JASWANTH VG | MM21B031

INDIAN INSTITUTE OF TECHNOLOGY MADRAS

Email | LinkedIn

EDUCATION

Program	Institution	%/CGPA	Completion
B.Tech **Metallurgical and Materials Engineering**	Indian Institute Of Technology Madras	8.92/10.0	2026
M.Tech **Computational Engineering**	(Inter-Disciplinary Dual Degree)		
Higher Secondary School (CBSE)	The Velammal International School	98.1%	2021
High School (CBSE)	The Velammal International School	97.4%	2019

RESEARCH INTERESTS

Computational Mechanics, Optimization Methods, Metamaterials, Machine Learning

RELEVANT COURSES

- Deformation and Failure of Materials
- Engineering Mechanics
- Foundations of Computational Fluid Dynamics
- Engineering Design of Additively Manufactured Components
- Numerical Methods for Metallurgists
- Optimisation Methods for Mechanical Design
- Fundamentals of Finite Element Analysis*
- Constitutive Modeling in Continuum Mechanics*
- Advanced Solid Mechanics*

RESEARCH PROJECTS

GRADED BCC LATTICE STRUCTURES FOR CRASHWORTHINESS AND HEAT DISSIPATION — MAR'25 - PRESENT

***Advisor**: Prof. Ratna Kumar Annabattula, Mechanics of Mechanics Group, IIT Madras*

- **Automated simulations** using Python scripts, and performed forced convection simulations in ANSYS FLUENT
- Utilized Latin Hypercube Sampling (LHS) to generate datapoints for multi-objective optimisation
- Surrogate Modelling was used to fit the datapoints to approximate trends over the design space
- Multi-objective optimisation was performed using Goal Programming to get the optimal BCC lattice, resulting in a 110% increase in absorbed energy and a 30% decrease in pressure drop

BIOMIMETIC HIERARCHICAL CELLULAR STRUCTURES FOR IMPACT ABSORPTION — DEC'24 - MAR'25

***Advisor**: Prof. Ratna Kumar Annabattula, Mechanics of Mechanics Group, IIT Madras*

- Performed **high strain-rate impact** simulations of regular and auxetic honeycomb structures in **Abaqus/Explicit**
- Developed Python scripts to generate **Voronoi substructures** within each honeycomb unit cell for hierarchy
- Studying the effect of varying Voronoi density to maximise specific energy absorbance

PARTICLE ANISOTROPY CORRELATION WITH SLM POWDER SPREADING DIRECTION — MAR'25 - JUNE'25

Mechanics of Mechanics Group, IIT Madras

- Exploited Voro++ to generate Voronoi tessellations of monodispersed and polydispersed packings
- Developed C++ script to calculate Minkowski tensors for quantifying anisotropy index
- Developed a Python script to generate .vtk files to visualise the generated Voronoi tesselations in Paraview

MECHANICAL DESIGN OPTIMISATION AND FABRICATION — JULY'22- JAN'24

Team Anveshak, Mars Rover Team, IIT Madras

- Performed analysis of the **rocker-bogie** suspension kinematics in MATLAB for tuning geometric parameters
- Designed and fabricated a revamped rocker-bogie system, including chassis and bar-differential-based components
- Developed a 3D-printed **gearbox** with a **57:1 reduction**, with a **planetary** (3:1) and a **dual-stage cycloidal** (19:1).
- Designed and fabricated lightweight **3D-printed wheels**, optimized for traction
- Ideated the next-gen four-wheeled independent-steering system with a double-pivoted rear-mounted differential

STUDY AND PREDICTION OF STEEL MELTING SHOP DEFECTS IN TI-STABILIZED SS COILS — MAY'24 - JULY'24

Summer Internship, Jindal Stainless Ltd., Odisha

- Investigated seven frequent inclusion-based and surface defects in Ti-stabilized grades - 416L, 439, and 441
- Developed a **classification model** to predict the defect probability and identified the top five influencing factors
- Built and tuned **Random Forest** and **LightGBM** models, with accuracy scores of 94.12% and 93.73%, respectively

DESIGN AND DEVELOPMENT OF AN ELECTRO-MECHANICAL TESTBED FOR HES SYSTEMS — MAY'23- AUG'24

***Advisor**: Prof. Tiju Thomas, Metallurgical and Materials Engineering, IIT Madras*

- Fabricated an electro-mechanical testbed for **simulating real-life EV** functions of a Battery-Supercapacitor system
- Implemented **remote monitoring** of real-time voltage, current, and power readings via **ESP32 microcontroller**

- Conducted **stress testing** on Li-ion, Lead-Acid, and hybrid systems under complex loads
- Fabricated 3D-printed enclosures for CR2032 supercpacitors
- Tailored the testbed to **measure capacitance** above 100mF (accuracy: ±10%) for stress-tested supercapacitors

Course Projects

Process Parameters of an Additively Manufactured Heat Exchanger — April'24

(Course Instructor: Prof. Gnanamoorthy, Mechanical Engineering, IIT Madras)

- Designed a **shell-and-tube heat exchanger** that requires minimal support structures for manufacturing via L-PBF
- Identified process parameters from literature to minimize **surface roughness** and **porosity**

3D Convex Hull Construction — Nov'24

(Course Instructor: Prof. Prasad Patnaik, Applied Mechanics, IIT Madras)

- Developed a Python script uses the **Gift-Wrapping** algorithm to construct a 3D convex hull from random points
- Visualized the 3D convex hull using the PyQt library for an interactive graphical representation

2D Lid Driven Cavity Flow and Analysis of Numerical Schemes — Nov'24

(Course Instructor: Prof. Arul Prakash, Applied Mechanics, IIT Madras)

- Developed a Python script to solve the **Navier-Stokes equations** with Finite Difference Methods
- Implemented **streamfunction-vorticity** formulation with **Upwind schemes** for decoupling pressure terms
- Generated streamlines and contour plots for a Re = 100 flow and validated results against ghia et al. (1982)
- Developed a Python script to compare Gauss-Seidel, SOR, and ADI schemes for solving the 2D Laplace equation
- Optimized **relaxation parameters** and analysed computational times for each scheme
- Visualized temperature distribution profiles and heat transfer rates along the boundary

Positions of Responsibility

Head of Operations - Team Anveshak — Jan'24 - Jul'24

- Led a team of over 40 students in international competitions by managing logistics and technical strategies, resulting in podium ranks.
- Scheduled inter-module meetings to facilitate team bonding and streamlined deliverables for upcoming competitions

Design Engineer (Mechanical Module) - Team Anveshak — July'22 - Jan'24

- Responsible for **Design, Manufacturing, Assembly, Testing and Validation** of the traversal system
- Responsible for Project Division and Management of 4-member subsystem with adherence to Overall Project Timeline

School Pupil Leader - Higher secondary School — May'20 - Oct'21

- Organized annual events and represented the student body to improve faculty-student interaction
- Represented the school in inter-school sports and cultural competitions
- Played a pivotal role in organising the annual Tech Fest

Skills

- **Modeling and Simulation:** Ansys, Abaqus, Autodesk Inventor, AutoCAD, Solidworks, Gazebo
- **Programming languages:** MATLAB, Python, C, LaTeX, Arduino IDE
- **Lab:** FT-IR Spectroscopy, Optical Microscopy, Rheometry, Contact-angle Goniometry

Lab Experiences

- **Metallography Lab** - Prepared and analyzed micrographs of martensitic, bainitic, and pearlitic steel using ImageJ
- **Anodization Lab** - Synthesized vertically aligned Pd nanowires by preparing AAO templates for anodization
- **Characterization Lab** - Gained hands-on experience with SEM and performed sample preparation for TEM imaging

Achievements and Awards

- Secured an All India Rank in **top 0.7 percentile** in the IIT-JEE Mains 2021 from over **1.4 million** applicants
- **NTSE Scholar (2019)**, An academic excellence scholarship awarded to **2,103 students** all over India
- 2nd place, **CAD Design Challenge**, AIRSS 2024 - Ideation and modelling of a three-component **stair-climbing bot**
- 2nd overall, **International Rover Challenge 2024**, Space Robotics Society

Certifications

- Manufacturing process selection and Design for manufacturing **Udemy**
- Machine Learning with Python **IBM**
- Matlab Onramp **MathWorks**