



Project Proposal for Ph.D.

Project Details (The research problem must clearly indicate the need for an interdisciplinary approach)

Project Title	Bio-Inspired Micro- and Nano-Textures Surfaces for Tunability and Directional Control of Sliding Friction.
Project Summary (Minimum 500 and maximum 2000 characters)	We propose to fabricate micro- and nano-structured surfaces, inspired from biological species (e.g., snakes), which display reduced friction and drag along specific sliding directions. These surfaces have great potential for applications in futuristic MEMS devices as well as for existing systems such as sliding components in car engines and cutting tools where the reduction in friction along specific sliding direction can have a tremendous impact on energy consumption, material losses and component failures due to friction and wear. Furthermore, we will prepare these surfaces in such a way that these surfaces will allow additional tunability of friction via external stimuli such as light or temperature. Such tunability is proposed to be achieved by using bimetallic coatings where stimuli induced changes in orientation of the individual elements, within the structured surfaces, will strongly influence the frictional response of the surface against a counter surface. In addition, we plan to integrate microfluidic channels for controlled release of lubricating oil, which will allow additional control for friction and wear.

Ph.D. Supervisors*
(Supervisor 1 and Supervisor 2 cannot be from the same department of IITD)

Role	Name of Faculty	Date of Superannuation [§] (DD/MM/YYYY)	Academic Unit in IITD/Institute/University	Email ID (Official) & Contact Number
Supervisor 1*	Prof. J. P. Singh	31/07/2038	Physics	ipsingh@physics.iitd.ac.in
Supervisor 2	Prof. Nitya Nand Gosvami	30/04/2045	Materials Science and Engineering	ngosvami@iitd.ac.in

*Supervisor 1 must be from IIT, Delhi.

+All cells in this table are mandatory fields that need to be filled by faculty for consideration of proposal.

§The date of superannuation of supervisors should be at least three years from the date of registration of selected candidates.

Project requirements (Student qualifications, experience required, etc)
*The candidate will be shortlisted based on common shortlisting criteria decided by ScRC (SIRe)

- Background in Physics, Chemistry and/or Materials Science and Engineering.

Source of fellowship/funding and project number

(CSIR/UGC/DBT/ICMR/ICAR/NEET-PG/DST-INSPIRE/IRD/FITT Project details, if any)
Candidates with own funding (CSIR/DST-INSPIRE etc.) will be preferred. Institute funded seats are also available if the suitable candidate has no other funding source.

Role of Faculty Members involved:	
Supervisor-1	Prof. J. P. Singh (PI) will supervise preparation and characterization of various bioinspired nanostructured surfaces.
Supervisor-2	Prof. N. N. Gosvami will supervise tribological studies of the nanostructured surfaces.

Note :-

1. Approval from the respective DRC/CRC/ScRC of your Department/Centre/School will be required for using the "Full-time Institute Assistantship (Category-wise) (FIA)" for selecting the students in SIRe.
2. Declaration:- Faculty members, please ensure that you have at least 3 years of service left before superannuation along with adequate sitting space & lab facilities for the SIRe student.
3. PI/s are also encouraged to submit joint proposals with AIIMS, NII, JNU and institutes with which IITD has an existing MoU. If the Co-PI (Supervisor 2) is from outside IITD, kindly share his/her detailed CV.
4. If a research scholar is to be considered for selection under the project fellowship, then the project should have a minimum of two-year duration remaining.
5. A candidate applying with a valid JRF/INSPIRE/any national level fellowship should have at least two-year validity from the date of joining the Ph.D. program.
6. The third supervisor’s name (if required) can be added only after the formation of Student Research Committee (SRC) subject to a strong recommendation of SRC and subsequent approval from the competent authority.
7. If institute fellowship is being sought then the DRC approval of the parent departments of both supervisors is required at the time of selection.