

Course code	Course Name	L-T-P-Credits	Year of Introduction
ME369	Tribology	3-0-0-3	2016
Prerequisite : Nil			
<p>Course Objectives</p> <ul style="list-style-type: none"> • To provide broad based understanding of the subject ‘Tribology’ and its technological significance • To understand the genesis of friction, the theories/laws of sliding and rolling friction and the effect of viscosity • To learn about consequences of wear, wear mechanisms, wear theories and analysis of wear problems • To learn about the principles of lubrication, lubrication regimes, theories of hydrodynamic and the advanced lubrication techniques and the application of lubrications in metal working. • To understand the importance of adhesion property in different applications and to get knowledge about different bearing materials. • To understand the nature of engineering surfaces, their topography and learn about surface characterization techniques 			
<p>Syllabus</p> <p>Introduction to Tribology- Tribology in Design, Tribology in Industry, Tribological Parameters Like Friction, Wear and Lubrication, different types of lubrication techniques and applications, measurement of friction and wear -The Topography of Engineering Surface, Contact Between Surfaces, surface modification techniques- Adhesion properties, Adhesion in Magnetic Recording Systems, Types of Bearings, Comparison of Sliding and Rolling Contact Bearings.</p>			
<p>Expected Outcome</p> <p>The students will be able to</p> <ol style="list-style-type: none"> i. Understand the subject ‘tribology’ and its technological significance. ii. Understanding the theories/laws of sliding and rolling friction and the effect of viscosity. iii. Get basic idea on consequences of wear, wear mechanisms, wear theories and analysis of wear problems iv. Get an exposure to theories of hydrodynamic and the advanced lubrication techniques and the application of lubrications in metal working. v. Gain overview of adhesion property in different applications and to get knowledge about different bearing materials vi. Get basic idea about the nature of engineering surfaces, their topography and learn about surface characterization techniques. 			
<p>Text books</p> <ol style="list-style-type: none"> 1. Ernest Rabinowicz, Friction and Wear of Materials, John Wiley & sons,1995 2. I.M. Hutchings, Tribology: Friction and Wear of Engineering Materials, Butterworth-Heinemann,1992 3. Prasanta Sahoo, Engineering Tribology, PHI Learning Private Ltd, New Delhi, 2011. 			

Reference books

1. B. Bhushan, Introduction to Tribology, John Wiley & Sons, Inc, New York, 2002
2. B. Bhushan, B.K. Gupta, Handbook of tribology: materials, coatings and surface treatments”, McGraw-Hill, 1997
3. Halling J, “Principles of Tribology“, McMillan Press Ltd., 1978

Course Plan

Module	Contents	Hours	End Sem. Exam. Marks
I	Introduction to Tribology- Tribology in Design, Tribology in Industry, Economic Aspects of Tribology	1	15%
	Tribological Parameters Like Friction, Wear and Lubrication	1	
	The Topography of Engineering Surface, Contact Between Surfaces.	2	
	Types of Bearings, Comparison of Sliding and Rolling Contact Bearings.	2	
II	Introduction, Empirical Laws of Friction, Kinds of Friction	1	15%
	Causes of Friction, Theories of Friction	1	
	Measurement of Friction	1	
	Friction of Metals, Ceramic Materials, Polymers.	2	
	Rolling Friction- Laws of Rolling Friction, Relation Between Temperature and Friction	1	
	Stick-Slip, Prevention of Stick-Slip, Consequences of Friction.	1	
FIRST INTERNAL EXAMINATION			
III	Types of Wear, Various Factors Affecting Wear	1	15%
	Theories of Wear, Wear Mechanisms	2	
	Measurement of Wear.	1	
	Wear Regime Maps, Alternative Form of Wear Equations	1	
	Lubricated and Unlubricated Wear of Metals, Materials Used in Different Wear Situations.	2	
IV	Fundamentals of Viscosity And Viscous Flow	1	15%
	Principle and Application of; Hydrodynamic Lubrication, Elastodynamic Lubrication, Boundary and Solid Lubrication	2	
	Types of Lubricants, Properties of Lubricants	1	
	Effect of Speed and Load on Lubrication, Frictional Polymers.	1	
	Lubrication in Metal Working: Rolling, Forging, Drawing and Extrusion.	2	
SECOND INTERNAL EXAMINATION			
V	Adhesion: Introduction, Adhesion Effect by Surface Tension, Purely Normal Contact and Compression Plus Shear	2	20%

	Adhesion in Magnetic Recording Systems	1	
	Dependence of Adhesion on Material and Geometric Properties.	1	
	Bearing Materials: Introduction, Rolling Bearing, Fluid Film Lubricated Bearing, Dry Bearing, Bearing Constructions.	3	
V1	Introduction To Surface Engineering, Concept and Scope of Surface Engineering.	1	20%
	Surface Modification – Transformation Hardening, Surface Melting, Thermo chemical Processes	3	
	Surface Coating – Plating and Anodizing Processes, Fusion Processes, Vapor Phase Processes.	3	
	Selection of Coating For Wear And Corrosion Resistance, Potential Properties and Parameters of Coating.	1	
END SEMESTER EXAMINATION			

Question Paper Pattern

Maximum marks: 100

Time: 3 hrs

The question paper should consist of three parts

Part A

There should be 2 questions each from module I and II

Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part B

There should be 2 questions each from module III and IV

Each question carries 10 marks

Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

Part C

There should be 3 questions each from module V and VI

Each question carries 10 marks

Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

Note: Each question can have a maximum of four sub questions, if needed.