Curriculum Vitae

Dr. Archana Arbind

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Research Interests:

Nonlinear large deformation, mechanics of soft matter, Computational mechanics, Applied continuum mechanics, higher-order theories of shell and rod/tubes, One-dimensional theories, large deformation, computational plasticity, Finite element methods, viscoelasticity, High performance computing, Fracture mechanics, Damage mechanics.

Professional experiences:

Assistant Professor(*July,2021–present*), Dept. of mechanical engineering, IIT Kharagpur, WB, India.
Post-doc research associate (*May,2017 – July,2020*), Dept. of mechanical engineering, Texas A&M University. College Station, USA.

Educational Qualifications:

Ph.D., Mechanical Engineering (2012 - 1017) , Texas A&M University, College Station, USA. *Advisor:* J. N. Reddy
MS, Civil Engineering (2010 - 2012), Texas A&M University, College Station, USA. *Advisor:* J. N. Reddy
B. Tech, Civil Engineering (2005 - 2009), IIT Guwahati, Guwahati, Assam, India.

Awards:

1. **Aruna and J. N. Reddy Distinguished Fellow** in Computational Mechanics, 2013, Department of Mechanical Engineering, Texas A&M University, College Station, USA.
2. **Travel award**, *13th World Congress in Computational Mechanics*, 2018, New York city, NY, USA.
3. **Travel award**, *15th US National Congress in Computational Mechanics*, 2019, Austin, TX, USA.

Research Grants:

1. **Core research grant**: *High-fidelity structural theories and its finite element model for the large deformation and rupture analysis of soft biological shell and tubular structures for the applications in vascular solid mechanics*, SERB, India, (2023-2026, PI)
2. **Faculty Start-up Research Grant**: *High-fidelity structural theories and its finite element model for the large deformation of tubular structures with residual stress for the applications in vascular solid mechanics*, SRIC, IIT kharagpur, India, (2023-2026, PI)
3. **The Royal Society: International Exchanges Scheme**: *Higher-Order Shell theory for Morphoelastic Shells.* (2023-2024, Co-PI, in collaboration with Edinburgh Napiers University, UK.)
4. 4D Cardiac Modelling of Paediatric Heart (2025-2028, Co-PI, IIT Kharagpur and TCS research, India)

Teaching:

Undergraduate courses:

1. Mechanics of solids:	Fall 2021, Fall 2022, Fall 2023, Fall 2024
2. Engineering Mechanics:	Spring, 2022, Spring 2023, Spring 2024, Spring 2025, Fall 2025
3. Mechanics of solids laboratory:	Fall 2021.
4. DIY project:	Fall 2021, Spring, 2022.

Graduate course:

1. Continuum Mechanics: Fall 2022, Fall 2024, Fall 2025
2. Applied Elasticity: Fall 2023
3. Mechatronics Laboratory: Spring, 2023, Spring 2024.

Journal Publications:

12. **A. Arbind**, J. N. Reddy, and A. R. Srinivasa. "A general higher-order shell theory for isotropic hyperelastic materials using orthonormal moving frame." *International Journal for Numerical Methods in Engineering,* (2021), DOI: 10.1002/nme.6536
11. **A. Arbind**, J. N. Reddy, and A. R. Srinivasa. "A nonlinear 1-D finite element analysis of rods/tubes made of incompressible neo-Hookean materials using higher-order theory." *International Journal of Solids and Structures*, (2019).
10. **A. Arbind**, A. R. Srinivasa, and J. N. Reddy. "A higher-order theory for open and closed curved rods and tubes using a novel curvilinear cylindrical coordinate system." *Journal of Applied Mechanics* 85, no. 9 (2018): 091006.
9. **A. Arbind**, and J. N. Reddy. "A one-dimensional model of 3-D structure for large deformation: a general higher-order rod theory." *Acta Mechanica* 229.4 (2018): 1803-1831.

   A. Arbind, and J. N. Reddy. "Correction to: A one-dimensional model of 3-D structure for large deformation: a general higher-order rod theory." *Acta Mechanica* 229.10 (2018): 4313-4317.
8. **A. Arbind**, and J. N. Reddy. "A general higher-order one-dimensional model for large deformation analysis of solid bodies." *Computer Methods in Applied Mechanics and Engineering.* 328 (2018): 99-121.
7. **A. Arbind**, J. N. Reddy, and A. R. Srinivasa. "Nonlinear analysis of plates with rotation gradient dependent potential energy for constrained micro-rotation." *Journal of Engineering Mechanics*, 144.2 (2017): 04017180.
6. **A. Arbind**, J. N. Reddy, and A. R. Srinivasa. "Nonlinear analysis of beams with rotation gradient dependent potential energy for constrained micro-rotation." *European Journal of Mechanics-A/Solids*, 65 (2017): 178-194.
5. **A. Arbind**, and J. N. Reddy. "Transient analysis of Cosserat rod with inextensibility and unshearability constraints using the least-squares finite element model." *International Journal of Non-Linear Mechanics*, 79 (2016): 38-47.
4. **A. Arbind**, J. N. Reddy, and A. R. Srinivasa. "Modified couple stress-based third-order theory for nonlinear analysis of functionally graded beams." *Latin American Journal of Solids and Structures*, 11.3 (2014): 459-487.
3. **A. Arbind**, and J. N. Reddy. "Nonlinear analysis of functionally graded microstructure dependent beams." *Composite Structures*, 98 (2013): 272-281.
2. J. N. Reddy, A. R. Srinivasa, **A. Arbind**, and P. Khodabakhshi. "On gradient elasticity and discrete peridynamics with applications to beams and plates." *Advanced Materials Research*, Vol. 745. Trans Tech Publications, 2013.
1. J. N. Reddy, and **A. Arbind**. "Bending relationships between the modified couple stress based functionally graded Timoshenko beams and homogeneous Bernoulli-Euler beams." *Annals of Solid and Structural Mechanics*, 3.1-2 (2012): 15-26.

Conference presentations:

1. **A. Arbind**, J. N. Reddy, and A. R. Srinivasa. "A one-dimensional model for large deformation analysis of 3D structures: an application of the general higher order rod theory to nonlinear material." Session: Novel Mathematical Models and Computational Methods, *13th World Congress in Computational Mechanics and 2nd Pan American congress on computational mechanics*, 2018, New York city, NY, USA.
2. **A. Arbind**, J. N. Reddy, and A. R. Srinivasa. "A Novel General Higher-order Shell Theory for Compressible and Incompressible Hyperelastic Materials Using Orthonormal Moving Frame." *15th U.S. National Congress on Computational Mechanics*, July, 2019, Austin, TX, USA.
3. **A. Arbind**. "A General Higher-Order Shell Theory for incompressible and anisotropic hyperelastic materials using Orthonormal Moving Frame: application to arterial mechanics", *15th World Congress in Computational Mechanics*, August,2022, Yokohama, Japan.

4. **A. Arbind**, "General higher-order one dimensional and shell theories for pipe like soft structures using orthonormal's moving frame", ACMFMS 2022, IIT Guwahati, December 2022. (**Invited for talk and chair session**)
5. **A. Arbind**, "A General Higher-Order Shell Theory using Orthonormal Moving Frame for transversely isotropic hyperelastic materials", 6th Indian conference on applied mechanics(INCAM-2024), NIT Warangal, July 2024. (**Invited for talk and chair session**)
6. **A. Arbind**, "A General Higher-Order Shell Theory using Orthonormal Moving Frame for transversely isotropic hyperelastic materials", *16th World Congress in Computational Mechanics*, July 2024, Vancouver, Canada.(**chair sessions**)
7. **A. Arbind**, "A General Higher-Order Shell Theory using Orthonormal Moving Frame and its application to isotropic, anisotropic and morphoelastic shell", *Fourth International Conference on Mechanics of Advanced Materials and Structures (ICMAMS),*, December 2024, Bengaluru, Karnataka, India. (**chair sessions**)

Invited talks:

1. General higher-order tube/rod theory for hyperelastic material model: mathematical formulation & finite element model, 2021, Mechanics of Time Dependent Materials Laboratory, Department of Mechanical engineering, IIT Madras.
2. General higher-order shell theory using orthonormal (Cartan's) moving frame for hyperelastic material model, May, 2021, Mechanics of Time Dependent Materials Laboratory, Department of Mechanical engineering, IIT Madras.
3. General higher-order one dimensional and shell theories for pipe like soft structures using orthonormal's moving frame with potential application in biomechanics, Engineering and applied science forum (EASF) Young webinar (invited talk), Oct, 2022.
4. General higher-order one dimensional and shell theories for pipe like soft structures using orthonormal's moving frame, ACMFMS 2022, IIT Guwahati, December 2022. (**Invited talk and chair session**)
5. A General Higher-Order Shell Theory using Orthonormal Moving Frame for transversely isotropic hyperelastic materials, 6th Indian conference on applied mechanics(INCAM-2024), NIT Warangal, July 2024. (**Invited talk and chair session**)

Service:

Reviewer:

- Mechanical Systems and Signal Processing
- International Journal of Structural Stability and Dynamics
- Annals of Solid and Structural Mechanics
- Engineering with Computers
- Thin Walled Structures
- Archives of Computational Methods in Engineering

Departmental and administrative responsibilities:

- Professor-in-charge, Training and Placement, Department of Mechanical Engineering, IIT Kharagpur.
- Vice chairperson, Kshitij, Technical festival of IIT Kharagpur,(2025 - present).
- Member, National core committee, Scheme for Promotion of Academic and Research Collaboration (SPARC), Ministry of Higher-education, India, (Oct 2025 - present).

Students:

Current Students:
1. Dolly Tiwari (PhD, Fall'23-current)
2. Himanshu Sharma (B.Tech & M.Tech dual degree, Fall25-present)

Past M. Tech./Dual Degree Students:
1. Ghadiyaram Uday Kiran (Spring'21)

2. Janga Abhi Sai Subhash Reddy (Spring'21)
3. Gobind Kumar (Spring'23)
4. Ghuncha Fatma (Spring'24)
5. P Sathwik Reddy (Spring'24)

References:

Prof. J. N. Reddy
O'Donnell Foundation Chair IV Professor,
Regents Professor, Distinguished Professor, NAE Member
J. Mike Walker '66 Department of Mechanical engineering
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