

SOURAV DAS

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RESEARCH STATEMENT

Focused on the electrochemical-mechanical interactions of metastable materials, including energy and 2D materials, using numerical techniques to study dynamics and degradation. My research also integrates real-time sensing and characterization technologies to advance sustainable, efficient solutions.

EDUCATION

Ph.D. Candidate in Mechanical Engineering

Iowa State University, Ames, USA

[2022-2026]

- **GPA** – 3.97/4.0
- **Advisor:** Dr. Pranav Shrotriya
- **Thesis:**

Master of Science in Mechanical Engineering

Iowa State University, Ames, USA

[2022-2024]

- **Advisor:** Dr. Pranav Shrotriya
- **Thesis:** “*Estimation and characterization of plated dead lithium of lithium batteries during fast charging.*”

Bachelor of Technology (B.Tech.) in Mechanical Engineering

[2014-2018]

Jalpaiguri Government Engineering College, Jalpaiguri, India (<https://jgec.ac.in>)

- **Advisor:** Dr. Nripen Mondal
- **Thesis:** “*Optimal outer shape and internal structure design of automatic under underwater vehicle with the help of ANSYS.*”

PROFESSIONAL EXPERIENCE

Graduate Research Assistant

[2022-2026]

Mechanical Engineering, Iowa State University and Ames National Lab, Ames, USA

Responsibilities:

- Development of a parametrized physics based fast charging battery model
- Electrochemical sensing of lithium-ion batteries and corresponding data analysis
- Degradation characterization and quantification of lithium batteries
- Molecular reactive force field modeling of polymer decomposition
- Development of machine learning-based charge protocol design
- Cell Disassembly and Experiment Design for Recycling of Batteries

Design Engineer in Piping

[2018-2022]

Worley India Private Limited (Formally Jacobs Engineering India Private Limited), India

Responsibilities:

- Stress analysis of low (-20°C) & high (500°C) temperature & pressure small (3/4" Dia) to large bore (48" Dia) pipelines of various industries like chemical plants, Oil refineries, and mining as per ASME, API, and NEMA codes.
- Led a team of designers and was involved in human resources allocation, project planning and execution, and delivery of the projects to clients.
- Equipment nozzle load and structural pipe support load analysis
- Design of the piping layout for various materials (CS, SS, GRP, FRP pipes), preparation of material take off the list, and piping specification list.

Project for various clients such as US methanol (USA), Midrex DRI steel plant (Algeria), Gunvor oil refinery (Netherland), Paul Wurth blast furnace pipelines (Turkey), Mangalore Chemicals & Fertilizers Ltd(India), Ashland HEC plant (USA), BASF Vega(Singapore), Sidpec polypropylene plant (Egypt), Cabot Carrolton FMO plant (USA), Lanjigarh DE project(India), Oyu Tolgoi project (Mongolia), TATA Steel cyanide removal plant(India) and Marathon refinery(USA)

Summer Internship

[May-Jun,2017]

Indian Institute of Technology (IIT) Guwahati, India

Project: "Numerical Simulation of Straight-bladed Darrieus Rotors"

Advisor: Dr. Ujjwal K. Saha

Responsibilities:

- Turbulence flow and vorticity analysis around vertical wind turbine using structured and unstructured meshing.

Research Communication

Journal Publication

- **Sourav Das**, Abhishek Sarkar, Papas Perrao, Pranav Shrotriya, Ikenna C. Nlebedim "Estimation and characterization of plated dead lithium of lithium batteries during fast charging" in Preparation
- **Sourav Das**, Sarah N Ebert, Anirudha Karati, Pranav Shrotriya, Ikenna C. Nlebedim "Unraveling magnetic field effect on plating and the corresponding impact on cyclic life for fast-charged lithium-ion batteries" in Preparation
- Sabyasachi Paul, **Sourav Das**, Anirudha Karati, Pranav Shrotriya, Ikenna C. Nlebedim "Green recovery of lithium carbonate from LCO, NMC and LFP batteries" in Preparation
- **Sourav Das**, and Pranav Shrotriya, "Electrochemical Mechanism Underlying Lithium Plating in Batteries: Non-Invasive Detection and Mitigation" in **Energies**, 17(23), 5930.
<https://doi.org/10.3390/en17235930>
- Anirudha Karati, Prashant P. Gargh, Sabyasachi Paul, **Sourav Das**, Pranav Shrotriya, Ikenna C. Nlebedim "Materials recovery from NMC batteries with water as the sole solvent" at Journal of Environmental Management (**JEMA**), Volume 366, 2024,
<https://doi.org/10.1016/j.jenvman.2024.121710>

Conference Publications

- Nripen Mondal, Tanumoy Banerjee, **Sourav Das**, "Aerostatic bearing performance analysis based on CFD study" in the International Conference on Thermal Engineering and Management Advances (**ICTEMA-2022**), Jalpaiguri Government Engineering College, West Bengal, India, [Research Gate](#)
- **Sourav Das**, Tanumoy Banerjee, Nripen Mondal, "A Comparative CFD Study to analyze the Performance of NACA 0018 and S1210 Darrieus Wind Turbine Blade" at Fluid Mechanics and Fluid Power (**FMFP-2021**) Conference, BITS Pilani, Rajasthan, India. https://doi.org/10.1007/978-981-19-6970-6_50
- **Sourav Das**, Nripen Mondal, Md Naim Hossain, "Hull shape optimization of autonomous underwater vehicle using CFD analysis" in the International Conference on Recent Innovation & Developments in Mechanical Engineering (**ICRIDME-2018**) at NIT Meghalaya, India, Paper ID-31, Pp. 138- 139. [Research Gate](#)
- Nripen Mondal, Madhab Chandra Mandal, **Sourav Das**, Tanumoy Banerjee, "Comparative study on EDM process parameters optimization using BBO and ACO algorithms" in Materials Today: Proceedings, <https://doi.org/10.1016/j.matpr.2022.04.610>
- Tanumoy Banerjee, **Sourav Das**, Richa Ghosh & Nripen Mondal, "Development and dimension of tiny methane micro flame jet under hot air and hot oxygen co-flow condition" at Fluid Mechanics and Fluid Power (**FMFP-2021**) Conference, BITS Pilani, Rajasthan, India. https://doi.org/10.1007/978-981-19-6970-6_42
- Nripen Mondal, **Sourav Das**, Tanumoy Banerjee, Madhab Chandra Mandal "Experimental study on drilling burr formation minimization and parameters optimization using BBO algorithm" in Materials Today: Proceeding at International Conference on Contemporary Advances in Mechanical Engineering (**ICCAME-2021**) at Chandigarh Engineering College, Punjab, India. <https://doi.org/10.1016/j.matpr.2021.09.154>

Conference Presentation-

- Maria G Salas-Fernandez, **Sourav Das**, Joshua Kemp, Pranav Shrotriya, Baskar Ganapathysubramanian, "A Materials Science and Engineering Approach to Elucidate Stalk

Lodging Resistance in Sorghum Bicolor" at "ASA, CSSA, SSSA International Annual Meeting," 2024, at San Antonio, TX.

- Pranav Shrotriya, **Sourav Das** "*Mechanistic study of the degradation mechanism of Lithium-ion batteries*," 16th World Congress on Computational Mechanics and 4th Pan American Congress on Computational Mechanics (WCCM-PANACM) 2024, Vancouver, Canada.

Conference Poster Presentations-

- **Sourav Das**, Mohammad Behtash, Sina Navidi, Abhishek Sarkar, Chao Hu, and Pranav Shrotriya, "*Physics-based state of health prediction of lithium-Ion battery during fast charging*" at "245th Electrochemical Society (ECS) Meeting", 2024, at San Francisco, USA.
- **Sourav Das**, Pranav Shrotriya, Abhishek Sarkar, Cajetan I Nlebedim, "*Numerical prediction of the performance of lithium-ion batteries during fast charging*," Virginia and William Binger Graduate Research Symposium, March 2024, Department of Mechanical Engineering, Iowa State University,
- **Sourav Das**, Sabyasachi Paul, Anirudha Karati, Prasant Gargh, Pranav Shrotriya, Cajetan I Nlebedim "*A comparative study of the effects of the plating mechanism under fast charging on libs*," Virginia and William Binger Graduate Research Symposium, March 2023, Department of Mechanical Engineering, Iowa State University.

Honors and Awards

- **R&D 100 Award, 2024**, Member of the Lithium recycling research Work in Ames National Lab/Iowa State University for the development of BRAWS (Battery Recycling and Water Splitting) Technology.
- **Received Honor as Associate, 2024** for the Center for the Integration of Research, teaching, and Learning (CELT) program prescribed and approved by Iowa State University
- **Honorary Badge, 2024**, for completion of the Graduate for Advancing Professional Skills (GAPS) program prescribed and approved by Iowa State University
- **William and Virginia Binger Symposium Awards, 2024** Department of Mechanical Engineering, Iowa State University, for Top poster presentation
- **William and Virginia Binger Symposium Awards, 2023**, Department of Mechanical Engineering, Iowa State University, for Top poster presentation
- **Performance Award, 2022**, Worley Australia, for managing and ensuring quality deliverables in the Lihir Gold Mine Project (Brownfield), Australia.
- **Business Excellence Appreciation & Recognition (Bear) award, 2019**, Jacobs Engineering India Private Limited, for value-added and quality work in Oyu Tolgoi Copper Mine Project (Brownfield),), Mongolia.
- **Swami Vivekananda Merit cum Means Scholarship, 2014-2018**, Government of West Bengal, India, as a financial scholarship for an undergraduate course.

Teaching Experience and Training

- **Preparing Future Faculty Fellow, Iowa State University, USA** [2024-Present]
Selected in a comprehensive and specialized faculty training program consisting of seminars on the faculty life, group discussions, workshops, and training on different aspects of teaching, curriculum design, fund writing, etc.
- **Mentoring undergraduate students (Two), Iowa State University, USA** [2024]
Guiding students from the Mechanical Engineering department for their creative component course "S2024-HON-290H-N7" under the supervision of Dr. Pranav Shrotriya.
- **Lab Teaching Assistant, Iowa State University, USA** [2022]
"ME 436 HEAT TRANSFER Lab" course, Department of Mechanical Engineering, under the supervision of Dr. Theodore (Ted) Heindel and Dr. Paola Grazia Pittoni
 - Presentation of the theories related to the experiment to a class
 - Monitoring the lab work and providing necessary technical and theoretical support to the students

- Grading and topic clarification; Student strength: 40 students (2 sections)
- **Private Tutor, West Bengal, India** [2015-2017]
Teaching (Subject- **Physics**) to high school students (Ten nos)

Service

- **Senator in the Graduate and Professional Student Senate (GPSS)** [2024-Present]
Department of Mechanical Engineering, Iowa State University, USA
 - Advocated for graduate education improvements and represented Mechanical Engineering graduate students at senate meetings.
 - Involved in planning and execution annual GPSS conference as Executive Member of the GPSS Conference Committee
- **Executive Member in Graduate Student Organization (MEGSO)** [2024-Present]
Department of Mechanical Engineering, Iowa State University, USA
 - Planned and executed social and professional development activities.
 - Promoted the graduate program's visibility and fostered networking and interaction among ME graduate students within the department, college, and university.
- **Volunteer for Iowa Regional Science Bowl (Middle & High School)** [2024]
Organized by Ames National Laboratory, USA
 - Served as timekeeper, runner, and score sheet arranger
- **Volunteer during Covid-19 nationwide lockdown** [2020-2021]
Jalpaiguri, West Bengal, India
 - Coordinated the arrangement and distribution of food items to those in need and coordinated emergency ambulance services.
- **Executive Member of Corporate Social Responsibility (CSR) Team** [2018-2019]
Jacobs Engineering India Private Limited, Kolkata, India
 - Organized clothing donation drives and facilitated CSR fund transfers and sports material donations to pediatric cancer hospitals and orphanages in West Bengal
- **Volunteer for National Social Service** [2015-2017]
Jalpaiguri Government Engineering College, West Bengal, India
 - Conducted surveys on water and soil-based diseases among tea plantation workers and coordinated food distribution

Professional Society Membership

- Electrochemical Society [2024-Present]

Software Skills

- COMSOL, MATLAB, Python, Lammmps, Ansys, Linux, Caesar II, Match, Fullprof suit, Solid Works, and Catia

Elective courses

- Computational Mechanics: Micro and Nano Mechanics, Fatigue and Fracture Mechanics, Continuum Mechanics, Computational Material science, Solid Modelling and GPU Computing, Finite Element Method, Numerical Methods, Introduction to Machine Learning(Coursera).
- Electrochemistry and Materials: Electrochemical Method, Advance Biosensor, Mechanical Behaviour of Materials, and Micro Nano additive printing.
- Energies: Advanced thermodynamics, Heat and Mass Transfer, Refrigeration and Air conditioning, Renewable Energy Studies, Internal Combustion Engine.

References

Dr. Pranav Shrotriya, Professor, DOGE

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Dr. Todd Kingston, Professor

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