UDBHAV VISHWAKARMA

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RESEARCH INTERESTS – Metamaterials, Soft Materials, Wave Propagation and Structural Optimization.

EDUCATION

• MTech (Research), Aerospace Engineering — **GPA** – 9.50/10.0
Indian Institute of Science, Bangalore — 2021 – 2024
Thesis – Deformation-based Topological Lattices and their Edge States (Submitted)
Advisor – Prof. Rajesh Chaunsali

• B.E., Mechanical Engineering (*with Distinction*) — **GPA** – 8.93/10.0
Birla Institute of Technology – Mesra, Ranchi — 2017 – 2021

RESEARCH EXPERIENCE

• Master's Thesis (Advisor – *Prof. Rajesh Chaunsali*) — Aug'21 – Aug'24
Dept. of Aerospace Engg., Indian Institute of Science
Synopsis: Proposed a prototypical spring-mass 1D lattice with hidden chiral and mirror symmetries that are revealed in the deformation framework. A spinner-based lattice is conceptualized that mimics the proposed model, and the results are experimentally verified. Furthermore, the deformation-based analysis is extended to 2D, and the mathematical framework for it is established for general 1D elastic lattices.

• Bachelor's Project (Advisor – *Prof. Nirmal Kumar*) — Aug'20 – Aug'21
Dept. of Mechanical Engg., Birla Institute of Technology – Mesra
Synopsis: Studied the indentation on an inflated low-pressure circular membrane by an inflated high-pressure circular membrane for different loading and rigidity constants. We discovered a critical radius of contact for the inflated low-pressure membrane where the maximum meridional curvature discontinuity jump exists.

• Remote Research Internship (Advisor – *Prof. Ganesh Tamadapu*) — May'20 – Aug'20
Dept. of Applied Mechanics & Biomedical Engg., Indian Institute of Technology – Madras
Synopsis: Linear stability analysis of swollen thin spherical dielectric gel shell subjected to pressure and voltage-controlled inflation. Pressure limit points and the onset of thinning instability were studied for different loading parameters.

SCHOLASTIC RECORDS & SCHOLARSHIPS

• AICTE Post Graduate Scholarship (2021 – 2023)
Awarded to Graduate Aptitude Test in Engineering (GATE) Qualified Candidates.

• All India Rank – 24
2021 GATE Exam – Engineering Sciences (**# of Candidates Appeared** – 22219)

• Department Rank – 5
Dept. of Mechanical Engg., Birla Institute of Technology – Mesra (**Batch Size** – 118)

PUBLICATIONS

• Udbhav Vishwakarma, Fotios Diakonos, Rajesh Chaunsali, "Generalized Deformation Framework for 1D Elastic Lattices with Hidden Topology." (In Preparation)

• Udbhav Vishwakarma, Murthaza Irfan, Georgios Theocharis, Rajesh Chaunsali, "Edge States with Hidden Topology in Spinner Lattices," *arXiv:2409.07949*. (Under Review)

• Nirmal Kumar, Udbhav Vishwakarma, Anirvan DasGupta, "On the mechanics of inflated hyperelastic membrane–membrane contact problem," *Int. J. Non-Linear Mech.*, 137 (2021), Article 103805.

CONFERENCES & MEETINGS

• Udbhav Vishwakarma, Rajesh Chaunsali, "Hidden Topological Edge States in Spinner Lattices," *American Physical Society*, Online, Mar. 2024.

COURSE PROJECT(S)

- Structural Optimization: Size, Shape, and Topology (Instructor – *Prof. G. K. Ananthasuresh*)
  a) Developed a MATLAB program for combined size and shape optimization of trusses for least compliance by utilizing the in-built **fmincon** function.
  b) Developed a MATLAB program using the in-built **fmincon** for designing 2D lattice-based structures for the least compliance by selecting appropriate lattices throughout the domain.
  c) Stress-constrained shape optimization of a flywheel with internal voids for maximum energy storage in the COMSOL software.

RELEVANT MASTER'S COURSEWORK

Flight Vehicle Structures	A
Structural Dynamics	A+
Thermodynamics of Crystalline Solids	A
Finite Element Method	A+
Structural Optimization: Size, Shape, and Topology	A+
Electromagnetic Metamaterials	A
Wave Propagation in Designed Materials	A+

Grade (Grade Point Value): A+ (10/10), A (9/10)

TECHNICAL SKILLS

Solid Mechanics, Vibration and Modal Analysis, Structural Optimization, Instrument Automation, Python and MATLAB Programming, COMSOL Software.

VOLUNTEERING & OUTREACH

- Village Education Programme – National Service Scheme (NSS) 2018 – 2019
  Taught underprivileged high school students residing in villages and slums near the college campus.