



PhD project proposal

Project Details

Project Title	Developing the bio-surfaces based cost effective technology for fabrication and improving the tribo-dynamic performances of Bi/Tri-metallic journal bearings
Project Summary	<p>Lead based Bi/Tri metallic bushings are usually employed to sustain relatively heavy loads under unidirectional/oscillatory motions in many industrial machines and mechanical systems. However, lead is a harmful heavy metal and due to environmental issues the limitation has been imposed on its usage. Presently, considerable research are being conducted to develop the lead free bush bearings. Few materials including the graphite have been applied into the copper matrix composites as replacement of lead. But the interface bindings between the materials (including graphite) and copper matrix have been found weak due to their incompatibility, which decreased the mechanical and tribological performances of the bushings at the elevated operating conditions. Thus, exploring the possibility of replacement of lead based material by different composites requires in-depth numerical and experimental research. Moreover, a novel, simple, cost effective and large scale production technique should also be explored to address the concerns in totality. Literature review also reveals an improvement in tribo-dynamic performances of tribological elements in presence of certain surface textures at limited range of operating parameters. It has been found that yet the bio-surfaces have not been employed in Bi/Tri metallic bearings to explore and improve its performances.</p> <p>The objectives of this PhD proposal are: (1) Numerical analysis and design of different bio-surfaces for reducing the friction in bushings in mixed and thin film lubrication regimes; (2) Identifying the best substitute of lead based materials for bushings, (3) Establishing the cost effective manufacturing process of bio-texture based bushings and related coatings; (4) Cost effective fabrication of different bushings with bio-textures for conducting the rigorous experiments to assess the tribo-dynamic performances vis-a-vis conventional bushings.</p>

PhD Supervisors

Role	Faculty	Academic Unit in IITD	Email ID
Supervisor 1	R K Pandey	Professor, Dept. of Mech. Engg., IIT Delhi	rajpandey@mech.iitd.ac.in
Supervisor 2	Dinesh Kalyanasundaram	Professor, Biomedical Engg. Centre, IIT Delhi	dineshk@cbme.iitd.ac.in
Supervisor-3	Deepak Kumar	Associate Professor, CART, IIT Delhi	dkumar@itmmech.iitd.ac.in

Project requirements (Student qualifications, experience required, etc.)

M.Tech. (Mechanical Engineering background)/B.Tech. (Mechanical Engineering with 75% and above marks and GATE qualified) having strong inclination/exposure to numerical and conducting the experiments.

Source of funding (IRD/FITT Project details, if any)

Institute assistantship (of Department of Mechanical Engineering, IIT Delhi)

Role of Faculty Members involved:

1. Prof. R. K. Pandey will supervise for analysis and design based on numerical simulations
2. Prof. Dinesh Kalyansundram will guide on bio-surface exploration, fabrication, and their characterization for conducting the experiments.
3. Prof. Deepak Kumar will guide related to the materials, fabrication, and coating aspects.