ENGINEERING TRIBOLOGY

V Semester: ME								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AMEC24	Elective	L	Т	Р	С	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: Nil				Total Classes: 45		
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Prerequisite: Materials and Mechanics of solids, Fluid Mechanics And Hydraulic Machines

I.COURSE OVERVIEW:

Engineering tribology explores the latest innovations in the study of friction,wear,and lubrication to solve practical manufacturing challenges in order to take a deep dive into tribology trends and strategies, including those related to surface energy. Tribology is the art of applying operational analysis to problems of great economic significance, namely, reliability, maintenance, and wear of technical equipment, ranging from spacecraft to household appliances Tribological knowledge helps in reducing the requirement of maintenance and improves reliability of interacting machine components. Essence of tribology at design stage yields substantial economic benefits. The different lubricant standards and its applications in the industries are addressed.

II.COURSE OBJECTIVES:

The students will try to learn:

- I To provide the knowledge and importance of Tribology in Design, friction, wear and lubrication aspects of machine components.
- II To select proper grade lubricant for specific application.
- III To understand the principles of lubrication, lubrication regimes, theories of hydrodynamic and the advanced lubrication techniques.
- IV To introduce the concept of surface engineering and its importance in tribology

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

- CO 1 **Demonstrate** surface topography, physio-chemical aspects of solid surfaces, and Understand surface interactions of metallic and non-metallic materials to understand the nature of function.
- CO 2 Make use the laws of friction, mechanisms of friction, friction space and surface Apply temperature for tribological applications.
- CO 3 List the various types of wears and wear measurementstechniques. Remember
- CO 4 **Identify** lubrication regimes based on nature of contact using lubrication standards Apply such as ISO, SAE, AGMA, BIS standardsand its applications.
- CO 5 **Outline** the importance of tribology in minimizing the factors influencing corrosion Understand for protecting the surface coating applications
- CO 6 Select the appropriate materials and its alloys based oncomposition for tribological Apply applications

III. COURSE SYLLABUS:

MODULE-I: SURFACE INTERACTION AND FRICTION (09)

Topography of Surfaces, Surface features-Properties and measurement, Surface interaction, Adhesive Theory of Sliding Friction, Rolling Friction, Friction properties of metallic and non-metallic materials, friction in extreme conditions, Thermal considerations in sliding contact

MODULE -- II: WEAR AND SURFACE TREATMENT (09)

Types of wear, Mechanism of various types of wear, Laws of wear, Theoretical wear models, Wear of Metals and Non metals, Surface treatments, Surface modifications, surface coatings methods, International standards in friction and wear measurements

MODULE -III: LUBRICANTS AND LUBRICATION REGIMES (09)

Lubricants and their physical properties, Viscosity and other properties of oils, Additives-and selection of Lubricants, Lubricants standards ISO, SAE, AGMA, BIS standards.

Lubrication Regimes, Solid Lubrication, Dry and marginally lubricated contacts, Boundary Lubrication Hydrodynamic lubrication, Elasto and plasto hydrodynamic, Hydro static lubrication.

MODULE -IV : CORROSION (09)

Introduction, Principle of corrosion, Classification of corrosion, Types of corrosion, Factors influencing corrosion, Testing of corrosion, Evaluation of corrosion, Prevention of Corrosion, Material selection, Alteration of environment, Cathodic and Anodic Protection.

MODULE -V: ENGINEERING MATERIALS (09)

Introduction, Advanced alloys, Super alloys, Titanium alloys, Magnesium alloys, Aluminium alloys, and Nickel based alloys, Ceramics, Polymers, and Applications.

V. TEXT BOOKS:

- 1. G.W.Stachowiak& A.W .Batchelor, "Engineering Tribology", Butterworth-Heinemann, UK, 2005.
- 2. E.Rabinowicz, "Friction and Wear of materials", John Willey & Sons, UK, 1995.

VI. REFERENCE BOOKS:

- 1. S.K.Basu, S.N.Sengupta & B.B.Ahuja ,"Fundamentals of Tribology", Prentice –Hall of India Pvt Ltd , New Delhi, 2005.
- 2. J.A.Williams, "Engineering Tribology", Oxford Univ. Press, 1994.

VII. WEB REFERENCES:

- 1. http://www.tribology-abc.com/
- 2. https://ocw.mit.edu/courses/mechanical-engineering/2-800-tribology-fall-2004/index.htm

VIII. E-TEXT BOOKS:

- 1. http://www.asminternational.org/documents/10192/3454476/ACFAA73.pdf/cdfc952b-62aa-477d-9bb2-3abb823a652d
- 2. http://as.wiley.com/WileyCDA/WileyTitle/productCd-047063927X.html