

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

ML-Assisted Mechanical Design, Convex Optimization, Architected Materials

RELEVANT COURSES

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| <ul style="list-style-type: none">Machine Learning TechniquesDeformation and Failure of MaterialsFoundations of Computational Fluid DynamicsMaterials CharacterizationComputational Materials Engineering LabEngineering Design of Additively Manufactured Components | <ul style="list-style-type: none">Numerical Methods for MetallurgistsOptimisation Methods for Mechanical DesignBiofluid MechanicsComputational LaboratoryFundamentals of Finite Element Analysis*Constitutive Modeling in Continuum Mechanics*Advanced Solid Mechanics* |
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PUBLICATIONS AND PATENTS

- Jaswanth V. Gurudev** and Ratna Kumar Annabattula, “Dual-Purpose Architected Materials: Optimizing Graded BCC Lattices for Toughness and Thermal Efficiency.” *Publication in preparation*
- “A device for spectral analysis of soil samples and a method thereof”, *Indian Patent (application number: 202541068459) - filed on July 17, 2025*

CONFERENCES

- Jaswanth VG** and Ratna Kumar Annabattula, “Design of functionally graded lattice structures for heat dissipation and energy absorption”, 14th International Symposium on Plasticity and Impact Mechanics ([IMPLAST 2025](#)) - oral presentation (October 2025)
- Jaswanth V. Gurudev** and Ratna Kumar Annabattula, “Multi-objective design of spatially-graded BCC lattice structures for thermal dissipation and energy absorption”, 10th International Congress on Computational Mechanics and Simulation ([ICCMS 2025](#)) - accepted

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

- Utilized **Latin Hypercube Sampling (LHS)** to generate datapoints for multi-objective optimisation
- Automated repetitive Abaqus and Ansys simulations using Python scripting
- Surrogate modelling with goal programming** was used to identify the optimal design variables
- The optimal lattice demonstrated a **115%** and **31% improvement** in absorbed energy and pressure drop, respectively
- Implementing **Physics-Informed Geometric Operators (PIGOs)** to accurately model and analyze thermal behavior

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 **2× 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 visualize the generated Voronoi tessellations 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, Applied Nanostructures Engineering and Nanochemistry (ANEN) Group, 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 an **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: $\pm 10\%$) 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

EXTRACURRICULAR POSITIONS

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