

# BBS College of Engineering & Technology, Prayagraj

## Lecture Plan

<b>Department:</b>	Mechanical Engineering
<b>Program / Session / Year / Semester:</b>	B.Tech. /2024-25 / 3 <sup>rd</sup> / 6 <sup>th</sup> .
<b>Course Name:</b>	Tribology
<b>Course Code:</b>	BME-063
<b>Name of Faculty:</b>	Dr. Atiqur Rehman
<b>Department of Faculty:</b>	Department of Mechanical Engineering
<b>Type of Course:</b>	Theory
<b>Number of Lecture Proposed:</b>	56

### Pre-requisites for the Course

Students should have interest in learning basics of Lubrication and Its Importance in mechanical engineering.

Student should have interest in learning of suitable lubrication method in different bearings and also learning how the surface coating techniques reduce the wear.

### Course Outcomes (COs)

At the end of this course students will demonstrate the ability to:

- CO1** Identify and explain various frictions and wear mechanisms.
- CO2** Select proper lubricants for different applications
- CO3** Select suitable lubrication methods in different bearings.
- CO4** Study the surfaces coating techniques for reduction of wear.
- CO5** Analyze the impact of friction in various kinematic pairs

Unit	Topic & sub–topic (as per University Syllabus)	Topics Covered	COs	Lectures proposed	No of Lecture delivered	Date	No. of student's present
	<b>Unit -1: Lubrication and Lubricants:</b>						
1	Introduction to tribology, tribology in industry.		CO1	1			
	Basics modes of lubrication, oil viscosity.		CO1	2			
	Temperature and pressure dependence of viscosity, Viscosity index.		CO1	2			
	Viscosity measurement.		CO1	1			
	Properties of lubricants, temperature characteristics of lubricants.		CO1	1			
	Lubricant impurities and contaminants, mineral oils based lubricants.		CO1	1			
	Synthetic oils based lubricants.		CO1	1			
	Emulsions and aqueous lubricants.		CO1	1			
	Greases, and lubricant additives.		CO1	2			
<b>Tentative no of Lectures Required to complete the Unit-1</b>				<b>12</b>			
	<b>Unit-2: Friction and Wear:</b>						
2	Friction-causes of friction, theories of dry friction.		CO2	2			
	Adhesion theory, abrasive theory, junction growth theory.		CO2	1			
	Laws of rolling friction, friction measurement, friction instabilities.		CO2	2			
	Wear- classification.		CO2	1			
	Abrasive wear, Erosive wear.		CO2	1			
	Cavitation wear, adhesive wear.		CO2	1			
	Corrosive wear, Oxidative wear.		CO2	1			

	Measurement of wear, theories of wear.		CO2	1			
	Approaches to friction control and wear prevention.		CO2	2			
	<b>Tentative no of Lectures Required to complete the Unit-2</b>			<b>12</b>			
<b>3</b>	<b>Unit-3: Lubrication of Bearings</b>						
	Theory of hydrodynamic lubrication.		CO3	1			
	mechanism of pressure development in oil film.		CO3	1			
	jet lubrication, mist lubrication, lubrication utilizing under race passage.		CO3	2			
	concept of journal bearing, minimum oil film thickness.		CO3	2			
	porous bearings, flat plate thrust bearing, tilting pad bearings.		CO3	2			
	hydrostatic lubrication, squeeze film lubrication.		CO3	2			
	Elasto-hydrodynamic lubrication, rolling element bearings.		CO3	1			
	Gas lubricated bearings, and hybrid bearings.		CO3	1			
	<b>Tentative no of Lectures Required to complete the Unit-3</b>			<b>12</b>			
<b>4</b>	<b>Unit-4: Solid Lubrication and Surface Treatment</b>						
	Lubrication by solids,		CO4	1			
	Friction and wear characteristics of lamellar solids.		CO4	2			
	Reduction of friction by soft metallic films.		CO4	1			
	Deposition methods of solid lubricants.		CO4	2			
	Techniques for producing wear resistant coatings.		CO4	2			
	Characteristics of wear resistant coatings.		CO4	1			
	<b>Tentative no of Lectures Required to complete the Unit-4</b>			<b>9</b>			
<b>5</b>	<b>Unit-5: Friction, Lubrication and Wear in Kinematic pairs</b>						
	The concept of friction angle, friction stability, friction in slide ways.		CO5	2			
	Friction in screws with square threads, friction in screws with triangular threads.		CO5	2			
	Mechanism and operation of plate clutch, cone clutch, rim clutch.		CO5	1			
	Centrifugal clutch, and belt drives.		CO5	1			
	Tribo design aspects of labyrinth seals, analysis of line contact lubrication.		CO5	1			
	analysis of point contact lubrication, cam follower system.		CO5	2			
	traction in the contact zone, and hysteresis losses.		CO5	2			
	<b>Tentative no of Lectures Required to complete the Unit-5</b>			<b>11</b>			

#### Text Books & References

1.	Fundamentals of Engineering Tribology with Applications by Harish Hirani, Cambridge English (2017).
2.	Applied Tribology (Bearing Design and Lubrication), by Michael M Khonsari, John Wiley & Sons (2001).
3.	Principles of Tribology, by J Halling, The Macmillan Press Ltd, London, (1975).
4.	Friction, Wear, Lubrication: A textbook in Tribology, by Ludema K C, CRC Press, (2010)

Signature of Faculty

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