

Curriculum Vitae - Apurv Kumar Yadav

Currently working as an Assistant Professor in the Department of Electrical Engineering (EE), Indian Institute of Technology, Roorkee, INDIA.

Website

<http://apurv.ee.faculty.iitr.ac.in/index.html>

Research Areas

- Motor drives with Wide-bandgap (WBG) devices
- Induction motor drives
- Multilevel inverters
- Static Wireless Power Transfer
- Dynamic Wireless Power Transfer
- Wide-bandgap enabled power electronics converters

Professional Experience

- **Assistant Professor**, Dept. of Electrical Engineering, Indian Institute of Technology, Roorkee, Uttarakhand, INDIA
May 2021– till date
- **Post-doctoral Associate**, Dept. of Electrical and Computer Engineering, University of Maryland, College Park, Maryland, USA
Feb. 2019 – May 2021
- **Research Associate**, Dept. of Electronic Systems Engineering, Indian Institute of Science, Bangalore, India
Aug. 2018 – Jan.2019
- **Deputy Manager**, Product Development, Ashok Leyland Technical Centre, Vellivoyalchavadi, Chennai
July2011 – July 2013

Honours and Awards

- **Associate Editor**, IEEE Transactions on Transportation Electrification (Impact Factor: 5.123), effective 26th September, 2021 onwards.
- 4 times awarded with Merit scholarship from VIT University for the best academic performance in the academic year 2007-08, 2008-09, 2009-10, 2010-11.
- Awarded with High Distinction in Australian National Chemistry Quiz-2005.
- Secured position in the Top 10% from a center in the part A of National Standard Examination in Physics 2006-07, conducted by Indian Association of Physics Teachers.

Educational Qualifications

| Exam/Degree | Board/University | Period | | Specialization | Score |
|----------------------------------|---|-----------|-----------|---|---------------|
| | | From | To | | |
| Ph.D. | Indian Institute of Science, Bangalore, INDIA | Jul. 2015 | Nov. 2018 | Multilevel Inverters, Induction Motor Drive | 6.8 out of 8 |
| M.Tech with Distinction (Master) | Indian Institute of Science, Bangalore, INDIA | 2013 | 2015 | Electronic Design and Technology | 7.2 out of 8 |
| B.Tech (Bachelor) | Vellore Institute of Technology, University, Vellore, INDIA | 2007 | 2011 | Electrical and Electronics Engineering | 9.1 out of 10 |

Research Publications

Transactions

- T9. Akshay Singh, **Apurv Kumar Yadav** and Alireza Khaligh, “Steady-state modeling of a dual-active bridge AC-DC converter considering circuit non-idealities and intra-cycle transient effects,” Early access, in *IEEE Transactions on Power Electronics*, April.2021.
- T8. Rakesh R, Krishnaraj R, **Apurv Kumar Yadav**, K. Gopakumar , Loganathan Umanand, and Kouki Matsuse, “A switched capacitive filter based harmonic elimination technique by generating a 30-sided voltage space vector structure for IM drives, ” in *IEEE Transactions on Power Electronics*, Volume:35 , Issue: 3 , March.2020 . doi: [10.1109/TPEL.2019.2930280](https://doi.org/10.1109/TPEL.2019.2930280).
- T7. Mriganka Ghosh mazumdar, **Apurv Kumar Yadav**, K. Gopakumar , Krishnaraj R, Loganathan Umanand, and Leopoldo G Franquelo, “A 5-level inverter scheme using single DC link with reduced number of floating capacitors and switches for Open-end IM drives, ” in *IEEE Transactions on Industrial Electronics*, Volume:67 , Issue:2 , Feb.2020 .doi: [10.1109/TIE.2019.2898594](https://doi.org/10.1109/TIE.2019.2898594).
- T6. Mohammed Imithias, Krishnaraj R, **Apurv Kumar Yadav**, K. Gopakumar , Loganathan Umanand, and Carlo Cecati, “Minimization of switched capacitor voltage ripple in a multilevel dodecagonal voltage space vector structures for drives , ” in *IEEE Transactions on Industrial Electronics*, Volume: 67 , Issue: 1 , Jan. 2020 . doi: [10.1109/TIE.2019.2893825](https://doi.org/10.1109/TIE.2019.2893825).
- T5. Krishnaraj R, K. Gopakumar, **Apurv Kumar Yadav**, Loganathan Umanand, Mariusz Malinowski and Wojciech Jarzyna, “A Twelve concentric multilevel twenty-four sided polygonal voltage space vector structure for variable speed drives , ” in *IEEE Transactions on Power Electronics*, Volume: 34 , Issue: 10 , Oct. 2019 . doi: [10.1109/TPEL.2019.2892329](https://doi.org/10.1109/TPEL.2019.2892329).
- T4. **Apurv Kumar Yadav**, K. Gopakumar , Krishnaraj R, Loganathan Umanand, Subhashish Bhattacharya and Wojciech Jarzyna , “A hybrid seven-level inverter using low voltage devices and operation with single DC-link, ” in *IEEE Transactions on Power Electronics*, Volume:34 , Issue:10 , Oct. 2019 . doi: [10.1109/TPEL.2018.2890371](https://doi.org/10.1109/TPEL.2018.2890371).

- T3. **Apurv Kumar Yadav**, K. Gopakumar, Krishnaraj R, Loganathan Umanand, Kouki Matsuse and Hisao Kubota “Instantaneous Balancing of Neutral Point Voltages for Stacked DC-link Capacitors of Multilevel Inverter for Dual Inverter fed Induction Motor Drives,” in *IEEE Transactions on Power Electronics*, Volume:34 , Issue:3 , March 2019.doi: 10.1109/TPEL.2018.2837680.
- T2. Krishnaraj R, K. Gopakumar, Mathews Bobby, **Apurv Kumar Yadav**, Leopoldo G Franquelo, and Sheldon S. Williamson, “Multilevel 24-sided polygonal voltage space vector structure generation for an IM drive using a single DC source , ” in *IEEE Transactions on Industrial Electronics*, Volume: 66 , Issue: 2 , Feb. 2019 . doi: [10.1109/TIE.2018.2831189](https://doi.org/10.1109/TIE.2018.2831189).
- T1. **Apurv Kumar Yadav**, M. Bobby, Sumit Pramanick, K. Gopakumar, Loganathan Umanand and Leopoldo G Franquelo , “Generation of High Resolution 12-Sided Voltage Space Vector Structure Using Low Voltage Stacked and Cascaded Basic Inverter Cells, ” in *IEEE Transactions on Power Electronics*, Volume:33 , Issue:9 , Sept. 2018.doi: 10.1109/TPEL.2017.2764541.

International Conferences

- C15. Sukumar Das, and Apurv Kumar Yadav, “A LCC-Series Based Multiphase Inductive Power Transfer System Employing Duty Ratio Control,” is accepted for presentation in IEEE Sustainable Energy and Future Electric Transportation Conference (SeFeT), 2023 to be held in Aug.2022 at SOA Bhubhaneshwar, INDIA.
- C14. S. Dutta, S. Negi, Apurv Kumar Yadav and A. Tripathi, “A New Carrier Based PWM for a 3-Phase 5-Level Neutral Point Clamped Inverter,” is accepted for presentation in IEEE Sustainable Energy and Future Electric Transportation Conference (SeFeT), 2023 to be held in Aug.2022 at SOA Bhubhaneshwar, INDIA.
- C13. D. Zakzewski, R. Resalayyan, A. K. Yadav and A. Khaligh, "Analytical Model for Device Currents in 5-Level Active Neutral Point Clamped Converter," 2023 IEEE International Conference on Electrical Systems for Aircraft, Railway, Ship Propulsion and Road Vehicles & International Transportation Electrification Conference (ESARS-ITEC), Venice, Italy, 2023, pp. 1-6, doi: 10.1109/ESARS-ITEC57127.2023.10114866.
- C12. Ashish Kumar, and **Apurv Kumar Yadav**, “A New Switching Scheme for H7 Current Source Inverter with Integrated Soft Switching Transitions”, is accepted for presentation in IEEE Power Electronics, Drives and Energy Systems (PEDES), 2022 to be held in Dec.2022 at MNIT Jaipur, INDIA.
- C11. Chanaka Singhabahu, Akshay Singh, Arafat Hasnain, **Apurv Kumar Yadav**, Jianfei Chen, and Alireza Khaligh, “Design and Optimization of Planar Magnetics for a Quadruple-Active-Bridge Converter,” is accepted for presentation in IEEE Industry Applications Society Annual Meeting, Detroit, Michigan, USA, Oct-2022.
- C10. Chayban Ghabech, **Apurv Kumar Yadav**, Chanaka Singhabahu, Reece Roehsler, and Alireza Khaligh, “Systematic Modelling and Design of Battery Pack for Formula Electric Vehicles,” accepted for presentation in WCX World Congress Experience 2021 - SAE International, Detroit, Michigan, USA. doi: <https://doi.org/10.4271/2021-01-0762>.

- C9. **Apurv Kumar Yadav**, Arun Sankar U and Alireza Khaligh, "A Three Stage Architecture for a High Voltage Step-Down Wireless Charging System", presented in IEEE Energy Conversion Congress & Expo-2020 (ECCE-2020), Detroit, Michigan, USA. doi: 10.1109/ECCE44975.2020.9235935.
- C8. Mriganka Ghosh Mazumdar, **Apurv Kumar Yadav**, K. Gopakumar , L. Umanand , Krishnaraj R, Leopoldo G Franquelo , "A 5-level inverter topology using a single DC-link with reduced switch count for Open-end Induction motor drives," presented in 2019 21st European Conference on Power Electronics and Applications (EPE'19 ECCE Europe). Doi: 10.23919/EPE.2019.8915527.
- C7. Rakesh R, **Apurv Kumar Yadav**, Krishnaraj R, K. Gopakumar , L. Umanand, "A 30-sided polygonal space vector structure with modular low voltage capacitor fed cascaded H bridge for IM drives," presented in 2019 IEEE 28th International Symposium on Industrial Electronics (ISIE), Vancouver, Canada. doi: 10.1109/ISIE.2019.8781446.
- C6. **Apurv Kumar Yadav**, K. Gopakumar, Krishna Raj R, L. Umanand, Subhashish Battacharya and Wojciech Jarzyna, "A hybrid seven level inverter topology formed by cascading T-type and active neutral point clamped inverter for induction motor drives", presented in *IECON 2018 – 44th Annual Conference of the IEEE Industrial Electronics Society*, Washington DC, USA, 2018. doi: 10.1109/IECON.2018.8591579.
- C5. R. Krishna Raj, K. Gopakumar, **Apurv Kumar Yadav**, L. Umanand , Mariusz Malinowski and Wojciech Jarzyna, "A thirteen level twenty-four sided polygonal voltage space vector structure for drives," presented in *IECON 2018 – 44th Annual Conference of the IEEE Industrial Electronics Society*, Washington DC, USA, 2018. doi: 10.1109/IECON.2018.8591564.
- C4. **Apurv Kumar Yadav**, K. Gopakumar, Krishna Raj R, L. Umanand, K. Matsuse, H. Kubota, "A Stacked 7-level Common Mode Voltage Eliminated Inverter Scheme with Single DC-link for Open-End Induction Motor Drive," presented in *PCIM Europe*, Nuremberg, Germany, 2018.
- C3. Mohammed Imthias, Krishna Raj R, **Apurv Kumar Yadav**, K. Gopakumar and Carlo Cecati , "Fast capacitor balancing scheme for low voltage cascaded H-bridges in multilevel dodecagonal space vector structure", presented in 2018 IEEE 27th International Symposium on Industrial Electronics (ISIE), Cairns, Australia.
- C2. R. Krishna Raj, K. Gopakumar, M. Bobby, **Apurv Kumar Yadav**, L. G. Franquelo and S. Williamson, "Six concentric multilevel twenty-four sided voltage space vector structure for IM drives," presented in *IECON 2017 - 43rd Annual Conference of the IEEE Industrial Electronics Society*, Beijing, China, 2017. doi: 10.1109/IECON.2017.8216366.
- C1. **Apurv Kumar Yadav**, M. Bobby, Sumit Pramanick, K. Gopakumar and Leopoldo G Franquelo , "Multilevel dodecagonal space vector generation using stacked inverter cells for IM drives", presented in 2017 IEEE 26th International Symposium on Industrial Electronics (ISIE), Edinburgh, UK. doi: 10.1109/ISIE2017.8001268.

Patents

- P1. Khaligh, Alireza, Akshay Singh, Apurv Kumar Yadav, Chanaka Singhabahu, and Jianfei Chen. "Multi-port power converters and power conversion systems, and methods for design and operation thereof." U.S. Patent Application 17/707,163, filed October 6, 2022 (Published but not granted).

Research Group

PhD

- Adarsh Dubey: Inductive power transfer systems
- Sukumar Das: Wireless chargers for EV batteries
- Ashish Kumar: WBG devices-based Motor Drive
- Shambhunath Dutta (PMRF): GaN based Integrated Motor Drives

Undergraduate Student

- Ashutosh Verma, Aditya Agrawal, Prateek Agrawal, and Tanisha Gupta, final year undergraduate students of Electrical Engineering department at Indian Institute of Technology, Roorkee, INDIA. Project title: "Design and analysis of 48V Rectifier system for telecom applications".
- Agrim Agarwal, Saksham Sinha, Suthar Nisarg Manishbhai, and Abhishek Saroniya, final year undergraduate students of Electrical Engineering department at Indian Institute of Technology, Roorkee, INDIA. Project title: "Design and Development of Contactless Charger for Electric Three-Wheelers".
- Rishab Jain, Anurag Srivastava, Punit Kumar, Lovish Balana, Akshat Jain, Ribhav Hans and Dharmendra Choudhary, third year undergraduate students of Electrical Engineering department at Indian Institute of Technology, Roorkee, INDIA. Project title: "Development of Cyber Resilient Features for EV Battery Chargers".
- Adarsh kumar singh, Hemant kumar meena, Anubhav Jangra, and Jatin Bansal, final year undergraduate students of Electrical Engineering department at Indian Institute of Technology, Roorkee, INDIA. Project title: "Design and development of generalized control board (PCB) using DSP based micro controller", Co-supervision with Prof. Anubrata Dey.

Intern

- Gursimran Singh, an undergraduate student of Electrical Engineering at Indian Institute of Technology, Kharagpur, INDIA. Work: "Design and Development of inductive power transfer system for charging EV batteries".
- Rishabh Yadav, Undergraduate student of Electrical Engineering at Delhi Technological University, New Delhi, INDIA. Work: "Impact of circuit parasitics on switching loss for WBG enabled power converters".

Courses Developed

- New core course on "Charging Infrastructure" for new proposed M.Tech Electric Vehicle Technology (EVT) program.
- New elective course on "Design of Wideband-gap devices based power converter" for M.Tech and senior UG students.

Teaching Experience

- Instructor for “Electric Drives (EEN-302)” in Spring-2022 (Jan to May 2022) at the Indian Institute of Technology, Roorkee, INDIA.
- Instructor for “Engineering Analysis and Design (EEN-291)” in Autumn-2021 (Aug to Nov. 2021) at the Indian Institute of Technology, Roorkee, INDIA.
- Instructor for “Advance Design Lab on Electric Cars (ENEE498K)” in spring-2020 (Jan to May 2020) at the University of Maryland, College Park, USA.
- Instructor for “Electric Car Design (ENEE408K)” in fall-2020 (Aug. to Dec. 2020) at the University of Maryland, College Park, USA.
- Co- Instructor for “Advance Design Lab on Electric Cars (ENEE498K)” in spring-2021 (Jan to May 2021) at the University of Maryland, College Park, USA.

Highlights of works at University of Maryland, College Park as a Post-Doctoral Associate

- Development of a SiC based 900W, 24V (output) wireless charging scheme.
- Development of an experimental set-up to test the wireless power transfer at different misalignment conditions.
- A 5kW GaN based single stage AC-DC regulated transformer rectifier unit for aircrafts application.
- Assisted in setting up the lab for design/development of an electric racing car.
- Course instructor for “Topics in Electrical Engineering; Advance Design Lab on Electric Cars (ENEE498K)” in spring-2020, 21 (Jan to May 2020, 21) and “Electric Car Design (ENEE408K)” in fall-2020 (Aug. to Dec. 2020) at the University of Maryland, College Park, USA.
- Mentoring undergraduate students to build a FSAE electric racing car and one of the major challenges is to design an in-house 400V, 7kWh lithium ion battery pack.

Highlights of Ph.D. research works done at Indian Institute of Science (IISc), Bangalore

- Instantaneous balancing of neutral point voltage in stacked multilevel inverter, using symmetrical 6-phase Induction motor.
- Generation of zero common mode voltage space vector structure with stacked multilevel inverter for open-end induction machine.
- A new 7-level hybrid topology using low voltage devices and its operation with single DC-link is proposed.
- Generation of highly dense 12-sided space vector structure using stacking and cascading of basic inverter cells

M.Tech project done at Indian Institute of Science (IISc), Bangalore

- Developed a single-phase high frequency transformer isolated 250W micro-inverter. The topology consists of a single-phase inverter with single stage power conversion.

B.Tech project done at Vellore Institute of Technology, Vellore

- Design & Implementation of ULTRACAPACITOR based power supply system for two-wheeler vehicles. This project is completed at the “Chheda Electrical and Electronics Pvt. Ltd., Pune”. The project also dealt with the testing of the system developed in the real time environment.

Other Activities

- Member IEEE
- Regular reviewer for TPEL, TIE, TTE, JSTPE manuscripts.
- Teaching Assistant for the NPTEL Online Certification course “Design of Photovoltaic Systems” during Jul-Oct 2018 session.
- Assisted in designing course content for “Topics in Electrical Engineering; Advance Design Lab on Electric Cars (ENEE498K)” during spring-2019 at University of Maryland, College Park, USA.

Address/ Contact/Other information

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