

Sarthak S. Singh, Ph.D.

Assistant Professor

Department of Mechanical Engineering

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AREAS OF INTEREST

- Mechanical characterization (quasi-static and dynamic) of heterogeneous materials
- Adhesion and mixed-mode fracture analysis of bi-material interfaces
- Laser induced spall characterization and optical metrology
- Thermo-dynamic mechanical analysis
- Finite element analysis (Hyperelastic-Viscoplastic Constitutive Modeling)
- Micromechanical damage mechanics of heterogeneous material

EDUCATION

- **Doctor of Philosophy**, Aerospace Engineering (CGPA: 9.80/10) - February 2020
Indian Institute of Technology, Kanpur, India
Dissertation: Influence of filler shape and strain rate on the mechanical and failure characteristics of glass-filled epoxy composites.
- ***Master of Technology**, Aerospace Engineering (CGPA: 9.80/10) - November 2017
Indian Institute of Technology, Kanpur, India
Dissertation: Aluminum/epoxy interface strength under dynamic loading conditions: Effect of interface profile and incident wave characteristics
**(Enrolled as a Joint M. Tech - Ph.D. student)*
- **Bachelor of Technology**, Mechanical Engineering (CGPA: 9.54/10) - May 2011
National Institute of Technology, Rourkela, India

ACADEMIC EXPERIENCE

- **Assistant Professor**: Department of Mechanical Engineering, *Indian Institute of Technology (Indian School Mines) Dhanbad (India)*, Oct 2020 to present
- **Post-Doctoral Researcher** (Department of Mechanical Engineering, *Denmark Technical University, Denmark*)
 - Interfacial fracture characterization of sandwich structures – CORTIR sponsored project, Mar 2020 – Aug 2020
- **Senior Student Research Associate** (Department of Aerospace Engineering, *Indian Institute of Technology, Kanpur (India)*)
 - Studies on the adhesion characteristics of Radar absorbing structural composites – DRDO sponsored project, July 2019 – Feb 2020
 - Mechanical and adhesion characteristics of radar absorbing paint coatings – DRDO sponsored project, Aug 2018 – June 2019

- **Course Tutor** (Department of Aerospace Engineering, *Indian Institute of Technology, Kanpur* (India))
 - Mechanics of Solids, Aug 2016-Nov 2016
 - Engineering Drawing, Jan 2016-April 2016
- **Graduate Teaching Assistant** (Department of Aerospace Engineering, *Indian Institute of Technology, Kanpur* (India))
 - Deformation and Fracture of materials, Aug 2017-Nov 2017
 - Optical Methods in Engineering, Jan 2015-April 2015
 - Experiments in Aerospace Engineering – I (Structures), Jan 2014-April 2014, Jan 2017-April 2017, Jan 2018-April 2018
 - Experiments in Aerospace Engineering – I (Structures), Aug 2014-Nov 2014, Aug 2015-Nov 2015

INDUSTRIAL EXPERIENCE

- Operations Officer, Hindustan Petroleum Corporation Limited (HPCL), Kattubadipalem, Andhra Pradesh, India (September 2011-June 2013)

COURSES TAUGHT

Theory Courses

- Advanced Solid Mechanics [Winter Semester (2020-21), Monsoon Semester (2021-22), Monsoon Semester (2022-23)]
- Fracture Mechanics [Winter Semester (2021-22), Winter Semester (2022-23), Winter Semester (2023-24)]
- Engineering Mechanics [Monsoon Semester (2023-24), Monsoon Semester (2024-25)]
- Composite Materials [Winter Semester (2024-25)]

Lab Courses

- CAD and Geometric Modeling Lab [Winter Semester (2020-21)]
- Machine Design Lab [Monsoon Semester (2021-22)]
- Solid Mechanics Lab [Monsoon Semester (2023-24), Monsoon Semester (2024-25)]
- Structural Modeling & Simulation Lab [Monsoon Semester (2024-25)]
- Material Characterization Lab [Winter Semester (2024-25)]

R & D PROJECTS

- *Formulation of spray technique for sand crust (composite) with binder solutions and laboratory testing of sand crust, DRDO (CARS)- Defence Lab Jodhpur, Sept 2023-Sept 2024, Project value: Rs 7.46 lakhs (PI and completed)*
- *Investigation of the spall behavior of glass-filled epoxy composites using laser spallation technique, Start-up Research Grant, SERB (DST), Dec 2021 to Dec 2023, Project value: Rs 29.97 lakhs (PI and completed)*
- *Hygroscopic and thermo-mechanical behavior of glass-filled epoxy composites, Faculty Research Scheme, Initiation Grant, Indian Institute of Technology (ISM) Dhanbad (India), Feb 2021 to Feb 2024, Project Value: Rs 15 lakhs (PI and completed)*

Ph.D. SUPERVISION

- Ongoing: 03 (As Principal Supervisor) and 03 (As Co-Supervisor)

M.TECH. SUPERVISION

- Completed: 03
- Ongoing: 04

PUBLICATIONS

Journal Publications

- Siddharth Kumar, Shrushti Maheswari, Sarthak S Singh, Patrick Rozycki: Dynamic mechanical analysis of epoxy composites: Master curve construction and prony series fitting to investigate filler shape effects on viscoelastic properties, *Emergent Materials* (Springer), 2025. DOI: [10.1007/s42247-024-00992-8](https://doi.org/10.1007/s42247-024-00992-8)
- Ranjan Kumar Mishra and Sarthak S. Singh: Comprehensive review of biological response, alloy design, strengthening mechanisms, performance evaluation, and surface modifications of titanium alloys for biomedical applications, *Multiscale and Multidisciplinary Modeling, Experiments and Design* (Springer), 8(1), 67, 2025.
- Ranjan Kumar Mishra and Sarthak S. Singh: Interfacial crack analysis in piezoelectric bi-material using coupled FE-XEFG approach, *Mechanics of Advanced Materials and Structures* (Taylor & Francis), 2024. DOI: [10.1080/15376494.2024.2438904](https://doi.org/10.1080/15376494.2024.2438904).
- Annada Prasad Moharana, Sarthak S. Singh, Amit Rai Dixit: Dynamic mechanical and viscoelastic properties of glass fiber reinforced photopolymer composite fabricated using vat-photopolymerization additive technique: Influence of filler volume fraction, *Journal of Manufacturing Processes* (Elsevier), 130, 72-86, 2024.
- Siddharth Kumar, Saurav Ranjan Sahay, Sarthak S. Singh, Patrick Rozycki: Exploring the filler morphology and temperature-dependent compressive response of glass-filled epoxy composites: Insights from experiments and viscoplastic simulations, *Polymer Composites* (Wiley), 45(18), 17001-17016, 2024.
- Sarthak S. Singh and R. Kitey: Investigating the spall phenomena in glass filler embedded epoxy composites using laser-induced stress wave, *Materials Today Communications* (Elsevier), 40, 110047, 2024.
- Shrushti Maheshwari, Anand Kumar, Pyaarjit S. Chaurasia, T. Niranjana, Zafar Alam, Sarthak S. Singh: Temperature and Strain Rate Dependent Compression Properties of 3D-Printed PLA: An Experimental and Modeling Analysis, *Rapid Prototyping Journal* (Emerald), 30(7), 1462-1475, 2024.
- Siddharth Kumar, Sarthak S. Singh: Concurrent Predictions of Tension, Compression, and Shear Characteristics of Epoxy Using Three-Network Viscoplastic Model, *Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science* (Sage), 238(21), 10480-10489, 2024
- Asish Siddharth, Ajay Bhandari, Sarthak S. Singh, Arun Dayal Udai: Effect of twisting of intravitreal injections on ocular bio-mechanics: a novel insight to ocular surgery, *Biomechanics and Modeling in Mechanobiology* (Springer), 23, 1013–1030, 2024.
- Manohar Kumar, Kesavan Ravi, Sarthak S. Singh: Temperature and strain rate effects on ultra-high-molecular-weight-polyethylene compression: An experimental and modeling approach, *Polymer Engineering and Science* (Wiley), 64(5), 2214-2229, 2024.

- Shrushti Maheshwari, Zafar Alam, Sarthak S. Singh: Investigating the large strain compression properties of PLA parts manufactured by FDM using experiments and constitutive modeling, **Rapid Prototyping Journal** (Emerald), 30(3), 555-570, 2024.
- Annada P. Moharana, Siddharth Kumar, Ratnesh Raj, Sarthak S. Singh, Amit Rai, Dixit: Effect of glass fiber reinforcement on compressive strength of photopolymer composite fabricated using vat-photopolymerization additive technique: An experimental and modeling approach, **Polymer Composites** (Wiley), 45(1), 193-214, 2024.
- Manohar Kumar, Kesavan Ravi, Sarthak S. Singh: Predicting the double-yield phenomenon in low-density polyethylene film using three-network viscoplastic model, **Mechanics of Materials** (Elsevier) 184, 104736, 2023.
- Sudepto Paul and Sarthak S. Singh: Modeling the strain-softening behavior of glass-filled epoxy composites using a hyperelastic–viscoplastic model, **Mechanics of Time-Dependent Materials** (Springer), 27(03), 929-947, 2023.
- Ratnesh Raj, Amit Rai Dixit, Sarthak S. Singh, Sudepto Paul: Print parameter optimization and mechanical deformation analysis of alumina-nanoparticle doped photocurable nanocomposites fabricated using vat-photopolymerization based additive technology, **Additive Manufacturing** (Elsevier), 60, 103201, 2022.
- Siddharth Kumar, Sarthak S. Singh, Patrick Rozycki: Numerical simulation of strain-softening behavior of glass-filled polymer composites: Comparison of two-dimensional and three-dimensional analyses using Arruda-Boyce and Three-Network viscoplastic models, **Mechanics of Materials** (Elsevier) 175, 104481, 2022.
- K. Kathiresan, Sarthak S. Singh, R. Kitey: Investigating the role of filler shape on the dynamic mechanical properties of glass-filled epoxy composites, **Polymer Composites** (Wiley), 43(10), 6912-6925, 2022.
- Sarthak S. Singh and R. Kitey: Spall characterization in epoxy via laser spallation technique, **Experimental Mechanics** (Springer), 60(7), 969-985, 2020.
- Sarthak S. Singh, P. Chakraborty and R. Kitey: Deformation characteristics of glass-filled epoxy under compression: Role of filler shape and volume fraction, **Polymer Composites** (Wiley), 40(12), 4726-4741, 2019.
- Sarthak S. Singh, P. Venkitanarayanan and R. Kitey: Dynamic compression behavior of glass-filled epoxy composites: Influence of filler shape and exposure to high temperature, **Composites Part B: Engineering** (Elsevier), 164, 103-115, 2019.
- Sarthak S. Singh and R. Kitey: Effect of interface profile and incident wave characteristics on aluminum/epoxy dynamic adhesion strength, **International Journal of Adhesion and Adhesives** (Elsevier), 79, 8-17, 2017.

Conference Proceedings

- Parth Dev Bundela, Ajay Bhandari and Sarthak S. Singh: Convection enhanced drug delivery in deformable human tumors, **AIP Conference Proceedings**, 2863, 020003 (2023).
- David Kumar and Sarthak S. Singh: Static and Dynamic Mechanical Characterization of Polydimethylsiloxane (PDMS) under Uniaxial Tensile Loading, **IOP Conference Series: Materials Science and Engineering**, 1225 (2022) 012041, 2022.
- Sarthak S. Singh, P. Chakraborty and R. Kitey: Quasi-static compression behavior of glass-filled epoxy composites, **Procedia Structural Integrity** (Elsevier), 14, 915-921, 2019.
- Sarthak S. Singh, R. Kitey and P. Venkitanarayanan: Filler shape and volume fraction effect on dynamic compression behavior of glass filler reinforced epoxy composites, **International Journal of Materials and Structural Integrity** (Indersciences): 13(1-3), 81-92, 2019.

- Sarthak S. Singh, R. Kitey and P. Venkitanarayanan: Effect of post cure temperature cycle on dynamic compression behavior of glass filled epoxy composites, ***Mechanics of Advanced Materials and Structures*** (Taylor and Francis), 26(1), 100-105, 2019.
- Sarthak S. Singh and R. Kitey: Measuring spallation strength of epoxy by laser spallation technique, ***Advancement of Optical Methods & Digital Image Correlation in Experimental Mechanics*** (Springer Cham), 3, 53-57, 2019.

CONFERENCE PRESENTATIONS

- Sarthak S. Singh and R. Kitey: Effect of surface asperity on thin film adhesion using laser induced stress waves, ***AeroNDT***, 22(1), 2016.
- Sarthak S. Singh, K. Kathiresan and R. Kitey: Influence of filler shape on the dynamic mechanical properties of glass reinforced epoxy composites, ICRACM-2019, 6th ***International Conference on Recent Advances in Composite Materials***, IIT BHU, Feb 25-28, 2019, Varanasi, India
- Sarthak S. Singh, P. Chakraborty and R. Kitey: Quasi static compression behavior of glass filled epoxy composites, SICE-2018, 2nd ***International Conference on Structural Integrity and Exhibition***, DMRL-Hyderabad, July 25-28, 2018, Hyderabad, India
- Sarthak S. Singh and R. Kitey, Laser spallation: A novel technique to evaluate thin film interface strength, ICTACEM-2017, 7th ***International Conference on Theoretical, Applied, Computational and Experimental Mechanics***, IIT Kharagpur, Dec. 28-30, 2017, Kharagpur, India.
- Sarthak S. Singh, R. Kitey and P. Venkitanarayanan: Effect of post cure temperature cycle on dynamic compression behavior of glass filled epoxy composites, ICCMS-2017, ***International Conference on Composite Materials and Structures***, IIT Hyderabad, Dec. 27-29, 2017, Hyderabad, India
- Sarthak S. Singh, V. Lingesha and R. Kitey: Effect of Surface Morphology and Strain Rate on Aluminum/Epoxy Adhesion Strength, PHENMA-2017, ***International Conference on Physics and Mechanics of New Materials and their Applications***, IIITDM Jabalpur, Oct. 14-16, 2017, Jabalpur, India
- Sarthak S. Singh, R. Kitey and P. Venkitanarayanan: Filler shape and volume fraction effect on dynamic compression behavior of glass filler reinforced epoxy composites, INCAM 2017, 3rd ***Indian National Conference on Applied Mechanics***, MNNIT Allahabad, July 5-7, 2017, Allahabad, India.
- Sarthak S. Singh and R. Kitey: Effect of surface asperity on thin film adhesion using laser induced stress waves, 8th ***International Symposium on NDT in Aerospace***, IISc Bangalore, 3-5 Nov 2016, Bangalore, India
- K. Mishra, C. Mohanty, Sarthak S. Singh, S. S. Mahapatra: A mathematical approach for machine cell formation in cellular manufacturing systems, ICAME, 2nd ***International Conference in Advances in Mechanical Engineering (ICAME)***, SVNIT Surat, Aug 3-5, 2009, Surat, India

INVITED TALK

- Delivered an online talk on 24 Feb. 2024, “Mechanical Deformation of 3D-Printed Components: Experiments and Viscoplastic Modeling,” at a DST-sponsored workshop, Kaaryashala, organized by NIT Rourkela

- Delivered 6 classes on “Material Characterization of 3D-printed Parts” as part of the approved AICTE-QIP-PG Certification Program on Robotics and 3D-Printing, organized by Dept. of Mechanical Engineering, IIT(ISM) Dhanbad during August 2024

AWARDS AND RECOGNITIONS

- The article “Effect of glass fiber reinforcement on compressive strength of photopolymer composite fabricated using vat-photopolymerization additive technique: An experimental and modeling approach” authored by Annada P. Moharana, Siddharth Kumar, Ratnesh Raj, Sarthak S. Singh, Amit Rai Dixit was considered as the Editor’s Choice Article (in Polymer Composites Journal) for January 2024.
- Outstanding tutorship award (for Engineering Drawing) by Academic Senate and Director of IIT Kanpur in 2016
- Ranked 2nd in the Department of Mechanical Engineering at NIT Rourkela (B.Tech.)
- Merit award by the National Institute of Technology (NIT), Rourkela in 2nd and 3rd of B.Tech. program
- A member of the runners up team which participated in the Formula SAE Design Challenge competition held at Anna University, Chennai, in 2009
- Awarded by Indian Association of Physics Teachers for being placed among the top 10% candidates in National Standard Examination in Physics (Class 12 level) in 2006
- Merit award for being the topper of the class in 10th board examination (2004)

MEMBERSHIP OF PROFESSIONAL BODIES

- American Society of Mechanical Engineers (ASME)

REVIEWER FOR THE JOURNAL

- Experimental Mechanics (Springer)
- Journal of Materials Science (Springer)
- Advanced Engineering Materials (Wiley)
- Physica A: Statistical Mechanics and its Applications

ADMINISTRATIVE RESPONSIBILITIES

- Faculty in-Charge (R&D) from 02 January 2025 till date.
- Coordinator (M.Tech., Design) from 18 October 2024 till date.
- Faculty in-Charge of Dynamic Mechanical Analyzer at Central Research Facility, IIT(ISM) Dhanbad from Feb 2023 till date.
- Coordinator (Academics) from 03 April to 03 October 2023.
- Representative member of Mechanical Engineering Department in Library Advisory Committee from April 2022 to April 2024.
- Co-Faculty-in-Charge of Mechanical Tool and Rapid Prototyping Unit of NVCTI, IIT(ISM) Dhanbad from Feb 2022 till April 2024.
- Faculty Advisor of American Society of Mechanical Engineers (ASME) Student Section from the year 2021 to 2023.
- Co-Convenor of an International conference named “Industrial Problems on Machines and Mechanisms IPRoMM – 22” to be organized by IIT (ISM) Dhanbad from 22-23 December 2022.