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Education

Ph.D. in Mechanical Engineering   *2018 – Present*   CPI: 9.5/10
IIT Kanpur
    Thesis(submitted): Symmetry based analysis of instabilities in a plate with stiffened edge.
    Supervisor: Basant Lal Sharma

M.Tech in Machine Design   *2016 – 2018*   CPI: 9.6/10
IIT (ISM) Dhanbad
    Thesis: Analytical and experimental investigation of generic perforated bias flow liners.
    Supervisor: Rabindra Nath Hota

B.Tech in Mechanical Engineering   *2012 – 2016*   CPI: 8.0/10
IIT (ISM) Dhanbad

Senior Secondary School (Grade 12$^{\text{th}}$)   *2012*   Score: 84.0%
CBSE

Secondary School (Grade 10$^{\text{th}}$)   *2010*   CGPA: 9.6/10
CBSE

Professional Summary

Ph.D. in Mechanical Engineering with specialization in nonlinear problems in structural mechanics. Expertise in nonlinear elasticity, theory of plates and shells, and Cosserat rod theory, with doctoral research focused on Lyapunov–Schmidt reduction and local bifurcation analysis of coupled plate–rod systems. Skilled in both analytical and numerical approaches, including writing custom finite element codes and applying symmetry-based nonlinear finite element analysis (FEA). Experienced in using commercial CAE tools such as ABAQUS and COMSOL Multiphysics for advanced structural and multiphysics analysis.

Possesses additional background in aeroacoustic problems during M.Tech., combining strong theoretical foundations with computational modeling to tackle complex engineering challenges.

Key Skills

– **Technical Expertise:** Nonlinear Finite Element Analysis, Structural Buckling Analysis, Group Theory, Bifurcation analysis, Aero-acoustics.

– **Software Proficiency:** Mathematica, Maple, ABAQUS CAE, COMSOL Multiphysics, ANSYS, SOLIDWORKS.

– **Programming Skills:** Python, MATLAB, C, C++.

Professional Experience

Ph.D. Candidate   *2018 – Present*
IIT Kanpur

– Teaching assistant: Duties included preparing assignment solutions, grading, and clarifying student doubts for the following courses:

Course	Instructor	Period
Nature and Properties of Materials	C. Chandraprakash	2018-19 2nd Semester
Introduction to Solid Mechanics	C. Chandraprakash	2019-20 1st Semester
Engineering Graphics	Basant Lal Sharma	2019-20 2nd Semester
Introduction to Solid Mechanics	C. Chandraprakash	2020-21 1st Semester
Introduction to Continuum Mechanics	Basant Lal Sharma	2020-21 2nd Semester
Introduction to Solid Mechanics	Basant Lal Sharma	2021-22 1st Semester
Calculus of Variations	Basant Lal Sharma	2021-22 2nd Semester
Wave Propagation in Solids	C. Chandraprakash	2022-23 2nd Semester
Introduction to Solid Mechanics	Basant Lal Sharma	2023-24 1st Semester
Introduction To Complex Analysis	Saurabh Kumar Singh	2024-25 1st Semester

– Tutor in undergraduate course on "Mechanics of Solids", under instructor C.S.Upadhyay during the period of 2022-23, 1st Semester. The duties involved solving tutorial problems in class, clearing corresponding doubts and grading examination answer scripts.

M.Tech Research Scholar   *2016 – 2018*
IIT (ISM) Dhanbad

– Contributed to the design and setup of a multi-flow impedance tube for measuring the acoustic characteristics of bias-flow liners, as part of a project funded by the Gas Turbine Research Establishment (GTRE), a national laboratory of India's Defence Research & Development Organisation (DRDO).

Internship

Undergraduate vocational training   *08.06.2015 – 07.07.2015*
Steel Authority of India, Rourkela

Research Topics and Projects

Symmetry-based Analysis of Instabilities in a Plate with Stiffened Edge   Ph.D. Dissertation

– Analyzed the bifurcation behavior and instabilities in a circular von Kármán plate using symmetry-based reduction methods. Utilized a variational approach to define the nonlinear differential operator and construct the null space of the linearized operator. Identified two distinct critical mode patterns—interior deformation and edge deformation—and determined corresponding local bifurcation curves semi-analytically. The results were validated with numerical simulations and Finite Element Analysis. This research provides insights into symmetry-driven bifurcation phenomena in nonlinear elastic systems.

Analytical and Experimental Investigation of Generic Perforated Bias Flow Liner   M.Tech Thesis Project

– Developed analytical models for conical cavity-liner ducts and liners with mixed porosity to suppress combustion instabilities in jet engines. Employed a control volume approach to account for acoustic coupling with mean flows. Experimentally investigated the damping performance of uniform and mixed porosity liners using the two-load method, comparing the performance of cylindrical and conical liners. Analyzed the effects of varying cone angles on absorption characteristics and observed a shift in absorption curve troughs with changing cone angles.

Projects done during course work

– In postgraduate "Applied Dynamics and vibration" course: Obtained state-space solutions for a rolling coin simulation and its animated results.

– In postgraduate "Calculus of variation" course: Derived conservation laws for micro-polar elasticity using Noether's theorem.

Scholastic Achievements

– Recipient of Fellowship for Academic and Research Excellence (FARE) at IIT Kanpur starting from April 2025.

– Graduate Aptitude Test in Engineering, **GATE (2016):** All India Rank – 2635 $\approx$ 98.6 percentile.

– Indian Institute of Technology Joint Entrance Examination, **IIT JEE (2012):** All India Rank – 5354 $\approx$ 98.9 percentile.

– **9th National Cyber Olympiad (2009):** National Rank – 82.

Major Courses

– **Undergraduate-level courses (B.Tech):** Advanced solid mechanics, Dynamics of machinery

– **Postgraduate-level courses (M.Tech):** Mechanical Vibration and control, Finite Element.

– **Postgraduate-level courses (Ph.D.):** Finite Element Methods in engineering, Nonlinear Finite Element Methods in, Fracture and Fatigue, Granular materials, Introduction to continuum mechanics, Calculus of variations, Mechanics of soft materials, Symmetry and Properties of Crystals, Mechanics of Biological Membranes.

Talks

1. 58th Meeting of the Society for Natural Philosophy (SNP 2024 - Nonlinear Theories in Mechanics)
   Title: Symmetry Based Analysis of Instabilities in a Plate with Stiffened Edge
   Venue: Aarhus University, Aarhus, Denmark
   Date: 11th June, 2024

2. 6th Indian Conference on Applied Mechanics (INCAM 2024)
   Title: Symmetry Based Analysis of Instabilities in a Plate with Stiffened Edge
   Venue: National Institute of Technology Warangal, Telangana, India
   Date: 14th June, 2024

3. 9th European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS 2024)
   Title: Symmetry Based Analysis of Instabilities in a Plate with Stiffened Edge
   Venue: Lisbon Congress Centre, Lisbon, Portugal
   Date: 4th June, 2024 (Missed due to delay in visa processing)

4. 11th European Solid Mechanics Conference (ESMC 2022)
   Title: Symmetry Based Analysis of Instabilities in a Plate with Stiffened Edge
   Venue: National University of Ireland, Galway, Ireland
   Date: 4th - 8th July, 2022 (Missed due to issues with visa processing)

In addition to above, also gave talks based on my PhD thesis in Research scholar's day 2022 and Institute research symposium 2024 held at institute level at IIT Kanpur.

Peer-Reviewed Publications

1. **Deepankar Das**, B. L. Sharma, "Equilibrium of circular von-Kármán plate bonded with Kirchhoff rod," *International Journal of Solids and Structures*[Accepted, Online link pending][arXiv pre-print: 2501.10442]

2. **Deepankar Das**, B. L. Sharma, "Local bifurcation analysis of circular von-Kármán plate with Kirchhoff rod boundary," *SIAM Journal on Applied Mathematics*, vol. 85, no. 4, pp. 1749–1784, 2025, DOI: 10.1137/24M1703999

3. N.K. Jha, **Deepankar Das**, Ashutosh Tripathi, R.N. Hota, "Acoustic damping: Analytical prediction with experimentalvalidation of mixed porosity liners and analytical investigation of conical liners," *Applied Acoustics*, vol. 150, 2019,Pages 179-189, ISSN 0003-682X. DOI: 10.1016/j.apacoust.2019.02.006.

4. **Deepankar Das**, Utkarsh Chhibber, R.N. Hota, "Modification of Two-Load Method for Measuring Acoustic Properties with Mean Flow," in *Kumar M., Pandey R., Kumar V. (eds) Advances in Interdisciplinary Engineering.* Lecture Notes in Mechanical Engineering. Springer, Singapore, 2019. DOI: 10.1007/978-981-13-6577-5_55.

Manuscripts under Preparation (Tentative Titles)

1. Symmetry based finite element technique for bifurcation analysis of plate problems.

2. Instabilities in system of plate and chiral rod.

3. Wrinkling in thin plates.

4. Instabilities in system of rod and infinite plate.

5. Book on Symmetry based bifurcation.

Miscellaneous

– **Autonomous Robotics:** Designed an autonomous robot for object sensing and manipulation.

– **Combat Robotics:** Built a user-controlled robot for robotics combat competitions and won first prize in institute-level robotics war competition.

– **Languages:** English, Hindi, Odia.

– **Student activity:** Was an active member of TV room committee in hostel.