Indian Institute of Technology Delhi

School of Interdisciplinary Research (SIRe)

Project Proposal for Ph.D.

SIRe Project Number

2025-01-31

(will be assigned by SIRe)

Project Details (The research problem must clearly indicate the need for an interdisciplinary approach)	
Project Title	Design of CFRP composite panels for underwater vessels.
Project Summary (Minimum 500 and maximum 2000 characters)	Carbon Fiber Reinforced Polymer (CFRP) panels are highly attractive for underwater vessel design due to their exceptional strength-to-weight ratio and corrosion resistance. However, their structural reliability is challenged by complex failure mechanisms. While CFRP panels exhibit excellent tensile properties, they are significantly weaker under compressive loading, which can lead to sudden and unpredictable failure. This project aims to develop an advanced fluid-structure interaction model to accurately capture the behavior of CFRP panels under hydrodynamic pressure. We will employ Smoothed Particle Hydrodynamics (SPH) to simulate the coupled response of fluid flow and CFRP panel, with a focus on predicting crack propagation. By analyzing failure patterns under realistic loading conditions, we will design optimized CFRP configurations that enhance resistance to crack growth, thereby improving the overall durability and safety of underwater vessels.

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	Saikat Sarkar	Civil Engineering	saikat@civil.iitd.ac.in
Supervisor 2	Md Rushdie Ibne Islam	Applied Mechanics	rushdie@am.iitd.ac.in

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

- M.Tech./MSR in Civil/Mechanical/Aerospace/Applied Mechanics or B.Tech. in Civil/Mechanical/Aerospace or related field.
- Throughout 1st Class or equivalent.

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 Institute Fellowship

Role of Faculty Members involved:	
Supervisor-1	Fracture mechanics, Constitutive modeling, CFRP panel design
Supervisor-2	SPH, CFD simulation, Fluid structure interaction