

# PIYUSH CHHALLARE

pchhalla@purdue.edu | West Lafayette, IN | chhallarepiyush27.com

Physics undergraduate at Purdue with hands-on experience in experimental condensed matter research, including crystal growth and electronic characterization. Strong interest in semiconductor device physics and nanoelectronics, with a focus on understanding and innovating next-generation transistor architectures. Eager to apply fundamental physics insight to device-level challenges and contribute to research bridging materials and electronics.

## EDUCATION

**Purdue University, College of Science**

**West Lafayette, IN**

*Bachelor of Science, Physics*

**May 2026**

Quantum Information Science and Technology (QIST) Certificate

**Relevant Coursework:** Semiconductor Physics, Solid State Physics, Quantum Physics, Electronics, Optical Physics, Plasma Physics

## SKILLS

- **Fabrication Tools & Process:** Photolithography, Thin Film Deposition (CVD, ALD, MBE, PECVD), Dry Etching (RIE, ICP), Diffusion, Oxidation, Ion Implantation, Semiconductor Device Physics, Device Fabrication, Process Optimization, Design of Experiments (DOE), Statistical Process Control (SPC), Plasma-Surface Interactions
- **Characterization:** Material and Device Characterization (MPMS, PPMS), Electrical Measurements, Thin Film Characterization, Hall Measurements, SEM, TEM, AFM, XRD, XRF, Experimental Data Validation & Analysis
- **Hardware Engineering:** Circuit Analysis & Design, PCB Layout, Oscilloscope Measurements, Signal Integrity Concepts & Debugging, Digital Logic & Design, Computer Architecture, Device Engineering & Electrical Testing, VLSI, Logic Analyzer
- **Software & Programming:** Python, C++, R, Circuit Simulations, TCAD, Monte Carlo Simulations, Data Analysis, Performance Analysis, Statistical Modelling, GitHub, VS Code, Jupyter Notebook, Origin, MS-Office, Large Dataset Processing

## PROFESSIONAL EXPERIENCE

**Purdue University (Dr Arnab Banerjee)**

**West Lafayette, IN**

*Undergraduate Physics Researcher*

**Aug 2024-Present**

- Synthesized 20+ quantum materials (>90% disorder-free), for cryogenic quantum materials studies.
- Performed electrical and material characterization to evaluate device behavior, transport properties, and performance metrics.
- Designed data analysis pipelines to automate processing, improve efficiency, and enable scalable performance evaluation.
- Executed cleanroom fabrication workflows including photolithography, thin-film deposition, and plasma etching, ensuring process stability, parameter control, and repeatability across runs enabling fabrication of measurement-ready devices for electrical characterization.
- Performed detailed inspection and characterization of fabricated samples to identify defects, evaluate process outcomes, and support process optimization.

**Purdue University (Dr Arnab Banerjee)**

**West Lafayette, IN**

*Summer Undergraduate Research Fellow*

**May 2024-Jul 2024**

- Led the synthesis of ytterbium-based delafossite compounds and studied their magnetic properties, establishing structure-property relationships in low-dimensional systems.
- Applied crystallographic and compositional characterization techniques (XRD, XRF, Rietveld refinement) to evaluate phase formation and material consistency.
- Performed low-temperature magnetic and transport measurements (MPMS/PPMS) to extract physical parameters and analyze quantum phases and field-dependent behavior using Microsoft Excel to ensure data quality, reproducibility and process reliability.
- Analyzed performance trends across varying experimental conditions to understand system-level behavior and efficiency trade-offs.

**Purdue University (Dr Andreas Jung)**

**West Lafayette, IN**

*Undergraduate Datamine Researcher*

**Aug 2023-Dec 2023**

- Modeled top quark decay processes using CMS datasets through Python-based Monte Carlo simulation frameworks, supporting high-energy physics analysis workflows.
- Simulated and analyzed system performance trends under varying workloads using Python, focusing on efficiency and data-driven optimization.
- Implemented data selection pipelines to segregate W and Z boson events, enabling structured evaluation of particle decay channels.
- Investigated anomalies in experimental data and performed root-cause analysis to identify sources of variability and improve measurement reliability.

## CERTIFICATES

- **Fundamentals of VLSI Design** (L&T EduTech) **Feb 2026**
- **Semiconductor Characterization: MOSFETS, Diodes, Optical & X-ray, Electron & Ion beam** (ASU) **Jan 2026**
- **Semiconductor Characterization 101** (Purdue University & Intel) **Nov 2025**