SWAPNIL SINHA

Curriculum Vitae
Phone: **+1(814) 954-2809**· Email: **swapnilsinha03@gmail.com**
LinkedIn Profile **:** **www.linkedin.com/in/swapnilsinha03** · Website: **www.swapnilsinha03.com**
Ph.D. candidate, Mechanical Engineering Department
The Pennsylvania State University, US

EDUCATION

2017 – PRESENT
Ph.D. Mechanical Engineering, The Pennsylvania State University - US
GPA 3.72/4

2015 – 2017
M.S. Engineering Design, The Pennsylvania State University - US
GPA 3.72/4

2011 – 2015
B.Tech. Mechanical Engineering, Manipal Institute of Technology -India
GPA 8.32/10

RESEARCH AND WORK EXPERIENCE

2019 - PRESENT
Graduate Assistant, Mechanical Engineering Department, The Pennsylvania State University - US
Design and development of a rig design for a future undergraduate laboratory course

- Digitally designed and analyzed a wind tunnel system with controlled air flow to allow experimental exploration of cooling in 3D printed channels for forced air conditions by the students
- Evaluated off the shelf pressure and temperature measurement devices, and data acquisition instruments for the system
- Successfully developed a prototype of the designed system and documented the process for course development
- Successfully launched the experiment during the Fall 2020 semester that was remotely operated by the students.

2017 - PRESENT
Graduate Researcher, Made by Design Lab, The Pennsylvania State University - US
Development of Heat Transfer Simulation of material extrusion Additive Manufacturing (AM)

- Developed a computational heat transfer model for material extrusion AM process that captures deposition tool path
- Successfully computed and experimentally validated tensile strength for different designs within 0 to 12% estimation error
- Incorporated anisotropy in thermal-properties of material by utilizing logical operations at each time step analyzed

2017 - 2019

Graduate Researcher, The Pennsylvania State University - US

Development of design guidelines for in-situ embedding via material extrusion additive manufacturing (AM)

- Developed a method to predict interfacial weld strength for polymer material extrusion parts with different cavity designs for embedding with the polymer weld theory
- Performed experimental exploration of mechanical properties of AM structures with process interruptions, different cavity designs, and different thermal conditions
- Developed a digital design tool to automate design for embedding complex geometry parts by finding their optimum orientation based on cavity's volume and cross section area

2016 - 2017

Graduate Researcher, School of Engineering Design Technology and Professional Programs (SEDTAPP), The Pennsylvania State University - US

Research and development in Undergraduate Engineering education in Additive Manufacturing (AM)

- Performed study to identify differences in creativity of ideas generated for additive manufacturing, as compared to traditional manufacturing. Compared the expert rating method with the Shah & Vargas Hernandez method to rate creativity
- Developed an informal curriculum for a mobile makerspace M.A.K.E.3D aimed at developing interest and retention in STEAM (Science, Technology, Engineering, Arts, and Mathematics) through Additive Manufacturing Technology
- Deployed the mobile makerspace at different campuses and collected survey data pre- and post-exposure to the makerspace
- Determined the key exposure variables that influenced students' self-ratings through analysis of the surveys and observations

2016

User Experience Researcher, Interaction Design Project, The Pennsylvania State University - US

Design of wearable wristband to reduce hand-to-face contact in biohazardous environments

- Managed and conducted stakeholder interviews to define the project's scope, define user needs, and receive user feedback
- Researched patents, laboratory safety protocols and protective equipment, behavior modification methods, alarm systems, and proximity sensors; created personas and use-case scenarios to inform device design
- Completed content analysis on 16 patents and conducted Wizard of Oz studies to design proof-of-concept prototype

2015

Product Designer, Engineering Design Studio Project, The Pennsylvania State University - US

Design and evaluation of possible ways to collect weight distribution on foot while using orthopedic CAM boot

- Brainstormed ideas and implemented engineering design to evaluate and select feasible solutions
- Developed prototypes of the selected ideas and evaluated effectiveness by comparing the output from the sensors

- Researched patents, laboratory safety protocols and protective equipment, behavior modification methods, alarm systems, and proximity sensors; created personas and use-case scenarios to inform device design

TEACHING EXPERIENCE

2019 - PRESENT

Graduate Teaching Assistant, Mechanical Engineering Department, The Pennsylvania State University - US

Assistance with theoretical development and experimentation in Heat Transfer for Senior students

- Responsible for grading, guiding, and supervising experimentation to develop understanding of Heat Transfer analysis
- Re-evaluated laboratory manuals to better align with course learning objectives
- Designed student surveys to analyze effectiveness of the laboratory

2017-2020

Graduate Student Mentor, The Pennsylvania State University-US

Guided three undergraduates during their Multi-Campus Summer Research Program

- Utilized universal design principles to identify design changes in 3D printers for elderly population
- Developed and Explored effectiveness of voxel-based modelling for cavity designs
- Explored reinforcement via material extrusion additive manufacturing

2019

Guest Lecturer, Design for Additive Manufacturing by Dr. Nicholas A. Meisel, The Pennsylvania State University - US

Prepared and presented lecture material for Dr. Nicholas A. Meisel's graduate-level Design for Additive Manufacturing

- Introduced opportunities of additive manufacturing through examples applications
- Led students in execution of short exercises of brainstorming and design thinking

2017

Faculty Leader, Summer by Design student exchange program by the Pennsylvania State University at Tecnun Universidad de Navara - Spain

Led undergraduate students for a two-week student exchange program

- Assisted students in design, development, and prototyping of ideas for the summer by design course
- Guided two undergraduates during their Summer Research Program on projects that investigated a. Effectiveness of voxel-based modelling for cavity designs & b. Explored reinforcement via material extrusion additive manufacturing

2016

Teaching Assistant, EDSN 100, College of Engineering, The Pennsylvania State University - Spain

Assistant to instructors for computer aided design (CAD) training and workshop for freshmen year engineering

- Conducted training sessions for structural finite element analysis with Solidworks
- Instructed students on the Engineering Design process by conducting a workshop on "brainstorming as a team"

PEER-REVIEWED JOURNAL PUBLICATION

1. **S. Sinha**, S. P. Lynch, N. A. Meisel, "Heat Transfer Simulation of Material Extrusion Additive Manufacturing to Predict Weld Strength between Layers," Additive Manufacturing Journal, 2021, In Preparation.

2. Alvaro Jordan, A. D. Knochel, N.A. Meisel, K. Reiger, and **S. Sinha**, "Making on the Move: Mobility, Makerspaces, and Transdisciplinary Art Education," The International Journal of Arts and Design Education, iJADE-May-19-090, 2020.

3. **S. Sinha** and N. A. Meisel, "Predicting Material Properties for Embedded Structures Created with Polymer Additive manufacturing," Additive Manufacturing Journal, 2020.

4. H. Hu, **S. Sinha**, N. A. Meisel, and S. Bilén, "Permittivity of 3D-Printed Nylon Substrates with Different Infill Pattern and Density for Design of Microwave Components", Designs 2020, 4, 39.

5. M. Malviya, S. Sinha, C. Berdanier, and N. A. Meisel, "Digital Design Automation to support In-Situ Embedding of Functional objects in Additive Manufacturing", Journal of Mechanical Design, 2020.

6. **S. Sinha**, K. Reiger, A. D. Knochel, N. A. Meisel, "The Impact of a Mobile 3D Printing and Making Platform on Student Awareness and Engagement," International Journal of Engineering Education, 36(4), 2020.

7. **S. Sinha** and N. A. Meisel, "Influence of process interruption on mechanical properties of material extrusion parts," Rapid Prototyp. J., p. RPJ-05-2017-0091, 2018.

PEER-REVIEWED CONFERENCE PUBLICATIONS

8. **S. Sinha** and N. A. Meisel, "Impact of Embedding Cavity Design on Thermal History between Layers in Polymer Material Extrusion Additive Manufacturing," Solid Free. Fabr. 2019 Proc. 30th Annu. Int., Austin, Texas.

9. M. Malviya, **S. Sinha**, and N. A. Meisel, "Digital Design Automation to Support In-Situ Embedding of Functional Components in Additive Manufacturing," pp. 1–10, ASME 2019 International Design Engineering Technical Conferences and Information in Engineering Conference, Anaheim, California.

10. **S. Sinha** and N.A. Meisel, "Quantifying effects of Embedding Component Orientation on Flexural Properties in Additively Manufactured Structures," Solid Free. Fabr. 2018 Proc. 29th Annu. Int., Austin, Texas.

11. **S. Sinha**, K. Rieger, A. D. Knochel, and N. A. Meisel, "Design and Preliminary Evaluation of a Deployable Mobile Makerspace for Informal Additive Manufacturing Education," pp. 2801–2815, Solid Free. Fabr. 2017 Proc. 29th Annu. Int., Austin, Texas.

12. **S. Sinha**, H. Chen, N. A. Meisel, and S. R. Miller, "Does designing for additive manufacturing help us be more creative? An exploration in engineering design education," pp. 1–12, ASME 2017 International Design Engineering Technical Conferences and Information in Engineering Conference, Cleveland, Ohio.

13. **S. Sinha** and N. A. Meisel, "Influence of Embedding Process on Mechanical Properties of Material Extrusion Parts," Solid Free. Fabr. 2016 Proc. 27th Annu. Int., pp. 847–863, 2016.

SKILLS

Conceptual

- Additive Manufacturing,
- Material Testing,
- Design of Experiments,
- Data Acquisition,
- Polymer Chemistry,
- Material Characterization,
- Data Analysis,
- Statistics,
- Finite Element analysis (FEA),
- Mathematical Modelling,
- Heat Transfer Analysis,
- Product Development,
- Engineering Design,
- Project Management

Software

- MATLAB,
- SolidWorks,
- Abaqus,
- COMSOL Multiphysics,
- Ansys,
- SPSS,
- PTC Creo (ProE),
- CATIA,
- C++, R,
- LabVIEW,

Systems

- Tensile testing,
- Flexural strength testing (Instron/MTS),
- Material Extrusion,
- Material Jetting,
- Stereolithography (SLA)

CERTIFICATIONS, AWARDS, MEMBERSHIPS

2020

Certification

Essential of Online Teaching Certification by World Campus Online Faculty Development, The Pennsylvania State University - US

2019

Award

Rising Stars in Mechanical Engineering, Stanford University – US

2018 AND 2019
Award
NSF student support recipient – Solid Freeform Fabrication (SFF) Symposium, Austin, TX

2017 - PRESENT
Membership
Society of Women Engineers - US

2020 - PRESENT
Membership
Women in 3D Printing - US