

# VANSHIKA SINGH

2350 Cherahala Blvd, Manufacturing Demonstration Facility, Oak Ridge National Laboratory, Knoxville, TN 37932

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## Education

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**Bredesen Center (University of Tennessee - Oak Ridge National Laboratory)** Aug. 2019 – Present  
*Ph.D., Energy Science and Engineering, 3.85/4.00, (Energy Material & Additive Manufacturing)* Knoxville, U.S.

**Indira Gandhi Institute of Technology** Sep. 2012 – June 2016  
*Bachelor of Technology in Mechanical and Automation Engineering* New Delhi, India

## Research Projects

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**Cooling Channel Design for Tip Shoes via AM** | *Conjugate Heat Transfer, Experimental Test Rig* In-Progress  

- Developing novel air-cooled cooling channel design for tip shoe in High Pressure Turbine application via Additive Manufacturing for improved heat transfer rate

**Nature Inspired Material Design for Tunable Mechanical Properties** | *Random-Walk method* In-Progress  

- Proposed nature-inspired method to expand design space for material design for non-linear regime for 2-phase metallic material system

**Novel Superheater Tube Design (ORNL)** | *Thermo-Mechanical FE Simulation, Schlieren Optics, CFD, AM* Feb. 2022  

- Proposed a novel asymmetric tube design for superheater tube and its variants for enhanced creep life and reduced ash deposition enabled via Laser Powder Bed Method
- Performed 1D Heat Transfer analysis and 2D FE Plain Strain Thermal-Structural Analysis for assessing the proposed design for creep life
- Performed CFD analysis coupled with particle tracing module to predict the number of particles striking the tube
- Setup Schlieren Optics Experiment to visualize change in gas flow and particle flow around differently shaped tube

**Ph.D. Qualifiers** | *Topology Optimization, Metal AM, FEM, MATLAB* Aug. 2020  

- Defended Qualifiers on "Topology and Microstructure Optimization through Additive Manufacturing" at Manufacturing Demonstration Facility, ORNL
- Developed a novel mathematical framework to integrate microstructural optimization with topology optimization for minimizing compliance for metallic structure

**Undergraduate Thesis** | *Engineering Equation Solver* Aug. 2015 – May 2016  

- Theoretical analysis and comparison of parameters for single effect and double effect Lithium Bromide - Water Vapor Absorption Refrigeration System

## Experience

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**General Electric, Aviation** July 2016 – July 2019  
*Edison Engineering Development Program* Bengaluru, India

- Additive Engineering Team (Mechanical Design Engineer; 2018 - 2019): Designing hardware for New Midsize Airplane (NMA) and Next Gen Narrow Body (NGNB) from Metal Additive standpoint
- System Engineering and Engine Architecture (3D Clearances Owner; LM9000 Whole Engine Model; 2017 - 2018): Executed Detailed Design Review for reporting out 3D closure predictions. Performed various trade studies and sensitivity studies to impact the design change in various hardware
- GE9X High Pressure Compressors (Mechanical Stress Analyst; 2016 - 2017): Performed non-linear FEA analysis to assess the buckling capability of High Pressure Compressor (HPC) case under Fan Blade-Out (FBO) load condition. Performed Maneuver and LCF life study for HPC case for FAR 33 Certification
- Advances "A" Course in Engineering (2016 - 2017): 35 classroom courses with assignments; the course covered a range of topics related to the aircraft engine design and architecture.
- Advanced "B" Course in Engineering (2017 - 2018): Did five real-time 60 hours projects leading to the successful completion of the Edison Engineering Development Program

**SK Engineering & Construction** June 2014 – July 2014  
*Summer Intern* Gurgaon, India

- Interned with Static Equipment Design group at the company's Mechanical Department, designing horizontal pressure vessels and a non-floating roof tank

## Technical Skills

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**Simulation and Modeling:** Ansys Mechanical APDL & Workbench, Abaqus, COMSOL (Computational Fluid Mechanics module and particle tracing module), Optistruct, Plato

**Design Tools:** UG NX Siemens, Autodesk Inventor, Autodesk Fusion 360, PTC Creo, Hypermesh tool, Gmsh

**Coding languages & Documentation tools:** Python, MATLAB, LaTeX, MS Word/PowerPoint

## Guest Talks/Seminars

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- Guest Talk: “Topology Optimization via Additive Manufacturing” in Principle of Additive Manufacturing (ME 569) (2022) at UT, Knoxville
- Guest Talk: “Topology Optimization via Additive Manufacturing” in Principle of Additive Manufacturing (ME 569) (2021) at UT, Knoxville
- Seminar Talk: “Novel tube design for ash deposition reduction enabled via Additive Manufacturing and Shape Optimization” at Manufacturing Demonstration Facility, ORNL
- Seminar Talk: “My Experience of Ph.D. Qualifiers” at Energy Science and Engineering Seminar (ESE 599) at UT, Knoxville
- Ph.D. Qualifier Defense: “Topology and Microstructure Optimization through Additive Manufacturing” at Manufacturing Demonstration Facility, ORNL

## Publications

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- **V. Singh**, S. S. Babu, M. M. Kirka, and A. Kulkarni, “Novel Tube Design for Superheater Heat Exchanger Enabled Via Additive Manufacturing,” *Journal of Pressure Vessel Technology*, vol. 144, no. 4, p. 041407, Aug. 2022, doi: 10.1115/1.4054727.
- Under Review “**V. Singh**, S.S. Babu, and M.M. Kirka, “Lifelike Metallic Structures using Origami and Compliant Mechanisms,” *Manufacturing Letters*.”

## Patent

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- Provisional Patent Filed (10/8/21): Novel Superheater Tube geometry for reduced ash deposition enabled via Additive Manufacturing - Lead Inventor (at The University of Tennessee and ORNL)
- Labyrinth Seal with Branched Configuration (IPCOM000258292D: IP.com PAD) - Lead Inventor (at GE Aviation)

## Conferences Presentation

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- “Nature Inspired Bi-phase Material Design for Tunable Mechanical Response”, *Advances in Welding and Additive Manufacturing Research Virtual Conference*, Virtual, June 2022
- “Novel Superheater Tube Design via Additive Manufacturing for Enhanced Creep Life and Reduced Ash Deposition”, *PowderMet/AMPM 2022*, Portland, OR, June, 2022
- “Superheater Tube Redesign via Additive Manufacturing”, *PowderMet/AMPM 2021*, Orlando, FL, June, 2021
- 49th North American Manufacturing Research Conference: Presented our idea as the primary speaker on “Lifelike Metallic Structure using Origami Designs and Complaint Mechanism” for the Blue Sky Competition alongside my faculty advisors Professor S. Suresh Babu and Dr. Michael M. Kirka.

## Awards and Achievements

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- First Runner-up at NSF Blue Sky Competition by 49th NAMRC SME - 2021
- NSF Student Grant Recipient 2021 (AM/PM Conference) - 2021
- Energy Science and Engineering Fellowship - (2019 - 2024)
- GE Volunteers Bangalore Council Award - 2019
- Purpose Award at General Electric - 2019
- GE India Technology Award - 2018
- First Runner-up at Make-a-thon at GE - 2018
- Impact Award (nine times) at General Electric - (2016 - 2019)
- First Runner-up at M&M Technical Quotient - 2015

## Student Memberships

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- Society for Manufacturing Engineers
- American Association for the Advancement of Science

## **Student Extracurricular**

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- Member of Student Advisory Council at the Bredesen Center for Interdisciplinary Research and Graduate Education
- Mentors SMaRT (University of Tennessee - Oak Ridge Innovation Institute) undergraduate interns