

## (ME 512) INDUSTRIAL TRIBOLOGY ( ELECTIVE - III )

### **Objective of the Course :**

*To provide fundamental knowledge in lubrication, rubbing of surfaces & wear. To design efficient mechanical systems using good bearings to provide high quality machines.*

### **UNIT – I**

**Introduction :** Nature of surfaces and contact -Surface topography-friction and wear mechanisms and effect of lubricants – methods of fluid film formation.

**Selection of rolling element bearings :** Nominal life, static and dynamic capacity – Equivalent load, probabilities of survival – cubic mean load – bearing mounting details, pre loading of bearings, conditioning monitoring using shock pulse method.

### **UNIT – II**

**Hydrodynamic bearings :** Fundamentals of fluid formation – Reynold's equation; Hydrodynamic journal bearings – Sommerfield number – performance parameters – optimum bearing with maximum load capacity – Friction – Heat generated and Heat dissipated. Hydrodynamic thrust bearings; Raimondi and Boyd solution for hydrodynamic thrust bearings – fixed tilting pads, single and multiple pad bearings-optimum condition with largest minimum film thickness.

### **UNIT – III**

**Hydrostatic Bearings :** Thrust bearings – pad coefficients – restriction – optimum film thickness-journal bearings – design procedure – Aerostatic bearings; Thrust bearings and Journal bearings – design procedure.

**Dry rubbing Bearings :** Porous metal bearings and oscillatory journal bearings – qualitative approach only.

### **UNIT – IV**

**Lubrication :** Choice of lubricants, types of oil, Grease and solid lubricants – additives – lubrication systems and their selection – selection of pump, filters, piping design – oil changing and oil conservation.

### **UNIT – V**

**Seals :** Different types – mechanical seals, lip seals, packed glands, soft piston seals, Mechanical piston rod packing, labyrinth seals and throttling bushes, oil flinger rings and drain grooves – selection of mechanical seals.

**Failure of Tribological components :** Failure analysis of plain bearings, rolling bearings, gears and seals, wear analysis using Ferrography.

### **TEXT BOOKS:**

1. Williams J.A , "Engineering Tribology" 2<sup>nd</sup> Edition, Cambridge University Press, 2005.
2. Bernard J. Hamrock, "Fundamentals of Fluid Film Lubricant", 2<sup>nd</sup> Edition, Marcel Dekker Publishers, 2004.

### **REFERENCE BOOKS:**

1. Shigley J, E Charles, "Mechanical Engineering Design", 9<sup>th</sup> Edition, Mc Graw Hill Co., 2010.
2. Rowe W W & O' Dionoghue, "Hydrostatic and Hybrid Bearing Design" 2<sup>nd</sup> Edition, Butterworths & Co. Publishers Ltd., 2007.
3. Collacott R.A. "Mechanical Fault Diagnosis and Condition Monitoring", 2<sup>nd</sup> Edition, Chapman and Hall, London, 2007.