Dilip Rana

PhD Student and Research Assistant at Rensselaer Polytechnic Institute

Email: ranad@rpi.edu | LinkedIn: linkedin.com/in/dilip-rana | Personal Website: diliprana.github.io

---

About me

I am pursuing a PhD in the field of Power Electronics (supervised by Prof. Zheyu Zhang), researching on gallium nitride (GaN) based power converters operable down to cryogenic temperatures. In addition, my research explores the reliability of GaN devices when operating inside the converter at these temperatures.

Education

PhD in Electrical and Electronics Engineering (Jan 2024 – Expected graduation in Dec 2028)

Rensselaer Polytechnic Institute, School of Engineering, Troy, New York, US
Term Average (until now): 3.86

Bachelor's Degree in Electrical Engineering (Jun 2017 – Nov 2022)

Tribhuvan University, Institute of Engineering, Pulchowk Campus, Lalitpur, Nepal
Term Average: 74.99%

Technical Skills

- ➔ Hardware: Design, assembly and testing of circuits such as power converters, reliability platforms
- ➔ Tools: Curve tracers, oscilloscopes, cryocooler setups
- ➔ Software: MATLAB, PLECS, LTspice, Altium Designer, COMSOL
- ➔ Programming: DSPs programming, system automation, instrument control and remote interfacing

PhD Research Experience

Cryogenic Operable Power Converter Design (Jun 2026 - Present)

- ➔ Designed 500W GaN based buck-boost converter to convert voltage from solar panel to fixed DC bus
- ➔ Used radiation hardened GaN HEMTs, operated at 500kHz
- ➔ Experimentally validated cryogenic operation and repeated cold-start operation capability with $\eta > 95\%$

GaN Reliability Platforms Design and Tests down to Cryogenic Temperatures (Jan 2024 – Jun 2026)

- ➔ Developed reliability platforms for: thermal cycling, gate stress (static and dynamic) and drain stress
- ➔ Full automation with MATLAB controlling cryocooler, oscilloscope, data acquisition unit, DSP controller
- ➔ Lifetime modelling and supplementary tests to understand failure mechanisms

Static Characterizations of GaN HEMTs down to Cryogenic Temperatures (Aug 2024 - Jan 2025)

- ➔ Characterized multiple samples of different commercial GaN HEMTs at temperatures 50 – 400 K
- ➔ Extracted performance and physical parameters to understand observed trend

Selected Publications

- ➔ D. Rana, P. Khadka, T. Qiu and Z. Zhang, "Reliability Characterization of GaN HEMTs under Extreme Temperature Cycling for Space Power Applications," 2026 IEEE Applied Power Electronics Conference and Exposition (APEC), San Antonio, TX, USA, 2026 open↗
- ➔ D. Rana, T. Qiu and Z. Zhang, "A Universal Reliability Platform for GaN HEMTs with Realistic Stress Emulation, Online Monitoring, and In-Circuit Characterization," 2025 IEEE Energy Conversion Conference Congress and Exposition (ECCE), Philadelphia, PA, USA, 2025 open↗
- ➔ P. Khadka, D. Rana, T. Qiu and Z. Zhang, "Cryogenic Testing Platform for Power GaN HEMTs - Part I: DC Static Characterization," in IEEE Transactions on Power Electronics, 2026 open↗

Experience

Embedded Hardware Engineer: Yatri Motorcycles (Dec 2022 – Dec 2023)

- ➔ Designed and updated embedded system boards of electric vehicles and charging stations, such as vehicle control units, communication boards and display control boards
- ➔ Worked on implementing power quality improvement and noise immunity strategies

Embedded Hardware Engineer Intern: Yatri Motorcycles (Sep 2022 - Nov 2022)

- ➔ Completed provided 3-month internship design task, that included embedded kit design, noise shielding, intelligent input sense system, and noise filters

Selected Engineering Projects

Undergrad final Year Project: Inductive Power Transfer: Electric Scooter based Design (Jun 2021 - Apr 2022)

- ➔ Optimized of coil design within scooter constraints using COMSOL, with and without shielding
- ➔ Developed hardware platform without shielding for power transfer of 150W at 20 cm distance and achieved power transfer efficiency up to 90%

Undergrad Project: Induction Heater (Nov 2021 - Dec 2021)

- ➔ Designed custom oscillator with LC resonant circuit to achieve ZVS operation
- ➔ Achieved power transfer of 36W with full load efficiency of 70%

Undergrad Project: Handheld LCR Meter (Oct 2020 - Nov 2021)

- ➔ Portable resonant sine wave source to measure impedance, solely using slow ADC voltage measurements
- ➔ LCD display interfaced with AVR to calculate and display the component values

Participations and Awards

Best Poster Presentation Award – PEASA (Jul 2026)

- ➔ For presentation of ‘Blocking State Reliability Characterization of GaN HEMTs for Lunar Power Applications’

Efficiency Theme Hackathon Winner Team: Energy Hackathon 4.0 - LOCUS (Dec 2021)

- ➔ For detailed analysis and presentation of ‘Transition from LPG to Induction Cooker in Nepal’

Overall and Health Theme Hackathon Winner Team: Quantum Hackathon - NxtGen (Sep 2020)

- ➔ For submission of a python-based face mask detection application named ‘Mask’