Syllabus

FUNDAMENTALS OF TRIBOLOGY (MEC 603)

C L T (4 3 1)

UNIT I

Introduction to tribology, tribology in Industry, energy saving through tribology engineering, Surfaces and interaction between surface, production of engineering surface, surface roughness, RMS value, average value and ten point average of surface roughness.

Development of engineering surface and measurement of surface roughness, Tribology in Industry, Losses of due to friction and wear in industry, Tribo-elements and a systems concept in tribology, Introduction to friction static and dynamic friction analysis, Da Vinci concept of friction, Amonton's laws of friction, Coulomb's laws of friction, Bowden and Tabor concept of friction.

UNIT II

Wear and Types of wear, adhesive wear and its mathematical model, Two body abrasive wear, Three body abrasive wear, abrasive wear and its mathematical model, corrosive wear model, erosive wear model, cavitation wear, scuffing wear, delimination wear, pitting wear, wear coefficient and wear measurement, wear measurement through Pin- on- Disc machine, Pinon-ring, Profilometer, wear coefficient of various materials.

UNIT III

Lubricants, types of lubricants, physical adsorption, Chemisorption, Self lubrication properties of materials, Solid lubrication, Lubrication in space, Food industry, etc, High temperature lubrication, Hydrodynamic lubrication, Various components of Reynolds equation, Sommerfeld number and its use in hydrodynamic lubrication, Materials for tribological applications.

Text Books

1. Czichos, H., "A system approach to science and Technology of Friction, Lubrication and Wear" Volume I, Tribology series, *Elsevier Publications, , 1978*.
2. Glaeser, J " Marerials for Tribology",Tribology series Vol. 20, *Elsevier Publications, , 1992.*

Reference Books

1. Peterson M.B.,Winner W.O, "Wear control Handbook" *sponsored by The Research Committee on Lubrication, Publsher, , 1980.*
2. Cameron A., "The principles of Lubrication", *Longman, London, 2000*.

Course Outcomes of Fundamentals of Tribology (MEC 603)

After the completion of course, students will be able,

CO1	**To introduce students the field of tribology and its historical development and understand the surface phenomena related to relative motion and the nature of friction.**
CO2	**Students will demonstrate the role of tribology in industry and also reveal the basic understanding of friction.**
CO3	**Understand the concept of friction, wear, analysis of friction & wear, techniques to control the wear and measurement technique to analyze friction and wear.**
CO4	**Familiar the students with the concept of lubricants, types of lubricants, compare boundary lubrication, mixed lubrication and hydrodynamic lubrication and materials for tribological applications.**

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs):

1. Graduates should be creative, imaginative and proficient mechanical engineers employable to serve in the industry, government and allied services.
2. Graduates should be able to advance in academic and research pursuits in mechanical and allied disciplines.
3. Graduates should take a lead in innovation and entrepreneurship activities with high standards of professional and moral ethics and prove themselves beneficial to society at large.

Mapping of CO's with PO's and PEO's

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	3	1	--	3	--	--	--	--	--	3	3	3	2
2	3	3	3	1	--	3	--	--	--	--	--	2	3	3	2
3	3	3	3	2	1	3	--	--	--	--	--	3	3	3	2
4	3	2	3	2	1	3	1	--	--	--	--	2	3	3	2

3: Excellent (highly correlated); **2: Good (moderate);** **1: Satisfied (Low);** **-- : Not correlated**