

ANIRBAN DAS

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RESEARCH INTEREST

I specialize in theoretical condensed matter physics and currently conduct research within the Strongly Correlated Electronic System lab at the Department of Physics, IIT Madras. My work primarily revolves around investigating various quantum phases of materials, with a particular focus on topological insulators (TI), topological superconductors, conventional and unconventional superconductors, charge order phase and the Tomonaga-Luttinger liquid (TLL). My expertise lies in high-performance computational work, with proficiency in Wolfram Mathematica, Python and Fortran. Additionally working on systems with realistic material parameters has allowed me to develop active collaborations with experimental groups from Singapore, Taiwan, and Japan.

EDUCATION

Program	Institution/Board	CGPA/Percentage	Year of completion
○ Ph.D.	IIT Madras, Chennai	8.79	2024
○ M.Sc.	University of North Bengal, West Bengal	72.6%	2017
○ B.Sc.	Raiganj University College, West Bengal	72%	2015

KEY COURSES

PhD	MSc	BSc
○ Advanced Condensed Matter Physics	○ Quantum Mechanics	○ Classical Mechanics
○ Quantum Field Theory	○ Statistical Physics	○ Thermodynamics
○ Introduction to Research	○ Electrodynamics	○ Electronics
	○ Astrophysics	○ Mathematical Methods in Physics
	○ Nuclear and Particle Physics	

SKILLS / EXPERTISE

- **Programming Languages:** Python, Fortran, C++, Wolfram Mathematica, MATLAB
- **Tools and Software** – LaTeX, MS Office, Linux, Origin, GNU plot, VESTA, Inkscape

LANGUAGES

○ Bengali	Native (Speaking, Reading, Writing)
○ English	Proficient (Speaking, Reading, Writing)
○ Hindi	Speaking

WORK / INTERNSHIP EXPERIENCE

- **Teaching Assistant (TA)** IIT Madras, Chennai
○ Teaching Assistant of multiple courses **Classical Mechanics, Thermodynamics, Statistical Mechanics, Electro Dynamics** for UG students (B-Tech and BS) Jul 2018 – Jul 2023
○ Teaching Assistant of **Superconductivity** course for PG students (MSc and MS)
○ Advised and guided **first-year B-Tech** students in the **UG Lab course**.
- **Guest Lecturer** in the Department of Physics. Raiganj University, WB
○ Taught **Quantum statistics** and **Digital electronics** to the **2nd year and 3rd UG students** Mar 2017 – May 2017
○ Advised and guided **3rd year UG** students in **Electronics practical classes**

SCHOLASTIC ACHIEVEMENTS / AWARDS / CERTIFICATIONS

- Awarded the **Institute Research Award** by KR-IR (Keshav Ranganath – Institute Research) committee of IIT Madras in recognition for the contribution to research in theoretical condensed matter physics in April 2024.
- Awarded **one of the top five best poster awards** among 54 candidates at the **CCMP-23 national conference** at PRL Ahmedabad in Jan, 2023.
- Secured an All India Rank **55** in the **Lectureship (LS)** category in **CSIR-UGC NET, June 2018**.

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- Secured an All India Rank **257** in Physics in **GATE 2018** with **GATE SCORE 614**.
 - Awarded **DST-INSPIRE scholarship** in **2012** for securing a position in the **top 10%** of the Higher Secondary examination (WBCHSE), 2012.

RESEARCH EXPERIENCE & PUBLICATIONS

- **Senior Research Fellow (SRF)** Department of Physics, IIT Madras, Chennai
 - **Supervisor:** Dr Shantanu Mukherjee
 - July 2018 – September 2024
 - **Subject of Research:** Theoretical Condensed Matter Physics
 - **Dissertation Title:** Unravelling exotic topological phases in 2D materials
- **Research Gate Profile:** <https://www.researchgate.net/profile/Anirban-Das-2/publications>
- **Google Scholar Profile:** <https://scholar.google.com/citations?user=Yry63AQAAAAAJ&hl=en>
- **Key Publications:**
 1. "Role of interface hybridization on induced superconductivity in 1T'-WTe₂ and 2H-NbSe₂ heterostructures"
Authors: Anirban Das, Bent Weber, Shantanu Mukherjee
Journal: Physical Review B Aug 2023
DOI: <http://dx.doi.org/10.1103/PhysRevB.108.075410>
 2. "Multi-band superconductivity in strongly hybridized 1T'-WTe₂/NbSe₂ heterostructures"
Authors: Wei Tao, Zheng Jue Tong, Anirban Das, Duc-Quan Ho, Yudai Sato, Masahiro Haze, Junxiang Jia, K. E. Johnson Goh, BaoKai Wang, Hsin Lin, Arun Bansil, Shantanu Mukherjee, Yukio Hasegawa, and Bent Weber
Journal: Physical Review B Mar 2022
DOI: <https://doi.org/10.1103/PhysRevB.105.094512>
 3. "Tuning the Many-body Interactions in a Helical Luttinger Liquid."
Authors: Junxiang Jia, Elizabeth Marcellina, Anirban Das, Michael S. Lodge, BaoKai Wang, Duc Quan Ho, Riddhi Biswas, Tuan Anh Pham, Wei Tao, Cheng-Yi Huang, Hsin Lin, Arun Bansil, Shantanu Mukherjee and Bent Weber
Journal: Nature Communications Oct 2022
DOI: <https://www.nature.com/articles/s41467-022-33676-0>
 4. "A gate-tunable ambipolar quantum phase transition in a topological excitonic insulator",
Authors: Yande Que, Yang-Hao Chan, Junxiang Jia, Anirban Das, Zhengjue Tong, Yu-Tzu Chang, Zhenhao Cui, Amit Kumar, Gagandeep Singh, Shantanu Mukherjee, Hsin Lin, and Bent Weber
Journal: Advanced Materials Nov 2023
DOI: <https://doi.org/10.1002/adma.202309356>
 5. "Signatures of orbital selective Mott state in doped Sr₃Ru₂O₇",
Authors: Buddhadeb Debnath, Anirban Das, Priyo Adhikary, Shantanu Mukherjee
Journal: Physical Review Materials Mar 2023
DOI: <https://doi.org/10.1103/PhysRevMaterials.7.035001>
 6. "Non-trivial impurity and field effects in topological Kondo insulator SmB₆",
Authors: Sayak Guha Roy, Anirban Das, Shantanu Mukherjee
Journal: Materials Today Proceedings Jan 2022
DOI: <https://doi.org/10.1016/j.matpr.2022.01.193>
 7. "Interlayer hybridization in a van der Waals quantum spin-Hall insulator/superconductor heterostructure.",
Authors: Fabio Bussolotti, Hiroyo Kawai, Ivan Verzhbitskiy, Wei Tao, Duc-Quan Ho, Anirban Das, Junxiang Jia, Shantanu Mukherjee, Bent Weber, and Kuan Eng Johnson Goh
Journal: AIP Advances Mar 2023
DOI: <https://doi.org/10.1063/5.0130393>