



Project Proposal for Ph.D.

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

Project Title	Light-controlled persistent photoconductivity and photo-memory devices in oxide materials
Project Summary (Minimum 500 and maximum 2000 characters)	This project investigates persistent photoconductivity and photo-memory effects in oxide materials. Two oxide systems capable of hosting two-dimensional electron gases (2DEGs), SrTiO₃ and KTaO₃, will be studied as model platforms. These non-magnetic oxides differ in their spin-orbit coupling strength, allowing us to examine how this interaction influences photogenerated carrier dynamics and persistent conductivity. In parallel, oxide thin films such as NiO will be grown on sapphire substrates, where vacancy defects can be intentionally introduced during deposition. Such defect engineering can strongly influence carrier trapping and photoconductive behavior. The project will proceed in two stages: first, growth and characterization of oxide materials and interfaces; second, development of prototype photo-memory devices based on photo-induced low-resistance states. The work requires an interdisciplinary approach combining materials growth, transport measurements, and micro-device fabrication. Prof. Kaushik Sen will focus on thin-film growth and physical characterization, while Prof. Ankur Goswami will lead micro-scale device fabrication and integration.

Ph.D. Supervisors* (Supervisor 1 and Supervisor 2 cannot be from the same department of IITD)			
Role	Name of Faculty	Academic Unit in IITD/Institute/University	Email ID (Official)
Supervisor 1*	Kaushik Sen	Physics	kaushik.sen@physics.iitd.ac.in
Supervisor 2	Ankur Goswami	DMSE	agoswami@mse.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)

- M.Sc. or M.Tech.
- Experience: The candidate must have prior expertise in electric transport experiments.

Source of fellowship/funding and project number
(CSIR/UGC/DBT/ICMR/ICAR/NEET-PG/DST-INSPIRE/IRD/FITT Project details, if any)

Candidate with his/her own fellowship /Institute fellowship

Role of Faculty Members involved:	
Supervisor-1	Prof. Kaushik Sen (Sample preparation, basic characterization, photo-conductivity study)
Supervisor-2	Prof. Ankur Goswami (2DEG-based micron-size device fabrication for photo-memory applications)

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 SRe.
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 SRe 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 DRC approval of the parent department of Supervisor 1 is required at the time of selection.