Rochan Prasad | **22B2248**
Mechanical Engineering | **B.Tech.**
Indian Institute of Technology Bombay | **Gender: Male**
DOB: 29/06/2004

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2026	
Intermediate	ISC	Delhi Public School Newtown	2022	96.25%
Matriculation	ICSE	Delhi Public School Newtown	2020	97.60%

Pursuing a Minor degree in **Aerospace Engineering** at the Department of Aerospace Engineering, IIT Bombay

Scholastic Achievements

- Secured **All India Rank 894** among **2+** lakh students in **JEE Advanced** examination *(2022)*
- Obtained **All India Rank 2393** among **10+** lakh students in **JEE Main** examination *(2022)*
- Achieved **SX Rank 1136** among **2** lakh students in **KVPY**, eligible for KVPY **scholarship** *(2022)*
- Secured **CRL** rank **85** in WBJEE for institutions in West Bengal, given by **1 lakh** students *(2022)*

Research Experience

Computational Modelling of Railgun Electromagnetics | WURP Project *(Dec'23- March'24)*

Guide: *Prof. Avishek Ranjan* | *Department of Mechanical Engineering*

- Researching on viable and efficient techniques from **conceptualization** to design and demonstation of launching an **aerodynamic projectile** from a railgun, utilizing **sophisticated electromagnetics** and mathematical concepts
- Analysing **30+** research papers on **magnetohydrodynamics** and simulations of railguns, including concepts like velocity skin effect, liquid film effect, high temperature flow fields, interface lubrication characteristics etc
- Modelled and simulated with various **multiphysics modules** including AC/DC, Heat Transfer, Fluid flow on **COMSOL** current carrying wires, electromagnetic fields in a 3D inductor, and Couette flow between moving plates
- Currently simulating on **COMSOL** the **velocity skin effect** due to high velocity armature movement between rails, implementing a **moving mesh** with time dependent magnetic fields and relevant boundary conditions for skin effect

Dynamics of Kirigami Metamaterials | Summer Project *(May'24-Present)*

Guide: *Prof. R. Ganesh* | *Department of Mechanical Engineering*

- Conducted in-depth research on **kirigami metamaterials**, which involve embedding arrays of periodic cuts into elastic geometries such as sheets or cylinders, exploring their potential for large-scale applications in various industries
- Currently modelling a kirigami cylindrical shell and sheet with on **Solidworks**, simulating progressive radial, axial pressures over time till **100** kPa on **COMSOL**, and comparing the resulting force vs displacement plots of the two

Technical Projects

SPART (Solar Powered Airship Research Team) | IIT Bombay *(Dec'23-Present)*

A 25+ member 3-tier student team aiming to participate in the World Solar Airship Race 2025-26 by building solar-powered autonomous airship to fly over 6000+ km across the South Atlantic ocean, promoting sustainable air transport

Design Engineer | Mechanical and Aerospace Subsystem

- Collaborating with **15+** members in the Mechanical and Aerospace Subsystem to design, simulate, fabricate, engineer and manufacture airships of various types, ranging from **2m** to **10m** in length, non-rigid to semi-rigid, rigid airships
- Modeled triangular **internal structure** of a 7m semi-rigid airship in **Solidworks** and engineered unique detachable motor mounts on a novel **T-shape** pipe assembly in the midsection of the airship, fastening the assembly in place
- Manufactured airship components by **3D printing** using **PLA**, implementing drilling and **laser cutting** machining
- Attended **DELTAs** conference as representative of Team SPART, achieved valuable insights into engineering autonomous solar airships with novel materials and **high payload capacity** with robust envelope and internal structure

RC Airship | Regatta Competition | DELTAs Conference

An international competition with 25+ teams participating in a Remote Controlled Airship Race

- Modeled gondola, unique detachable motor and tail mounts, fins on **SolidWorks**, simulated effects of forces and moments on gondola due to motor thrust of **200g** and maximum lift force of **1130g**, including factor of safety **1.5**
- Analyzed **simulations** in SolidWorks and plots of von Mises stresses and strains, adjusted specifications on mechanical parts to minimize weight while ensuring mechanical stability, accurate **centre of mass**, suitable area for attachments
- Fabricated envelope of a non-rigid **2m** airship as well as implemented proper **sizing** of fins, volume of the airship, and total mass by researching various **envelope shapes** such as Zhiyaun, Lotte, GNVR, and NPL

Heat Transfer Analysis using Neural Networks | Course Project *(March'24- May'24)*
Guide: *Prof. Alankar Alankar | Department of Mechanical Engineering*

- Analysed how thermal parameters affect electronics, implementing ML algorithms using **neural networks**, **LPTNs**
- Predicted temperature distribution due to heating in devices using **TNN** by feeding input data into **MLPs**

Analysis of Tool Wear during Orthogonal Machining | Course Project *(April'24-May'24)*
Guide: *Prof. Amitava De | Department of Mechanical Engineering*

- Modelled in **ABAQUS** the 2D orthogonal Machining at various cutting speeds of **0.1** m/s, **1** m/s and **5** m/s
- Simulated and **analysed plots** of stress, strain distribution, cutting forces, maximum temperature as a function of time, and compared the **chip formation** and material characteristics for workpiece materials aluminium and titanium

Computational Analysis of Windshield Screen Wipers | Course Project *(April'24-May'24)*
Guide: *Prof. Amit Singh | Department of Mechanical Engineering*

- Conducted comprehensive research on windshield wiper mechanisms with multiple linkages and joints
- Designed wiper system in **SolidWorks**, simulated static force analysis for stresses and forces at driving point
- Performed kinematic simulation and **dynamic motion analysis** of the wiper tip to evaluate velocity and acceleration plots as a function of time at a constant angular velocity of **100rpm** and torque of **10000N/mm** respectively
- Verified the dynamic analysis done by modelling a **Python** code to plot the position, velocity and acceleration graphs

Modal Analysis of a Kinova Robotic Arm | Course Project *(May'24)*
Guide: *Prof. R.Ganesh | Department of Mechanical Engineering*

- Analysed a **3D** model of **Kinova Gen3** robotic arm by writing a code in **MATLAB**, evaluated shape functions for a 10 noded-tetrahedron and formed global stiffness and mass matrices using **finite element methods** and algorithms
- Applied essential **boundary conditions** on the bottom surface of the shoulder link, solved the **eigenvalue** problem and obtained the natural frequency for the first seven natural modes of vibration, calculated the natural frequency

Control Systems and Control Theory *(May'24-Present)*
Summer of Science | Mathematics and Physics Club

- Researched mathematical foundation of control theory, open, closed loop systems and **linear time invariant** systems
- Designed DC motor and PID controller from scratch on **MATLAB**, utilising **Simulink**, tuning the PID parameters for desired trajectories of increasing angular velocity signals with sinusoidal shaft rotation at various time instants

Positions of Responsibilty

Seasons of Code Mentor | Web and Coding Club *(May'24-Present)*
Institute Technical Council, IIT Bombay

- Mentored **5+** students on **Finite Element Methods** and algorithms, allocating efficient resources, assigning tasks
- Currently solving basic **Python/MATLAB** code for modelling finite element algorithms on **complex truss** structures

Technical Skills

Softwares	AutoCAD, COMSOL, Solidworks, Fusion 360
Programming Languages	C, Java, MATLAB, Python, HTML, CSS, LaTeX

Courses Undertaken

Mechanical Engineering	Solid Mechanics, Thermodynamics, Structural Materials, Solid Mechanics Lab, Fluid Mechanics, Applied DS and ML, Mechanical Processing of Materials, Kinematics and Dynamics of Machines, Finite Element and Boundary Element Methods
Aerospace Engineering	Introduction to Flight, Aerospace Structural Mechanics
Mathematics	Calculus-I, Calculus-II, Linear Algebra, Differential Equations
Miscellaneous	Introduction to Economics, Psychology and Design

Extracurricular Activities

- Pursued training in Football under the National Sports Organization, IIT Bombay *(Dec'22 - June'23)*
- Pursued training in Football in **Inter-IIT Pre Camp** *(July'23 - Oct'23)*
- Conducted weekly English classes for **25+** students as a Teaching Assistant under ELP *(Aug'23-Nov'23)*
- Participated in a team of 7 and achieved **2nd position** in **Wall Painting General Championship** *(Oct'23)*
- Coordinated **Half Marathon** Event by **Aavhan** and managed hydration stalls for the runners *(Oct'23)*
- Mentored three mentees, who achieved **3rd** position in **100+** teams in EnB Buzz, a BMC competition *(Oct'23-Dec'23)*