Devi Ahilya University, Indore, India **Institute of Engineering & Technology**				**IV Year B.E. (Mechanical Engg.)** **(Full Time)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
7MERE4	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
TRIBOLOGY	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: **3 Hours**							

Course Objectives:

1. The basic objective of the subject is to deal fundamentals of friction, wear and lubrication.
2. The subject is useful in understanding the nature of surfaces of engineering materials.
3. The basic objective of the subject is to learn about types of lubricants.
4. The subject is useful in understanding the various tribological applications.

Pre requisite(s): Material Science, Machine Design I & II.

COURSE CONTENTS

UNIT- I

Fundamentals of Tribology: Introduction to tribology and its historical background, Industrial importance, factors influencing Tribological phenomenon. Engineering surfaces- surface characterization, computation of surface parameters. Surface measurement techniques, statistical description.

UNIT- II

Friction of Surfaces: Genesis of friction, friction in contacting rough surfaces, sliding and rolling friction, various laws and theory of friction, friction of elastomers, friction of various materials, friction measurement methods, friction of non metallic materials.

UNIT- III

Wear Mechanism: Introduction, types of wear, wear mechanism, minor forms of wear, wear debris analysis, wear testing method, wear of metals, ceramics, polymers, system approach for wear reduction.

UNIT-IV

Theory of Lubrication: Basic principal of lubrication, choice of lubricant type, selection of lubrication oils, oil changing and oil conservation, oil feed system, Greece and anti seizes, gas bearing, lubricating sealing, lubricating testing and specifications, lubrication monitoring, Additives in lubricants.

UNIT- V

Design for Tribological Elements: An overview of engineering materials having potential for tribological application, characterization and evaluation of ferrous materials for tribological requirements/application, selection of ferrous materials for rolling element bearings, Basic Equation for fluid film lubrication Boundary lubrication, Hydrodynamic lubrication, elastohydrodynamic lubrication.

Course Outcomes:

Upon completing the course, student will be able to:

CO1. Understand and importance of Tribological phenomenon
CO2. Optimize the friction and wear rate.
CO3. Understand the wear mechanism.
CO4. Determine the application of Lubricants.

BOOKS RECOMMENDED:

[1] Moore F Desmond ,*Principals and application of Tribology*, ,Pergamon press,1975

[2] Sahoo Prashant *Engineering Tribology*, Prentice-Hall of India, New Delhi, 2005

[3] Lansdown A R ,*Lubrication, A practical Guide to Lubricant selection*, Pergamon Press1982

[4] Majumdar BC, *Introduction to Tribology of Bearings*, Wheeler Publishing, New Delhi,1999.

LIST OF PRACTICAL ASSIGNMENTS

1. Performance analysis of Journal Bearings.
2. Experimental analysis of Lubricants.
3. Experimental analysis of Friction on different material.
4. Study of method for Wear Debris analysis.
5. Design analysis for Hydrodynamic Journal Bearing and rolling contact bearing.

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1. The basic objective of the subject is to deal fundamentals of friction, wear and lubrication.
2. The subject is useful in understanding the nature of surfaces of engineering materials.
3. The basic objective of the subject is to learn about types of lubricants.
4. The subject is useful in understanding the various tribological applications.

Course Outcome:

Students earned credits will develop ability to

CO. No.	CO	PO
CO1	Understand and importance of Tribological phenomenon	PO1, PO2, PO3
CO2	Optimize the friction and wear rate.	PO1, PO4, PO7, PO11
CO3	Understand the wear mechanism.	PO1, PO2, PO4, PO12
CO4	Determine the application of Lubricants.	PO1, PO2, PO5, PO12

CO-PO Relationship

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO1	3	3	3									
CO2	3			3			2				2	
CO3	3	3		3								2
CO4	3	3			3							2
CO5												

* CO (rows) mention nil/very small/insignificant contribution to the PO(column)

1→ relevant and small significance 2 → medium or moderate and 3 →strong