.4 Fluid and cavitations Erosion wear.	10
<b>5<sup>th</sup> topic</b>	<b>5. Lubrication methods:</b> 5.1 Lubrication regimes 5.2 Lubrication of journal bearings. 5.3 Lubrication of porous metal bearings 5.4 Lubrication of wire ropes. 5.5 Lubrication of gears. 5.6 Lubrication of slide in machine tool.	8
<b>6<sup>th</sup> topic</b>	<b>6. Seals:</b> Selection of seals. Mechanical seals Lip seals Packed glands. Piston seals.	6
<b>7<sup>th</sup> topic</b>	<b>7. Failure of common components:</b> plain bearing failures. Gear failures. Rolling bearing failures Seal failures. Friction surfaces failures. Failure detection methods.	12
<b>8<sup>th</sup> topic</b>	<b>8. Repair Methods of:</b> Plain bearings. Worn surfaces. Friction lining.	8

#### 4. Grades Distribution

Assesment Methods	Percentage
Final Exam	66%
Oral Final Exam	-

<b>Mid term exams</b>			
<b>Assessments</b>	<b>Written Exam</b>	<b>20%</b>	<b>34%</b>
	<b>Oral Exam</b>	-	
	<b>Tutorial assessment</b>	<b>6%</b>	
	<b>Project assessment</b>	-	
	<b>Model assessment</b>	-	
	<b>Report assessment</b>	<b>2%</b>	
	<b>Quiz assessment</b>	-	
	<b>Presentation assessment</b>	-	
	<b>Discussion</b>	<b>6%</b>	
	<b>Laboratory test</b>	-	
	<b>Home Exam</b>	-	
	<b>Monitoring</b>	-	
<b>Total</b>		<b>34%</b>	

### 5. List of References

Course notes	
Text books	
Recommended books	<ul style="list-style-type: none"> <li>- Neale, "Tribology Hand Book" London 1973.</li> <li>- Czichos, Horst, "Tribology" (A systems Approach to the science and technology of Friction, Lubrication, and Wear), 1978.</li> <li>- B. Bhushan and B. K. Gupta, "Handbook of Tribology (Materials, Coatings, and Surface Treatments)" Krieger Publishing Company Malabar, Florida, 1997.</li> </ul>
Periodicals, web sites.. etc.	