VISHAL MAHEY

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Career Objective

Looking for an opportunity to enhance my technical capabilities in metallurgy, materials science, and steel manufacturing through hard work, hands-on experience, and continuous learning of advanced engineering practices. Committed to developing expertise in steelmaking, failure analysis, metallurgical testing, and statistical process control, with the goal of contributing to quality improvement, defect reduction, and root cause analysis, while delivering lasting value to the organization.

Educational Qualifications

- **Master of Science,** Mechanical Engineering, **3.83/4.0, Iowa State University**, Ames, IA *August 2023-May 2025*
- **Bachelor of Technology**, Materials & Metallurgical Engineering, **7.5/10, Punjab Engineering College** *August 2016-May 2020*
- **Honours:** Advanced Materials, **9.0/10, Punjab Engineering College**, Chandigarh, India *August 2019-May 2020*

Skills

- **Metallurgical Evaluation:** Fractography, Defect Characterization, Non-Destructive Testing, Metallographic Evaluation
- **Thermal Processing :** Heat Treatment, Phase Transformation Analysis, Metal Working, Process Optimization
- **Mechanical Testing:** Tensile Testing, Charpy Impact Testing (DBTT), Microhardness Testing, Failure Mode Evaluation, Materials Property Correlation
- **Microstructural Characterization:** Optical Metallography, SEM (EDS/EBSD), XRD, Grain Size Analysis, Texture & Phase Distribution Analysis
- **Process & Quality Control:** Statistical Process Control, Material Test Reports, Lean Manufacturing, ISO 9001, ASTM Standards
- **Engineering Tools:** AutoCAD, Abaqus, MATLAB, Python, OriginPro, MTEX, AZtecCrystal, MIPAR, ImageJ, Advanced Excel

Research Projects

Additive Manufacturing of Duplex Stainless Steel (*Funded by U.S. Department of Defense*) [August 2023 - May 2025]

Wire Arc Additive Manufacturing (WAAM) of DSS 2209

- Deposited a large-scale WAAM wall and evaluated the effects of build height, scan direction, and sample orientation
- Analyzed microstructure, porosity, phase content, texture, and mechanical behavior, achieved uniformity in structure and properties across the wall

Laser Powder-Directed Energy Deposition (LP-DED) of DSS 2205

- Optimized laser power and scan speed to deposit DSS 2205 on SS316 substrate with minimal defects
- Performed microstructural and microhardness characterization to identify a stable process window

Multi-Institutional Collaboration

- Worked with Lincoln Electric, Oak Ridge National Laboratory, AGH University (Poland), and ISU's Materials Science department, to integrate cross-disciplinary expertise for advancing research in additive manufacturing processes

Design & Performance Analysis of Ship Propeller using DSS (ME 517 Course Project) [August 2023 - December 2023]

- Investigated cavitation failure in conventional propellers materials and proposed DSS 2205 as a potential alternative
- Designed improved propeller geometry in CATIA and performed ANSYS Fluent simulations to evaluate cavitation resistance of DSS 2205 compared to traditional materials (SS 316 and carbon steel) under marine operating conditions

Synthesis and Characterization of High Entropy Alloy, Punjab Engineering College [August 2018 - November 2018]

- Synthesized AlCrFeNiMn alloy by powder metallurgy (ball milling and sintering) route, evaluated its phase structure using X-ray diffraction, and evaluated its feasibility for high-strength applications

Professional Experiences

Graduate Assistant, Department of Mechanical Engineering, Iowa State University [August 2023 - May 2025]

- **Research Assistant:** Conducted thesis research on additive manufacturing of duplex stainless steels, optimized processing parameters, and performed microstructural and mechanical analysis to enhance material performance
- **Teaching Assistant:** Led undergraduate Engineering Measurements lab sessions, guided students through experimental procedures, equipment calibration, and provided technical support through interactive discussions and office hours

Senior Research Analyst, GreyB, India [December 2020 - December 2022]

- Performed prior art and technology assessments to support innovation strategy, new product development, and risk reduction in materials-centric industries
- Led technical research projects in domains like advanced manufacturing, material systems, and mechanical devices, and ensured timely delivery of project deliverables
- Collaborated with R&D teams to align technical findings with product development, material selection, and manufacturing feasibility
- Executed searches for industry leaders, including Saint-Gobain, Texas Instruments, Laticrete International, Philip Morris International, Carelight, and Tata Steel

Internships

Research Intern, Metallurgical Research Laboratory, Hyderabad, India [January 2019 - May 2019]

- Researched advanced magnetic materials for next-generation refrigeration technologies, explored eco-friendly alternatives to reduce CFC emissions
- Investigated the effect of Si substitution in Ni-Mn-In alloys and Dy addition and Mn-Ni-Sn alloys to investigate their magnetocaloric properties for room temperature refrigeration applications

Industrial Trainee, Aarti Steels Ltd., India, [May 2018 - July 2018]

- Studied various techniques for Desulphurization of Steel for its quality improvement, along with the improvement of existing technology for increasing the efficiency of the EAF steelmaking process

Technical Writing & Research Publications

Published Journal Articles

- First-author research paper on advanced metal 3D printing of stainless steel, published in the JOM - The Minerals, Metals & Materials Society, (2025) [10.1007/s11837-025-07282-6]
- Co-authored a research paper on surface finish improvement of additively manufactured materials, published in Materials Today Communications, (2025) [10.1016/j.mtcomm.2024.111434]
- Co-authored a research article on materials for magnetic refrigeration technology, led to a publication in the Journal of Applied Physics, (2020) [10.1007/s00339-020-03651-x]

Articles Under Review

- Co-authored a research article on investigating the effects of build height on mechanical behavior of large-scale laser wire directed energy deposited nickel titanium alloy, Submitted to Journal of Manufacturing Processes (2025)

Manuscripts in Preparation

- First-author research article on Large-Scale Wire Arc Additive Manufacturing of Duplex Stainless Steel: Insights into Microstructure and Mechanical Behavior
- First-author research paper on Exploring the Impact Toughness and Texture Evolution in Large-Scale Wire Arc Additive Manufacturing of Duplex Stainless Steel
- Co-author of a research paper on A Hybrid Additive Manufacturing Approach to Fabricate Austenitic Stainless Steel with Enhanced Tribo-Mechanical Behavior

Professional Memberships & Affiliations

- Member, **Pi Tau Sigma,** Iowa State University, Ames, IA — *November 2024 - Present*
- Member, **American Welding Society (AWS)** - Student Chapter — *October 2024 - Present*
- Member, **Material Advantage,** Iowa State University, Ames, IA — *September 2024 - Present*