

Nagendra Tanikella



EXPERTISE

- **Materials Science:** Polymer & ceramic composites, natural fiber reinforcement, rheology, and material characterization.
- **Additive Manufacturing:** DIW, DLP, extrusion 3D printing, and custom open-source hardware design.
- **Statistical Analysis:** Python (statistical modeling, complex visualization) and rigorous experimental design.
- **Leadership:** Undergraduate instruction, capstone team mentorship, and cross-functional project management.

EDUCATION

University of Idaho	Ph.D. Mechanical Engineering	December 2025
Thesis: Hemp reinforcement for improved strength of Wood Sodium Silicate composites for additive manufacturing		
Michigan Technological University	M.E. Material Science	December 2021
Thesis: Mechanical testing of fused filament 3-d printed components for distributed manufacturing		
NMIT, Bangalore, India	B.E. Mechanical Engineering	August 2014

RESEARCH EXPERIENCE

University of Idaho - Graduate Research Assistant	June 2022 – Present
Analyzed mechanical and rheological properties of 80+ wood-sodium silicate composite samples for additive manufacturing, optimized formulation for extrudability, strength, and cost.	
Engineered a hemp-reinforced wood composite for use in manufactured housing, increasing flexural strength by 32%, and compression strength by 118%.	
Designed and manufactured (SolidWorks, CNC Mill) a novel extruder system to process continuous fiber, increasing the tensile strength of 3D printed parts by 53%.	
Collaborated with Forestry and Chemistry departments to identify a sustainable bio-resin for additive manufacturing, conducting material characterization (pycnometer, rheometer, X-ray Tomography, FTIR), successfully identified wood-oil as a viable material.	

Oak Ridge National Laboratory - Research Intern	May 2024 – August 2024
Resolved stability issues for Direct Ink Writing (DIW) and Digital Light Processing (DLP) printing by analyzing the Zeta potential of zeolite and alumina solutions across pH levels, resulting in consistent, defect-free printing.	
Assessed and optimized curing depths for Blank-C solutions containing up to 34 Vol% zeolite catalysts.	
Implemented a new inventory system for research materials (Darvan821, PVP, PVA), achieving 100% material availability to eliminate research delays and ensuring full Material Safety Data Sheets (MSDS) compliance in partnership with the safety team.	



- Designed and tested a novel cooling system for Re3D's Gigabot-X 3D printer, resulting in a 30% reduction in print failures and improved quality of 3D-printed components using recycled PET.
- Authored a comprehensive database for 20+ Fused Filament Fabrication (FFF) materials for Aleph Objects by developing a Design of Experiments (DOE), and a two-step quality control protocol that enhanced functional output.
- Innovated an open-source ventilator through teamwork with individuals from diverse disciplines, including biology, electronics, and electrical engineering.
- Led a 4-person team to deliver 100+ face shields during the COVID-19 crisis, managing all project logistics from 24/7 shift scheduling and safety compliance to final product quality assurance.
- Utilized XRD analysis to identify the crystallinity of Polylactic Acid (PLA)-Graphite composite polymers.
- Developed a novel composite via injection molding from waste Acrylonitrile Styrene Acrylate (ASA) and hazardous stamp sand (40% mass) that achieved a tensile strength comparable to virgin Acrylonitrile Butadiene Styrene (ABS), offering a remediation strategy for 500M tons of toxic waste.

TEACHING AND MENTORING

• ME 4240 (Fall 2022 - 2024); ME 4260 (Spring 2023 – 2025) – 6 Semesters

Mentored 9 capstone projects (40+ senior-year students) from concept to completion by providing hands-on training in CAD, Design for Manufacturing (DfM), Laser Cutting, and CNC machining.

- Provided laser cutting training, administering certification exams to ensure safe and proficient equipment use
- Trained students on Manual and CNC mill/lathe and supervised safe usage
- Presented “Introduction to 3D Printing” seminar to senior year mechanical engineering cohort (100+ students), demonstrating safe operation and best practices for additive manufacturing
- Enforced machine shop safety, PPE compliance and maintenance protocols

• ME 2010, ME 3310 (Spring 2022) 1 Semester

Led discussion sections for Statics and Mechanics of Materials for 100+ students, focusing on numerical problem solving.

• MSE 4777 / MSE 5777 (Fall 2018 - 2020) – 3 Semesters

Trained undergraduate students (class of 60+) with the assembly and troubleshooting of their 3-D Printers.

- Authored lab reports and developed SOPs for training 10+ peers and students, ensured lab safety rules and regulations (2022-2025)
- Coached prospective students on the basics of 3-D printing and mechanical design. Provided hands-on learning experience with 3-D printers and CAD projects (2020-2021)

JOURNAL PUBLICATIONS

1. **Development of continuous natural-fiber reinforcement in thermoset additive manufacturing (In preparation)**
NG Tanikella, AG McDonald, MR Maughan.
2. **Optimizing Wood-Hemp-Sodium Silicate Composites for Strength, Extrudability, and Cost in Additive Manufacturing Applications (2026)**
NG Tanikella, AG McDonald, MR Maughan. Materials 19 (2), 357
3. **Extrudability and mechanical properties of wood-sodium silicate composites with hemp fiber reinforcement for 3D printing (2025)**
NG Tanikella, AM Lehman-Chong, AG McDonald, MR Maughan. *Polymers*, 17(18), 2478
4. **Conceptual Design and Rationale for a New Agrivoltaics Concept: Pasture-Raised Rabbits and Solar Farming (2021)**
W Lytle, TK Meyer, NG Tanikella, L Burnham, J Engel, C Schelly, ...Journal of Cleaner Production 282, 124476
5. **Partially RepRapable automated open-source bag valve mask-based ventilator (2020)**
A Petsiuk, NG Tanikella, S Dertinger, A Pringle, S Oberloier, JM Pearce. HardwareX 8, e00131
6. **Open source high-temperature RepRap for 3-D printing heat-sterilizable PPE and other applications (2020)**
NG Skrzypczak, NG Tanikella, JM Pearce. HardwareX 8, e00130
7. **Parametric nasopharyngeal swab for sampling COVID-19 and other respiratory viruses: Open-source design, SLA 3-D printing and UV curing system (2020)**
N Gallup, AM Pringle, S Oberloier, NG Tanikella, JM Pearce. HardwareX 8, e00135
8. **Towards distributed recycling with additive manufacturing of PET flake feedstocks (2020)**
HA Little, NG Tanikella, M J Reich, MJ Fiedler, SL Snabes, JM Pearce. Materials 13 (19), 4273
9. **Potential of distributed recycling from hybrid manufacturing of 3-D printing and injection molding of stamp sand and acrylonitrile styrene acrylate waste composite (2020)**
TK Meyer, NG Tanikella, MJ Reich, JM Pearce. Sustainable Materials and Technologies 25, e00169
10. **Technical pathways for distributed recycling of polymer composites for distributed manufacturing: Windshield wiper blades (2020)**
SC Dertinger, N Gallup, NG Tanikella, M Grasso, S Vahid, PJS Foot, ...Resources, Conservation and Recycling 157, 104810
11. **Mechanical properties and applications of recycled polycarbonate particle material extrusion-based additive manufacturing (2019)**
MJ Reich, AL Woern, NG Tanikella, JM Pearce. Materials 12 (10), 1642
12. **Viability of distributed manufacturing of bicycle components with 3-D printing: CEN standardized polylactic acid pedal testing (2017)**
NG Tanikella, J Gershenson, B Savonen, JM Pearce. Journal of Humanitarian Engineering
13. **Tensile strength of commercial polymer materials for fused filament fabrication 3D printing (2017)**
NG Tanikella, B Wittbrodt, JM Pearce. Additive Manufacturing 15, 40-47

SKILLS

Material Characterization

Optical Microscopy, Scanning Electron Microscopy (SEM), Computed Tomography (CT scan), Image analysis (ImageJ)
Mechanical Testing (Tensile, Flexure, Fatigue, Creep, Nanoindentation, DMA)
Differential Scanning Calorimetry (DSC), Thermo-Gravimetric Analysis (TGA)
Rheology (caliper, parallel plate, cone and plate)
Zeta potential testing

Design, Fabrication and Prototyping

CAD design (SolidWorks, CATIA, NX, Creo)
Design for Additive Manufacturing, Design for Manufacturing
Machining (milling, lathe, welding, CNC, laser cutting)
3-D Printing (FFF, FGF, SLA, DLP, DIW)
Single and twin-screw extrusion, injection molding

Statistics, Analysis, Writing

Design of Experiments (Minitab, R)
MATLAB, Python
Lean Six Sigma: Black Belt certificate
Report/ SOP writing, training, journal article writing

SERVICE AND VOLUNTEER ACTIVITIES

Peer Review

23 manuscripts reviewed for *Progress in Additive Manufacturing*, *Discover Applied Sciences*, *Scientific Reports*, and *Multiscale and Multidisciplinary Modeling, Experiments and Design*

Outreach

Taught polymers deformation at Pullman High School (2023-2025); organized educational activities at Michigan Tech Summer Youth Program (2020-2021)

REFERENCES

Michael Maughan

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