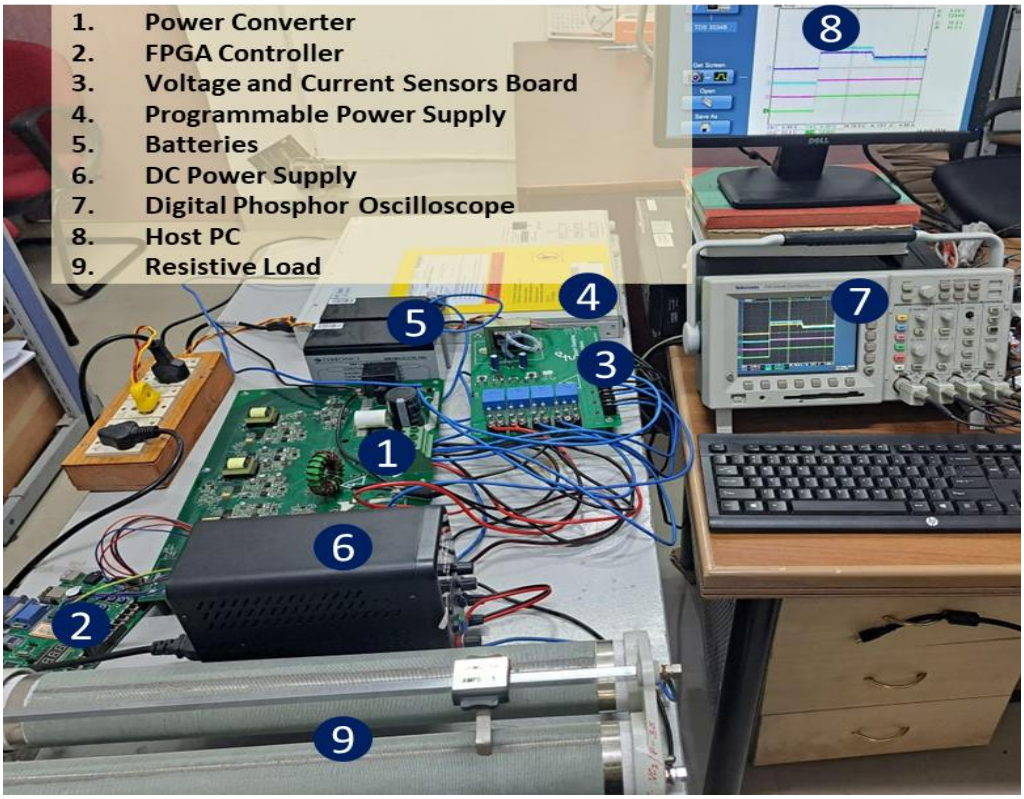
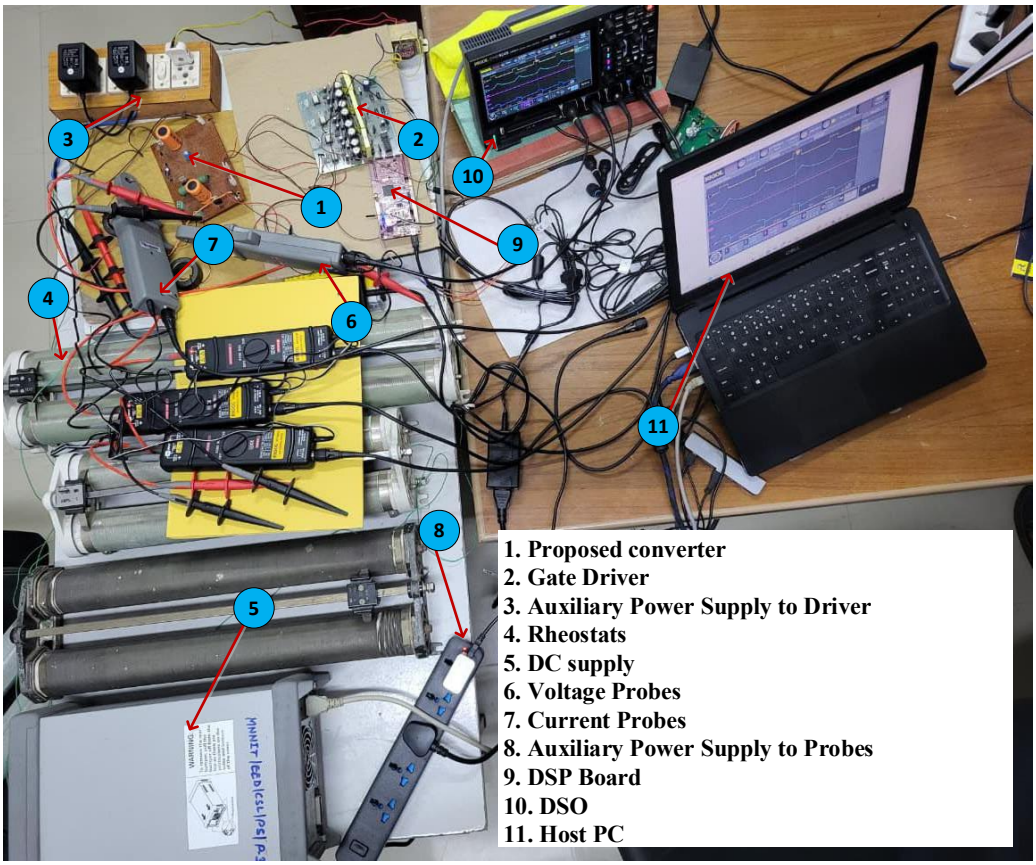
Samples of Test Setup Developed for PhD/M.Tech Students at MNNIT

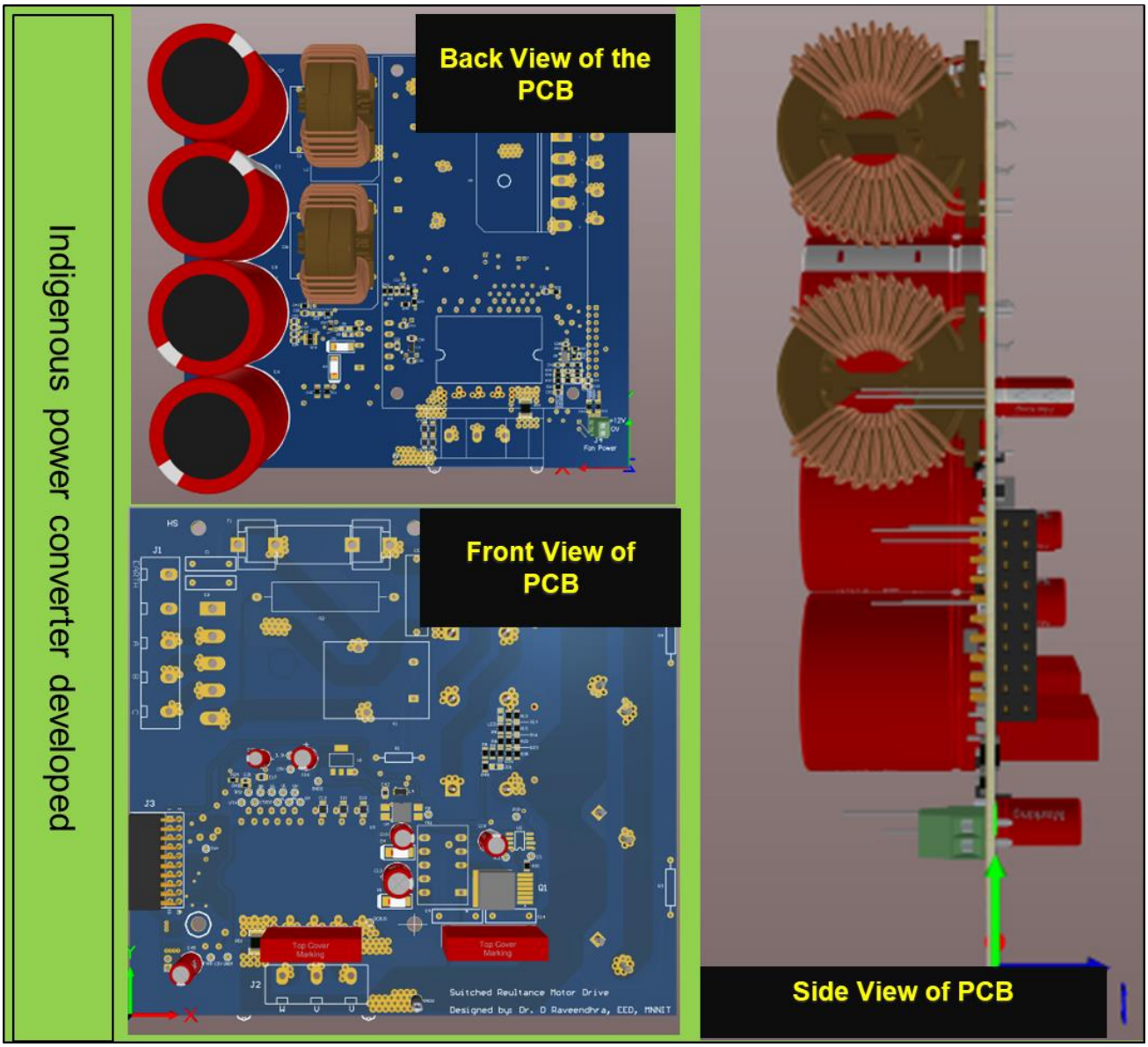
A novel Four Port Non-Isolated DC-DC Converter for Energy Storage Systems in DCMG Applications



High Voltage Gain Transformer-Less DC-DC Converter for FC Electric Vehicle



Indigenous power converter developed



Some of the outcomes of the research

Patent Disclosures (Granted: 1, Published: 3)
1. Raveendhra Dogga, Ravi Kumar KS, A Pandian, V. V. Sastry Vedula, Poojitha Rajana, Praveen Jugge, "*High Gain Non-Isolated Bi-Directional DC-DC Converter*" **Granted** on January 16, 2023 (Patent No: 418205)
2. *US Patent Disclosure*: Douglas C Hopkins, Dogga Raveendhra, "Energy Re-Circulation Circuit and Controls for Applications including Power Semiconductor Device Characterisation", Filed at Office of Technology Commercialisation and New Ventures, NCSU for US patent. Ref. No: 17126
3. *Indian Patent*: Raveendhra Dogga, M K Pathak, "Novel Single-Stage Inverter", Application Number: 201641038706, **Published**
4. *Indian Patent*: Ravi Kumar KS, Raveendhra Dogga, Nagesh Kumar, V V Sastry Vedula, Novel Capacitor Clamped Bidirectional DC-DC Converter, Application Number: 201641038706, **Published**
Publications (Journals, Patents, Book Chapters and Conferences): Citations: 640, h-index: 14, i10-index: 15
Journals Disclosures
5. D. Raveendhra and M. K. Pathak, "Three-Phase Capacitor Clamped Boost Inverter," in IEEE Journal of Emerging and Selected Topics in Power Electronics, vol. 7, no. 3, pp. 1999-2011, 2018, doi:

10.1109/JESTPE.2018.2873154, Print ISSN: 2168-6777, Electronic ISSN: 2168-6785 (Impact Factor: 5.177). (SCIE Indexed, Q1 Journal)
6. Raveendhra Dogga, M.K. Pathak, "Recent trends in solar PV inverter topologies", Solar Energy (Elsevier), Volume 183, 2019, Pages 57-73, ISSN 0038-092X, doi: 10.1016/j.solener.2019.02.065 (Impact Factor: 4.608). (SCIE Indexed, Q1 Journal)
7. S. Mukhopadhyay, R. Dhaouadi, M. Takrouri and R. Dogga, "Supercapacitor Characterization Using Universal Adaptive Stabilization and Optimization," in IEEE Open Journal of the Industrial Electronics Society, vol. 1, pp. 166-183, 2020, doi: 10.1109/OJIES.2020.3008339. (Impact Factor: 5.2). (ESCI Indexed, Q1 Journal)
8. D Raveendhra *, Poojitha Rajana, BL Narasimharaju, Babu Y Suri, Eugen Rusu*, Fayek H Hady. Analysis and Operation of High DC-AC Gain 3-ϕ Capacitor Clamped Boost Inverter. Energies 2022, 15(8), 2955; https://doi.org/10.3390/en15082955 (Impact Factor: 3) (SCIE Indexed, Q1 Journal)
9. Dogga Raveendhra; Praveen Jugge; Ravi Kumar KS; Poojitha R; Denis Sidorov, Daniil Panasetsky; Narasimha Raju BL, "Part I: State-of-the-Art technologies of DC Micro Grid with Hybrid Energy Storage Systems: Architectures and Converter Topologies", Energies, https://doi.org/10.3390/en16020923 (Impact Factor: 3) (SCIE Indexed, Q1 Journal))
10. B. L. Narasimharaju, U. Ramanjaneya Reddy and R. Dogga, "Design and analysis of voltage clamped bidirectional DC–DC converter for energy storage applications," in The Journal of Engineering, vol. 2018, no. 7, pp. 367-374, 7 2018, doi: 10.1049/joe.2018.0127. Open Access, Online ISSN 2051-3305 (ESCI Indexed, Q2 Journal)
11. Dogga Raveendhra, Rached Dhaouadi, Habib-ur Rehman, Shayok Mukhopadhyay, "LC Impedance Source Bi-Directional Converter with Reduced Capacitor Voltages", Electronics 2020, 9(7), 1062; https://doi.org/10.3390/electronics9071062. Open Access (Impact Factor: 2.397) (SCIE Indexed, Q2 Journal)
12. Kumar, K.S.R.; Pandian, A.; Sastry, V.V.; Raveendhra, D. Capacitor Clamped Coupled Inductor Bi-Directional DC-DC Converter with Smooth Starting. Machines 2022, 10, 47. https://doi.org/10.3390/machines10010047 Open Access (Impact Factor: 2.428) (SCIE Indexed, Q2 Journal)
13. Dogga Raveendhra, Poojitha Rajana, Ravi Kumar KS, Praveen Jugge, Ramesh Devarapalli, Eugen Rusu, Hady H. Fayek, "High Gain Multi Phase Interleaved Differential Capacitor Clamped Boost Converter", Electronics 2022, 11(2), 264; https://doi.org/10.3390/electronics11020264 Open Access (Impact Factor: 2.397) (SCIE Indexed, Q2 Journal)
14. Rao, D. S. N. M., Raveendhra, D., Kumar, D. G., Narukullapati, B. K., Rao, D. S., & Palakaluri, S. D. (2021). Comparison Investigation into Power System Optimization and Constraint-Based Generator Load Scheduling Using Metaheuristic Algorithms. ECTI Transactions on Electrical Engineering, Electronics, and Communications, 19(2), 200-208. (SCOPUS Indexed, Q3 Journal)
15. Satyesh, P. Ravikanth, D. Raveendhra, "Rectifier Load Analysis for Electric Vehicle Wireless Charging System using Fuzzy Logic Controller", High Technology Letters, Vol. 27 (7), 2021. ISSN NO: 1006-6748 (Q3 SCOPUS Journal)
16. Vadlakonda Ranadeep, Dogga Raveendhra, "Control of Capacitively Coupled Impedance source type Wireless Power Transfer Network ", High Technology Letters, Vol. 27 (7), 2021. ISSN NO: 1006-6748 (Q3 SCOPUS Journal)
17. Keerthi Volisetty, Dola Gobindha Padhan, Dogga Raveendhra, "Single Phase H Bridge Inverters Without Using Additional Power Electronics by Power Decoupling Strategy ", High Technology Letters, Vol. 27 (10), 2021. ISSN NO: 1006-6748 (Q3 SCOPUS Journal) (https://doi.org/10.37896/HTL27.10/4465)

18. Raveendhra, D.; Poojitha, et. al., Part II: State-of-the-Art Technologies of Solar-Powered DC Microgrid with Hybrid Energy Storage Systems: Converter Topologies. Energies 2023, 16, 6194. https://doi.org/10.3390/en16176194. (Impact Factor: 3) (SCIE Indexed, Q1 Journal)
19. Raveendhra, D., Lavanya, K., Ravi Kumar, K.S., Koreboina, V.B., Pakalapati, J. and Gopal, Y. (2025), Impact of Parasitics on the Dynamic Performance of Capacitor Clamped Bidirectional DC–DC Converter. IET Power Electron., 18: e70059. https://doi.org/10.1049/pel2.70059 [SCIE Journal, Impact Factor: 2]
20. G. Nagesh, D. Raveendhra et.al , "Extraction and Energy Management of Solar Photovoltaic, Fuel Cell, and Battery Systems Using a Novel Multi Port Power Converter for DC Microgrid Applications," in IEEE Access, vol. 13, pp. 87418-87437, 2025, doi: 10.1109/ACCESS.2025.3570190. [SCIE Journal, Impact Factor: 3]
21. G. Nagesh, D. Raveendhra**,** et.al "Integration of Renewable Energy Sources with Energy Storage Devices Using a Novel Four Port Converter for DC Microgrid Applications," Engineering Research Express, DOI: 10.1088/2631-8695/ade224 [ESCI Journal, Impact Factor: 1.5].
22. Guguloth Nagesh, Dogga Raveendhra, et.al.; "High Voltage Gain Transformer-Less DC-DC Converter for Fuel Cell Electric Vehicles", IEEE Open Journal of the Industrial Electronics Society. (Impact Factor: 4.3) (Accepted). (ESCI Indexed, Q1 Journal)
23. Guguloth, Nagesh, Dogga Raveendhra, et.al.; "Four Port Non-Isolated DC-DC Converter for Fuel-Cell Electric Vehicles" IEEE Transactions on Transportation Electrification (Under Review)
24. Guguloth, Nagesh, Dogga, Raveendhra, et.al.; "Operation and Analysis of a Four Port Non-Isolated DC-DC Converter for Energy Storage Systems in DC Micro-Grid Applications" Journal of Energy Storage (Under Review)
25. Dogga Raveendhra, Douglas C Hopkins, Utkarsh Mehrotra, Hady H. Fayek, "Neutralized CMV Inverter (NCI) for Electrical Vehicle Applications" IEEE Access (SCIE Indexed) (In Communication)
Book Chapters (6)
26. Dogga Raveendhra, M Prashanth, K Sudha, "Effects of Common Mode Voltage in ZSI based Induction Motor Drive for EV applications", 3rd International Conference on Machine Learning, Advances in Computing, Renewable Energy and Communication, 10-11 December 2021.
27. Dogga Raveendhra, K Sudha, M Prashanth, "Single Stage Power Conditioning Unit for Battery Assisted, Solar Powered Remote Area Power Supply", 3rd International Conference on Machine Learning, Advances in Computing, Renewable Energy and Communication, 10-11 December 2021.
28. Raveendhra D, Thakur P., Chauhan A. (2015), FPGA Controlled Power Conditioning System for Solar PV Fed PMDC Motor. In: Kamalakannan C., Suresh L., Dash S., Panigrahi B. (eds) Power Electronics and Renewable Energy Systems. Lecture Notes in Electrical Engineering, vol 326. Springer, New Delhi, Online ISBN: 978-81-322-2119-7 (*Indexing: ISI Proceedings, EI-Compendex, SCOPUS, EI Compendex, MetaPress, Springerlink*)
29. Chauhan A., Thakur P., Raveendhra D. (2015) Quantification of Voltage Unbalance Conditions. In: Kamalakannan C., Suresh L., Dash S., Panigrahi B. (eds) Power Electronics and Renewable Energy Systems. Lecture Notes in Electrical Engineering, vol 326. Springer, New Delhi, Online ISBN: 978-81-322-2119-7. (*Indexing: ISI Proceedings, EI-Compendex, SCOPUS, EI Compendex, MetaPress, Springerlink*)
30. DBLP Lecture Notes in Computer Science Engineering: Raveendhra, Dogga, "Simulation-based study of FPGA based controller for Single-Phase Matrix Converter for different types of loads", IDES CPS in LSCS Series. (*Indexing: Thomson ISI Proceedings, DBLP, IET Inspec, Scopus, EI Compdex, Google Scholar, ProQuest, etc.*)
31. Shiv Prakash Singh, Suneel Raju Pendem, Brij Kishor, Dogga Raveendhra and M Venkatesh Naik, "A Review on Hybridization and Energy Management Strategies for Hydrogen based Fuel Cell Electric Vehicle Applications," 1st Edition of Hydrogen Energy Production, Storage and Utilization, Taylor & Francis.
Conference Proceedings (37)

32. D. Raveendhra, M. K. Pathak and A. Panda, "Power conditioning system for solar power applications: Closed loop DC-DC convertor fed FPGA controlled diode clamped multilevel inverter," 2012 IEEE Students' Conference on Electrical, Electronics and Computer Science, Bhopal, 2012, pp. 1-4, doi: 10.1109/SCEECS.2012.6184820. (Indexed in SCOPUS)
33. D. Raveendhra, K. P. Guruswamy and P. Thakur, "FPGA based 2-stage power conditioning system for PV power generation," 2013 International Conference on Power, Energy and Control (ICPEC), Sri Rangalatchum Dindigul, 2013, pp. 44-50, doi: 10.1109/ICPEC.2013.6527622. (EI indexed and Indexed in SCOPUS)
34. S. Semwal, D. Joshi, R. S. Prasad and D. Raveendhra, "The practicability of ICA in home appliances load profile separation using current signature: A preliminary study," 2013 International Conference on Power, Energy and Control (ICPEC), Sri Rangalatchum, Dindigul, 2013, pp. 756-759, doi: 10.1109/ICPEC.2013.6527756. (EI indexed and Indexed in SCOPUS)
35. D. Raveendhra, B. Kumar, D. Mishra and M. Mankotia, "Design of FPGA based open circuit voltage MPPT charge controller for solar PV system," 2013 International Conference on Circuits, Power and Computing Technologies (ICCPCT), Nagercoil, 2013, pp. 523-527, doi: 10.1109/ICCPCT.2013.6529012. (Indexed in SCOPUS)
36. D. Raveendhra, P. Thakur and B. L. Narasimha Raju, "Design and small-signal analysis of solar PV fed FPGA based Closed Loop control Bi-Directional DC-DC converter," 2013 International Conference on Circuits, Power and Computing Technologies (ICCPCT), Nagercoil, 2013, pp. 283-288, doi: 10.1109/ICCPCT.2013.6529011. (Indexed in SCOPUS)
37. T. Saini, D. Raveendhra and P. Thakur, "Stability analysis of FPGA based perturb and observe method MPPT charge controller for solar PV system," 2013 Students Conference on Engineering and Systems (SCES), Allahabad, 2013, pp. 1-5, doi: 10.1109/SCES.2013.6547545. (Indexed in SCOPUS)
38. A. Chauhan, P. Thakur and D. Raveendhra, "Assessment of induction motor performance under supply voltage unbalance: A review," 2013 Students Conference on Engineering and Systems (SCES), Allahabad, 2013, pp. 1-6, doi: 10.1109/SCES.2013.6547498. (Indexed in SCOPUS)
39. D. Raveendhra, P. Prakash and P. Saini, "Simulation based analysis of FPGA controlled Cascaded H-Bridge Multilevel inverter fed solar PV system," 2013 International Conference on Energy Efficient Technologies for Sustainability, Nagercoil, 2013, pp. 568-572, doi: 10.1109/ICEETS.2013.6533447. (Indexed in SCOPUS)
40. S. Singh, M. Singh, S. Chanana and D. Raveendhra, "Operation and control of a hybrid wind-diesel-battery energy system connected to micro-grid," 2013 International Conference on Control, Automation, Robotics and Embedded Systems (CARE), Jabalpur, 2013, pp. 1-6, doi: 10.1109/CARE.2013.6733758. (Indexed in SCOPUS)
41. D. Raveendhra, P. Joshi and R. K. Verma, "Performance and control system design for FPGA based CVMPPT boost converter for remote SPV water pumping system applications," 2014 POWER AND ENERGY SYSTEMS: TOWARDS SUSTAINABLE ENERGY, Bangalore, 2014, pp. 1-6, doi: 10.1109/PESTSE.2014.6805305. (Indexed in SCOPUS)
42. D. Raveendhra, S. Faruqui and P. Saini, "Transformer less FPGA Controlled 2-Stage isolated grid connected PV system," 2014 POWER AND ENERGY SYSTEMS: TOWARDS SUSTAINABLE ENERGY, Bangalore, 2014, pp. 1-6, doi: 10.1109/PESTSE.2014.6805304. (Indexed in SCOPUS)
43. D. Raveendhra, R. Kumar and S. Singh, "Performance investigation of FPGA controlled central three-level diode clamped inverter in two-stage solar photo voltaic (SPV) system," 2014 IEEE 2nd International Conference on Electrical Energy Systems (ICEES), Chennai, 2014, pp. 206-211, doi: 10.1109/ICEES.2014.6924169. (Indexed in SCOPUS)

44. D. Raveendhra, P. R. u. Zaman and K. Govind, "FPGA controlled high gain bi-directional DC-DC converter (BDC) for energy storage of solar power," 2014 IEEE 2nd International Conference on Electrical Energy Systems (ICEES), Chennai, 2014, pp. 300-305, doi: 10.1109/ICEES.2014.6924185. (Indexed in SCOPUS)
45. D. Raveendhra and M. K. Pathak, "Modular multi-level inverter with self-healing power unbalancing capability in single stage solar PV systems," 2017 IEEE 15th Student Conference on Research and Development (SCOReD), Putrajaya, Malaysia, 2017, pp. 402-407, doi: 10.1109/SCORED.2017.8305356. (Indexed in SCOPUS)
46. D. Raveendhra, H. Mohan, M. K. Pathak and P. Rajana, "Model reference adaptive controller-based stand-alone solar PV pumping system," 2017 IEEE 15th Student Conference on Research and Development (SCOReD), Putrajaya, Malaysia, 2017, pp. 408-413, doi: 10.1109/SCORED.2017.8305355. (Indexed in SCOPUS)
47. Dogga Raveendhra, Mohammed Mahdi, Ramy Hakim, Rached Dhaouadi, Shayok Mukhopadhyay, Nasser Qaddoumi, "Wireless Charging of an Autonomous Drone", 6th International Conference on Electric Power and Energy Conversion Systems (EPECS-2020), Istanbul, Turkey, Oct. 5 –7, 2020. (Indexed in SCOPUS)
48. D. Raveendhra, Praveen. J and P. Rajana, "Capacitor Clamped Boost Inverter for Fuel Cell-based Distributed Generation system with Battery Back Up," 2021 Fourth International Conference on Electrical, Computer and Communication Technologies (ICECCT), 2021, pp. 1-6. (Indexed in SCOPUS)
49. D. Raveendhra, J. Praveen and P. Rajana, "Mitigation of Electrical Inertia of PE Converters in Solar Powered HESS system for Remote Area Power System Applications using Synergetic Controller," 2021 Fourth International Conference on Electrical, Computer and Communication Technologies (ICECCT), 2021, pp. 1-8, doi: 10.1109/ICECCT52121.2021.9616698. (Indexed in SCOPUS)
50. M. Prashanth, D. Raveendhra, A. Giridhar and B. Narasimha Raju, "DC-Link Current Ripple Reduction in Switched Reluctance Machine Drives," 2022 IEEE 2nd International Conference on Sustainable Energy and Future Electric Transportation (SeFeT), Hyderabad, India, 2022, pp. 1-6, doi: 10.1109/SeFeT55524.2022.9909285. (Indexed in SCOPUS)
51. M. Prashanth, D. Raveendhra, A. Giridhar and B. Narasimha Raju, "Switched Reluctance Machine Drive Analysis with Fault-Tolerant Power Converter," 2022 IEEE 2nd International Conference on Sustainable Energy and Future Electric Transportation (SeFeT), Hyderabad, India, 2022, pp. 1-6, doi: 10.1109/SeFeT55524.2022.9909332. (Indexed in SCOPUS)
52. S. Kalathi, D. Raveendhra and N. Raju Bl, " Efficient single-phase grid connected transformer-less inverter with active and reactive power control," 2022 IEEE 2nd International Conference on Sustainable Energy and Future Electric Transportation (SeFeT), Hyderabad, India, 2022, pp. 1-6, doi: 10.1109/SeFeT55524.2022.9909332. (Indexed in SCOPUS)
53. S. Kalathi, D. Raveendhra and N. Raju Bl, "Single-Phase H6 Inverter with Hybrid Modulation Scheme for Solar PV application," 2022 IEEE 2nd International Conference on Sustainable Energy and Future Electric Transportation (SeFeT), Hyderabad, India, 2022, pp. 1-6, doi: 10.1109/SeFeT55524.2022.9909000. 2 (Indexed in SCOPUS)
54. D. G. Padhan, D. Raveendhra, S. Sahoo and V. Mahesh, "Comparative Analysis between Fuzzy and PR controller in Single-Phase H bridge Inverters by Power Decoupling Strategy," 2022 IEEE 2nd International Conference on Sustainable Energy and Future Electric Transportation (SeFeT), Hyderabad, India, 2022, pp. 1-4, doi: 10.1109/SeFeT55524.2022.9909082. (Indexed in SCOPUS)
55. R. B, S. D. J, U. R. V and D. Raveendhra, "Performance and analysis of three phase SAPF under different control algorithms for power quality problems," 2022 IEEE 2nd International Conference on Sustainable Energy and Future Electric Transportation (SeFeT), Hyderabad, India, 2022, pp. 1-8, doi: 10.1109/SeFeT55524.2022.9909033. (Indexed in SCOPUS)

56. T. Amulya, D. Raveendhra, J. Praveen and B. Narasimha Raju, "SPV Power Conversion using Bidirectional H6 Inverter with reduced Common Mode Voltages," 2022 IEEE 2nd International Conference on Sustainable Energy and Future Electric Transportation (SeFeT), Hyderabad, India, 2022, pp. 1-7, doi: 10.1109/SeFeT55524.2022.9908980. (Indexed in SCOPUS)
57. T. Amulya, D. Raveendhra, J. Praveen and B. Narasimha Raju, "Performance of Dual Differential Parallel Buck Grid Connected inverter for Solar Power Conversion," 2022 IEEE 2nd International Conference on Sustainable Energy and Future Electric Transportation (SeFeT), Hyderabad, India, 2022, pp. 1-6, doi: 10.1109/SeFeT55524.2022.9909470. (Indexed in SCOPUS)
58. Shiv Prakash Singh, Suneel Raju Pendem, Dogga Raveendhra, "A Review on DC-DC Converters for Fuel Cell Electric Vehicle Applications," 2024 IEEE students Conference on Engineering and Systems (SCES-2024), June 21-23, Prayagraj, India (Indexed in SCOPUS)
59. Abhinav Kumar Singh, Dogga Raveendhra "High Performance Solar Powered EV Charger", 2024 IEEE 4th International Conference on Sustainable Energy and Future Electric Transportation (SeFeT), Hyderabad, India, 2024 (Indexed in SCOPUS)
60. Abhinav Kumar Singh, Dogga Raveendhra, Suneel Raju Pendem "Improved Filtering with Hybrid Damping Suppression in Grid Connected Solar PV inverter", 2024 IEEE 4th International Conference on Sustainable Energy and Future Electric Transportation (SeFeT), Hyderabad, India, 2024 (Indexed in SCOPUS)
61. Varun Sharma, Dogga Raveendhra, Souradip Dey, "Robust Controller for EV Onboard Charger for Grid Resilience under Weak Grid Conditions" 2024 IEEE 4th International Conference on Sustainable Energy and Future Electric Transportation (SeFeT), Hyderabad, India, 2024 (Indexed in SCOPUS)
62. Siddhant Rao, Ankita Kumari, Dogga Raveendhra, BL Narasimha Raju, Aurobinda Panda, "Efficient Tracking Control Strategy for High Voltage Gain Transformerless DC-DC Converter in DC Drive Applications", 2024 IEEE 4th International Conference on Sustainable Energy and Future Electric Transportation (SeFeT), Hyderabad, India, 2024 (Indexed in SCOPUS)
63. Gyanendra Vaishya, Dheeraj Saini, Yugal Patidar, Dogga Raveendhra, BL Narasimha Raju, Praveen J, "Development of Characterization Circuit for Power Semiconductor Devices", 2024 IEEE 4th International Conference on Sustainable Energy and Future Electric Transportation (SeFeT), Hyderabad, India, 2024 (Indexed in SCOPUS)
64. Mohammad Asif Ali, Nilesh Prakash Singh, Dogga Raveendhra, Suneel Raju Pendem, BL Narasimha Raju & Phaneendhra Babu B, "Single Stage Isolated Power Conditioning Unit for Plugin Electric Vehicles On-Board Charger", 2024 IEEE 4th International Conference on Sustainable Energy and Future Electric Transportation (SeFeT), Hyderabad, India, 2024 (Indexed in SCOPUS)
65. Aman Keshari, Dogga Raveendhra, BL Narasimha Raju, Pradyumn Chaturvedi, U Ramanjaneya Reddy & Phaneendhra Babu B, "Switched Reluctance Motor-based EV Drive with Bidirectional Grid Interaction", 2024 IEEE 4th International Conference on Sustainable Energy and Future Electric Transportation (SeFeT), Hyderabad, India, 2024 (Indexed in SCOPUS)
66. Maya Vijayan, Ramanjaneya Reddy U, Tarkeshwar Mahto, Narasimharaju B L, Raveendhra Dogga, "Independently controlled single-input dual-output DC-DC converter for DC microgrid based PV-fed EV charging stations", 2024 IEEE 4th International Conference on Sustainable Energy and Future Electric Transportation (SeFeT), Hyderabad, India, 2024 (Indexed in SCOPUS)
67. Mohammad Asif Ali, Aman Keshri, Dogga Raveendhra, BL Narasimha Raju, "Higher Order Sliding Robust Control Design for Single-Stage Plugin Electric Vehicle ", international Transportation Electrification Conference (iTEC), INDIA 2025, Pune, India, 18-20 September 2025. (**Accepted**)
68. Mohammad Asif Ali, Aman Keshri, Dogga Raveendhra, Sunil Raju Pendem, BL Narasimha Raju & Pradyumn Chaturvedi, "Robust Controller for Single-Stage Isolated Power Conditioning Unit On-Board

Charger", The IEEE International Conference on Smart Technologies for Power, Energy, and Control (STPEC-2025), Goa, 10-13 December, 2025. (**Accepted**)

69. Aman Keshari, Mohammad Asif Ali, Dogga Raveendhra, Suneel Raju Pendem, BL Narasimharaju, "Performance investigation and characterization of High-Power Semiconductor devices using ERSC", The IEEE International Conference on Smart Technologies for Power, Energy, and Control (STPEC-2025), Goa, 10-13 December, 2025. (**Accepted**)

Faculty Development Programs organised/Conducted

1. TPC Chair, SCES 2024
2. Session Chair, SCES 2024
3. Tutorial Chair, SeFeT - 2022
4. Co-Ordinator for Online Faculty Development Programme (FDP) on" Modelling, Simulation and Control of Advanced Power Converters" during 28th March – 06th April, 2022 Organized by E & ICT Academy & Department of Electrical Engineering, NIT Warangal in association with Gokaraju Rangaraju Institute of Engineering and Technology, Hyderabad (Sponsored by Ministry of Electronics and Information Technology (MeitY), GOI).
5. Co-Ordinator for One Week Faculty Development Programme on "Recent Developments in Power Electronics and its Applications", organized by Electrical and Electronics Engineering Department, Vardhaman College of Engineering, Hyderabad, during 31st Aug 2020 to 5th Sep 2020, in Association with Zunik Energies Pvt. Ltd.
6. Convener for Multi-Agent Systems and Distributed Control (MAS 2024) September 27-31, 2024 Organized by Department of Electrical Engineering Motilal Nehru National Institute of Technology
7. Co-Ordinator for Online Faculty Development Programme (FDP) on" Power Electronics, Energy Storage and Renewable Technologies (PEESRT) for E-Transportation in India (Basic)
8. Co-Ordinator for Online Faculty Development Programme (FDP) on" Power Electronics, Energy Storage and Renewable Technologies (PEESRT) for E-Transportation in India (Advanced)
9. Co-Ordinator for One Week Faculty Development Programme on "Recent Developments in Power Electronics", organized by Electrical and Electronics Engineering Department, Aditya Engineering College, Surampalem, during 12st Nov 2018 to 17th Nov 2018, in Association with Zunik Energies Pvt. Ltd.
10. Co-Coordinator for AICTE Sponsored Two Week FDP (Online-Phase-I) on "Sustainable Technologies for Electric Transportation Systems" scheduled on 14th June 2021 – 26th June 2021.

Awards/ Honoured Positions

#	Award/Honoured Position	Awarded/ Honoured By	Year
1.	Member Board of Studies (BoS)	KL University	Dec 2025
2.	Resource Person	AICTE–ATAL Faculty Development Programme (FDP) on Advanced Technologies and AI/ML Integration in Microgrids and Electric Vehicles at Guru Nanak Institute of Technology (GNIT)	Dec 2025
3.	Resource person	FDP on "Intelligent Power Electronics and Cyber-Physical Energy Systems for a Sustainable Future" at Vel Tech Rangarajan Dr. Sagunthala R&D Institute of Science and Technology	Nov 2025
4.	Resource person	Online Faculty Development Programme (FDP) on Advancements in Electric Vehicles and Autonomous Mobility for a Sustainable Future (AEVAMSF) at BVRIT Hyderabad and NIT Warangal	July 2025
5.	Speaker	AICTE ATAL Online 6-Day Faculty Development Programme on "Emerging Trends and Future Prospects in Advanced Energy Conversion Technologies and Applications at VIT Bhimavaram	Aug 2025

6.	Expert Talk	Online FDP on "Power Electronics Technology for Self-Reliant and Viksit Bharat at NIT Warangal	Feb 2025
7.	Resource person	FDP on “Leveraging Advanced Power Conversion Systems and Artificial Intelligence for Electric Vehicles at NIT Patna	May 2025
8.	Resource person	FDP on Design of Advanced Controller for Microgrid and Electric Vehicles at Vignan Lara Institute of Technology	Jan 2025
9.	Expert Lecture	the MSME-sponsored Five-Day Advanced-ESDP Programme on “Renewable Energy Sources in Electric Vehicle and Distributed Generation Systems at NIT Sikkim	Feb 2025
10	Member Board of Studies (BoS)	KL University	Aug 2025
11	BOS Member	EEE Department, KLU	2024
12	Resource Person	Sustainable Development: Intersection of Green Energy and eMobility (IGEEM-2024)” at NIT Rourkela	2024
13	DCC Sub-Committee Member	Quantum Technology Division, Telecommunication Engineering Center	2024
14	Resource Person	“AI&ML Tools for Material Science & Electrical Engineering Applications”, Gayatri Vidya Parishad College of Engineering, Vizag	2024
15	National Webinar as a Resource Person	Webinar on “Electrifying Experiences: Design-Thinking the Future of EV Mobility”, K.S. Rangasamy College of Technology, Tamilnadu	2024
16	BOS Member	EEE Department, KLU	2024
17	Resource Person	Anil Neerukonda Institute of Technology and Sciences, Andhra Pradesh.	2023
18	Resource Person	Delivered an Invited Lecture in ATAL sponsored FDP entitled on Certain Aspects of Electric Vehicles to achieve Sustainable Energy, Vignan Lara Institute of Technology, Vadlamudi	2023
19	Keynote Speaker	DST-SERB Sponsored Conference, KL University	2023
20	Resource Person	Delivered an Invited Lecture in ATAL sponsored FDP entitled “AI & Smart Technology Applications to Solar energy and Electrical vehicles Technology - Challenges, Issues and Hands-on" (AIST-SET), ATAL-FDP, BVRIT Narsapur	2023
21	**BOS Member**	EEE Department, KLU	2023
22	Seminar	Machine Learning, Computer Vision, and Dynamic Systems Group, The Skolkovo Institute of Science and Technology, Russia	2023
23	Invited Session	FDP, MNNIT	2023
24	Invited Session	FDP, GRIET	2023
25	Invited Session	FDP, GRIET	2023
26	Invited Session	FDP, MNIT Jaipur	2022
27	Invited Session	FDP, SVNIT	2022
28	Invited Session	FDP, SVNIT	2022
29	Excellence in Doctoral Research Award (for best Ph. D. Work)	IIT Roorkee	2020
30.	BOS Member	VNIT Nagpur	2022
31.	Resource person in a Faculty Development programme	Eight-day online FDP on “Modelling, Simulation & Control of Advanced Power Converters”, at GRIET	2022
32.	Resource person in a Faculty Development programme	Eight-day online FDP on “Power Electronics for Electric Vehicles and Renewable Energy Systems during **16th – 24th March, 2022**	2022

33.	Resource person in a Faculty Development programme	Eight-day online FDP on “Applications of Power Electronics in Electric Vehicles & Energy Storage”, at NITK	2022
34.	Resource person in AICTE-ISTE Sponsored Induction/Refresher Induction Programme	Online FDP on “Recent Trends in Electric Vehicles” 17th – 23rd February 2022 in Online Mode at Vardhaman College of Engineering, Hyderabad, Telangana, India.	2022
35.	Resource person in AICTE-ISTE Sponsored Induction/Refresher Programme	AICTE/ ISTE Refresher Programme (ONLINE) - Micro Grid: Integration and Power Quality Issues - Dec. 7-13, 2021	2021
36.	Resource person in a Faculty Development programme	CEP, NIT Warangal Sponsored Five-day online FDP on Potential Research Trends in Advanced Energy Conversion Technologies and Applications, December 06 -10, 2021 at VIT Bhimavaram	2021
37.	Resource person in a Faculty Development programme	ATAL Academy Sponsored Online Faculty Development Programme (FDP) on “Electric Vehicle (EV) : Challenges and Technology Advancements" by NSIC, Hyderabad	2021
38.	Resource person in a Faculty Development programme	AICTE sponsored ATAL FDP on "ELECTRIC TRANSPORTATION INFRASTRUCTURE FOR E-MOBILITY IN INDIA" to be held during 02 to 06, Aug 2021	2021
39.	Resource person in a Faculty Development programme	AICTE Sponsored Two Week FDP (Online-Phase-I) on "Sustainable Technologies for Electric Transportation Systems, GRIET	2021
40.	Guest Lecture	Guest Lecture - Start-up Cell - KSRMCE	2021
41.	Guest Speaker	AICTE –ATAL Sponsored FDP on “ELECTRIC VEHICLES- RESEARCH ISSUES AND CHALLENGES” GRG POLYTECHNIC COLLEGE	2021
42.	BOS Member	KL University	2021
43.	Keynote Speaker in FDP	Government Engineering College Raipur, Chhattisgarh	2020
44.	Keynote Talk	Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal	2020
45.	Keynote Speaker	Government Engineering College Raipur, Chhattisgarh	2020
46.	Resource person in a Faculty Development programme	ATAL FDP/NMREC	2020
47.	Resource person in a Faculty Development programme	ATAL FDP at Kallam Harinadh Reddy Institute of Technology	2020
48.	Resource person in a Faculty Development programme	Vardhaman Engineering College Hyderabad	2020
49.	Guest Lecture	KL University, Viziawada	2020
50.	Guest Lecture	Vishakha Institute of Engineering & Technology	2020
51.	Resource person in a Faculty Development programme	ATAL FDP at MVGR College of Engineering	2020
52.	Best Innovation Award	Zunik Energies Pvt. Ltd	2019

53.	Who's Who in the World 2019	Marquis, USA	2019
54.	Resource person in a Faculty Development programme	NIT, Warangal	2019
55.	Industry Expert for Board of Studies	NIT Nagpur	2019
56.	Albert Nelson Marquis Lifetime Achievement Award	Marquis Who's Who (USA)	2018
57.	Who's Who in the World 2018	Marquis, USA	2018
58.	Resource person in a Faculty Development programme	Aditya Group of Engineering Colleges	2018
59.	Guest Lecture	Dev Bhoomi Group of Institutes	2018
60.	Expert Lecture	NITTTR, Chandigarh	2018
61.	Delegate for India-Italy Summit	DST-CII, New Delhi	2018
62.	Most Promising Innovation Award (1st Prize)	IKMC 2018 Start-up Exhibition	2018
63.	Mentor for start-ups	SAIC, Thapar University	2018
64.	Session Chair	IEEE SCOReD International Conference, Malaysia	2017
65.	International Travel Grant	IIT Roorkee	2017
66.	Resource person in a Faculty Development programme	MVGR College of Engineering	2017
67.	Judges Choice award	TIDES-IITRHF	2017
68.	Bhaskara Advanced Solar Energy Fellowship	DST, India	2016
69.	MHRD scholarship for M. Tech	Ministry of Human Resource Development	2010-12
70.	MHRD scholarship for Ph.D.	Ministry of Human Resource Development	2014-19

Reviewer for Journals

1. IEEE Transactions on Industrial Electronics (Impact factor of 6.498)
1. IEEE Transactions on Journal of Emerging and Selected Topics in Power Electronics (Impact factor of 5.177)
2. International Journal of Electrical Power and Energy Systems, Elsevier (Impact factor of 3.432)
3. Journal of Solar Energy, Elsevier (Impact factor of 3.469)
4. Power Electronics, IET (Impact factor of 1.6)
5. Generation, Transmission & Distribution, IET (Impact factor of 1.353)
6. International Transactions on Electrical Energy Systems (Impact factor of 1.085)
7. Renewable Power Generation, IET (Impact factor of 1.60)
8. Electric Power Components and Systems Journal, Taylor and Francis (Impact factor of 0.69)

9. Reviewer for IETE Journal of Research (Impact factor of 0.6)
10. Reviewer for IEEE Access
11. Reviewer for Mathematics and Computers in Simulation (Elsevier)
12. Bulletin of Electrical Engineering and Informatics (BEEI)
13. Journal of TELKOMNIKA (Telecommunication, Computing, Electronics and Control)
14. Indonesian Journal of Electrical Engineering and Computer Science
15. International Journal of Electrical and Computer Engineering (IJECE)
16. International Journal of Advances in Applied Sciences (IJAAS)
17. Journal of Computing and Digital Systems
18. Journal of Trends in Computer Science and Information Technology
19. International Journal of Robotics and Automation (IAES)
20. International Journal of Computing and Digital Systems (IJCDS)
21. IETE Journal of Research
22. International Journal of Green Energy
23. International Journal of Emerging Electric Power Systems (IJEEPS)
24. International Journal of Electrical Power and Energy Systems
25. International Journal of Engineering Science and Technology

Reviewer for IEEE Conferences

1. Reviewer for IEEE International Conference on Research & Development (SCOReD), 16-17 December 2013, Putrajaya, Malaysia.
2. Reviewer for IEEE International Conference on Composite materials and Renewable Energy Applications ICCMERA'2014, 22-24 January 2014, Sousse, Tunisia.
3. Reviewer for 2014 IEEE 8th International Conference on International Power Engineering and Optimization (PEOCO2014), 24-25 March 2014, Langkawi, Malaysia.
4. Reviewer for 23rd IEEE International Symposium on Industrial Electronics (ISIE 2014), June 1-4, 2014, Istanbul, Turkey.
5. Reviewer for 3rd International Conference on Frontiers in Intelligent Computing, Theory and Application (FICTA-2014), Orissa, India, 14-15 November 2014.
6. Reviewer for Annual Convention and International Conference on Emerging ICT for bridging future (CSI-2014), 12 Dec 2014.
7. Reviewer for Second International Conference on Information systems Design and Intelligent Applications - 2015 (INDIA-2015) Kalyani, India, January 8-9, 2015
8. Reviewer for Renewable Energy and Green Technology International Conference 2015 (REEGETECH'2015), Bali, Indonesia, 2 – 4 June 2015.
9. Reviewer for 2015 Advanced Research in Material Sciences, Manufacturing, Mechanical and Mechatronic Engineering Technology International Conference (AR4MET2015), Bali, Indonesia, 2-4 June 2015
10. Reviewer for 2017 IEEE SCOReD held during 13th Dec 2017 to 14th Dec 2017 at Everly Hotel, Putrajaya, Malaysia
11. Reviewer for CENCON 2017-(2017 IEEE Conference on Energy Conversion (CENCON)) Kuala Lumpur, Malaysia on 30–31 October 2017
12. Reviewer for [ARiEET'2017] 2017 2nd Advanced Research in Electrical and Electronic Engineering Technology (ARiEET)
13. Reviewer for [RESEECS'2017] 2017 Recent Development in Sciences, Engineering, and Computer Sciences International Conference
14. Reviewer for [I4CT'2018] 2018 4th International Conference on Computer, Communication and Control Technology

15. Reviewer for [SISTECH'2018] 2018 Symposium on Islamic Sciences and Technology
16. Reviewer for [AVAREIT'2018] 2018 2nd Advanced Research in Electronic Engineering and Information Technology International Conference
17. Reviewer for the 2018 International Conference on Advances in Computing, Communications, and Informatics (ICACCI)
18. Reviewer for ICCMREA 2017 (2017 International Conference on Composite Materials & Renewable Energy Applications)
19. Reviewer for Green Energy Conference 2018
20. Reviewer for Conference on Engineering Education (ICEED 2018)
21. Reviewer for IEEE International Conference on Advanced Computational and Communication Paradigms (ICACCP-2018)
22. Reviewer for IEEE PES Asia-Pacific Power and Energy Engineering Conference (APPEEC 2018)
23. Reviewer for International Conference on Computing and Network Communications (CoCoNet'19)
24. Reviewer for IEEE Conference on Energy Conversion (CENCON 2019)
25. Reviewer for International Conference on Advanced Computational and Communication Paradigms (ICACCP 2019)
26. Reviewer for IEEE Transportation Electrification Conference (ITEC 2019)
27. Reviewer for International Symposium on Computer Vision and Machine Intelligence in Medical Image Analysis (ISCMM-2019)
28. Reviewer for IEEE International Conference on Power and Energy (PECon 2020)
29. Reviewer for Conference on Internet of Things and Embedded Intelligence, 2020
30. Reviewer for IEEE Toronto International Conference on Power and Energy (TICPE 2020)
31. Reviewer for International Conference on Electrical Engineering, Computer Science and Informatics (EECSI 2020)
32. Reviewer for Ahmad Dahlan International Conference Series on Engineering, Science and Information Technology 2020
33. Reviewer for Conference on Internet of Things and Embedded Intelligence 2020
34. Reviewer for IEEE International Conference on Power and Energy (PECON 2020)

Invited Talks

1. Speaker Invitation for INAIT Conference-2019, University of Cambridge, United Kingdom.
2. Speech Invitation from 7th Annual World Congress of Advanced Materials (W.C.A.M) 2018, in Xiamen, China with the theme of "Innovation, Integration, Transformation, and Sustainability"
3. Got an Opportunity to present an Invited paper at MIC-Electrical 2014 (1st International Conference on Electrical Engineering and Application), to be held in Athens, Greece: 4-6 April 2014.
4. Got an invitation to deliver a speech at 1st International Symposium on Energy Challenges and Mechanics, Aberdeen, Scotland, UK, 8-10 July 2014.
5. Got an invitation to contribute a talk in a Session 02: Renewable energy at 3rd International Symposium on Energy Challenges and Mechanics (ECM3) - towards a big picture, 7-9 July 2015, Aberdeen, Scotland, UK
6. Speech Invitation from the World Congress of Smart Energy-2017, Wuxi, China for Session 301: Solar PV Technologies
7. Speaker Invitation for 6th Annual World Congress of Advanced Materials-2017 (WCAM-2017, Xi'an) at Track702: Photovoltaics, Solar Energy, Artificial Photosynthesis Materials and Devices.

Editor/ Associate Editor/ Lead Guest Editor

1. **Associate Editor** for International Journal of Applied Power Engineering (IJAPE), ISSN 2088-8708, e-ISSN 2722-2578, p-ISSN 2252-8792, e-ISSN 2722-2624 (open access and free of charge journal).

2. Got an Invitation from SciencePG to propose a Special Issue in my research field and offered Lead Guest Editor, Science Publishing Group, NEW YORK, U.S.A.

Technical Program Committee for Journals, Government Summits & Conferences

1. Technical Program Committee for IEEE International Conference on Smart Technologies for Power, Energy and Control (STPEC), held in the Department of Electrical Engineering, Visvesvaraya National Institute of Technology, Nagpur, M.S., India during 25th to 26th September 2020
2. Technical Program Committee for IEEE International Conferences on Composite materials and Renewable Energy Applications (ICCMERA'2015), Sousse, Tunisia, 22-24 January 2015.
3. Technical Program Committee for International Conference on Solar Energy and Building (ICSoEB' 2015).
4. Program Committee for 2014 IEEE International Conference on Intelligent Energy and Power Systems, June 2-6, 2014, Kyiv, Ukraine.
5. Technical Program Committee for IEEE International Conferences on Composite materials and Renewable Energy Applications (ICCMERA'2014), Sousse, Tunisia, 22-24 January 2014
6. Technical Program Committee for International Conference on Computer Vision and Image Analysis applications (ICCVIA' 2014), 25-27 March 2014, Ras Al Khaimah, UAE.
7. Technical Program Committee for 2014 IEEE Conference on Energy Conversion (CENCON 2014), 13–15 October 2014, Johor Bahru, Malaysia
8. Technical Program Committee member for IEEE International Conference on Energy Conversion (CENCON 2015), Johor Bahru Malaysia, 19-21 October 2015.
9. Technical Program Committee member for 2017 IEEE SCOReD to be held during 13th Dec 2017 to 14th Dec 2017 at Everly Hotel, Putrajaya, Malaysia
10. Technical Program Committee member for CENCON 2017-(2017 IEEE Conference on Energy Conversion (CENCON)) Kuala Lumpur, Malaysia on 30–31 October 2017
11. Member for SIRS-2017 (Third International Symposium on Signal Processing and Intelligent Recognition Systems (SIRS'17))
12. Member for IEEE TENSYMP 2017 (2017 IEEE Region 10 Symposium (TENSYMP))
13. Technical Program Committee for International Biometrics & Smart Government Summit (IBMSGS' 2014), 22-24 March 2014, Dubai, UAE.
14. Technical Program committee member for the International Journal of Computing and Digital Systems (IJCDS).

Products Developed

My research interests lie in the interface of Wide Band-Gap Devices, Renewable Energy Sources, Advanced Power Electronics, Micro-grids, Switched mode Power supply. FPGA, DSP controllers for PE Application, Power systems, and IoT based Smart Power Converters for EVs. I believe in a multidisciplinary research approach and I stand for teamwork and enjoy the enrichment of collaboration, both within my field and between fields. Finally, I hope to find an environment that will enable me to continue enjoying productive collaboration and intellectual growth.

The following section provides you further details of my research till now and the outcomes of the project.

1. Research Directions

Project 1: Electric Vehicle two-wheeler (Zunik Energies Pvt. Ltd., I-2, TIDES, IIT Roorkee)

V_{dc}= 48V/60V

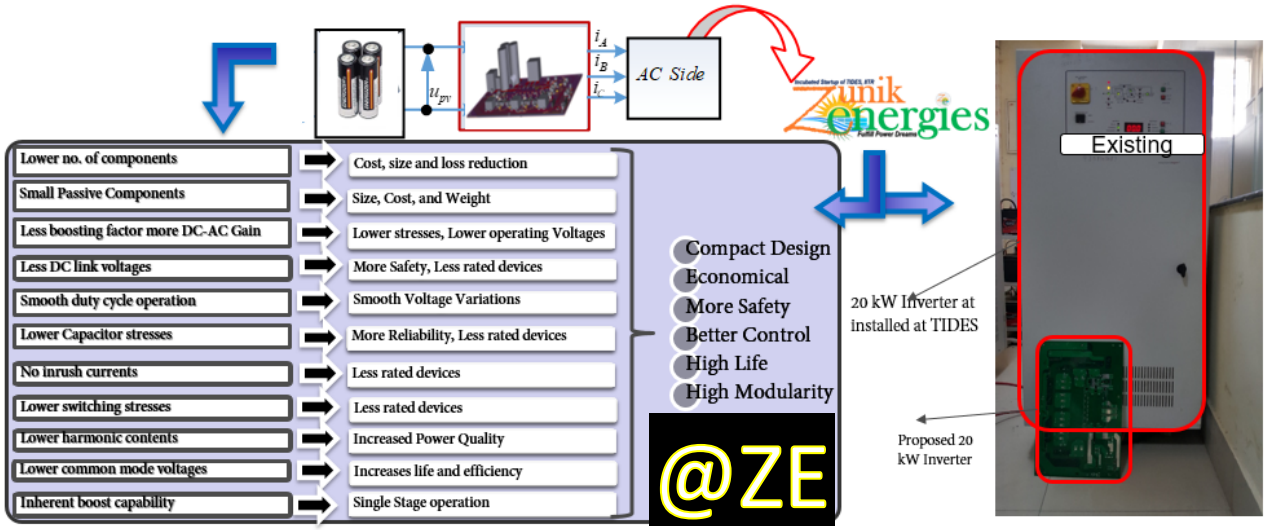
P_o=1KW

- **WBG devices**
- **Single Stage Conversion**

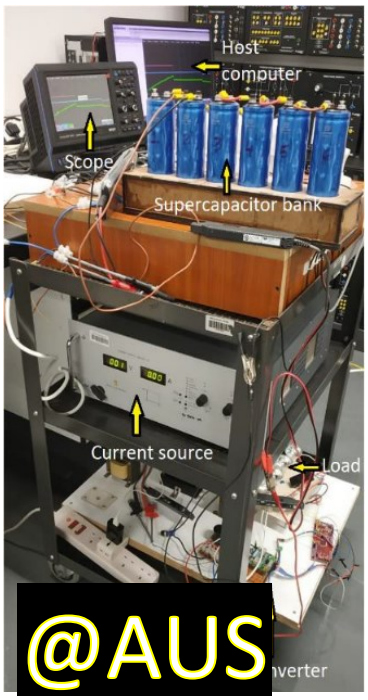
Compatible for 48V upto 1kW

1. **Compact Converter (6cm x 4cm)**
2. **Smooth Input Current – High Battery Life**
3. **Effective DC Bus utilization**
4. **Reduced Current stress on batteries**
5. **Advanced PWM techniques**
6. **Reduced Common mode voltages**

Project 2: Solar PV Inverter with intrinsic boost abilities (Zunik Energies Pvt. Ltd., I-2, TIDES, IIT Roorkee)

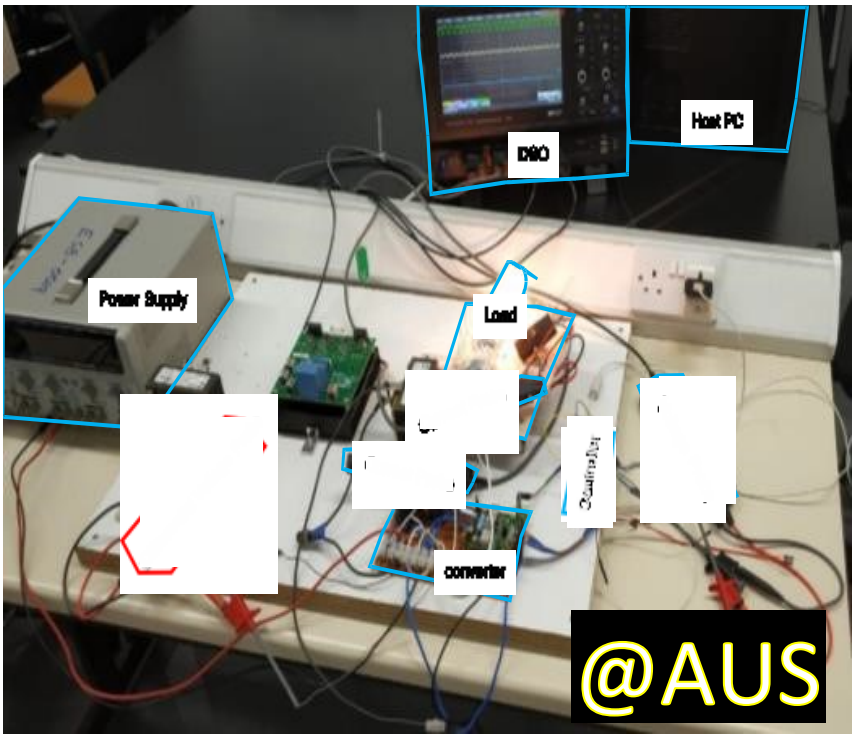


Project 3: Super capacitor Characterization (Renewable Energy Center, American University of Sharjah, UAE)



This project presents a simplified supercapacitor model and a universal adaptive stabilization, optimization (UAS+O) based parameter identification technique. Analytic solutions for the description of super capacitors current, voltage, subject to cyclic voltage and current sources of varying amplitudes and frequency, consistent with electric vehicle driving cycles, are developed. Supercapacitor I-V relationships show hysteresis, indicating simultaneous energy storage and dissipation mechanisms. A reduced equivalent circuit model is proposed to accurately represent hysteresis I-V characteristics. The proposed UAS+O based technique for estimating model parameters, is supported by mathematical proofs, simulation, and experimental results.

Project 4: LC Impedance Source Bi-Directional Converter (Renewable Energy Center, American University of Sharjah, UAE)



This project proposes an LC (Inductor and Capacitor) impedance source bi-directional DC–DC converter by redesigning after rearranging the reduced number of components of a switched boost bi-directional DC–DC converter. This new converter with a conventional modulation scheme offers several unique features, such as a) a lower number of components and b) reduced voltage stress on the capacitor compared to existing topologies. The reduction of capacitor voltage stress has the potential of improving the reliability and enhancing converter lifespan. An analysis of the proposed converter was completed with the help of a

mathematical model and state-space averaging models. The converter performance under different test conditions is compared with the conventional bi-directional DC–DC converter, Z-source converter, discontinuous current quasi Z-source converter, continuous current quasi Z-source converter, improved Z-source converter, switched boost converter, current-fed switched boost converter, and quasi switched boost converter in the Matlab Simulink environment. MATLAB/Simulink results demonstrate that the proposed converter has lesser components count and reduced capacitors' voltage stresses when compared to the topologies mentioned above. A 24 V to 18 V LC-impedance source bi-directional converter and a conventional bidirectional converter are built to investigate the feasibility and benefits of the proposed topology. Experimental results reveal that capacitor voltage stresses, in the case of proposed topology are reduced by 75.00% and 35.80% in both boost and buck modes, respectively, compared to the conventional converter circuit.

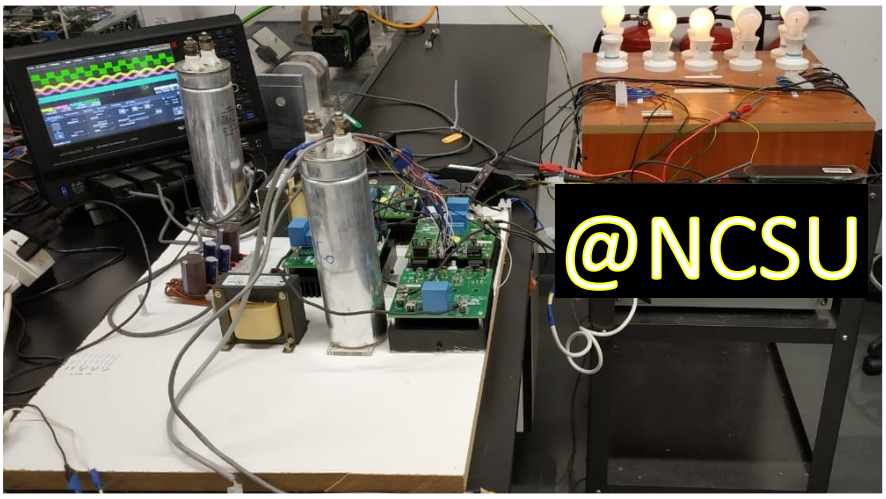
Project 5: Performance Investigation of 200KW Sic Inverter (FREEDM Systems Centre, NC State University)

The Project presents the characteristics of the latest commercial 1200V 300A SiC MOSFET modules used Agile Switch Inverter and compares its performance with Si IGBT with the same rating using experimental results and the LTSpice software environment. Our SiC MOSFET model in LTSpice gives accurate results across a wide range of temperatures. The results show that the 1200V SiC MOSFET has faster switching speed and significantly less switching loss compared to the Si IGBT. The main objective of this SiC-based project is to develop the modulation and control scheme using FGPA to investigate the performance at higher switching speeds. Moreover, the Si IGBT switching loss will increase significantly for higher operation temperature, while the SiC MOSFET switching loss has little variation over different temperatures. This project also investigated the stray inductance effect on the gate, drain, and source side and verifies its performance with Si IGBT.

Project 6: Novel Single Stage Boost Inverter (FREEDM Systems Centre, NC State University)

This Project introduces a novel type of 3-phase single stage dc-ac converter, which is controlled by sliding mode control, offers an intrinsic step up abilities. The proposed inverter is designed with the lesser number of solid-state semiconductor switches and small passive elements. Sliding mode controller (robust controller) is designed to control this power converter in order to achieve high robustness, sustain any kind of line or load variations and achieve a good dynamic response. In addition to this, the voltage across every capacitor is less when compared with existing traditional boost inverter topologies, which leads to better reliability and enhanced lifespan of the converter. This scheme also offers very less harmonic in the output voltage and currents. The proposed scheme is tested for a different line and load varying conditions on MATLAB Simulink environments as well as on a prototype. A 500W prototype has been fabricated and experimented to validate the feasibility and benefits of the system. Simulation and Experimental results reveal that proposed inverter offers better reliability, power quality and high lifetime over the existed topologies.

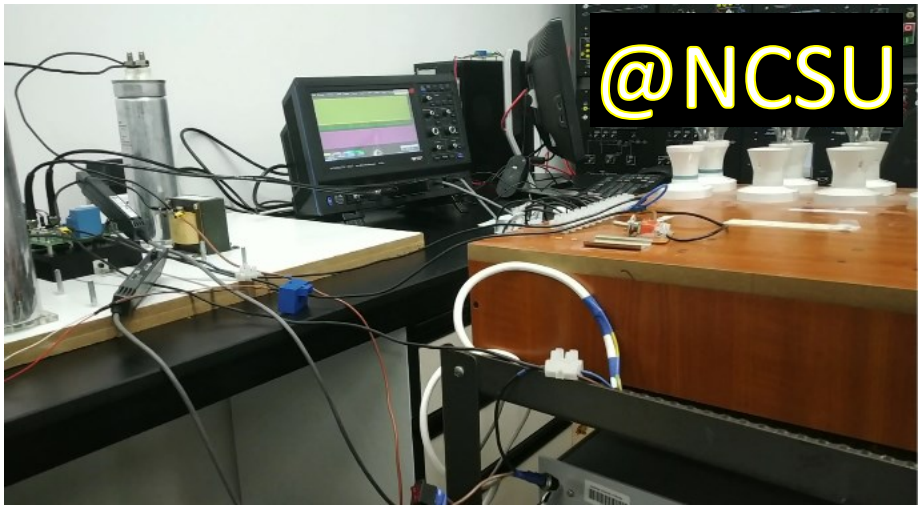
Project 7: Performance Investigation of 200KW Sic Inverter: (FREEDM Systems Centre, NC State University, USA)



The Project presents the characteristics of the latest commercial 1200V 300A SiC MOSFET modules used Agile Switch Inverter and compares its performance with Si IGBT with the same rating using experimental results and the LTSpice software environment. Our SiC MOSFET model in LTSpice gives accurate results across a wide range of temperatures. The results show that the 1200V SiC MOSFET has faster switching speed and significantly less switching loss compared to the Si IGBT. The main objective of this SiC-based project is to develop the modulation and control scheme using FGPA to investigate the

performance at higher switching speeds. Moreover, the Si IGBT switching loss will increase significantly for higher operation temperature, while the SiC MOSFET switching loss has little variation over different temperatures. This project also investigated the stray inductance effect on the gate, drain, and source side and verifies its performance with Si IGBT.

Project 8: Testing Circuit for Power Electronic Device Characterization: (FREEDM Systems Centre, NC State University, USA)



A novel energy recirculation circuit utilizes the concept of energy recirculation, with the power augmentation capability, is proposed. Proposed ERSC can be used as a device in-situ testing unit, by utilizing naturally occurring high electrical stresses on devices from a low-cost low-power source to supply energy for high power testing of power electronic devices. This topology allows devices to be examined at full-power stresses without connected with high power load and also without demanding high power, by storing and recirculating the energy of the energy storage elements, which elevates the capability of source power. This converter can operate in four different modes of operation, namely, soft start, magnetize, charge and energy recirculation modes with the four active states of operations attained by two active switches of the proposed converter. Another feature of this converter is, based on the devices under test devices performance these two circuits can be designed to operate in a synchronous or asynchronous manner, i.e. faster devices or slower devices can be tested.

For in-situ testing of high current and/or voltage devices, this circuit offers several advantages such as simple circuit design, does not demand any high voltage step-up transformer for realizing high voltages/currents, can be able to operate from low voltage/ power supply, cheapest solution and also provides fast response in comparison with conventional cascaded boost/buck and cascaded buck/boost ERSCs. To validate the concept, simulations are carried for testing of 1.2KV and 100A using 100V and 8A. And, the same is going to prove with the help of a lab-made prototype.

Project 9: Improved Power Quality Transformerless Power Converters for Solar PV applications (IIT Roorkee)

To further enhance the conversion gain, coupled inductor based capacitor clamped boost inverter has been proposed. This chapter introduces coupled inductor based capacitor clamped 3-phase DC-AC boost inverter with an intrinsic step up abilities by utilizing the small passive components. The main objective of this proposed inverter is to reduce the usage of capacitors (generally preferred to increase the gain), which are a weakest reliable element in the inverter design. By shifting the filter components from ac side to intermediate place, inverter can attain boost capability as well as good power decoupling ability, since shifted capacitor acting as a good power decoupling element. Furthermore, modulating waveforms are altered such a way that voltages across the capacitors are decreased. Reduced voltage stresses on capacitors lead to better reliability and enhanced lifespan of the inverter. This inverter performance under different test conditions is compared with boost converter fed voltage source inverter (BVSI), Z-Source Inverter (ZSI), quasi Z-Source Inverter (q-ZSI), Switched Boost Inverter (SBI), Current-Fed SBI (CF-SBI), quasi SBI (qSBI), Improved ZSI (IZSI), Switched Inductor-ZSI (SL-ZSI), Switched Inductor-qZSI (SL-qZSI), Diode Assisted qZSI (DA-qZSI), Capacitor Assisted qZSI (CA-qZSI), Extended Boost ZSI (EB-ZSI), Extended Boost qZSI (EB-qZSI) and CCBI; MATLAB Simulink results demonstrated that proposed inverter capabilities are superior to above-mentioned topologies. A 1200W experimental prototype has been built to validate the feasibility and benefits of the system. Simulation and experimental results reveal that proposed inverter offers better power quality, reliability and high lifetime.

Project 10: Development of Converter System for Solar PV Power Generation: (IIT Roorkee)

Renewable energy resources will be an increasingly important part of power generation in the new millennium. The main objective of this project is to develop a power conditioning system, which can be used to extract the variable DC power from the sun. It is converted into fixed dc by using DC-DC boost converter and then converted into AC power by using 3- level diode clamped inverter, to feed AC load effectively. In this project simulation results of the FPGA Controlled Photovoltaic

(PV) power conditioning system for AC, loads are presented. The power conditioning system consists of a diode clamped three-level inverter fed by a closed-loop voltage-controlled DC-DC Boost converter. This closed-loop control of the DC-DC converter is implemented by a conventional Pulse Width Modulator (PWM) with a duty cycle ratio control method. This boost converter is designed to obtain regulated voltage from the variable DC supply. A level shifts sinusoidal PWM is used to control the multilevel inverter on FPGA.

Project 11: FPGA Controlled Diode Clamped 3-Level Inverter (IIT Roorkee)

In this project, the hardware of the Diode clamped 3-level inverter is implemented and is controlled by FPGA Controller. This 3-level inverter is mainly developed for medium-level power applications. FPGA has been preferred over a traditional microcontroller because an FPGA can work at frequencies of the order of 50MHz, while the latter can work with frequencies up to 5-6 MHz only, making the FPGA faster and more accurate in the generation of firing pulses.