PORTFOLIO

Srivatsav Josuyla

✉ josuyla.s@ufl.edu

☎ +1 352 740 4385

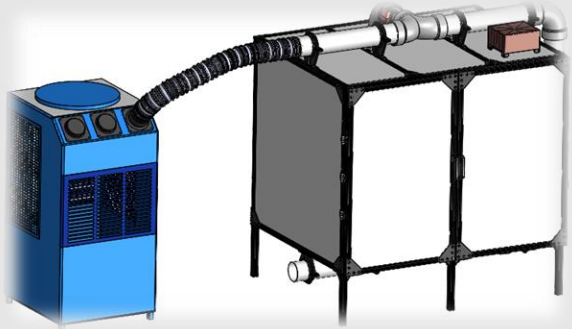
I am a dedicated Mechanical Engineer with a strong background in product design, thermal analysis, and structural optimization, complemented by expertise in CAD modeling, simulation tools, and programming. My experience in startups and industrial R&D has honed my adaptability, problem-solving skills, and ability to deliver high-impact solutions. With a passion for innovation and continuous learning.

UF IFAS UNIVERSITY of FLORIDA

Blueberry BREEDING PROGRAM

Project -Growth Chamber-Rapid Breeding

Graduate Student Researcher



Unlocking the Future of Blueberries: 🌿

🔬 Imagine a world where blueberries grow **twice as fast**, thriving in a perfectly controlled environment.

Inside this compact, chamber, blueberries experience an optimized climate 24/7. With automated temperature, light, and humidity control, plants can flourish as if nature itself is accelerating their growth.

💡 **How It Works:**

✔ A custom-built chamber simulates day and night cycles, ensuring consistent development.

✔ A Raspberry Pi brain provides real-time monitoring & remote access.

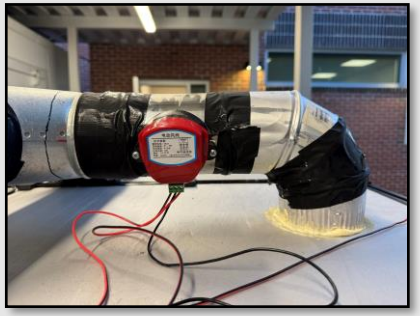
✔ Designed for precision, this innovation enhances breeding efficiency like never before.

Growth Chamber System Overview

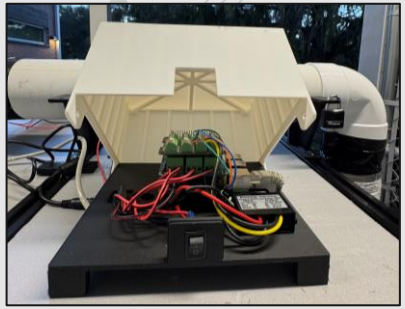
1 Climate Control & Airflow
•Integrated **HVAC system** regulates temperature and humidity.
•**Control valves** manage airflow distribution for uniform conditions.
•Efficient **air conditioning system** ensures stability in different environments.

2 Insulation & Lighting
•**Well-insulated chamber** minimizes external temperature fluctuations.
•**RGB lighting system** provides adjustable light settings for different growth stages.

3 Automation & Monitoring
•**Electronics-based automation** enables precise environmental control.
•**Temperature sensors** track real-time data for optimized conditions.
•System runs on a **Raspberry Pi**, allowing for remote monitoring and adjustments.

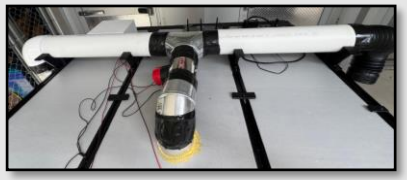


Control Valves



Electronics

Insulation



HVAC

RGB Lighting System

Circularity Fuels
0% Fossil. 100% Compatible

Chemical Pilot Reactor

Role: Mechanical Engineering Intern
Duration: Aug 2024 – Jan 2025

- **System Overview**

Designed and optimized a chemical reactor system for efficient catalyst integration, improving reaction kinetics and thermal management

- **Key Contributions:**

✓ Reactor Structural Design – Developed SolidWorks-based reactor layout within a shipping container.
✓ Designed a Jig for corrugation.
✓ Flow Optimization – Designed corrugated catalyst sheets, enhancing flow distribution by 20% for improved reaction efficiency.
✓ Designed a Dip coating machine.

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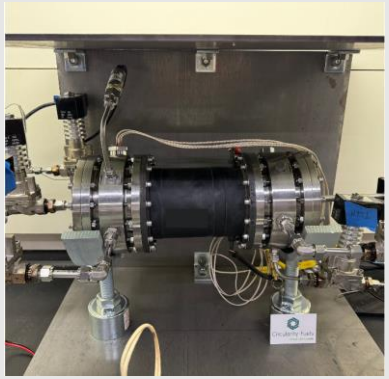
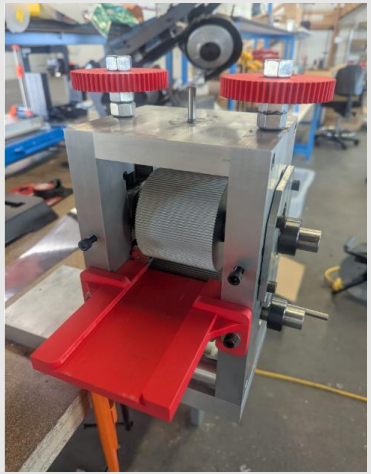
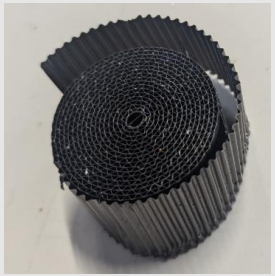


Chemical Reactor

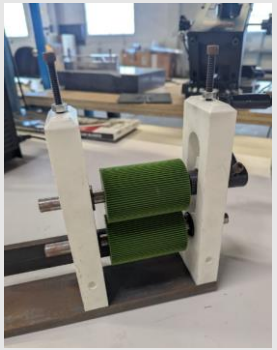


Corrugation Jig

Dip Coating Machine



Corrugated Sheet



3 D printed Corrugation Jig

Project 1: Air Duct Design for Vande Bharat Express-freight

R&D Mechanical Engineer | Duration: Sep 2021 – May 2023

System Overview

Developed an airflow management system for traction motor cooling, optimizing heat dissipation for high-speed train applications. The project focused on reducing thermal loads, improving system durability, and ensuring compliance with railway standards.

Key Contributions:

✓ CFD-Optimized Air Ducts – Increased cooling efficiency by 15%, minimizing pressure drop.
✓ FEA & Structural Analysis – Ensured duct durability by simulating loads.
✓ Thermal Performance Simulation – Evaluated temperature gradients & airflow to enhance efficiency.
✓ Manufacturing & Quality Control – Led fabrication inspections and ensured GD&T compliance.

Ducts Installation in the field.

Traction Motor 1 Air duct

Traction Motor 2 Air duct

Traction Motor 3 Air duct

Traction Motor 4 Air duct

- **Key Contributions**

✓ 8 Ducts of each type were manufactured and installed.

✓ Negotiated with suppliers to maintain cost efficiency, while ensuring compliance with engineering specifications.

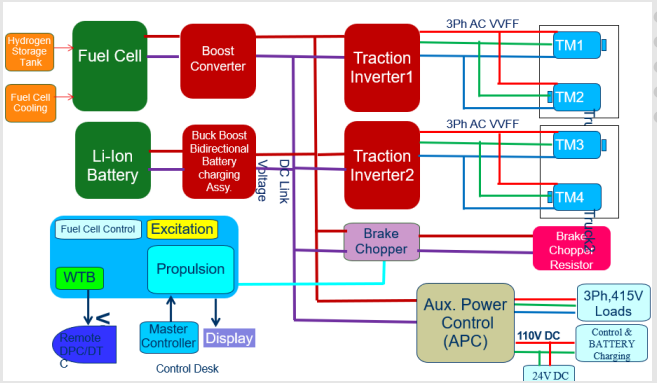
Project 2: Hydrogen Fuel Cell DEMU

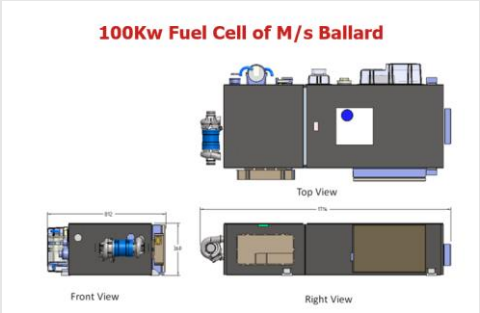
- **System Overview**

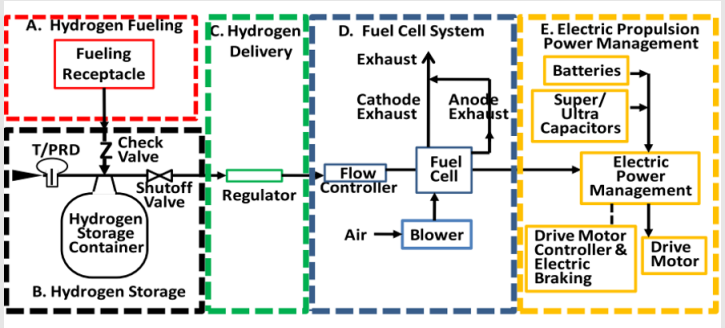
The project involved designing an advanced thermal management system for a hydrogen-powered Diesel Electric Multiple Unit (DEMU), integrating active cooling strategies to enhance fuel cell efficiency.

- **Key Contributions:**

✓ Designed a structural cooling system to support heat exchangers and blowers, replacing traditional HVAC.
✓ FEA & Structural Analysis – Validated load-bearing capacity.
✓ Optimized Weight – Reduced system weight by 12% while ensuring high structural efficiency.
✓ Thermal Performance Simulation – Evaluated temperature gradients & airflow to enhance efficiency.

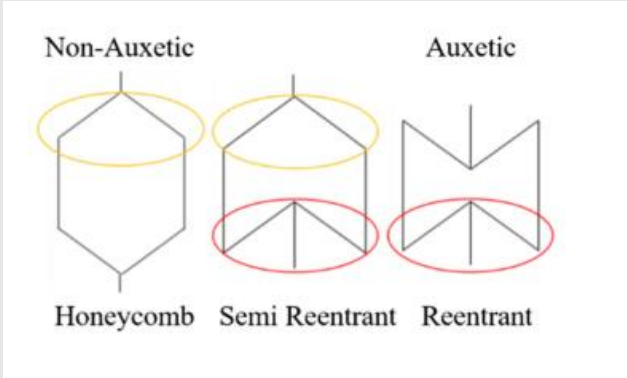






"Study of Hierarchically Architectured Materials

Research Assistant | Duration: Feb 2021 – May 2021



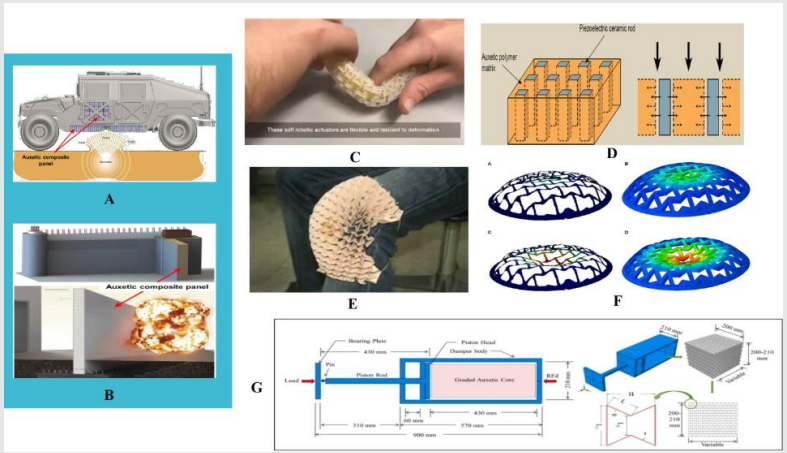
- **System Overview**

Investigated auxetic structures to enhance mechanical resilience, flexibility, and energy absorption in engineering applications.

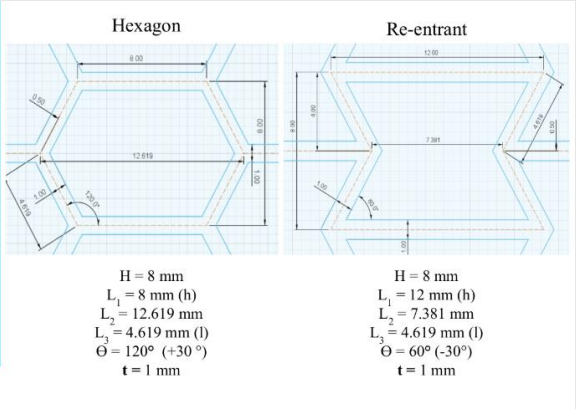
- **Key Contributions:**

✓ FEA Analysis & Optimization – Simulated stress distribution & deformation patterns using Autodesk Fusion 360 to determine optimal auxetic configurations.

✓ Material Performance Evaluation – Assessed load-bearing capacity, impact resistance, and flexibility across multiple auxetic structures.



Results and observations



H = 8 mm
L_1 = 8 mm (h)
L_2 = 12.619 mm
L_3 = 4.619 mm (l)
Θ = 120° (+30 °)
t = 1 mm

H = 8 mm
L_1 = 12 mm (h)
L_2 = 7.381 mm
L_3 = 4.619 mm (l)
Θ = 60° (-30°)
t = 1 mm

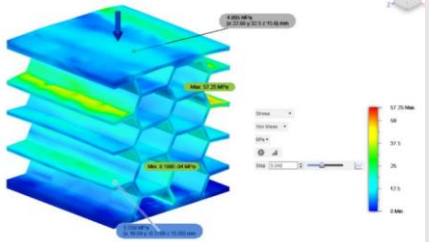


Fig. 4.82 HEXA structure deformed under impact loading.

Fig. 4.45 AU structure with prescribed displacement (X_1 loading).

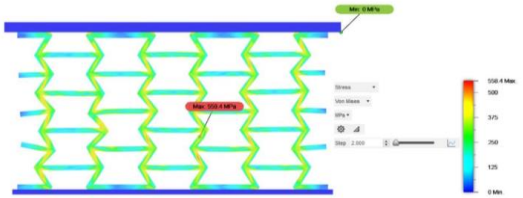


Fig. 4.46 AU honeycomb structure after 2mm displacement in X_1 direction.

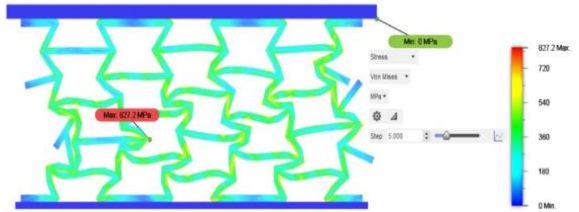


Fig. 4.47 AU honeycomb structure after 6mm deformation in X_1 direction.

σ_{ys} = 679.154 Mpa
ε_2 = 0.16152
E_2 = 6.88 Gpa (Analytical)
E_2 = 4.204 (FEA)
ν_{21} = -1.39864
ν_{21} = -3.68769

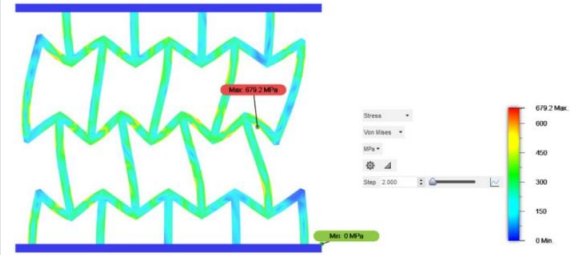


Fig. 4.58 AU structure after 2mm deformation in X_2 direction.

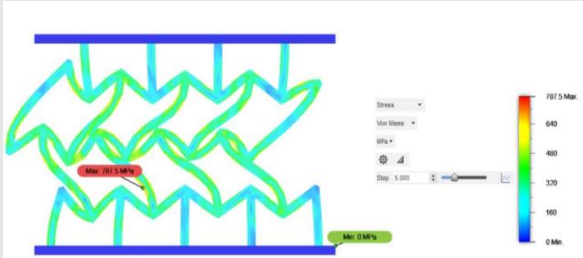
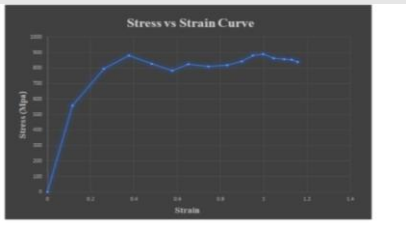


Fig. 4.59 AU structure after 8mm of deformation in X_2 direction.



σ_{ys} = 558.382 Mpa
ε_1 = 0.114177
E_1 = 3.518 Gpa (Analytical)
E_1 = 4.890 Gpa (FEA)
ν_{12} = -0.71497
ν_{12} = -0.271172

Go-Kart Team –INITIA 3.0

Bake Team Head

Duration: July 2018 - March 2019

- **System Overview**

A competition involving the design, analysis and fabrication of a student Go-Kart vehicle by a team of 25 students from undergraduate classification to compete in several events such as Braking test, Acceleration test, Skid Pad and Endurance Race that test the performance of the vehicle fabricated.

- **Key Contributions:**

✓ Designed and optimized a high-performance braking system in SolidWorks, ensuring enhanced safety & efficiency.

✓ Conducted theoretical calculations for braking torque, caliper sizing, piston dimensions, hub, and disc specifications

✓ FEA & Structural Analysis – Validated load-bearing capacity of the Pedal.

Team Ampere Motorsport India

Supra-SAE India Student Formula
Duration: Nov 2018 -Aug 2019

- **System Overview**

A competition involving the design, analysis and fabrication of a student formula vehicle by a team of 25 students from undergraduate classification to compete in several events such as Braking test, Acceleration test, Skid Pad and Endurance Race that test the performance of the vehicle fabricated.

- **Key Contributions:**

One of the most cost-effective designs in the competition
•Complete in-house fabrication of components
•373.2 cc (22.77 cu in) 4-stroke, liquid-cooled single cylinder engine
•Bybre 2 piston calipers with 230mm Slotted Rotors in all 4 corners
•ECU Tuning and custom mapping to have high initial torque
•Fiber Reinforced Polymer Body panels
•Designed for 95th Percentile Male criterion
•Generative Design for Suspension Parts