Course No.: MSD 301 DESIGN OF TRIBOSYSTEMS C L P (4 3 2)

DESIGN OF TRIBOSYSTEMS (MSD-301)	**Dr. Mukund Dutt Sharma**	**CO1:**	**Understand the function of Tribo-mechanical systems and the concept of contact mechanics. Know the application of system concepts to tribology.**
		CO2:	**Identify the materials for various tribo-components and know the concept of selection considerations in design.**
		CO3:	**Analyze the selection of materials for plane bearing, materials for gear, materials for brakes, clutches, materials for Internal combustion engines and know the concept of design of lubrication systems.**
		CO4:	**Know the concept to design of various tribo-elements.**

UNIT I

Application of system concepts to tribology, Function of Tribo-mechanical systems, Structure of Tribo-mechanical systems, Tribological interaction, Functional plane, mechanical work plane, thermal plane and material plane. Role of tribo processes in mechanical systems, Wear as a system property. Contact Mechanics, number of bodies taking part in contact process, macro geometry of bodies, Deformation mode; elastic, plastic and elastic-plastic, Types of relative motion; static contact, rolling contact, sliding contact, contact physics and geometry, contamination layer, absorbed gas layer, oxide layer, work hardened layer, metal substrate.

UNIT II

Materials for various tribo-components, materials for plane bearing, materials for gear, materials for brakes, clutches, materials for Internal combustion engines, ceramics and special alloys, cermets, polymer materials, selection considerations in design.

UNIT III

Design of various tribo-elements; such as: Plane bearing, Gear, Seals, Piston and cylinder, Friction devices, cutting tools, chains. Design of lubrication systems.

Text Book:

1. Czichos, H., “Tribology: A system approach to the science & technology of friction, lubrication and wear,”– Tribology Series 1, Elsevier Scientific Publishing Company, Amsterdam, Netherland, 1978.

Reference Books:

1. Peterson, M. B., Winer, W. O., “Wear Control Handbook,” ASME, N. Y., 1992.

2. Glaeser, W. A., “Tribology: Materials for Tribology,” –Tribology series – Vol. 20, Elsevier, N. Y. 1992.

3. Stolarski, T., “Tribology in Machine Design”, Butterworth-Heinemann, N. Y., 1990.

1. Mapping of CO’s with PO’s and PEO’s

Session 2018-2019														
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	1	--	3	--	--	--	--	--	3	3	3	2
CO2	3	3	3	1	--	3	--	--	--	--	--	2	3	3	2
CO3	3	3	3	2	1	3	--	--	--	--	--	3	3	3	2
CO4	3	2	3	2	1	3	1	--	--	--	--	2	3	3	2
Session 2017-2018															
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	1	--	3	--	--	--	--	--	3	2	3	2
CO2	3	3	3	1	--	3	--	--	--	--	--	2	3	3	2
CO3	3	3	3	2	1	3	--	--	--	--	--	3	2	3	2
CO4	3	2	3	2	1	3	1	--	--	--	--	2	3	3	2
Session 2016-2017															
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	1	--	3	--	--	--	--	--	2	2	3	2
CO2	3	3	3	1	--	3	--	--	--	--	--	2	3	3	2
CO3	3	3	3	2	1	3	--	--	--	--	--	3	2	3	2
CO4	3	2	3	2	1	3	1	--	--	--	--	2	3	3	2

Appendix A

PROGRAM OUTCOMES (POs)

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs):

1. Mechanical engineering graduates will be able to function in the area of design, modeling, simulation and analysis to realize physical systems /processes by creating knowledge base and facilities.

2. Mechanical Engineering Graduates will be able to apply knowledge of materials, testing and advanced manufacturing to Realize Physical Systems /Processes leading to Research and Consultancy Capabilities.

3. Mechanical Engineering Graduates will imbibe holistic approach for lifelong learning to achieve, deliver and occupy positions of excellence in their chosen areas.