Shammo Dutta

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EDUCATION

The University of Alabama (UA) Tuscaloosa, U.S.
Doctor of Philosophy & Master of Science in Mechanical Engineering *Aug. 2022-Present*
GPA: 3.9/4.0
Lab: Smart Materials and Robotic Technologies (SMART) Lab
Advisor: Dr. Sree Kalyan Patiballa

The University of Alabama (UA) Tuscaloosa, U.S.
Master of Science in Mechanical Engineering *Dec. 2025*
GPA: 3.9/4.0

Amrita Vishwa Vidyapeetham (University) Amritapuri, India
Bachelor of Technology in Mechanical Engineering *Jul. 2017-Jun. 2021*
GPA: 9.0/10.0

RESEARCH INTERESTS

Design and optimization of mechanical metamaterials; computational modeling of soft robotics.

RESEARCH EXPERIENCE

SMART Lab, UA Tuscaloosa, U.S.
Graduate Research Assistant — Advisor: Dr. Sree Kalyan Patiballa *Aug. 2022-Present*

- Developing computational pipeline for spatially deformable metamaterial design and optimization.
- Modeled and analyzed dynamic impact behavior of civil metamaterial-based sandwich composites.
- Developed a high-fidelity finite element (FEM) framework for tendon-driven soft actuators.
- Devised a robust stress-based design optimization method for planar mechanical metamaterials.

Department of Mechanical Engineering, Amrita University Amritapuri, India
Research Assistant — Advisor: Dr. Hariprasad M.P. *Sep. 2021-Jul. 2022*

- Authored a technical guide on computational tools for experimental mechanics and digital image correlation (DIC).
- Collaborated with an interdisciplinary team to analyze load flow and biomechanics of dental implant systems using DIC and FEM.

Department of Mechanical Engineering, Amrita University Amritapuri, India
Undergraduate Researcher — Advisor: Dr. Hariprasad M.P. *Aug. 2019-Jun. 2021*

- Designed lightweight high-strength structures reinforced with auxetic metamaterials.
- Co-invented one U.S. patent and communicated a high-impact journal article.

PUBLICATIONS

JOURNALS

[J1] **Dutta, S.**, Krishnan Girish, Patiballa, S. K. (2026). A Sequential Two-Step Design Framework for Deformable Mechanical Metamaterials. Manuscript in-preparation, Planned for *ASME Journal of Mechanical Design*

[J2] Turna, N. R., Luong, T., **Dutta, S.**, Aaleti, S., & Patiballa, S. K. (2026). Auxetic Metamaterials Embedded Concrete Systems (AuxMeCs) for Resilient Civil Infrastructures. Manuscript in-preparation, Planned for *Wiley Advanced Engineering Materials*.

[J3] **Dutta, S.**, Conzola, J., Vikas, V., & Patiballa, S. K. (2025). Development and Validation of Computational Modeling Framework for Tendon-based Soft Robotics. *ASME Journal of Mechanisms and Robotics*. https://doi.org/10.1115/1.4069292

[J4] **Dutta, S.**, & Patiballa, S. K. (2025). Design Optimization for Uniform Stress Distribution in Mechanical Metamaterials Using a Maximum Material Utilization Metric. *ASME Journal of Mechanical Design*, 148(1): 011702. https://doi.org/10.1115/1.4068956

[J5] Baghiana G, Manju V, Hariprasad M.P., Menon H.G., **Dutta S**, Vinod Kumar Gopal (2022) Comparison of Attachment Types in Maxillary Implant-assisted Obturators using Digital Image Correlation Analysis. *J Contemp Dent Pract*, 23(7), 695-702. https://pubmed.ncbi.nlm.nih.gov/36440515/

[J6] Menon, H. G., **Dutta, S.**, Krishnan, A., M. P., H., Shankar, B. (2022). Proposed auxetic cluster designs for lightweight structural beams with improved load bearing capacity. *Engineering Structures*, 260, 114241. https://doi.org/10.1016/j.engstruct.2022.114241

CONFERENCE PROCEEDINGS

[C1] **Dutta, S.**, & Patiballa, S. K. (2025). Towards self-sensing in auxetic metamaterials using displacement mapping framework. Volume 5: 21st IEEE/ASME International Conference on Mechatronic and Embedded Systems and Applications (MESA); 49th Mechanisms and Robotics Conference (MR). https://doi.org/10.1115/DETC2025-169766

[C2] **Dutta, S.**, & Patiballa, S. K. (2023). Design optimization framework for uniform stress distribution of mechanical Metamaterials. Volume 4: Advanced Materials: Design, Processing, Characterization and Applications; Advances in Aerospace Technology. https://doi.org/10.1115/imece2023-112793

[C3] Menon H.G., **Dutta S**, Hariprasad M.P., Shankar B. (2021). Investigation on deflection characteristics of auxetic beam structures using FEM. Recent Advances in Manufacturing, Automation, Design and Energy Technologies, 621-628. https://doi.org/10.1007/978-981-16-4222-7_70

[C4] **Dutta, S.**, Menon, H. G., Hariprasad, M., Krishnan, A., Shankar, B. (2021). Study of auxetic beams under bending: A finite element approach. Materials Today: Proceedings, 46, 9782-9787. https://doi.org/10.1016/j.matpr.2020.10.479

PATENTS

[P1] Shankar, B., MP, H., **Dutta, S.**, Menon, H. G. (2024). Auxetic Member for Load Bearing Structures. U.S. Patent No. 11981111. U.S. Patent and Trademark Office. (Status: Granted, Filed in 2021) https://patentcenter.uspto.gov/applications/17404733

INVITED TALKS AND PRESENTATIONS

1. ASME 2025 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC-CIE), *Anaheim, California* [Aug. 17-20, 2025]
2. Embodied Intelligence Conference (EI) 2025 by Bio-Inspired Robotics Laboratory, University of Cambridge, *Held in Cambridge U.K., Attended virtually* [Apr. 02-04, 2025]
3. ASME 2024 Smart Materials, Adaptive Structures and Intelligent Systems (SMASIS), *Atlanta, Georgia* [Sep. 9-11, 2024]
4. ASME 2023 International Mechanical Engineering Congress & Exposition (IMECE), *New Orleans, Louisiana* [Oct. 29, 2023-Nov. 2, 2023]
5. ASME 2022 International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC-CIE), *St. Louis, Missouri* [Aug. 14-17, 2022]
6. "Investigation on Deflection Characteristics of Auxetic Beam Structures Using FEM", International Conference on Future Technologies in Manufacturing, Automation, Design & Energy, *National Institute of Technology Puducherry* [Dec. 28-30, 2020]
7. "Study of auxetic beams under bending: A finite element approach", International Mechanical Engineering Congress 2019, *National Institute of Technology Tiruchirappalli* [Nov. 29, 2019-Dec. 1, 2019]

TEACHING EXPERIENCE

ME 489 & 490 - Mechanical Engineering Design I & II

Graduate Teaching Assistant, Department of Mechanical Engineering, UA *Aug. 2025-Present*

- Mentoring 50+ senior engineering students through capstone design projects, evaluating technical feasibility, innovation, and presentation quality.

ME 372 - Dynamic Systems

Graduate Teaching Assistant, Department of Mechanical Engineering, UA *Aug. 2024-May. 2025*

- Developed supplementary MATLAB tutorials for dynamic systems modeling, improving student performance by providing hands-on computational skills training.
- Evaluated 70+ assignments per term and provided detailed feedback to individual students.

ME 349 - Engineering Analysis

Graduate Teaching Assistant, Department of Mechanical Engineering, UA *Aug. 2023-Aug. 2024*

- Graded 100+ assignments per term and provided detailed feedback to individual students.

ME 215 - Thermodynamics I

Graduate Teaching Assistant, Department of Mechanical Engineering, UA *Jun. 2023-Jul. 2023*

- Evaluated over 50 assignments per term, including homework, exams, and final assessments.

SKILLS

- **Computational Tools:** ABAQUS, COMSOL, Solidworks, Autodesk Fusion, MATLAB, Python
- **Visualization & Post-Processing:** Inkscape, Origin, Paraview, Adobe Creative Cloud
- **Languages:** English, Hindi, Marathi (Professional); Bengali (Native); Malayalam (Basic)

PROFESSIONAL MEMBERSHIP

- American Society of Mechanical Engineers (ASME)
- U.S. Association for Computational Mechanics (USACM)