

IIT Roorkee,
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Education

B. Tech in Engineering Physics from Indian Institute of Technology, Roorkee

- Relevant coursework: Condensed Matter Physics, Thermal Physics and Statistical Mechanics, Quantum Mechanics, Nanotechnology, Quantum Computing, Numerical Analysis and Computational Physics, Atomic and Laser Physics, Mathematical Physics
- Additional Coursework: Signal Processing, Machine Learning, Data Mining

Experience

Internship: A Study of Electronic Properties of P-EDOT at Indian Institute of Space Science and Technology

Trivandrum [\[1\]](#)

May 2023 – July 2023

- Studied the concepts of Density Functional Theory and Molecular Mechanics to aid in Simulation
- Conducted an extensive study of transparent conductors like ITO and compared it with equivalent properties found in Cu, Au and Ag Nanowires
- Used Gaussian and GaussView Software to implement Density Functional Theory Calculations on Oligomers of EDOT and studied its properties
- Worked on Schrodinger Material Sciences Suite to calculate some properties of the polymer and simulate the Cu Nanowire using Molecular Dynamics
- Continuing the work to check the feasibility of Cu Nanowire as substitute for ITO in the case of Organic Hole only Devices with PEDOT: PSS being deposited on it. We use CFD++ and Ansys

Transport Properties of Thin Films: Studying $1/f$ conductivity noise at IIT Roorkee [\[2\]](#)

January 2023- May 2023

- Working in the instrumentation laboratory with Four Probe Method to measure the transport properties of fabricated samples
- Studied the effects of Weak Localization in thin films and reviewed experimental results produced by previous authors and researchers
- Explored several applications and disadvantages of Weak Localization for future research
- Studied the theory behind $1/f$ noise in general and how prevalent it is in Condensed Matter Physics
- Learned the usage of a Lock-in Amplifier to study noise in material and used it to study $1/f$ conductivity noise in several samples

Demystifying Frequency Filters Using Laplace Analysis at IIT Roorkee

September 2022 – November 2022

- Worked with a knowledge of Signal Processing and MATLAB/Python Libraries to analyze frequency filters
- Studied Low Pass, High Pass, Band Pass and Band Reject Filters using Circuit Analysis and analytically
- Used Laplace Analysis to provide characteristic frequency and Bode Plots using MATLAB
- Explored several applications involving each filter and tried implementing a few of them

Using GEANT4 for simulation of Optical Photon processes at IIT Roorkee**May 2022 – December 2022**

- Investigated several phenomena, like scintillations, built a form of Cerenkov Radiation Detector model while also studying the concepts required to understand the processes
- Working with the idea of multiple gamma emitters and coincidence summing and how to detect gamma photons to determine the energy dependence of efficiency in a more precise manner
- Used ROOT software to analyze the data outcome of the events happening in the simulations of GEANT4

Study of Disordered 1D Quantum Systems at IIT Roorkee**October 2021 – March 2022**

- Worked on studying the tight-binding model and understanding the effect of disordered potentials on 1D systems using simulation on Python and MATLAB
- Covered aspects of Anderson Localization and Andre'-Aubry Model and their implications in Condensed Matter Physics. Also worked on Off Diagonal Disorder
- Understood the basics of the Many-Body Localization problem

IBM Qiskit Fall Fest Quantum Hackathon: Quantum Chess at IIT Roorkee**September 2021 – November 2021**

- Worked in a team to create a rendition of chess, a quantum variation of the original game.
- Used Quantum Random Number Generator to introduce Superposition among the pieces, QRNG was implemented using IBMQ's cloud implementation
- Project got placed 2nd in the regional round of the competition. Team got selected for participation in the Global

Studying Analytic Integrability and Non-Integrability in Bosonic String Theory [\[3\]](#) at IIT Roorkee July 2023 – Ongoing

- Studied the concepts of Analytic Integrability and the methods involved in studying the integrability of a dynamical system
- Studied the concepts related to String Theory from Professor David Tong's Lecture notes in order to build a base.
- Made use of the Kovacic Algorithm in order to study integrability and non-integrability for strings in $AdS_5 \times E_5$ and related manifolds
- Plan is to work on more novel backgrounds and show Analytic Integrability or Non-Integrability in their context
- Also plan to continue in the direction of work in Conformal Field Theory

Skills**Languages:** English, Hindi, Tamil, (Learning) Japanese**Programming Languages:** Python, C++, Fortran90, Java**Software Packages:** MATLAB, Octave, GEANT4, Gaussian, GaussView, Schrodinger**Activities:** Cricket, Badminton

Extra-Curricular

Additional Secretary of Physics and Astronomy Club IIT Roorkee

May 2023 – Present

- Heading the mathematics vertical of the club, organizing, and conducting events like Integration Bee (inspired from MIT's original), Journal Club where we take up intellectual discussions on any relevant published paper and taking part in amateur astronomy
- Taking excursions to capture rare astronomical events like the comet of 2023.
- Mentoring and undertaking small projects in physics to increase the research experience amongst students one which I am undertaking currently on Studying Disorder and Randomized Potential
- Helping in conducting lectures with renowned professors taking them

UG Teaching Assistant for a course in Physical Chemistry helping first year students go through the course by helping with their assignments and study process

Volunteered at **National Service Scheme (NSS IIT Roorkee)** to help underprivileged kids or kids from rural areas prepare for the JEE exam.

Participation in IRMUN (MUN at IIT Roorkee) and won High Commendation in Special Committee **September 2021**

Participated in Hyperion Journal Writing Competition conducted by IIT Kanpur on **Dark Matter** where we, a team of 3, had to go through articles and solve problems both computational and analytical and summarize it all in a journal article format. **Team secured the 7th position in the entire country**

Participated in the Physics Bowl Competition in 2021. Team of 4 secured 18th position in the world. **January 2021**

President of the TGELF Youth Leadership Program at PSBB

July 2019 – March 2020

- Was President of The Global Education and Leadership Foundation's school leader's club.
- Headed the group of leaders towards a sustainability project to reuse plastic waste generated in the school campus, to make useful products.