JASWANTH V. GURUDEV
INDIAN INSTITUTE OF TECHNOLOGY MADRAS
[Website](#) | [Email](#) | [LinkedIn](#)

EDUCATION

Program	Institution	%/CGPA	Completion
B.Tech **Metallurgical and Materials Engineering** + M.Tech **Computational Engineering**	Indian Institute Of Technology Madras (Inter-Disciplinary Dual Degree)	8.92/10.0	2026

RESEARCH INTERESTS

Convex Optimization, Architected Materials, ML-Assisted Mechanical Design

RELEVANT COURSES

- Deformation and Failure of Materials
- Machine Learning Techniques
- Foundations of Computational Fluid Dynamics
- Materials Characterization
- Computational Materials Engineering Lab
- Engineering Design of Additively Manufactured Components
- Numerical Methods for Metallurgists
- Optimisation Methods for Mechanical Design
- Biofluid Mechanics
- Computational Laboratory
- 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
- Abstracts accepted at the IMPLAST'25 and ICCMS'25 conferences, to be held at IIT-R and IIT-BBS, respectively
- Utilized Latin Hypercube Sampling (LHS) to generate datapoints for multi-objective optimisation
- Surrogate Modelling with goal programming was used to identify the optimal design variables
- The optimal BCC lattice resulted in a 115% increase in absorbed energy and a 31% 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
- Achieved a 2x improvement in overall energy absorbed per unit mass during low velocity impacts

PARTICLE ANISOTROPY CORRELATION WITH SLM POWDER SPREADING DIRECTION — MAR'25 - JUNE'25
Personal Project, 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 and HES systems and fabricated 3D-printed enclosures for supercapacitors
- Tailored the testbed to **measure capacitance** above 100mF (accuracy: ±10%) for stress-tested supercapacitors

ROBOTICS DEVELOPMENT - SPACE WAREHOUSE BOT July'23- Dec'23
eYantra 2023 Robotics Competition, IIT Bombay
- Implemented **OpenCV** for ArUCo detection to facilitate package identification in a virtual extraterrestrial setup
- Integrated a **UR5 robotic arm** with a depth camera and used **ROS2 (MoveIt, RViZ)** for pick-and-place operations
- Programmed a virtual autonomous ground vehicle to navigate and deliver packages within a simulated environment
- Utilized Nav2 for mapping, **localisation**, and **path planning**, leveraging **LiDAR** data to optimize movement in Gazebo

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)
- Coded Python solvers for **Navier–Stokes** and **2D Laplace equations** using the Finite Difference Method (FDM)
- Applied psi-omega formulation with Upwind schemes and compared Gauss–Seidel, SOR, and ADI methods
- Generated visualisations for a Re = 100 flow and validated the flow results against ghia et al. (1982)

ACHIEVEMENTS AND AWARDS

- Secured **99.35** percentile in JEE Mains B.E/B.Tech and **99.74** percentile in JEE Mains B.Arch in 2021
- Recipient of **Visweswariah Scholarship for Excellence in Technology**, awarded **full tuition waiver** in 2021
- Received the **NTSE Scholarship**, an academic excellence scholarship awarded to 2,103 high school students in 2019
- 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

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

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