

HEMA RUDRA

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EDUCATION

Northeastern University, Boston, MA

Candidate for Master of Science in Mechanical Engineering

Expected May 2027

Relevant Coursework: Material Processing and Process Selection, Robot Mechanics and Control, Computer Aided Design and Manufacturing, Gas Turbine Combustion, Mathematical Models

Amrita Vishwa Vidyapeetham, Coimbatore, India

Bachelor of Technology in Mechanical Engineering

June 2024

Relevant Coursework: Thermodynamics, Additive Manufacturing, Biomass Energy Conversion Techniques, Automotive Technology, Supply Chain Management

TECHNICAL SKILLS

- **Design and Simulation:** SolidWorks-CSWA Certification (3D Modeling & Viewing, Curves, Surfaces, Sheet Metal & Weldments, Sustainable Design, Tolerancing, Injection Molding), Autodesk Inventor, AutoCAD, ANSYSworkbench, Fusion 360
- **Manufacturing:** 3D Printing, CNC Machining, Welding, Casting, Prototyping, GD&T
- **Analysis:** Thermal, Static, Modal, Fatigue, CFD Basics
- **Soft Skills:** Design Thinking, Problem Solving, Team Collaboration, Technical Reporting
- **Programming:** Python, MATLAB

ACADEMIC PROJECTS

Design and Analysis of a Parallel Jaw Gripper Mechanism | Northeastern University | Boston

Aug 2025 – present

- Designed and developed a worm-driven parallel jaw robotic gripper with a centrally placed worm and dual worm wheels for symmetric actuation.
- Performed kinematic and DOF analysis to derive the jaw displacement function , confirming 1-DOF motion.
- Conducted SolidWorks Motion Study to validate forward kinematics and range of motion, achieving a total stroke of 60.5 mm with 331° worm rotation.
- Analyzed singularity and force transmission, obtaining a maximum slope of 10.47 mm/rad and predicted grip force 48 N for a 0.5 N·m input torque.

Pyrolysis Kinetic Study of Waste Plastic and Biomass Materials | Amrita University | India

Aug 2023 – Jun 2024

- Conducted a kinetic study on the co-pyrolysis of Soapnut (biomass) and PVC plastic to produce renewable bio-oil, biochar, and biogas.
- Performed TGA/DTG analysis and evaluated activation energy using iso-conversional methods (KAS, FWO, Starink, and Kissinger).
- Determined optimal process parameters 700 °C heating temperature, 10 °C/min rate, and 1:1 feed ratio achieving efficient mass-to-energy conversion.
- Analyzed the thermodynamic behavior (H, S, G) and calorific value (12,947 kJ/kg) of the produced oil, identifying purification as a path to improve its energy potential.

Design and Simulation of a Pick-and-Place Robotic Arm | Amrita University | India

Feb 2023 – Aug 2023

- Designed and analyzed a 2-jaw robotic arm mechanism for automated pick-and-place operations using Adams and Fusion 360.
- Modeled a two-link manipulator with gear constraints and synchronized joint motions to achieve smooth and accurate object transfer between platforms..
- Defined 3D object contact, gripping torque, and frictional interactions to simulate realistic handling conditions.
- Demonstrated automation concepts applied in industrial manufacturing, material handling, and inspection systems, reinforcing skills in mechanism design, simulation, and robotics integration..

Design and Analysis of Handle Bar and Top Tree | Amrita University | India

Aug 2022 – Jan 2023

- Designed and analyzed a bike handle bar and top tree assembly using SolidWorks and ANSYS Workbench to optimize both strength and mass.
- Performed modal analysis on the handle bar (Carbon Epoxy/Glass Fibre) and static structural analysis on the top tree (Aluminum Alloy 1060).
- Conducted meshing, load application, and result interpretation, identifying critical stress and deformation regions to ensure structural integrity and vibration resistance.
- Enhanced understanding of material selection, vibration behavior, and FEA-based design optimization for lightweight automotive components.

INTERNSHIP

Hindustan Shipyard Limited (HSL) — Manufacturing Intern

Aug 2024 – Nov 2024

Visakhapatnam, India

- Gained hands-on manufacturing experience in the Pipe Fitting and Sheet Metal Fabrication Shops within the Submarine Division, assisting in precision component fabrication and assembly.
- Operated and observed CNC-controlled 3-axis pipe bending, plasma profile cutting, and pipe bevelling machines, ensuring dimensional accuracy and high-quality production.
- Supported engineers in workflow optimization and safety procedures within pipe flushing and high-pressure testing bays, contributing to efficient and reliable ship manufacturing operations.