

Dipankar De, Ph.D.

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📍 B-105, School of Electrical and Computer Sciences, IIT Bhubaneswar, Jatni, Odisha-752050, India



Employment History

- 2016 – **Assistant Professor.** School of Electrical and Computer Sciences, Indian Institute of Technology Bhubaneswar, India.
- 2014 – 2016 **Research Fellow.** Department of Electrical and Computer Engineering, Toronto Metropolitan University, Toronto, Canada.
- 2011 – 2014 **Research Fellow.** Department of Electrical and Electronics Engineering, University of Nottingham, Nottingham, UK.

Education

- 2007 – 2011 **Ph.D., Indian Institute of Science, Bangalore, India** in Power Electronics
Thesis title: *High Frequency Link Inverters and Multi-resonant Controllers*
- 2005 – 2007 **M.E. Indian Institute of Science, Bangalore, India** in Electrical Engineering
- 2001 – 2005 **B.E. Indian Institute of Engineering Science and Technology, Shibpur, India** in Electrical Engineering

Research Interests

- Switched Mode Power Converters
- Application of Power Electronics in Power Systems
- Grid Interactive Converters
- Design of Integrated Magnetics
- Wide Band-gap Device based Power Conversion
- Renewable Energy and Energy Storage
- Electrical Drives Systems

Research Supervision

PhD

- Guddy Satpathy (Thesis Title: Improved One-Cycle and Proportional Multi-resonant Controllers for D-STATCOM with Sensor Reduction) - 2024 (completed)
- Burle Tulasi Rao (Thesis Title: Coupled Inductor Based High Voltage Gain Non-Isolated DC-DC Converters with Quadratic Input Stage) - 2024 (Completed)
- Silpashree Sahu (Area of Focus: Series Voltage Injection Based Modified Triple Active Bridge Converter with Link Current Optimization (Ongoing))

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JRF

- Abinash Dash (completed)
- Sujit Kumar (Completed)
- Hruday Beeravalli (Completed)
- Varri Chandra Sekhar Pavan Kumar (Ongoing)

MTech/Dual Degree

- Completed - 18

BTech

- Completed - 32
- Ongoing - 1

Research Funding/Sponsored Projects

- Comparison of control techniques for residential PV system with module based maximum power point tracking (PI), IIT Bhubaneswar – ₹ 10 Lakhs (completed)
- Si/SiC Hybrid Semiconductor based solid state transformer for PV application (PI), DST – ₹ 36.12 Lakhs (completed) – RP146
- Brush Less DC Machine Based Solar Pumping System (co-PI), DST – ₹ 66.24 Lakhs (completed) [PI: Prof. C. N. Bhende] – RP142
- Design and implementation of High-speed low-power embedded signal processor based custom power devices for power quality improvement (co-PI), DST – ₹ 33 Lakhs (completed) [PI: Dr. S. B. Karanki] – RP120
- Optimized Modulation of Triple Active Bridge Converter for Electric Vehicle Application with Wide Band Gap Semiconductor Devices (PI), DST, – ₹ 36.51 Lakhs (ongoing) – RP327

Research Publications

Journal Articles

- J1. G. Satpathy, and **D. De**, "Reduction in switching losses/DC bus requirement for a grid-connected inverter with minimal sensors using PMR-OCC." Electr Eng, 106, 509–519, 2024.
- J2. S. Maharana, S. Sahu, R. K. Bhat, S. Kumar, **D. De**, "Analysis and compensation of dead time effects on power transfer in dual active bridge for a general optimized modulation", Electrical Engineering, 2024, Accepted for Publications.
- J3. G. Satpathy, and **D. De**, Guddy Satpathy, and Dipankar De, "PV-MPPT Based One Cycle Control of LV-DC Fed Three Leg Single-phase STATCOM for High Quality Grid Current", Electrical Engineering, 2024.
- J4. G. Satpathy, and **D. De**, "A Novel Proportional Multi-Resonant Current Controller Strategy for Reduced DC Voltage fed D-STATCOM with Internal LCL Resonance Damping", Power Electronics and Drives, vol. 9 (44), 2024.
- J5. B. T. Rao, G. Satpathy, **D. De**, "Hybrid controller configuration for master–slave paralleling of DC–DC converters with improved sliding manifold", Electrical Engineering, 106, 79–91 (2024).

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- J6.** B. T. Rao and **De, D.**, "A Coupled Inductor-Based High-Gain ZVS DC-DC Converter With Reduced Voltage Stresses," in IEEE Transactions on Power Electronics, vol. 38, no. 12, pp. 15956-15967, Dec. 2023.
- J7.** B. T. Rao and **De, D.**, "Effective Leakage Energy Recycling in High Gain DC-DC Converter with Coupled Inductor," in IEEE Trans. Circuits and Systems II: Express Briefs, Vol. 69, No. 7, pp. 3284 - 3288, July 2022.
- J8.** B. T. Rao and **D. De**, "A Single Switch High Voltage Gain DC-DC Converter with Reduced Switch Voltage Stress," in IEEE Journal of Emerging and Selected Topics in Industrial Electronics, Vol. 3, No. 4, pp. 978 - 987, October 2022.
- J9.** C. Klumpner, M. Rashed, **D. De**, C. Patel, G. Asher, "Experimental evaluation of an energy storage system for medium voltage distribution grids enabling solid state substation functionality", IET Smart Grid, vol. 4, issue. 2, pp. 190-201, April 2021.
- J10.** S. Maharana, S. Mukherjee, **D. De**, A. Dash, A. Castellazzi, "Study of Dual Active Bridge with Modified Modulation Techniques for Reduced Link Current Peak Stress and Harmonics Losses in Magnetics", IEEE Trans. Ind. Applicat., Vol. 56, No. 5, Sept-Oct. 2020.
- J11.** T. Behera, **D. De**, "Enhanced operation of a Sen transformer with improved operating point density/area for power flow control", IET Generation, Transmission & Distribution, Vol. 13 No. 14, pp. 3158-3168, July 2019.
- J12.** N. Mukherjee, **D. De**, "A New State-of-Charge Control Derivation Method for Hybrid Battery Type Integration," IEEE Trans. Energy Conversion , vol. 32, no. 3, pp. 866-875, Sept. 2017.
- J13.** D. Barater, C. Concari, G. Buticchi, E. Gurpinar, **D. De**, and A. Castellazzi, "Performance evaluation of a 3-level ANPC photovoltaic grid-connected inverter with 650V SiC devices and optimized PWM," IEEE Trans. Ind. Applicat., vol. 52, no. 3, pp. 2475 - 2485, May-June 2016.
- J14.** F. Giuliani, **D. De**, N. Delmonte, A. Castellazzi, P. Cova, "Robust snubberless soft-switching power converter using SiC power MOSFETs and bespoke thermal design," Microelectronics Reliability - ELSEVIER, vol. 54, issue 9-10, pp. 1916-1920, Sept-Oct. 2014.
- J15.** **D. De**, C. Klumpner, C. Patel, P. Kulsangcharoen, M. Rashed, and G. Asher, "Modelling and control of a multi-stage interleaved DC-DC converter with coupled inductors for super-capacitor energy storage system," IET Power Electron., vol. 6, no. 7, pp. 1360-1375, Aug. 2013.
- J16.** N. Mukherjee, and **D. De**, "Analysis and improvement of performance in LCL filter based PWM rectifier/inverter application using hybrid damping approach," IET Power Electron., vol. 6, no. 2, pp. 309-325, Feb. 2013.
- J17.** **D. De**, and V. Ramanarayanan, "Analysis, Design, Modeling, and Implementation of an Active Clamp HF Link Converter," IEEE Trans. Circuit Sys.- I: Regular Papers, vol. 58, no. 6, pp. 1446-1455, Jun. 2011.
- J18.** **D. De**, and V. Ramanarayanan, "Improved Utilization of HF transformer in a DC-AC Application," IET Power Electron., vol. 4, no. 5, pp. 508-515, May 2011.
- J19.** **D. De**, and V. Ramanarayanan, "Decentralized Parallel Operation of Inverters Sharing Unbalanced and Non-linear Loads," IEEE Trans. Power Electron., vol. 25, no. 12, pp. 3015-3025, Dec. 2010.
- J20.** **D. De**, and V. Ramanarayanan, "A DC to three phase AC high frequency link converter with compensation for non-linear distortion," IEEE Trans. Ind. Electron., vol. 57, no. 11, pp. 3669-3677, Nov. 2010.
- J21.** **D. De**, and V. Ramanarayanan, "A proportional + multiresonant controller for three phase four-wire high-frequency link inverter," IEEE Trans. Power Electron., vol. 25, no. 4, pp. 899-906, Apr. 2010.

Conference Proceedings

- C1. G. Satpathy, **D. De**, A. Castellazzi, "Bidirectional Proportional Multi-SOGI Based OCC for LV PV-STATCOM with Trapezoidal Modulation", IEEE PEDES 2024, Surathkal, India.
- C2. S A, Sai Sumukh, B. T. Rao, **D. De**, A. Castellazzi, "GaN Switch Based Novel Quadratic-Double-Boost Floating-Input High Gain DC-DC Converter", ECCE Europe 2024, Darmstadt, Germany.
- C3. R. K. Bhat, **D. De**, S. Sahu and S. Kumar, "Individual Current Stress Optimization for Multiple Dual Active Bridges with Common Input Stage", National Power Electronics Conference (NPEC), Dec. 2023, pp. 1-6.
- C4. Sai Sumukh S A, Burle Tulasi Rao and **D. De**, "Novel Zero-Current Switched Quad-Boost High Gain DC-DC Converter", National Power Electronics Conference (NPEC), Dec. 2023, pp. 1-6.
- C5. MK K. Mohanta, **D. De**, S. Sahu, A. Castellazzi, "Mitigation of Dead-Time Effects on Transient DC Bias Elimination in Dual Active Bridge Link Current", in Proc. EPE ECCE Europe 2022, Hannover, Germany, pp. 1-8.
- C6. S. Mithun, **D. De**, B. T. Rao, A. Vijaywargiya, N. B. Puhan, "Analysis of Advanced Space Vector PWM Techniques Extended to Over-Modulation Region for Induction Machine Drive," in Proc. IEEE PESGRE 2022, Trivandrum, India, pp. 1-6.
- C7. G. Satpathy, **D. De**, "Reduced DC Voltage Fed Grid Connected Transformer-less Shunt Compensator with AC-Side Impedance-Source Configuration", in Proc. IEEE IECON 2021, pp. 1-6.
- C8. G. Satpathy, **D. De**, "Integration of Active Filter to the Grid at Reduced DC Voltage with Suppressed Leakage Current and Minimal Switches", in Proc. IEEE APEC 2021, pp-1-6.
- C9. A. Dash, MK. K. Mohanta, **D. De**, P. Abhishek, A. Castellazzi, "Modeling and Mitigation of Transformer Saturation in Dual-Active-Bridge Converter", in Proc. IEEE ECCE-Asia, 2021, pp. 1-6.
- C10. S. Maharana, S. Mukherjee, **D. De**, A. Castellazzi, "Dead-Time Compensated Dual Active Bridge with Online Hybrid Optimized Operation", in Proc. IEEE ICPEE, 2021, pp. 1-6.
- C11. S. Maharana, **D. De**, A. Castellazzi, "A New ZVS Zone Identification for Dual Active Bridge with a General Modulation Objective", in Proc. EPE ECCE'20. September 2020, pp, 1-10.
- C12. B.T. Rao, **D. De**, "Additional Voltage Assisted High Gain DC-DC Converter with Modified Cuk Configuration", in Proc. IEEE PESGRE 2020, Kerala, India, pp. 1-6.
- C13. B.T. Rao, **D. De**, U. Dey, K. Satyadeep, "Generalized Variable Interleaving Technique for Parallel Connected DC-DC Converters", in Proc. IEEE PESGRE 2020, Kerala, India, pp. 1-6.
- C14. S. Mukherjee, A. Dash, **D. De**, A. Castellazzi, "Trade-off in Minimization of Fundamental Link Current and Reactive Power using a Novel Online Calculation based Triple Phase Shift Modulator for Dual Active Bridge", in Proc. EPE 2019, Genoa, Italy, pp.1-10.
- C15. S. Mukherjee, A. Dash, **D. De** and A. Castellazzi, "A Study of Dual Active Bridge with Modified Modulation Techniques for Harmonic Reduction in AC Link Current", in Proc. IEEE ICSETS 2019, Bhubaneswar, India, pp. 1-6.
- C16. G. Satpathy and **D. De**, "DC Voltage Reduction in PV connected LV D-STATCOM with In-Phase Series Voltage Injection and Improved Transformer Ratings," in Proc. IEEE SPEC 2018, Singapore, pp. 1-8
- C17. A. Dash, and **D. De**, "Dual Active Bridge Magnetic Component Configurations for High Boost Application", in Proc. IEEE ICEPE 2018, Meghalaya, India, pp. 1-6.
- C18. A. Hassan, A. Dash, and **D. De**, "Comparison of Converter Structures for Residential PV System with Module based Maximum Power Point Tracking, in Proc. IEEE ICSESP 2018, March 28-30, Bhubaneswar, India, pp. 1-6.

- C19.** G. Satpathy, P. Patnaik, and **D. De**, "Shunt Compensation with Reduced DC Bus Voltage using Modulation Margin Controller, in Proc. IEEE INDICON, Dec. 2017, Roorkee, India, pp. 1-6
- C20.** N. Mukherjee, **D. De** and N. Nandagaoli, "Effect of sudden variation of grid voltage in primary frequency control application using converter based energy storage systems for weak grid systems," in Proc. EPE, Sept. 2017, pp. 1-10.
- C21.** C. Klumpner, M. Rashed, **D. De**, P. Kulsangcharoen, C. Patel, and G. Asher, "Experimental validation of the solid state substation with embedded energy storage concept," in Proc. ECCE, Sept. 2016, pp 1-8.
- C22.** **D. De**, B. Wu, D. Xu, and N. R. Zargari, "A Novel ZCS Back-to-Back Current Source Converter for High Power Applications," in Proc. EPE, Sept. 2015, pp 1-8.
- C23.** D. Barater, C. Concari, G. Buticchi, E. Gurpinar, **D. De**, and A. Castellazzi, "Performance evaluation of a 3-level ANPC photovoltaic grid-connected inverter with 650V SiC devices and optimized PWM," in Proc. IEEE ECCE, Sept. 2014, pp. 2233-2240.
- C24.** E. Gurpinar, **D. De**, A. Castellazzi, D. Barater, G. Buticchi, and G. Francheschini, "Performance analysis of SiC MOSFET based 3-level ANPC grid-connected inverter with novel modulation scheme," in Proc. IEEE COMPEL, Jun. 2014, pp. 1-7.
- C25.** **D. De**, A. Castellazzi, and A. Lamantia, "1.2kW dual-active bridge converter using SiC power MOSFETs and planar magnetics," in Proc. IPEC, May 2014, pp. 2503-2510.
- C26.** D. Barater, G. Buticchi, C. Concari, G. Franceschini, E. Gurpinar, **D. De**, A. Castellazzi, "Performance analysis of UniTL-H6 inverter with SiC MOSFETs," in Proc. IPEC, May 2014, pp. 433-439.
- C27.** E. Gurpinar, S. Lopez-Arevalo, J. Li, D. De, A. Castellazzi, L. Mills, "Testing of a lightweight SiC power module for avionic applications," in Proc. PEMD, April 2014, pp. 1-6.
- C28.** **D. De**, A. Castellazzi, S. L. Arevalo, and A. Lamantia, "SiC MOSFET based Avionic Power Supply," in Proc. PEMD, April 2014, pp. 1-6.
- C29.** P. Kulsangcharoen, R. Mohamed, C. Klumpner, **D. De**, C. Patel, G. Asher, "Experimental evaluation and efficiency optimization of a grid-connected converter for household energy storage applications," in Proc. PEMD, April 2014, pp. 1-6.
- C30.** **D. De**, A. Castellazzi, A. Solomon, A. Trentin, M. Minami, and T. Hikihara, "An all SiC MOSFET High Performance PV Converter Cell," in Proc. EPE, Sept. 2013, pp. 1-10.
- C31.** P. Kulsangcharoen, R. Mohamed, C. Klumpner, **D. De**, C. Patel, G. Asher, and G. Z. Chen, "Evaluation of a digitally controlled power electronic emulator for Supercapattery," in Proc. IET PEMD, Mar. 2012, pp. 1-6.
- C32.** **D. De**, R. Mohamed, C. Klumpner, C. Patel, P. Kulsangcharoen, and G. Asher, "Achieving the desired transformer leakage inductance necessary in DC-DC converters for energy storage applications," in Proc. IET PEMD, Mar. 2012, pp. 1-6.
- C33.** **D. De**, and V. Ramanarayanan, "An Active Shunt Compensator for Reactive, Unbalanced and Harmonic Loads under Balanced and Unbalanced Grid Voltage Conditions," in Proc. IEEE PEDES, Dec. 2010, pp. 1-6.
- C34.** **D. De**, and V. Ramanarayanan, "High Frequency Link Topology Based Double Conversion UPS System," in Proc. IEEE PEDES, Dec. 2010, pp. 1-6.
- C35.** S. Jagadale, **D. De**, and V. Ramanarayanan, "An Inexpensive Digital Network Analyzer," in Proc. IEEE IECON, 2009, pp. 206-211.
- C36.** **D. De**, and V. Ramanarayanan, "Compact Isolated Power Supply Topologies," in Proc. National Power Electronics Conf., 2010, pp. 1-7.

- C37.** D. De, and V. Ramanarayanan, "Regenerative Dynamometer with Vector Controlled Drive," in Proc. National System Conf. India, 2008, pp. 1-6.
- C38.** D. De, and V. Ramanarayanan, "Bidirectional Isolated Soft Switching Converter," in Proc. National Power Electronics Conf., 2007, pp. 1-6.

Teaching Subjects

- Switched Mode Power Conversion (EE6L051)
- Advanced Power Electronics (EE6L010)
- Advanced Machine Drives (EE6L055)
- Theory and Analysis of Electric Drives (EE6L052)
- HVDC and Flexible AC Transmission Systems (EE6L005)
- Grid Integration of Renewable Energy Sources (EE6L013)
- Electric Power Quality (EE6L002)
- Electrical Machines (EE2L003)
- Electrical Technology (EE1L001)
- Switched Mode Power Conversion Laboratory (EE6P052)
- Power Converter and Electric Drives Laboratory (EE6P053)
- Power Electronics Laboratory (EE3P003)
- Power Systems Laboratory (EE3P006)
- Electrical Technology Laboratory (EE1P001)
- Digital Electronics and Circuit Laboratory (EC2P004)

Membership of Societies

- Senior Member IEEE
- Member IET

Reviewer of Technical Articles

- IEEE Journal of Emerging and Selected Topics in Industrial Electronics
- IEEE Journal of Emerging and Selected Topics in Power Electronics
- IET Power Electronics
- EPE Journal
- IEEE Trans. Power Electronics
- IEEE Trans. Industrial Electronics
- IEEE Trans. Industry Applications
- IEEE System Journals

Various Research Projects as Lead Researcher

- Resonant Power Converter for medium voltage drive (NSERC and Rockwell Automation sponsored project), Ryerson University, Toronto, Canada
 - Design of novel DC-link resonant converter for high power back-to-back current source converter (CSC) (2 MVA, 4160V)
 - Detailed study on different commutation schemes to achieve soft switching of rectifier/inverter switches and comparison with state-of-art topologies
 - Involved in implementation of the experimental low power prototype and testing.

- 20 kW Energy Storage Interface with Grid for 1 MJ Super Capacitor System (E-ON sponsored project), University of Nottingham, UK
 - Design, development and control implementation of 100A multi-modular interleaved DCDC converter interface between super capacitor stack and a grid-tie inverter.
 - Multi-staged coupled inductors was introduced to limit inter-channel circulating current (hence associated high frequency losses) due to high differential mode inductances and to achieve very fast dynamic response due to low common mode inductances in the magnetic structure.
 - Analytical modelling and loss evaluation were carried out in detail and compared with experimental 20 kW prototype.
 - Worked along with other team members to interface the energy storage system with low voltage (440 V, 3 Φ) and medium voltage grid (2 kV, 1 Φ) for various functionality testing like charge-discharge cycling of the super capacitor stack, ride through a medium voltage grid fault operation, peak power levelling. The interfacing with medium voltage grid was carried out through a cascaded multilevel converter.
 - Involved in design, development and testing of medium frequency transformer and dual active bridge converter for cascaded multilevel converter.

- Implementation of Fully SiC based Bidirectional Switch Neutral Point Clamped (BSNPC) Converter for PV application, University of Nottingham, UK
 - Design, development and testing of compact multi-layer printed circuit board for BSNPC converter with 1200V SiC MOSFETs as half bridge devices and 600V SiC MOSFETs as bidirectional devices.
 - The efficiency comparison of SiC MOSFET with/without anti-parallel diode and with IGBT counter parts was carried out experimentally at different heat-sink temperature and switching frequencies upto 64 kHz.

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Various Research Projects as Lead Researcher (continued)

- 270V-28V Bidirectional DC-DC Converter for Avionic System (EU funded REGENESYS project), University of Nottingham, UK
 - Lead researcher in designing, prototyping and testing of 1.2 kW bi-directional DC-DC converter for use in novel avionic power system (helicopter application) incorporating regenerative loading and high frequency (100 kHz) gate driver circuit for new generation SiC MOSFET for the application.
 - Involved in design of controller and input filter compatible with aircraft standards MILSTD-704F.

- Development of High Frequency Link Converter for DC– three phase AC Application and Decentralized Paralleling, Indian Institute of Science, Bangalore, India
 - Introduced a three-phase four-wire high frequency link converter for stand alone and grid connected applications. The issues involved regarding poor transformer utilization were investigated.
 - Implementation of Decentralized paralleling of HF link 3-phase 4-wire inverters (1 kW and 0.5 kW) sharing unbalanced and non-linear loads by P/Q droop technique.
 - Sinusoidal domain proportional + multi-resonant controllers were used to achieve an excellent sharing accuracy of all sorts of loads with a simple virtual impedance (resistive output impedance). The design of the various stages of the controller were carried out addressing the stability issues, improved dynamic response and resonance damping of LC filter.
 - Proposed, implemented and tested a high frequency link based double conversion UPS system based on three winding transformer.
 - A shunt compensator (HF link based) to make grid currents balanced, harmonics free and at unity power factor using proportional + multi-resonant controller. The system was tested under balanced, unbalanced and transient faulty conditions of the grid.

- Implementation of Vector Controlled Dynamo-meter Indian Institute of Science, Bangalore, India
 - The objective was to circulate power between two mechanically coupled induction motors (3.7 kW) fed from a common DC bus. The motor under test was loaded with a particular torque command with a low power consumption.

Miscellaneous Experience

Awards and Achievements


- 2007 ■ **The N. R. Khambhati Memorial Medal** for the year 2006-2007 by the council of the Indian Institute of Science for the best M. E. student in EE discipline.
- 2006 ■ **GE Foundation Scholar-leader** by the GE Foundation and the Institute of International Education.

Workshop/Conference/Seminar Organized

- 2023 ■ **Workshop on Power Electronics Converters for Electric Vehicle Application (PECEVA-2023)**. School of Electrical and Computer Sciences, IIT Bhubaneswar.

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Miscellaneous Experience (continued)

2025  **Power Electronics Converters for Transportation and Energy Application (PECTEA-2025)**. School of Electrical and Computer Sciences, IIT Bhubaneswar (to be held at June 2025).

References

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