| Course Type | Course Code | Name of Course | L | T | P | Credit |
|---|---|---|---|---|---|---|
| DE | NMED501 | Engineering Tribology | 3 | 0 | 0 | 3 |

**Course Objective**

- This course which deals with fundamentals of surface contact, friction, wear and lubrication. Topics will include engineering surfaces, surface contact theories, major modes of friction, wear, and lubrication. The tribology challenges in micro systems will be discussed as well.

**Learning Outcomes**

After successful completion of this course, students will be able to:

- Understand the basics of tribology and related sciences, theoretical background about processes in tribological systems, mechanisms and forms of interactions of friction surfaces.
- Characterize features of rough surface and liquid lubricants as they pertain to interface sliding

| Unit No. | Topics to be Covered | Lecture Hours | Learning Outcome |
|---|---|---|---|
| 1 | **Introduction:** Friction, Wear and Lubrication, History of Tribology. | 2 | Understanding of friction, lubrication, and wear processes |
| 2 | **Engineering Surfaces:** Properties and Measurement; Typical surface layers, Measurement Methods (Surface Profilometry, Optical Microscopy, Electron Microscopy), Surface Contact. | 8 | This unit will help student to have a knowledge of surface topography and also to model a rough engineering surface. It will help to know the methods of surface measurements and ways to reduce friction for engineering surfaces. |
| 3 | **Friction:** Measurement Methods, Adhesion, Deformation, Friction Theories, Stick-slip, Rolling Friction, Friction of Metals, Friction of Non-Metallic Materials. | 8 | This will help to familiarize with adhesion theories and effects of adhesion on friction. |
| 4 | **Wear:** Types of Wear and its Mechanisms (Adhesive Wear, Abrasive Wear, Erosive Wear, Corrosive/Oxidative Wear, Fatigue Wear), Wear of Metals, Wear of Ceramics, Wear of Polymers, Wear Test (Pin on Disc Tribometer, Reciprocating Tribometer), Wear reduction methods. | 10 | Describe the types of wear with applications on different materials and measurement methods. |
| 5 | **Lubricants and Lubrication:** Lubricants and their types, Purpose of Lubrication, General Properties of Liquid Lubricants, Animal and Vegetable Oils, Mineral oils, Synthetic oils, Blended Oils, Lubricant Additives, Semi Solid Lubricant or Greases, Solid Lubricants, Testing of Lubricants (Viscometer, Four Ball Tester). | 10 | Describe the types and role of lubricants, their influence on the quality of lubrication, friction, and also various friction and wear mechanics. |
| 6 | Case studies on friction, wear and lubrication | 4 | Apply the basic theories of friction, wear and lubrication to predict the frictional behavior of commonly encountered sliding interfaces. |
| | Total | 42 | |

**Textbooks:**

1. Engineering Tribology by Gwidon W. Stachowiak and Andrew W. Batchelor, 4th Edition,2014.
2. Tribology: Friction and Wear of Engineering Materials, by Ian Hutchings and Philip Shipway,2nd Edition, 2017.

**Reference Books:**

1. Engineering Tribology by. PrasanthSahoo, published by Prentice Hall India Learning Private Limited (2005).
2. Introduction to Tribology , Bharat Bhushan,Wiley, 2nd Edition, 2002.
3. Fundamentals of Tribology, Ramsay Gohar and Homer Rahnejat, Imperial College Press, 2nd Edition, 2012.