

SHREYA RAI

Research Scholar–Aerospace Engineering–IIT Madras

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PHD THESIS

Title of Research - Bioinspired fiber reinforced polymer composites for tailorable mechanical properties.

- **Objective:** Applied biomimicry principles inspired by the helicoidal structures of fish scales to improve tailorability of mechanical properties of fibre reinforced polymer (FRP) composites.
- **Preliminary Numerical Investigation:** Performed Finite Element Analysis (FEA) on bioinspired laminates under low-velocity impact using LS-Dyna Software.
- **Fabrication Techniques:** Fabricated basalt FRP and glass FRP laminates using hand layup and vacuum bagging methods.
- **Mechanical Characterization:** Performed mechanical testing (compression, Interlaminar shear, flexural, and low-velocity impact test) and detailed failure analysis of fabricated composites using CT scan.
- **Relevant Courses** – Composite Materials; Smart Materials; Mechanics of Damage Tolerance; Fracture Mechanics; Experimental Stress Analysis; Finite Element Analysis; Advanced Mechanics of Solids.

EXPERIENCE

INDUSTRY- Vestas wing technology (APRIL 2025-Present)

Performed extreme and fatigue load calculations on wind turbines and assessed structural feasibility to ensure design reliability and compliance.

TEACHING-

Performed duties of Teaching Assistant (TA) for courses of Composites Structures and Mechanics of Damage Tolerance)(NOV 2020-APRIL 2025)

Taught **Engineering Mathematics, Statistics** and **Structural Analysis** to undergraduate students. (JAN 2020-DEC 2020)

Worked part-time at CADD Centre for teaching software for structural analysis and design- **STAAD.Pro** to undergraduate students and working professionals. (FEB 2019-FEB 2020)

INTERNSHIP- FEMSTRUCT CONSULTING ENGINEERS LLP. (DEC 2018-JAN 2019)

- Conducted non-destructive and destructive tests on a given structure and reported its structural health.

PUBLICATION

- **Rai S, Rawat P. Flexural, compressive, and low-velocity impact behavior of bioinspired helicoidal glass fiber/epoxy composites under different loading rates.** Polym Compos. 2025;1-17. [doi:10.1002/pc.29869](https://doi.org/10.1002/pc.29869)
- **Rai S, Rawat P. Three-point bending, interlaminar shear, and impact strength in bioinspired helicoidal basalt fiber/epoxy composites: A comparative experimental analysis.** Polym Compos. 2024;45(10):9407-9420. [doi:10.1002/pc.284179420](https://doi.org/10.1002/pc.284179420)
- **Rai, S. (2024). Implementation of biomimicry for advanced impact-resistant composites: Advanced manufacturing techniques.** Composites: Modeling and Manufacturing, 166. CRC Press. <https://doi.org/10.1201/9781003564355-10>
- **Rai, S., Mahesh, & Rawat, P. (2022, November). Numerical Simulation Approach for Low-Velocity Impact Response of Bioinspired Layup Design in GFRP Laminates.** In Indian Conference On Applied Mechanics (pp. 187-195). Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-97-0472-9_25

CONFERENCES

- **26th International Congress of Theoretical and Applied Mechanics (ICTAM 2024)-** Daegu, Republic of Korea (August 25-30, 2024)

- **8th International Conference on Material Science and Engineering-** Paris, France (September 20-21, 2023)
- **5th Indian Conference On Applied Mechanics (INCAM 2022)**-(November 11-13, 2022)

WORKSHOPS

- **Supervised Machine Learning: Regression and Classification**, Coursera- AUG 2024
- **Workshop on Intro to ML, DL and Computer Vision**, organised by AI Club IITM- JULY 2023
- **Workshop on Recent Advances in Modelling of Materials**, organised by Indian Society for Applied Mechanics- IIT Madras- (May 2022)
- **5th Kenyon – IITM Technical and Science Writing Workshop—Five-day Workshop-** July 2022
- **Workshop and Demonstration of "Basic Facility for High Impact Measurement in Engineering Solids,"** Department of Applied Mechanics, IIT Madras- Nov 2021
- **International Conference on “Rehabilitation and Retrofitting of Structures,”** Bhabha Atomic Research Centre -Mumbai- (June 2019)

EDUCATION

Direct Ph.D.- Aerospace Engineering— (NOV 2020 - Present)	CGPA – 9.5
<i>Indian Institute of Technology, Madras</i>	
Bachelor of Engineering in Civil Engineering— (JULY 2016 - OCT 2020)	CGPA – 8.32
<i>Datta Meghe College of Engineering-Mumbai University</i>	
Higher Secondary Certificate— (JULY 2014 -MARCH 2016)	Percentage-84.77%

SKILLS

Computing Skills AutoCAD, LS-DYNA, STAAD.Pro , Python, MATLAB, MS office	Technical Skills Experimental Research, Technical writing, Mathematics and Statistics, Analytical skills, Data science, Basic machine learning, Structural Analysis.	Languages English,Hindi, Marathi
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ACHIEVEMENTS & AWARDS

Technical Achievements

- Secured an **All India Rank of 3770** among one lakh+ candidates in **Graduate Aptitude Test in Engineering** (Percentile-97)
- Secured **All India Rank of 127** in a maths competition conducted by the Institute for Promotion of Mathematics (IPM) in 6th grade. Secured the first rank in a district-level maths competition.
- Won various state-level Abacus (Mental Maths) competitions.

Sports Awards

- Won the “Strongest Woman” title in the Powerlifting competition for the Dean’s Trophy at IIT Madras.
- Won several medals in Powerlifting, Frisbee and athletics Interhostel competitions at IIT Madras.

POSITIONS OF RESPONSIBILITY

- **Placement Co-ordinator at Placement and Internship cell, IIT Madras.**
- **PhD representative at Women’s Forum** at Indian Institute of Technology, Madras.
- **Career Development Cell- Research - Head of the Events team-** Organised various events and seminars for research scholars at the Indian Institute of Technology, Madras.
- **Manager** at World Culture Team at **International and Alumni Relation** at IIT Madras.

EXTRACURRICULARS

- Hosted numerous events, seminars and functions.
- **Hobbies-** Powerlifting, Classical Dance, Reading.