



Project Proposal for Ph.D.

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

Project Title	Development and Scale-Up of Sustainable Microalgal Bioprocesses for Carbon Utilization and Bioproduct Recovery
Project Summary (Minimum 500 and maximum 2000 characters)	The growing need for sustainable technologies has increased interest in biotechnological processes that combine carbon utilization, resource recovery, and value-added bioproduct production. Microalgae offer significant potential due to their ability to utilize inorganic carbon, produce biomass, and synthesize commercially valuable compounds, contributing to environmental sustainability and circular bioeconomy development. This research aims to develop and optimize microalgae-based processes for carbon utilization and sustainable bioproduct generation. It will focus on selecting suitable microalgal strains and evaluating the effects of carbon availability, nutrient composition, and cultivation conditions on biomass productivity and product formation. Alternative carbon and nutrient sources will also be explored to improve process efficiency and resource utilization. The study will investigate cultivation strategies and bioreactor configurations to enhance carbon transfer and biological conversion efficiency. Optimized laboratory-scale processes may be advanced to pilot scale to assess productivity, operational stability, and scalability under practical conditions. Efficient biomass harvesting, product recovery, and downstream processing techniques will also be investigated. Environmental and techno-economic assessments will be conducted to evaluate sustainability and commercial feasibility. The research aims to support scalable and economically viable solutions for carbon management and sustainable bioproduct development. Objectives 1. Selection and optimization of microalgal strains for carbon utilization and bioproduct production. 2. Development and optimization of laboratory-scale cultivation systems. 3. Scale-up and performance evaluation under practical operating conditions. 4. Optimization of bioproduct recovery and assessment of environmental and economic feasibility.

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. Anushree Malik	31/07/2034	Centre for Rural Development and Technology, Indian Institute of Technology, Delhi	anushree@rdat.iitd.ac.in ;
Supervisor 2	Prof. Vikram Singh	31/10/2049	Chemical Engineering Department, Indian Institute of Technology, Delhi	vs225@chemical.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)

- B.Tech./M.Tech. or equivalent degree in Biotechnology, Biochemical Engineering, Chemical Engineering, Environmental Engineering, Bioprocess Engineering, Microbiology, Life Sciences, or other relevant disciplines.
- Prior research experience in microalgal cultivation, microbial biotechnology, carbon capture and utilization, bioreactor operation, biomass processing, or bioproduct recovery will be preferred.
- Knowledge of bioprocess optimization, analytical techniques, downstream processing, or environmental and techno-economic assessment will be an added advantage.

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

CSIR/UGC/DBT/ICMR JRF

Role of Faculty Members involved:

Supervisor-1	Prof. Anushree Malik (Environmental Science): Will guide microalgal strain selection, characterization, and optimization for carbon utilization and sustainable bioproduct production, with emphasis on biological performance and environmental sustainability.
Supervisor-2	Prof. Vikram Singh: Will guide bioprocess development, bioreactor optimization and scale-up, downstream bioproduct recovery, and techno-economic and environmental feasibility assessment.

- 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.