



Project Proposal for Ph.D.

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

Project Title	Design and Development of Optical Components for Power Scaling Potential by Using Spectral Beam Combining for High-Power Laser Application
Project Summary (Minimum 500 and maximum 2000 characters)	The project deals with development of critical optical components using ultra-precision facility like diamond turning machining, high-damage threshold coatings, CNC lathe, CNC milling, multi-axis polishing, surface structuring using Laser machining, lithography and different characterization facilities like AFM, CMM, optical profilometry, mechanical profiler and interferometry. The major objective is the development of high-resolution diffraction grating and optical elements like steering mirrors collimators for their use in high power laser systems, which has the following research goal: - Establishment of the fabrication process of off-axis optical component (to be used a collimator) and folding mirrors - The thermal management has to be developed to actively cool the optics and other components like fiber optics array for their use in high power laser systems - Development of polishing machine for super-finishing of optical surfaces: A multi-axis precision polishing system will be developed with a capability to handle diameter up to 300 mm optics of various shapes such as optical flats, spheres, aspheric and freeform. - Establishment of multilayer coating process for dielectric to sustain very high laser induced damage threshold (LIDT) ~ 500 kw/cm2

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 Gufran S Khan	30/06/2040	SeNSE, IIT Delhi	gufran.sayed.khan@sense.iitd.ac.in
Supervisor 2	Prof Sudarsan Ghosh	30/12/2039	Department of Mechanical Engineering	ghoshs@mech.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. Tech/ MSR/ M.Sc in Mechanical Engineering /Instrumentation/ Instrument Technology/Mechatronics/ Production Engineering
- B. Tech in Mechanical Engineering

Source of fellowship/funding and project number

(CSIR/UGC/DBT/ICMR/ICAR/NEET-PG/DST-INSPIRE/IRD/FITT Project details, if any)

Design and Development of Optical Components for Power Scaling Potential by Using Spectral Beam Combining for High-Power Laser Application

Funded by DRDO (RM00054G)
Completion date: 05/02/2031

Role of Faculty Members involved:

Supervisor-1	Supervisor 1 will provide expert guidance in the development of a polishing machine, ultra-precision fabrication processes, process parameter optimization, feedback mechanics, and compensation techniques . The prime focus will be on enabling the student to develop ultra-precision polishing machines and set up its process parameters for polishing critical optical components like freeforms, aspheric, flats. The other objective will be development of critical optical components and optomechanical assemblies using advanced manufacturing techniques such as CNC lathe, CNC milling, single-point diamond turning (SPDT), and multi-axis polishing machines . Supervisor 1 will play a crucial role in advancing high-precision optical manufacturing, ensuring cutting-edge developments in optics and opt mechanics.
Supervisor-2	Supervisor 2 will contribute expertise in multilayer coating and polishing process modeling to support the development of optics suitable for high power laser optics. His role will involve guiding the student to machining the new materials and coating processes required to develop optics to sustain high laser induced damage threshold (LIDT) ~ 500 kw/cm2

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.