

# NIPUN MISHRA

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## PROFESSIONAL SUMMARY

Results-oriented Electrical & Electronics Engineering graduate (B.Tech, 2025) with specialist R&D experience in high-voltage locomotive transformer design, IEC 61869-compliant instrument transformer testing, and Hall-effect current transducer validation. Executed 8+ routine and type tests on 22 kV traction transformers achieving zero non-conformances. Hands-on exposure to full-chain MEMU locomotive systems — traction motors, auxiliary converters, and regenerative braking — through internship at Northern Railways. Niche fresher-level differentiator: compliance-documented testing experience in an active IEC-certified manufacturing environment. Proficient in MATLAB/Simulink, LTspice, and Python. Targeting roles in power systems, EV technology, or electrical design engineering.

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## TECHNICAL SKILLS

**Software & Tools:** MATLAB/Simulink, LTspice, Altium Designer, Python, C++

**Power Systems:** Power Electronics, Electrical Machines, Transformer Design, Circuit Simulation

**Testing & Standards:** IEC 61869, High-Voltage Testing, Impulse Testing, Partial Discharge Analysis, Insulation Resistance

**Railway / EV Systems:** Traction Motor Analysis, MEMU Systems, Regenerative Braking, EV Modelling

**Core Competencies:** BOM Review, Technical Documentation, Compliance Testing, Thermal Performance Analysis

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## PROFESSIONAL EXPERIENCE

**Graduate Engineer Trainee** | Arihant Electricals – Greater Noida, UP

*Jun 2025 – Present*

### 22 kV Locomotive Instrument Transformer R&D

- Contributed to R&D of a 22 kV primary voltage transformer for 3-phase electric locomotives per IEC 61869 and CLW specifications.
- Executed 8+ routine and type tests — insulation resistance, winding resistance, polarity verification, terminal marking, and accuracy testing — achieving zero non-conformances on sign-off.
- Conducted high-voltage impulse testing and partial discharge analysis to validate dielectric performance and insulation integrity under rated load.
- Reviewed and validated BOM covering insulation systems, epoxy resin encapsulation, HV bushings, and copper windings.
- Evaluated thermal performance and temperature rise data; documented findings in formal IEC-compliant test reports.

### Hall-Effect Current Transducer for Electric Locomotives

- Developed and validated Hall-effect current transducers for locomotive traction systems, covering a measurement range of 0 to  $\pm 1,500$  A.
- Verified galvanic isolation rated at 6 kVAC between primary and secondary circuits, ensuring compliance with high-voltage railway safety requirements.
- Confirmed sensor accuracy ( $\pm 0.3\%$ ) and linearity ( $\pm 0.1\%$ ); designed and validated a 1:5,000 signal conversion ratio for accurate high-current measurement in traction control systems.

### Primary Current Transformer (22 kV Traction Systems)

- Supported R&D and testing of primary current transformers for protection and monitoring in 22 kV locomotive traction systems.
- Performed calibration, functional testing, and performance validation; authored technical documentation and compliance records per IEC 61869.

**Electrical Engineering Intern** | MEMU Car Shed, Northern Railways – Kanpur, UP *Jul 2024 – Aug 2024*

- Studied operation and maintenance of MEMU locomotive systems including traction motors, auxiliary converters, regenerative braking, and traction transformers.

- Observed preventive maintenance and fault diagnostics for high-power electrical equipment; analysed control panel systems and safety mechanisms including VCD, Fire Detection, and RTIS.
- Developed working knowledge of induction motor traction principles, speed-torque characteristics, and synchronous speed calculations.
- Assisted engineers in inspection and troubleshooting of speed sensors, temperature sensors, and PCB control cards in locomotive control systems.

## PROJECTS

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### 1. Design & Simulation of LLC Resonant Converter | Tools: LTspice

- Designed a 200 W isolated LLC resonant DC-DC converter (300–400 V DC input, 24 V DC output) using ICE2HS01G controller in LTspice.
- Calculated and optimised resonant tank parameters ( $L_r$ ,  $L_m$ ,  $C_r$ ) for stable operation at ~100 kHz resonant frequency.
- Achieved Zero Voltage Switching (ZVS) across MOSFETs, reducing estimated switching losses by 20–30%.
- Attained ~92–95% simulated efficiency under nominal load; verified voltage regulation within  $\pm 3\%$  across 20–100% load range.
- Analysed switching waveforms, resonant current, and transformer magnetising current via LTspice transient simulations.

### 2. Electric Vehicle Modelling & Simulation | Tools: MATLAB/Simulink

- Built a comprehensive MATLAB/Simulink model of an EV system integrating battery pack, electric motor, power electronics, and vehicle dynamics.
- Simulated performance under varied driving conditions; evaluated battery state-of-charge behaviour, motor efficiency curves, and power consumption profiles.
- Validated model accuracy against analytical benchmarks; results provided quantifiable insights into energy efficiency optimisation for EV drivetrain design.

## EDUCATION

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### B.Tech – Electrical & Electronics Engineering

*Graduated Jun 2025*

ABES Engineering College, Dr. A.P.J. Abdul Kalam Technical University, Lucknow | CGPA: 6.3/10