Aaryan Shah

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Education

University of Michigan, Ann Arbor — **Ann Arbor, USA**
Master of Science in Mechanical Engineering (GPA:3.96/4) — *Aug 2024 - May 2026*
Coursework: Power Electronics, MEMS, Finite Element Method, Mechanical Vibrations, Vehicle Crashworthiness and Occupant Protection

Vishwakarma Government Engineering College, GTU — **Ahmedabad, India**
Bachelor of Engineering in Mechanical Engineering (GPA:3.81/4) — *July 2019 - May 2023*
Coursework: Design of Machine Elements,Applied Thermodynamics, Rapid Prototyping, Dynamics of Machinery, Kinematics of Machines

IIT - Indian Institute of Technology, Gandhinagar — **Gandhinagar, India**
Exchange Student - 6th Sem (Junior year) — *Jan 2022 - May 2022*
Coursework: Synthesis and Analysis of Mechanisms, Integrated Design and Manufacturing, Industrial Engineering and Operations Research

Skills

FEA Softwares Ansys Workbench, COMSOL, Abaqus, Hyperworks, LS-Dyna, LS-Prepost, SolidWorks Simulation
CAD Softwares SolidWorks (**Certified SolidWorks Professional** - (C-JVWTZ4D9NG)), Autodesk Inventor, Fusion 360, AutoCAD, CATIA
Languages Python, C, C++, Arduino IDE, MATLAB

Experience

University of Michigan, Ann Arbor — **Ann Arbor, USA**
Research Assistant, Packaging Engineer — *May 2025 – Present*
- Designed a **compact power module** in **SolidWorks** for application in an EV inverter, focusing on thermal efficiency and spatial optimization.
- Performed thermal crosstalk simulations to optimize **spacing between switches, half-bridges**, ensuring minimal heat interference.
- Optimized **material thicknesses** in the switch using steady-state thermal simulations to improve heat dissipation and thermal performance.
- Performed Multiphysics FEA simulation in COMSOL to evaluate the **parasitic commutation loop inductance** of full-bridge SiC Power Module.
- Optimized copper layout on the substrate to reduce parasitic inductance while meeting **creepage and clearance constraints**.
- Used CFD simulation to analyze coolant flow and thermal distribution in the module.

Adani Green Energy Ltd. — **Ahmedabad, India**
Engineer, Logistics Optimization — *Jul 2023 – Jun 2024*
- Developed a Logistics Management Solution software, which streamlined logistics and customs movements, managing **3bn$/year** operations.
- Created project timelines and technical specifications to manage procurement and integration schedules.
- Developed a route optimization model using **data analysis** and open-source SUMO, reducing daily demurrage costs by **18%**.

ISRO - Indian Space Research Organisation — **Ahmedabad, India**
Intern, Mechanical Design Engineer — *Jan 2023 – May 2023*
- Designed three iterations of an Electronic Power Conditioner (EPC) unit for microwave space payloads using **Autodesk Inventor**
- Performed structural analyses (**modal, random response, Quasi-Static**) using **Ansys Workbench** for space conditions.
- Performed **steady-state and transient thermal** analyses using **Ansys Workbench** to evaluate thermal management under space conditions.
- Performed **topology optimization** to minimize material usage while maintaining structural integrity, resulting in reduction of weight by **47%**.
- Built thermal FEA models to assess system-level **thermal performance** and predict **thermal resistance** under extreme space conditions.

IITGN Robotics Lab, IIT Gandhinagar — **Gandhinagar, India**
Intern, Mechanical Design Engineer — *May 2022 – Aug 2022*
- Designed and 3D printed an 11:1 cycloidal drive using SolidWorks and performed validation testing using **Motor Control**.
- Prototyped a **robotic gripper** using SolidWorks, 3D printing technology and **arduino**, enhancing robotic manipulation capabilities.
- Designed and developed a **Series Elastic Actuator** for Humanoid Robot for space application with **backdrivable torque** of less than 2 nm.

Projects

Stress Analysis of Carbon Composite Material for Space-Based RF Components — **June 2021 – Sept 2021**
- Designed a carrier plate for microwave integrated circuits, incorporating **Kover material** using **SolidWorks**.
- Conducted **modal, stress, and displacement** analyses via FEM in SolidWorks, assessing lug constraints and incorporating CFRP materials.
- Observed a reduction in **stress by 85%** and **weight by 78%** when using CFRP material, demonstrating its superior structural performance.

Simulation of crack behavior of secondary particles in Li-ion battery electrodes during lithiation/de-lithiation cycles **Apr 2025 – July 2025**
- Developed Voronoi Algorithm to generate Secondary Particle consisting of Primary Particle in Battery using MATLAB
- Performed **Diffusion Analysis** in **COMSOL** to get the diffusion rate of Li ion.
- Developing **cohesive bonding** between the primary particles to obtain the information of the cracks developed using **COMSOL**.

Design and Analysis of a MEMS Electro-Thermal Micro-actuator — **Nov 2025 – Dec 2025**
- Designed a U-shaped MEMS microactuator, validating 2.1 μm lateral displacement via fully-coupled COMSOL Multiphysics FEA simulations.
- Optimized micro-gripper performance via coupled electric-thermal-mechanical simulations to achieve a 0.3 ms response time.
- Correlated 1.5D analytical thermal fin models with COMSOL data to accurately predict peak operating temperatures and structural integrity.

Automotive Stop/Start Buck LED Driver:- DC-DC Voltage Stabilization Module — **Nov 2025 – Dec 2025**
- Designed non-isolated buck LED driver with average current-mode control, sizing L/C for $\leq 5\%$ ripple & validating loop stability within PLECS.
- Designed schematic and 2-layer Altium PCB layout featuring top-layer routing, contiguous ground planes, & Kelvin-sensed shunt placement.
- Conducted component selection & loss modeling under $35 BOM, optimizing MOSFET/diode choices & winding inductors to achieve targets.

Publications

- **Aaryan Shah**, Ashish Soni, Dhaval Vartak, Pina Bhatt. *"Stress Analysis of Carbon Composite Material for Space-Based RF Components Using CAE Simulation"*. LNME series, Springer-Nature, 2023. URL
- **Aaryan Shah**, Piyush Shukla, Ulkesh Desai. *"Structural and Thermal Evaluation of Electronic Power Conditioner Unit for Space Payload"*. Advances in Thermal Engineering series, Springer, 2024. URL