CURRICULUM VITAE

Vasudha Kapre, Ph.D.

Postdoctoral Research Assistant
Composites Manufacturing and Simulation Center (CMSC)
School of Mechanical Engineering
Purdue University, West Lafayette, IN

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SUMMARY

- Postdoctoral Researcher with expertise in **composite materials, additive manufacturing, and computational modeling**.
- Ph.D. in Aerospace Engineering with six years of research experience in characterization, process–structure–property relationships, and simulation frameworks (DEM–FEM, FEA) for process modeling carbon fiber reinforced polymers.
- Experienced in **cross-disciplinary collaboration, teaching, and mentoring**, with publications in Polymer Composites and leading conference proceedings.
- Interested in advancing **research and development, teaching, and product innovation** in composites and advanced manufacturing.

EDUCATION

Ph.D., Aerospace Engineering — West Lafayette, IN
Purdue University, GPA 3.92/4.00 — 2020 - 2024
Advisor: Prof. R Byron Pipes
Thesis: *Fiber length attrition of long-discontinuous fiber reinforced polymer pellets in a single screw extruder.*

M.S, Aerospace Engineering — West Lafayette, IN
Purdue University, GPA 3.68/4.00 — 2018 - 2020
Structures (Major), Materials (Minor)

B. Tech., Civil Engineering — Hyderabad, India
Indian Institute of Technology, GPA 8.88/10 — 2014 - 2018

SKILLS

Modeling & Simulation: ABAQUS, LIGGGHTS, ANSYS, Additive-3D, MATLAB, Python, Paraview
Characterization: X-ray CT, Microscopy, DSC, TGA, DMA, Tensile/Compression/Shear Testing
Microstructural & Shape Analysis: VG Studio, LEICA, ZEISS, ImageJ, Faro ARM Laser Scanner
Other: Wolfram Mathematica, SolidWorks, VIC-3D, GeomagicWrap, IntelliMax, TA Universal Analysis
Collaboration & Communication: Technical writing and presentation, cross-disciplinary teamwork
Languages: English (Proficient), Hindi (Proficient), Telugu (Proficient), Marathi (Basic), Sanskrit (Basic)

RESEARCH EXPERIENCE

Post-doctoral Researcher, Mechanical Engineering, Purdue University 2025
P.I: Dr. Eduardo Barocio

- Execute an industry funded project with Juggerbot3D to develop additive manufacturing capabilities for fiber reinforced thermoset resin systems.
- Support the Composites Additive Manufacturing and Simulation Consortium (CAMS) at the Composites Manufacturing and Simulation Center through simulation, characterization, and validation for printing with various thermoplastic composites.
- Prepare reports and publications that will be submitted to archival journals, contributing to the preparation of funding proposals.

PhD Thesis: Fiber length attrition of long-discontinuous fiber (LDF) reinforced polymer pellets in a single screw extruder 2020 – 2024

- Modeled the flow of cylindrical pellets in a single screw extruder using LIGGGHTS, a discrete element method opensource code implement in C++, and used Paraview for pellet trajectory visualization.
- Validated pellet motion in the solid-conveying zone of a single screw extruder for starve-fed extrusion of 40% CF-PPS by building an extruder system with acrylic barrel for visual pellet tracking.
- Created a sequentially coupled discrete element – finite element (DEM-FEM) framework to capture heat-transfer and melting of a single pellet in ABAQUS based on contact information obtained from LIGGGHTS.
- Extended melting and crystallization kinetics model of semi-crystalline 40% CF-PPS and implemented in ABAQUS heat-transfer simulations through user-subroutine UMATHT.
- Developed analytical models based on beam theory for partially molten pellet deformation and fiber-breakage in the melting zone of a single screw extruder.

Research Assistant, Composites Manufacturing and Simulation Center (CMSC) 2019 – 2023

- Collaborated with the additive manufacturing team to develop material cards for short-fiber reinforced polymer composites such as 50% CF-PPS, 25% CF-PESU, and 25% CF-PSU to enable simulations.
- Performed various experiments to characterize the thermo-mechanical and microstructural properties of orthotropic viscoelastic materials used in extrusion deposition additive manufacturing (EDAM)
- Wrote MATLAB codes to measure and obtain the fiber-orientation tensor and fiber-length distribution from optical micrographs using the image-processing toolbox.
- Validated residual stresses and deformation of additively manufactured geometries using Additive-3D, an in-house physics-based simulation software.
- Investigated the effect of printing parameters such as bead aspect ratio, layer height, and stretching ratio on the effective mechanical properties of printed parts and validated.

TEACHING EXPERIENCE

Teaching Assistant, Purdue University

- Analytical Geometry & Calculus – I, MA 16500 — Fall 2018
- Elasticity for Aerospace engineers, AAE 55300 — Fall 2023
- Mechanics of Composite Materials, AAE 55500 — Spring 2024
- Advanced Manufacturing of Composite Materials, AAE 59000 — Spring '23, '24
- Aeromechanics II, AAE 20400 — Fall 2024
- Mechanics of Materials, ME 32300 — Fall 2025

I delivered three lectures for ME323 (Mechanics of Materials) which included explain new concepts, solving problems in class and taking quizzes. During my PhD and Masters, I was a Teaching Assistant for three courses in Aerospace Engineering (AAE 553, AAE 555, AAE 204) where I conducted office hours, and helped in grading homework and proctoring exams. For AAE 590 (Advanced Manufacturing of Composite Materials), I helped in the lab by setting up experiments and guiding students through various composite manufacturing experiments. In the math department, I taught recitation lectures to three sections of first year undergraduate students for MA 165 (Analytical Geometry & Calculus – I).

PUBLICATIONS AND PRESENTATIONS

1. **V. Kapre**, E. Barocio, and R. B. Pipes, "Single screw extrusion of long discontinuous fiber-reinforced polymers: Pellet motion and heat transfer," *Polymer Composites* **46**, 10102–10113 (2025).
2. **V. Kapre**, E. Barocio, and R. B. Pipes, "Modeling Flow of Long Discontinuous Fiber Reinforced Polymer Pellets in a Single Screw Extruder," *2024 ASME Aerospace Structures, Structural Dynamics, and Materials Conference*, Seattle, WA, April 2024.
3. E. Barocio, P. Pibulchinda, A. J. Thomas, **V. Kapre**, and A. Franc, "Validated Simulation for Large Scale Additive Manufacturing," *2024 The Composites and Advanced Materials Expo*, Anaheim, CA, Oct. 2024, doi: 10.33599/nasampe/c.22.0064.
4. A. J. Thomas, E. Barocio, **V. Kapre**, P. Pibulchinda, F. N. Nguyen, and R. B. Pipes, "Relationship between flow-controlled fiber orientation and spring-in deformation in extrusion deposition additive manufacturing," *2022 International Solid Freeform Fabrication Symposium*, Austin, TX, July 2022, doi: 10.26153/tsw/44204.
5. **V. Kapre**, E. Barocio, and R. B. Pipes, "Effects of Bead Deposition Parameters on Mechanical Properties in Extrusion Deposition Additive Manufacturing," 2021 Composites and Advanced Materials Expo, Dallas, TX, Oct. 2021.

FELLOWSHIPS

Institute Merit-cum-means fellowship, IIT Hyderabad — 2017 - 2018

PROFESSIONAL SERVICE

Reviewer - *Polymer Engineering & Science* — 2024 - Present

PROFESSIONAL AFFILIATIONS

- American Institute of Aeronautics and Astronautics (AIAA)
- Society for the Advancement of Material and Process Engineering (SAMPE)
- Society of Women Engineers (SWE)
- National Postdoctoral Association (NPA)

COMMUNITY INVOLVEMENT

Council Member, Purdue Postdoctoral Association (PPDA) 2025

REFERENCES

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Dr. R Byron Pipes
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John L. Bray Distinguished Professor of Engineering
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