

17MD012INDUSTRIAL TRIBOLOGY

COURSE CODE	COURSE TITLE	L	P	T	C
17MD012	INDUSTRIAL TRIBOLOGY				

Course Description and Objectives:

Tribology deals with the study of friction, lubrication and wear in all contacting pairs.

The Tribological knowledge helps:

- To provide fundamental knowledge in lubrication, rubbing of surfaces & wear.
- To design efficient mechanical systems using good bearings to provide high quality machines.
- To improve service life, safety and reliability of interacting machine components; and yields substantial economic benefits.

Course Outcomes:

Upon successful completion of this course student should be able to:

- understand the concept selection of rolling contact bearings
- understand the concepts of journal bearing design
- understand the concept of thrust bearing design
- acquire knowledge about types of lubrication and lubricants
- understand the reasons of bearing failure and testing

SKILLS ACQUIRED:

Calculate the dynamic capacity of rolling bearings and selection of suitable bearing
Evaluation of film thickness and amount of heat generated in the journal bearing
Understand the design procedure of thrust bearing
Suggest proper lubrication procedure and equipment
Understand the wear analysis of components

Unit – I

L-13

Introduction : Nature of surfaces and contact-Surface topography-friction and wear mechanisms and effect of lubricants–method 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, preloading of bearings, conditioning monitoring using shock pulse method.

Unit – II 13

L-

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 13

L-

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 12

L-

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 13

L-

Seals: Different types–mechanical seals, lip seals, packed glands, soft piston seals, Mechanical piston rod packing, labyrinth seals and throttling bushes, oil fling errings and draining grooves–selection of mechanical seals.

Failure of Tribological components:

Failure analysis of plain bearings, rolling bearings, gears and seals, wear analysis using Ferrography.

Activities:

1. Design of journal bearing using C/Matlab programming
2. Design of thrust bearing using C/Matlab programming
3. Evaluating pressure distribution at journal bearing interface using C programming
4. Design calculations for the selection of rolling bearings