

# DILEEP KUMAR, Ph.D.

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## Professional Summary

- **Experienced Control Systems Engineer** with expertise in control systems analysis and design, power electronics, motor control, vehicle dynamics, embedded systems, electric vehicle architecture, requirements, integration and validation, and modeling & simulation using MATLAB/Simulink.
- Proven abilities in **project management, cross-functional collaboration, and problem-solving**, demonstrated through successful development of electric powertrain software for Mahindra Vehicles.
- **Strong analytical and troubleshooting skills** to identify and resolve electrical system issues and software-related issues.

## Education

<b>Ph.D. in Electrical Engineering (Control and Automation)</b>	<b>[07/2015 – 11/2023]</b>
Indian Institute of Technology Kanpur, India.	CGPA 8.00/10.0
<b>M.Tech in Electrical Engineering (Control Systems)</b>	<b>[08/2010 – 05/2012]</b>
National Institute of Technology Patna, India.	CGPA 8.25/10.0
<b>B.Tech in Electronics and Communication Engineering</b>	<b>[08/2006 – 06/2010]</b>
Shri Mata Vaishno Devi University, Jammu & Kashmir, India.	CGPA 7.62/10.0

## Technical skills

**Control Systems:** PID-tuning, Loop Shaping, Disturbance Rejection, ADRC, DC and BLDC Motor Control.

**Power Electronics:** Motor Controller (H-Bridge and Inverter), Power Converters, Solar-MPPT.

**Electric Vehicles:** Vehicle Dynamics, Tire Dynamics, Autonomous Vehicles, Energy Efficiency, In-Wheel Motors, Electric Powertrain Hardware/Software, System Engineering, Root-Cause Analysis.

**Embedded Systems & HW-SW Co-Design:** Expertise with STM32, dsPIC, ESP32, Raspberry Pi.

**Serial Protocols:** USART, CAN, SPI, I<sup>2</sup>C.

**Software & Simulation:** MATLAB, Simulink, Octave, C/C++, Python, CANoe, Bash, Latex.

## Industrial Experience [12/2023 – to date]

### Lead Engineer – Electric Powertrain Software Development M&M

- Leading collaboration with cross-functional teams (systems and software engineering) to ensure seamless and robust development of electric powertrain software for Mahindra Electric Vehicles.

## Teaching Experience [08/2012 – 07/2015]

### Assistant Professor – Electrical Engineering NIMS University, Jaipur

- Subjects Taught: Classical Control, Modern Control, Power Electronics, Embedded Systems, MATLAB.

## Experience Gained During Education

### Control Systems: Gained during Ph.D

- Designed and implemented high-gain control and disturbance observer-based control (DOBC) for speed-tracking of PMDC and In-Wheel BLDC motors.
- Proposed active-disturbance rejection control (ADRC) and DOBC strategies for disturbance rejection in in-wheel motor drive systems to be employed in an electric vehicle.
- Physics-based modeling of the motors, tires, and vehicle body for the development of path-tracking control in an overactuated electric vehicle.

**Power Electronics:****Gained during Ph.D & M.Tech**

- Developed expertise in power electronics, electric drives, and various converter topologies (DC-DC, AC-DC, and DC-AC).
- Designed and implemented a 48V inverter for a 250W BLDC motor using the **DRV8320S** gate driver.
- Developed and tested a maximum power point tracking (MPPT) system for a 100W solar panel driving a DC motor load.

**MATLAB & Simulink:****Gained during Ph.D & M.Tech**

- Developed a MATLAB & Simulink model for autonomous path-tracking control of a 4WIS4WID electric vehicle as part of Ph.D. research.
- Developed a MATLAB & Simulink model of an inverter with AC and DC loads for a smart battery-backup system, incorporating an MPPT algorithm during M.Tech.

**Embedded Systems:****Gained during Ph.D, M.Tech & B.Tech**

- Utilized microcontrollers such as 8051, Arduino, ESP32, STM32, dsPIC30F4012, and Raspberry Pi (PICO & 4B), in hardware projects involving USART, CAN, SPI, motor control, CNC machines, 3D printers, and graphical displays.

**Electric Vehicles:****Gained during Ph.D**

- Evaluated path-tracking control algorithms for a four-wheel independent steering and four-wheel independent drive (4WIS4WID) electric vehicle to optimize tire usage.
- Conducted in-depth analysis of vehicle, tire, and motor dynamics, with a focus on vehicle stability during Ph.D. research.
- Designed and implemented speed-tracking and torque-tracking motor control systems for a 4WIS4WID electric vehicle.
- Estimated tank-to-wheels (TTW) energy efficiency across vehicle classes (bikes, microcars, mid-size cars, full-size cars, and buses), contributing to a peer-reviewed publication.
- Contributed to the development of a full-size autonomous 4WIS4WID electric vehicle as part of a multidisciplinary team.

**Scientific Events Attended/Organized**

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- Delivered an oral presentation at the Institute Research Symposium (IRS'23), IIT Kanpur, 2023.
  - Served as an organizing student member for the Indian Control Conference (ICC), IIT Kanpur, 2018.
  - Organized a short-term QIP course on "Frequency Domain Control System Design & Experiments," IIT Kanpur, 2017.

**Publications**

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1. **Dileep Kumar**, Vasu Jain, and Ramprasad Potluri, "Energy Efficiency of Battery Electric Vehicles with In-Wheel Motors," *SAE International Journal of Sustainable Transportation, Energy, Environment & Policy*, 4(13-04-01-0002), 2022.
  2. **Dileep Kumar** and Ramprasad Potluri, "On Optimal Tire Usage in the Path-Tracking Control of 4WIS4WID Electric Vehicles," *under review*.
  3. **Dileep Kumar**, Ashiwani Kumar, Neha Gupta, and Ramesh Kumar, "Control and Simulation of Smart Backup System for Photovoltaic Array in MATLAB/Simulink," in *Proceedings of the IEEE International Conference on Advanced Research in Engineering and Technology (ICARET-2013)*, Vijayawada, Feb 2013.