

NIHAL SAJI

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PROFESSIONAL SUMMARY

Mechanical engineer specializing in computational process modeling and digitalization for steelmaking and secondary refining systems. Experienced in multiphase CFD, FEA and AI based process optimization. Skilled in simulating ladle metallurgy and refining processes to enhance clean steel production and mixing efficiency.

EDUCATION

Purdue University Northwest, Indiana

Master of Science in Mechanical Engineering [GPA: 4.0/4.0]

(2024 - May 2026)

Coursework: Advanced FEA, Fatigue & Fracture, Computational Fluid Dynamics, Advanced Mechanics of Materials

Awards: Graduate Research Grant Award (2025-2026)

National Institute of Technology Calicut, India

Bachelor of Technology in Mechanical Engineering [CGPA: 8.2/10, First Class & Distinction] (2016-2020)

PROFESSIONAL EXPERIENCE & PROJECTS

Graduate Research Assistant ([Purdue University Northwest CIVS](#))

(2024–Present)

- Leading computational research on **Ladle Metallurgy Furnace** to optimize mixing efficiency, inclusion removal, supporting Steel Manufacturing Simulation and Visualization Consortium
- Participating in technical conferences and poster competitions to present ongoing research and expand professional engagement
- Developing **multiphase** simulations in ANSYS Fluent to optimize **RH degasser** performance, reducing mixing time by 15%

Engineer FEA ([Trane Technologies](#), ETC Bangalore)

(2020–2024)

- Performed **structural, multibody dynamics, vibration, and fatigue life** analysis using ANSYS Workbench, MSC Adams, HyperWorks and nCode DesignLife for complex HVAC assemblies with over 150 components
- Supported mechanical **product design and testing** across cross functional teams, applying simulation and data driven validation to meet **mechanical performance and reliability standards**.
- Conducted **modal hammer testing** and vibration data processing using **Simcenter TestLab** to refine and validate FE models
- Supervised the **migration of geometry** from DesignModeler to SpaceClaim, achieving a final model with only 5% deviation
- Developed and validated a **digital twin** model incorporating a DOE based **Reduced Order Model** enhanced with AI tools for real-time prediction and control
- Led automation of simulation and test data post-processing using Python and ANSYS ACT, **reducing human error** by 25%, and saving \$20k annually through **productivity improvements**
- **Collaborated** with the **testing team** to acquire and process **sensor data** using **Python**, supporting the development of **innovation and R&D projects**
- Worked with the **manufacturing team** to evaluate **actuation force requirements** for mechanical systems through MSC Adams
- Automated consolidation of multiple project files into a synchronized notebook using MS Power Automate, **reducing manual effort** by 75%

Mechanical Coordinator ([Robotics Interest Group](#), NITC)

(2018–2020)

- Coordinated maintenance activities for mechanical equipment and provided **technical guidance** to team members
- Organized and actively participated in **national-level robotics competitions**, workshops, and exhibitions
- Designed and deployed a **mechanical design calculator** application to simplify design calculations
- Developed a **pneumatic** controlled multifunctional crutch system with an **ergonomic** and **patent pending** design
- Designed and fabricated a 5-degrees-of-freedom **robotic manipulator** with an **augmented reality** interface

TECHNICAL SKILL SET (listed in order of proficiency)

3D CAD Modelling: SOLIDWORKS, PTC Creo, ANSYS Spaceclaim, DesignModeler, Fusion 360, AutoCAD

Structural Simulation: ANSYS Mechanical, MSC Adams, Altair Hyperworks, APDL, LS-DYNA, Abaqus

Vibration Testing/Model Correlation: Simcenter TestLab, Model Assurance Criterion , Product Testing & Validation

Fatigue Analysis: nCode Design Life, FEA, ANSYS

CFD & Thermal Simulation: ANSYS Fluent, COMSOL Multiphysics, thermal-structural coupling, heat transfer analysis

Mathematical Modelling: MATLAB, OpenModelica, Reduced Order Model building

Digitization & AI: Python, ANSYS ACT, MS Power Automate, C++ , Machine learning for process optimization

Mechatronics: Arduino programming, pneumatic circuit building, sensor integration, system troubleshooting, prototyping

Engineering Design Methods: Design Thinking, Design Failure Mode and Effects Analysis (DFMEA)

PUBLICATIONS

Comparison of Lance and Plug Methods for Gas Purging in a Ladle on Mixing Efficiency (2025)

- Proceedings – AISTech 2025. Iron & Steel Technology Conference (DOI: 10.33313/389/116)

Optimization of Accelerometer Locations for Experimental Modal Analysis Using Modal Assurance Criteria (2023)

- Proceedings – 18th International Conference on Vibration Engineering & Technology of Machinery (IIT Roorkee)

Finite element analysis of strength of different non-permanent joints subjected to eccentric loading (2020)

- Proceedings – AIP Conference 2020 (Vol. 2283, No. 1). AIP Publishing. (DOI: 10.1063/5.0024910)

Controlling a Robotic Manipulator Using an Augmented Reality Interface (2020)

- Proceedings – 4th Indian conference on Applied Mechanics (Indian Institute of Science (IISc) Bangalore)

INVOLVEMENT & LEADERSHIP

Vice President (Material Advantage Club, Purdue University Northwest) (2025-Present)

- Organizing seminars, training sessions, networking events and industrial visits as a part of the student chapter

Global Ambassador (Purdue University Northwest) (2024-Present)

- Assisting prospective international students by conducting meetings to clarify queries and to share personal insights

CERTIFICATIONS & PROFESSIONAL DEVELOPMENT

- **Project Management** (Google Qwiklabs) (2025)
- **Introduction to Ansys ACT Mechanical** (Ansys) (2023)
- **Design Thinking and Innovation** (Indian Institute of Science (IISc) Bangalore) (2022)
- **Noise & Vibration – Advanced Basics & Data Processing** (NV Dynamics) (2022)
- Recipient of **spot awards & path breaker awards** (Trane Technologies) (2020-2024)
- Idea selected for final round - **Operation Possible Innovation Challenge: Tackling Food Loss** (2021)
- Finalist of **Young Innovators Program** (K-DISC, Kerala) (2019)
- Winner of **Samsung star scholarship** (Samsung & NIT Calicut) (2016-2020)

PROFESSIONAL AFFILIATIONS

- [Association for Iron & Steel Technology](#)
- [The Minerals, Metals & Materials Society](#)
- [American Society for Materials International](#)
- [American Ceramic Society](#)