



Project Proposal for Ph.D.

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

Project Title	Development of a Novel Filler Alloy for joining Electric Vehicle Batteries and evaluation of its electro-thermo-mechanical performances
Project Summary (Minimum 500 and maximum 2000 characters)	This project proposes the development of a new low-temperature filler alloy to be used for the solid-liquid state bonding, specifically for joining electric vehicle (EV) battery components, with a focus on optimising the electro-thermo-mechanical performance required in advanced battery interconnects. This alloy is designed to address critical challenges in joining materials such as aluminum and copper busbars commonly used in EV battery assemblies, enhancing overall reliability and safety under demanding operational conditions. Project Objectives - Develop a new filler alloy formulation with a tailored microstructure for improved joining capability between battery components. - Evaluate electrochemical compatibility to minimise electrical resistance and thermal runaway risks. - Assess thermo-mechanical behaviour under thermal cycling and mechanical loading relevant to EV usage. The project's interdisciplinary nature is focused on integration of materials science and mechanical engineering, i.e., (i) design joining processes (e.g., welding, soldering, bonding) that ensure the structural and electrical integrity of battery connections within automotive environments; and (ii) focuses on the development of novel filler alloys with tailored properties such as conductivity, corrosion resistance, and compatibility with battery electrical connection materials.

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*	Dr Abhishek Das	Department of Mechanical Engineering	abhi@mech.iitd.ac.in
Supervisor 2	Dr Sangeeta Santra	Department of Materials Science and Engineering	ssantra@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)

- Exposure to different welding, soldering, and brazing techniques for Al, Cu, Ni welding
- Experience and understanding of metallurgical behaviours of materials

Source of fellowship/funding and project number

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

Role of Faculty Members involved:

Supervisor-1	Providing guidance on welding for high-volume manufacturing using advanced welding and bonding processes Providing guidance for modelling and simulation studies
Supervisor-2	Providing guidelines for new alloy development and filler material development, and in-depth metallurgical synthesis and analysis

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.