CVM UNIVERSITY
Aegis: Charutar Vidya Mandal (Estd.1945)

FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **Bachelor of Technology (Mechanical Engineering)**

Semester: **VIII**

Course Code: **202090804**

Course Title: **Tribology**

Course Group: **Professional Elective Course - V**

Course Objectives: The course is design to Apply the basic theories of friction, wear and lubrication to predictions about the frictional behavior of commonly encountered sliding interfaces. Characterize features of rough surface and liquid lubricants as they pertain to interface sliding.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Theory		J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	
3	0	2	4	50 / 18	50 / 17	25 / 9	25 / 9	150/53

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr. No.	Contents	Hours
1	**Introduction to tribology:** Historical background, practical importance, and subsequent use in the field. Lubricants: Types and specific field of applications. Properties of lubricants, viscosity, its measurement, effect of temperature and pressure on viscosity, lubrication types, standard grades of lubricants, and selection of lubricants.	8
2	**Friction:** Origin, friction theories, measurement methods, friction of metals and non-metals Wear: Classification and mechanisms of wear, delamination theory, constant and variable wear rate, geometrical influence in wear models, wear damage debris analysis, Wear testing methods and standard.	9

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3	**Hydrodynamic journal bearings:** Friction forces and power loss in a lightly loaded journal bearing, Petroff's equation, mechanism of pressure development in an oil film, and Reynold's equation in 2D. Introduction to idealized journal bearing, load carrying capacity, condition for equilibrium, Sommerfeld's number and its significance; partial bearings, end leakages in journal bearing.	**10**
4	**Plane slider bearings with fixed/pivoted shoe:** Pressure distribution, Load carrying capacity, coefficient of friction, frictional resistance in a fixed/pivoted shoe bearing, center of pressure. Hydrostatic Lubrication: Introduction to hydrostatic lubrication, hydrostatic step bearings, load carrying capacity and oil flow through the hydrostatic step bearing.	**9**
5	**Bearing Materials:** Commonly used bearings materials, and properties of typical bearing materials. Advantages and disadvantages of bearing materials. Introduction to Surface engineering: Concept and scope of surface engineering. Surface modification – transformation hardening, surface melting, thermos-chemical processes. Surface Coating – plating, fusion processes, vapor phase processes. Selection of coating for wear and corrosion resistance.	**9**
	Total	**45**

List of Practicals / Tutorials:

1	Introduction to tribology.
2	Study and measurement of viscosity of different lubricants.
3	Study of friction and its measurement methods.
4	Study of different wear testing methods.
5	Design of hydrodynamic journal bearing.
6	Study of pressure distribution and load carrying capacity in plane slider bearing.
7	Study of hydrostatic lubrication and hydrostatic step bearing.
8	Study of properties of bearing materials.
9	Study of surface engineering and its importance.
10	Study of coating for wear and corrosion resistance.

Reference Books:

1	" Introduction to Tribology", B. Bhushan, John Wiley & Sons, Inc., New York, 2002
2	"Engineering Tribology", Prasanta Sahoo, PHI Learning Private Ltd, New Delhi, 2011.
3	"Engineering Tribology", J. A. Williams, Oxford Univ. Press, 2005.
4	"Introduction to Tribology in bearings", B. C. Majumdar, Wheeler Publishing.
5	"Friction and Wear of Materials", Ernest Rabinowicz, John Wiley & sons,1995.
6	"Handbook of tribology: materials, coatings and surface treatments", B.Bhushan, B.K. Gupta, McGraw-Hill,1997.

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Supplementary learning Material:	
1	NPTEL resources

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Industrial/ Field visits

Internal Evaluation:

The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						**R**: Remembering; **U**: Understanding; **A**: Applying; **N**: Analyzing; **E**: Evaluating; **C**: Creating
R	**U**	**A**	**N**	**E**	**C**	
15%	30%	25%	10%	15%	5 %	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Understand the fundamentals of tribology and associated parameters.	**18**
CO-2	Apply concepts of tribology for the performance analysis and design of components experiencing relative motion.	**20**
CO-3	Analyze the requirements and design hydrodynamic journal and plane slider bearings for a given application.	**22**
CO-4	Select proper bearing materials and lubricants for a given tribological application.	**20**
CO-5	Apply the principles of surface engineering for different applications of tribology.	**20**

Curriculum Revision:	
Version:	2
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	--
Next Review on (Month-Year):	June-2025

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