HEMA RUDRA

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EDUCATION

Northeastern University, Boston, MA *Expected May 2027*
Candidate for Master of Science in Mechanical Engineering
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 *June 2024*
Bachelor of Technology in Mechanical Engineering
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.