SASANKA KAKATI

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Personal Information

Date of Birth : 01/01/1993
Nationality : Indian
Gender : Male
Marital Status : Married
Spoken Languages : English, Assamese (mother tongue), Hindi, Bengali
Present address : H/N-5, Bylane-4, Piyoli Phukan Road, Rehabari, Guwahati, Assam, India, 781008

Academic Qualification

Degree/Certificate	**Institution/Board**	**CGPA/ Percentage**	**Year**
PhD: Mechanical Engineering (Machine Design)	Indian Institute of Technology Guwahati	7	2018-2023
MTech: Mechanical Engineering (Machine Design)	Indian Institute of Technology Guwahati	9.02	2016-2018
B.E. (Bachelor of Engineering) in Mechanical Engineering	Royal School of Engineering and Technology *(Gauhati University)*	78.4%	2010-2014
Senior Secondary (Science)	CBSE	87.17%	2010
Secondary	CBSE	87.8%	2008

Key courses taken

- Finite Element Method
- Fracture Fatigue and Failure Analysis
- Mechanical Vibration
- Continuum Mechanics
- Computational Continuum Mechanics
- Tribology of Bearings
- Introduction to Composite Materials
- Advance Mechanics of Solid
- Rotor Dynamics
- Engineering Design Methodology
- Advanced Engineering Mathematics

PhD details

Specialisation: Machine Design
Department of Mechanical Engineering, Indian Institute of Technology Guwahati, Guwahati-781039, India
PhD Thesis topic: *Analysis of GLARE laminates under low velocity impact*
PhD status: *Completed on 27/12/2023*
Thesis Supervisor: Prof Debabrata Chakraborty

Research Interests

Broad area of my present research lies in the low velocity impact (LVI) analysis of FRP laminated composites in general and hybrid laminates in particular which are widely used in the aerospace sector. Glass aluminium reinforced epoxy (GLARE) is a fibre metal laminate (FML) which has glass/epoxy prepregs alternately stacked between aluminium layers. Although, GLARE has better impact resistance, it is common for any laminated composites to sustain damages due to LVIs. In view of this, my PhD work was aimed at investigating the intricate damages that occur during impact, including delamination, fibre fracture and matrix cracking.

By using 3D finite element analysis (FEA), stress distribution, energy absorption, deformation patterns and interfacial delamination were estimated for such laminates subjected to single or multiple normal and oblique impacts considering the effect of important geometrical and material parameters. Further, the work

investigated the different hybrid configurations of such laminates by incorporating Kevlar inner layers in GLARE to improve impact resistance and how such configurations perform under impact load. In addition, the presence of discontinuities in the form of cut-outs or holes in a laminate are often necessary functional requirements for access to inner components such as wires and for carrying out scheduled repair and maintenance of inner assemblies and for riveting purpose. Influence of such cut-outs in GLARE subjected to impact was also investigated for the dynamic response and delamination at the interfaces.

The insights gained from this research not only contribute to a deeper understanding of the impact behaviour of laminated and advanced hybrid composites but also hold the potential to refine the design strategies for materials used in critical applications, such as aerospace components and other critical impact prone structures. With advances in the manufacturing and in experimental setups, my immediate future interests lie in integrating the computational methods of analysis with experimental investigations for getting a thorough insight of the complex mechanisms associated with the study of such hybrid composite structures.

Keywords: *Low velocity impact, Delamination, FRP laminates, GLARE, Blast loading, Composite damage, Finite element analysis*

List of Publications

1. Kakati S, Chakraborty D. *Delamination in GLARE laminates under low velocity impact*. Compos Struct 2020;240:112083. https://doi.org/10.1016/j.compstruct.2020.112083.
2. Kakati S, Chakraborty D. *Cylindrical Impacts on GLARE 5 Plates with Open Hole*. Appl Compos Mater 2021. https://doi.org/10.1007/s10443-021-09999-4.
3. Kakati S, Chakraborty D. *Influence of impactor mass on the low energy impact response of thin GLARE plates*. Mech Adv Mater Struct 2022:1–15. https://doi.org/10.1080/15376494.2022.2134529.
4. Kakati S, Chakraborty D. *Delamination in GLARE laminates subjected to oblique low velocity impact considering friction*. Eur J Mech / A Solids 2023;97:104817. https://doi.org/10.1016/j.euromechsol.2022.104817.
5. Kakati S, Chakraborty D. *Effect of Impact Energy Divisions for Repeated Low - Velocity Impacts by Varied Masses on GLARE*. Iran J Sci Technol Trans Mech Eng 2023. https://doi.org/10.1007/s40997-023-00726-x.
6. Kakati S, Chakraborty D. *Low velocity impact on fibre metal laminates: A review*. J Compos Mater 2023. https://doi.org/10.1177/00219983231212544.
7. Kakati, S., Chakraborty, D., 2024. *GLARE laminate subjected to multiple oblique low velocity impacts considering frictional tangential compliance*. Int. J. Solids Struct. 291, 112701. https://doi.org/10.1016/j.ijsolstr.2024.112701

Conferences

1. Kakati S, Chakraborty D. *Effect of hybridisation on low velocity impact of GLARE laminates*. ICCS24 (2021), Faculty of Engineering, University of Porto, Portugal.
2. Kakati S, Chakraborty D. *Effect of open holes on the delamination of a GLARE plate subjected to low velocity impact*. **IMPLAST-2022**, Mater Today Proc 2023. https://doi.org/10.1016/j.matpr.2023.03.169.
3. Kakati S, Chakraborty D. *Impact response of a GLARE 5 plate with open holes subjected to low-velocity cylindrical impact*. **SICE 2022**, Department of Mechanical and Aerospace Engineering, IIT Hyderabad.
4. Kakati S, Chakraborty D. *Effect of hybridization of a GLARE plate with central cut-out subjected to offset low velocity impact*. **VETOMAC 2022**, Institute of Engineering, Pulchowk Campus, Nepal.
5. Kakati S, Chakraborty D. *Low velocity impact response of GLARE laminates under multiple spherical impacts*. 8th Asian Conference on Mechanics of Functional Materials and Structures (**ACMFMS-2022**), IIT Guwahati.

Technical skills

- **Programming languages :** C/C++, Mathematica*, MATLAB, Python*
- **Software:** AUTOCAD, ANSYS Mechanical APDL/Workbench, ABAQUS (VUMAT*/UMAT*), SOLIDWORKS*
- **Operating system :** Windows, Linux *(*Elementary proficiency)*

Projects

- **MTech Thesis:** ***Finite element analysis of interfacial delamination in FRP laminated composites*** *under the supervision of Prof Debabrata Chakraborty ,Professor, Dept. of Mechanical Eng., IIT Guwahati; (2018)*
  Objective: *Analysis of the FRP laminates having embedded elliptical delaminations; investigating the effect of fibre angle, laminate configurations using MATLAB / C.*

- **Finite element analysis of a 2D plate (Term Project, 2017)**
  Objective: *To develop FEA code for determining the temperature distribution over a 2-D plate using MATLAB/C/C++.*

- **Construction and structural analysis of a bamboo frame bicycle (Term Project, 2016)**
  Objective: *To construct a bicycle using locally sourced bamboo of north-east: design and analysis of the structural stability and strength of the resin bonded joints, mechanical testing of the strength parameters of bamboo and effect of environmental factors. The design and analysis was done using FEA software ABAQUS and finally developing a full scale prototype.*

- **B.E. Project: Construction and Study of Amphibious Tricycle (2014)**
  Objective : *To fabricate a three-wheel, pedal-powered amphibious tricycle, meant for floods as well as recreational purposes, and constructed to navigate both on land and water bodies. The design and analysis was done using FEA software ANSYS and developing a final working prototype.*

Experience

- **Teaching Assistant for the NPTEL online certification course on** *Jan-Apr, 2022 and 2023*
  Mechanics of Fiber Reinforced Polymer Composite Structures
- **Project Manager at IITG** *Oct 2014 - March 2015*
  MNRE sponsored project on promotion for utilisation of biogas in North East region of India.
- **Summer Internship at Indian Oil Corporation Limited (IOCL) Guwahati** *June- July, 2013*
  Understanding the different units of the crude oil refining plant, operation of the different components and their maintenance.
- **Assam State Transport Corporation (ASTC)** *June 2012*
  Two weeks summer internship in central workshop of ASTC for heavy vehicles like bus and trucks. The internship provided a detailed insight of the working of the engine and drivetrain assembly and other critical components.

Positions of Responsibility

- A student volunteer in the workshop on Wind Disaster Problems-Challenges Ahead, conducted by Mechanical Department, Royal School of Engineering and Technology.

Scholastic Achievements

- **Best Student Award :** Awarded during B.E. at Royal School of Engineering and Technology
- **GATE 2016 :** Secured 614 rank in Graduate Aptitude Test in Engineering (GATE).
- Awarded MHRD Merit scholarship for masters dissertation (MTech) at IIT Guwahati, Assam from July 2016-July 2018.
- Awarded MHRD Merit scholarship for doctoral dissertation at IIT Guwahati, Assam from July 2018-July 2023.

Extracurriculars

- Two months training course on Power Plant Familiarization conducted by National Power training Institute, Guwahati. *Jan 2013-March 2013*

- Attended a two day international workshop on Wind Disaster Problems-Challenges Ahead, held during February 21-22, 2013 organised jointly by Mechanical Department, Royal Group of Institution and Indian Society of Wind Engineering. *Feb 21-22, 2013*

References

Prof Debabrata Chakraborty

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Declaration

I declare that the details stated above are true and correct to the best of my knowledge.

Sasanka Kakati