CMR Institute of Technology, Bangalore			
Department(s): Mechanical Engineering			
Semester: 04(M.Tech)	Section(s): NA		
Tribology and Bearing Design		14MDE41	Lectures/week: 06
Course Instructor(s): Amith S Kumar			
Course duration: Jan 2016 –May 2016			

Lecture #	Book & Sections	Topics	Portions coverage %	
			Individual	Cumulative
1-2		Introduction to Tribology	-	-
3-8	TB 3 1.2-1.6	Introduction, Friction, Wear, Wear Characterization, Regimes of lubrication, Classification of contacts, lubrication theories, Effect of pressure and temperature on viscosity. Newton's Law of viscous forces, Flow through stationary parallel plates. Hagen's poiseuille's theory	15	15
9-12	TB3 1.7-2.6	Viscometers. Numerical problems, Concept of lightly loaded bearings, Petroff's equation, Numerical problems	5	20
13-16	TB3 3.1-3.7	**Hydrodynamic Lubrications**: Pressure development mechanism. Converging and diverging films and pressure induced flow. Reynolds's 2D equation with assumptions. Introduction to idealized slide bearing with fixed shoe and Pivoted shoes	5	25
17-22	TB3 3.8-3.16	Expression for load carrying capacity. Location of center of pressure, effect of end leakage on performance, Numerical problems Journal Bearings: Introduction to idealized full journal bearings. Load carrying capacity of idealized full journal bearings, Sommerfeld number and its significance, short and partial bearings	10	35
23-28	3.17-3.22	Comparison between lightly loaded and heavily loaded bearings, effects of end leakage on performance, Numerical problems.	5	40

29-34	TB3 4.1-4.9	**Hydrostatic Bearings**: Hydrostatic thrust bearings, hydrostatic circular pad, annular pad, rectangular pad bearings, types of flow restricters, expression for discharge, load carrying capacity and condition for minimum power loss, numerical problems, and hydrostatic journal bearings	10	50
35-40	TB3 4.10-4.14	**EHL Contacts**: Introduction to Elasto - hydrodynamic lubricated bearings. Introduction to 'EHL' constant.Grubin type solution	10	60
41-46	TB1 14.1-14.6	**Antifriction bearings**: Advantages, selection, nominal life, static and dynamic load bearing capacity, probability of survival, equivalent load, cubic mean load, bearing mountings	10	70
47-52	TB1 14.7-14.15	**Porous Bearings**: Introduction to porous and gas lubricated bearings. Governing differential equation for gas lubricated bearings, Equations for porous bearings and working principal, Fretting phenomenon and its stages	10	80
53-58	TB1 15.1-15.12	**Magnetic Bearings**: Introduction to magnetic bearings, Active magnetic bearings. Different equations used in magnetic bearings and working principal. Advantages and disadvantages of magnetic bearings	15	95
59-64	15.13-15.16	Electrical analogy, Magneto-hydrodynamic bearings	5	100

Syllabus for Internal Assessment Tests (IAT)*

IAT #	Syllabus
IAT-1	Class # 01 – 28
IAT-2	Class # 29 – 46
IAT-3	Class # 47-64

Literature:

Book Type	Code	Author & Title	Edition // Publisher
Text Book	TB1	Mujamdar.B.C "Introduction to Tribology of Bearing"	Wheeler Publishing, New Delhi 2001
Text Book	TB2	Radzimovsky, "Lubrication of Bearings - Theoretical principles and design"	Oxford press Company, 2000
Text Book	TB3	Tribology – Suresh Kumar R	Subhas Publications, 2011

CMR Institute of Technology, Bangalore			
Department(s): Mechanical Engineering			
Semester: 04(M.Tech)	Section(s): NA		
Smart Materials and Structures		14MST422	Lectures/week: 06
Course Instructor(s):Srinivas Reddy Mungara			
Course duration: Jan 2016 –May 2016			

Lecture #	Book & Sections	Topics	Portions coverage %	
			Individual	Cumulative
1-2		Shape memory Alloy: Experimental Phenomenology, Shape Memory Effect, Phase Transformation	-	-
3-8	TB 3 1.2 -1.6	1.6 Tanaka's Constitutive Model, testing of SMA Wires, Vibration Control through SMA, Multiplexing. Applications Of SMA and Problems.	15	15
9-12	TB3 1.7-2.6	ER and MR Fluids: Mechanisms and properties, Fluid Composition and behavior, The Bingham Plastic and Related Models, Pre-Yield Response.Post-Yield flow applications in Clutches, Dampers and Others	5	20
13-16	TB3 3.1-3.7	MEMS – Mechanical Properties of MEMS Materials, Scaling of Mechanical Systems, Fundamentals of Theory, The Intrinsic Characteristics of MEMS, Miniaturization, Microelectronics Integration	5	25
17-22	TB3 3.8-3.16	Devices: Sensors and Actuators, Conductivity of Semiconductors, Crystal Planes and Orientation, (Stress and Strain Relations	10	35
23-28	3.17-3.22	Flexural Beam Bending Analysis Under Simple Loading Conditions), Polymers in MEMS, Optical MEMS Applications.	5	40
29-34	TB3 4.1-4.9	Vibration Absorbers: series and Parallel Damped Vibrations (OverView), Active Vibration Absorbers, Fiber Optics, Physical Phenomena,Characteristics, Sensors, Fiber Optics in Crack Detection, applications.	10	50

35-40	TB3 4.10-4.14	Control of Structures: Modeling, Control Strategies and Limitations, Active Structures in Practice	10	60
41-46	TB1 14.1-14.6	Smart Structures: Types of Smart Structures, Potential Feasibility of Smart Structures, Key Elements Of Smart Structures, Applications of Smart Structures.	10	70
47-52	TB1 14.7-14.15	Piezoelectric materials, Properties, piezoelectric Constitutive Relations, Depoling and Coersive Field, field strain relation. Hysteresis, Creep and Strain Rate effects, Inchworm Linear Motor.	10	80
53-58	TB1 15.1-15.12	Beam Modeling: Beam Modeling with induced strain Rate effects, Inchworm Linear Motor Beam Modeling with induced strain	15	95
59-64	15.13-15.16	Actuation-single Actuators, dual Actuators, Pure Extension, Pure Bending harmonic excitation, Bernoulli-Euler beam Model, problems, Piezoelectrical Applications.	5	100

Syllabus for Internal Assessment Tests (IAT)*

IAT #	Syllabus
IAT-1	Class # 01 – 28
IAT-2	Class # 29 – 46
IAT-3	Class # 47-64

Literature:

Book Type	Code	Author & Title	Edition // Publisher
Text Book	TB1	Smart Materials and Structures - M. V. Gandhi and B. So Thompson	Chapman and Hall, London; New York, 1992 (ISBN: 0412370107).
Text Book	TB2	Smart Structures and Materials - B. Culshaw	Artech House, Boston, 1996 (ISBN :0890066817).
Text Book	TB3	Smart Structures: Analysis and Design - A. V. Srinivasan	Cambridge University Press, Cambridge; New York, 2001 (ISBN: 0521650267).