

# Faculty Profile

**Name:** Dr. Dogga Raveendhra

## About me:

Dr. Dogga Raveendhra, Associate Professor of Electrical and Electronics Engineering, completed his Post-Doctoral Fellowship Programme (One academic year) at Renewable Energy Research Center, AUS, UAE along with the affiliation of Senior Research Engineer at Zunik Energies Pvt. Ltd. followed by Ph.D. on the topic entitled "High Power Quality Transformerless Inverters for Solar PV Systems under the esteemed guidance of Dr. M K Pathak, Professor, Electrical Engineering Department, Indian Institute of Technology (IIT) Roorkee, India (part of PhD work was carried out at NSF FREEDM System Center, North Carolina State University, USA) with following remarks from Foreign Examiner Prof. Bimal K Bose (Considered as pioneer of Power Electronics).

The examiner is highly impressed with the scientific contributions made in the thesis. The quality is unique and quantity is enormous. In fact, the standard of the thesis is superior to any advanced universities of the world (even above the standard of MIT and Stanford). The organization and composition of the thesis are also perfect. The examiner has never encountered such a high quality thesis in his entire career. My congratulations to Dogga with the blessings for a very prosperous career.

During my Ph.D. program, I worked as a Visiting Researcher at NC State University under the guidance of Prof. Douglas C Hopkins. This visitation program was funded by DST, Govt. India and IUSSTF. Prior to PhD, he has worked as an Assistant Professor at Department of Electrical and Electronics Engineering, Graphic Era University, Dehradun for a period of 2 years.

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## Curriculum Vitae: (Professors)

### Educational Details:

<b>Ph.D.</b>	Thesis: Improved Power Quality Transformerless Power Converters for Solar PV applications Electrical Drives and Power Electronics Research Group in the Electrical Engineering Department <b>Indian Institute of Technology, Roorkee</b>	<b>2019</b> with <b>A</b> grade (92.1%-course work)
<b>M.Tech</b>	Dissertation: Development of Converter System for Solar PV Power Generation Specialization of Electrical Drives and Power Electronics <b>Indian Institute of Technology, Roorkee</b>	<b>2012</b> with <b>88.33%</b>
<b>B.Tech</b>	Specialization of Electrical and Electronics Engineering University: JNTU Kakinada.	<b>2009</b> with <b>65.63%</b>

### Professional Background:

### Teaching Experience:

**Associate Professor, Gokaraju Rangaraju Institute of Engineering and Technology, Hyderabad, India from Oct'20 to till date**

**Roles and Responsibility:**

- Teaching and Research

**Assistant Professor, Graphic Era University, India from July'12 to July'14 (2 years)**

**Roles and Responsibility:**

- Teaching and Research
- Conduct Research in Industrial Drives Lab
- Faculty advisor/course coordinator for Advanced Control and Industrial Drives Lab
- Working on Developing Supervisory Controls for Hybrid Electric Vehicles

**Major Projects Handled**

- Multi-Level Converter and Control Using FPGA for Drives Applications and Bi-Directional Power Converters for Solar PV Applications

**Research Experience:**

**Senior Research Engineer, Zunik Energies Pvt. Ltd., India as from Aug'17 to Present (3 years)**

**Roles and Responsibilities**

- Research and product development of Power Electronic Converters for Renewable Energy Applications and Electrical Vehicles.
- Maintain current knowledge of technology landscape and developments
- Track, analyze and monitor technology performance metrics and consolidate our technology platforms and create plans for each
- Identify new areas of opportunities and create plans to implement them for our clients and us
- Develop, test, and implement processes for product manufacture and production.
- Developed prototypes & tools and leveraged current applications
- Evaluating and implementing new systems and infrastructure
- Discover and implement new technologies that yield competitive advantage
- Preparing research proposals and funding applications

**Major Projects Handled**

- Single Stage Converters for Solar PV Applications
- High Gain Converters for Electrical Vehicles
- FPGA Controlled Power Converters

**Products Developed**

- Single Stage Capacitor Clamped Boost Inverter, Super Capacitor Characterization Circuit using SiC-based Power Converter, 200kW SiC-based Central Inverter, LC-Bi-Directional DC-DC Converter for Solar Applications, FPGA based MPPT charge controller for PV system, FPGA Controlled Coupled Inductor based LC- Bidirectional Converter, Reduced Common-Mode Voltage Converter based Induction Motor Drive, Diode Clamped Three-Level Inverter, Cascaded H-Bridge Three-Level Inverter for solar PV systems

**Senior Research Fellow, IIT Roorkee, India from June'16 to July'19 (3 Years)**

- Worked on Single-Stage Power Conversion Project

**Major Projects Handled**

- Simulation and Hardware Implementation of Power Electronics Converters for Solar PV Applications

**Junior Research Fellow, IIT Roorkee, India from July'14 to May'16 (2 Years)**

- Worked on Capacitor Clamped Boost Inverter Project Funded by TIDES, IIT Roorkee

**Major Projects Handled**

- Design and Development of Power Converter for Solar PV Systems.

**Assignments Abroad:**

**Post-Doctoral Research Associate, Renewable Energy Research Center, American University as from Sep'19-June'20 (1 Academic Year)**

**Roles and Responsibilities:**

- Develop, test, and implement innovative research for Hybrid Energy Storage Systems of Electric Vehicle Systems.
- Develop prototypes & tools for Hybrid Energy Storage Systems of Electric Vehicles.

**Major Projects Handled**

- LC-Bidirectional DC-DC Converter
- Super Capacitor Characterisation using SiC Converters
- Elimination of Common Mode Voltages in power Converters
- Wireless Power Supply for Drones

Visiting Researcher, FREEDM Systems Center, NC State University, USA from July'16 to Nov'16

**Roles and Responsibilities:**

- Design and Development of Power Converter for Solar PV Systems.

**Major Projects Handled**

- Novel Characterization Circuit for Power Semiconductor Device Testing

**Administrative Experience:**

**Committee Work:**

**Courses Taught:**

**UG Level**

Course Name	Duration	Students Strength	Credits
<b>Switchgear and Protection</b>	Aug 2012 to Dec 2012	120 (2 sections)	4
	Aug 2013 to Dec 2013	120 (2 sections)	
<b>Modern Control Systems</b>	Aug 2014 to Dec 2014	60	4
<b>Electrical Machines-I</b>	Jan 2013 to May 2013	60	4
<b>Power Electronics</b>	Jan 2013 to May 2013	120 (2 sections)	4
	Jan 2014 to May 2014	120 (2 sections)	

**Post-Graduate (PG-Level) Courses**

Table 2: Courses Taught as an Assistant Professor at Graphic Era University

Course Name	Duration	Students Strength	Credits
<b>Industrial Drives</b>	Aug 2012 to Dec 2012	12	4
<b>Non-Linear Control Systems</b>	Aug 2013 to Dec 2013	12	4

**Sponsored Projects:**

**Ongoing Projects:**

**Completed Projects and Grants Received:**

#	Duration	Received Amount	Details	Funding Agency
1.	Feb'19 – Mar'21	1,40,00,000	GAIL Pankh Commercialization Grant	GAIL India Ltd
2.	Sept'19 – June'20	38,50,000	Post-Doctoral Fellowship	Renewable Energy Research Center, AUS
3.	June'18 – June'20	22,00,000	Incubation Facilities	TIDES, IIT Roorkee
4.	June'16 – Nov'16	– 10,40,000	Bhaskara Advanced Solar Energy Fellowship	DST, India
5.	July'14 – June'19	16,00,000	MHRD Fellowship	MHRD

6.	Dec' 17	25,000	International Travel Grant	IIT Roorkee
7.	Aug'17 – Dec'17	80,000	Prototyping Grant	TIDES, IIT Roorkee
8.	May'19	45,000	Faculty Development Program	NIT Warangal
9.	May'18	30,000	IITRHF Business Plan Competition	TIDES, IIT Roorkee
10.	Oct'18	50,000 + 8,000	IMC Most Promising Innovation Award	IKP
11.	Nov'18	2,00,000	Faculty Development Program	Aditya College of Engineering, Kakinada
12.	Dec'18	40000+1,20,000+40,000	Slush, Helsinki	DIPP, Govt, of India and APIS
13.	Dec'18	50,000	IEEE Journal Additional Pages	IITR
14.	June'20	1,20,000	Open Access Charges	RERC, AUS, Sharjah

## Publications:

1. **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).
2. **Raveendhra Dogga**, M.K. Pathak, "Recent trends in solar PV inverter topologies", [Elsevier Solar Energy](#), Volume 183,2019,Pages 57-73, ISSN 0038-092X, doi: 10.1016/j.solener.2019.02.065 (Impact Factor: 4.608).
3. Shayok Mukhopadhyay, Rached Dhaouadi Takroui, Mohannad, **Dogga Raveendhra**, "Supercapacitor Characterization Using Universal Adaptive Stabilization and Optimization" [IEEE Open Journal of the Industrial Electronics Society](#), vol. 1, pp. 166-183, 2020.
4. 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
5. **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: 1.72)
6. **D Raveendhra**, BL Narasimharaju, D Panasetsky, D Sidorov, "Testing Circuit for Power Electronic Device Characterization", Аналитические и численные методы моделирования естественно-научных и социальных проблем: материалы, pp.155, 2016. (ISBN 978-5-906913-23-4)
7. [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
8. [US Patent Disclosure](#): Douglas C Hopkins, **Dogga Raveendhra**, Subhasis Bhattacharya "Novel Single-Stage Converter and Control Scheme", Filed at NCSU Office of Technology Transfer for US patent. Ref. No: 17125
9. [Indian Patent](#): **Raveendhra Dogga**, M K Pathak, "Novel Single-Stage Inverter", Application Number: 201641038706
10. [Indian Patent](#): Ravi Kumar KS, **Raveendhra Dogga**, Nagesh Kumar, V V Sastry Vedula, Novel Capacitor Clamped Bidirectional DC-DC Converter, Application Number: 201641038706
11. 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", IDEAS CPS in LSCS Series. ([Indexing: Thomson ISI Proceedings, DBLP, IET Inspec, Scopus, EI Compdex, Google Scholar, Proquest, etc.](#))
12. **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](#))
13. 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](#))
14. **D. Raveendhra**, M. K. Pathak and A. Panda, "Power conditioning system for solar power applications: Closed loop DC-DC

- converter 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](#))
15. **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](#))
  16. 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](#))
  17. **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](#))
  18. **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](#))
  19. 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](#))
  20. 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](#))
  21. **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](#))
  22. 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](#))
  23. **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](#))
  24. **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](#))
  25. **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](#))
  26. **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](#))
  27. **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](#))
  28. **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](#))
  29. 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.

## Research Projects:

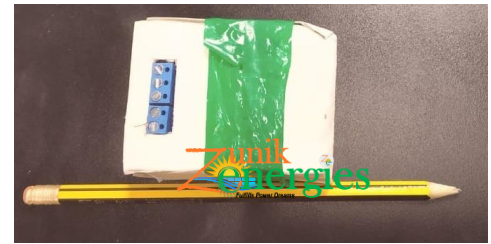
### Project 1: Electric Vehicle two-wheeler (Zunik Energies Pvt. Ltd., I-2, TIDES, IIT Roorkee)



$$V_{dc} = 48V/60V$$

$$P_o = 1KW$$

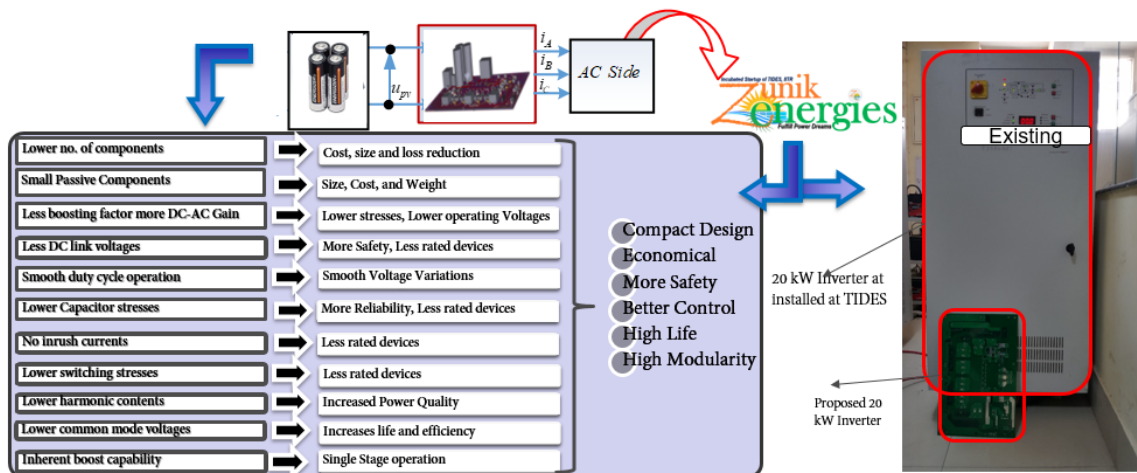
Wide band gap devices  
Single Stage Conversion  
Compatible for 48V up to  
1kW Motor.



#### Variants:

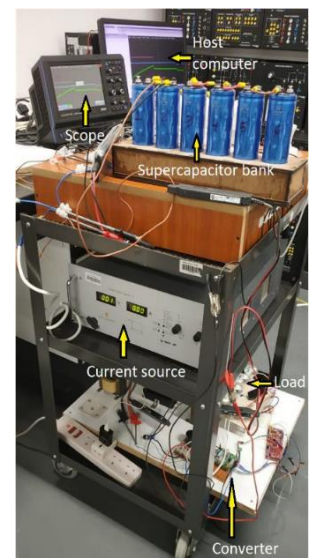
1. Compact Converter (6cm x 4cm)
2. Smooth Input Current – High Battery Life
3. Effective DC Bus utilization
4. Reduced Current stress on batteries
5. Advanced PWM techniques
6. Reduced Common mode voltages

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

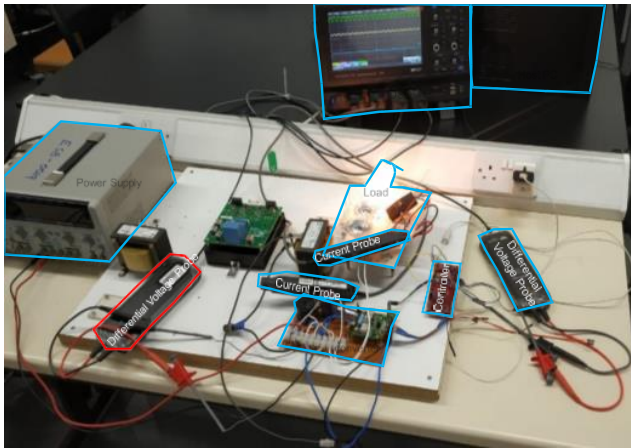


### Project 3: Super capacitor Characterization (Renewable Energy Center, American University of Sharjah, UAE)

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 supercapacitors 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 FPGA 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.

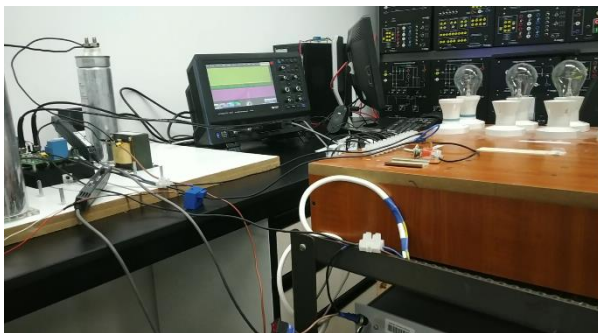
**Project 7: Performance Investigation of 200KW Sic Inverter: (FREEDM Systems Centre, NC State University, USA)**



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 FPGA 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.

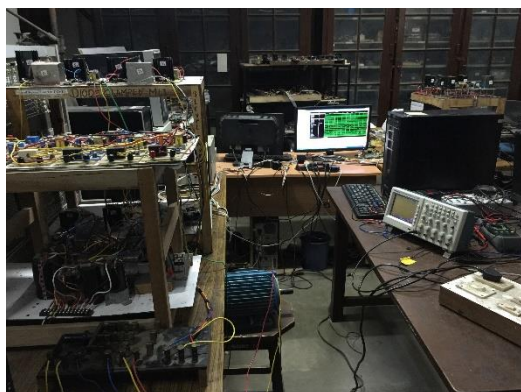
For in-situ testing of high current and/or voltage devices, this circuit offers several advantages such as simple circuit design, does not demand any high voltage step-up transformer for realizing high voltages/currents, can be able to operate from low voltage/ power supply, cheapest solution and also 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.

### PhD Supervision: Nil

### Professional Work:

#### Talk/Papers Presentations:

#	Award/Honored Position	Awarded/ Honored By	Year
1.	Key Note Speaker in Faculty Development Programme	Government Engineering College Raipur, Chhattisgarh	2020
2.	Key Note Talk in Faculty Development Programme	Rajiv Gandhi Prudyogiki Vishwavidyalaya, Bhopal	2020
3.	Key Note Speaker in Faculty Development Programme	Government Engineering College Raipur, Chhattisgarh	2020
4.	Resource person in a Faculty Development programme	ATAL FDP/NMREC	2020
5.	Resource person in a Faculty Development programme	ATAL FDP at Kallam Harinadh Reddy Institute of Technology	2020
6.	Resource person in a Faculty Development programme	Vardhaman Engineering College Hyderabad	2020
7.	Guest Lecture	KL University, Viziawada	2020
8.	Guest Lecture	Vishakha Institute of Engineering & Technology	2020
9.	Resource person in a Faculty Development programme	ATAL FDP at MVGR College of Engineering	2020
10.	Best Innovation Award	Zunik Energies Pvt. Ltd	2019
11.	Who's Who in the World 2019	Marquis, USA	2019
12.	Resource person in a Faculty Development programme	NIT, Warangal	2019
13.	Industry Expert for Board of Studies	NIT Nagpur	2019
14.	Albert Nelson Marquis Lifetime Achievement Award	Marquis Who's Who (USA)	2018
15.	Who's Who in the World 2018	Marquis, USA	2018
16.	Resource person in a Faculty Development programme	Aditya Group of Engineering Colleges	2018
17.	Guest Lecture	Dev Bhoomi Group of Institutes	2018
18.	Expert Lecture	NITTTT, Chandigarh	2018
19.	Delegate for India-Italy Summit	DST-CII, New Delhi	2018
20.	Most Promising Innovation Award (1 <sup>st</sup> Prize)	IKMC 2018 Startup Exhibition	2018
21.	Mentor for start-ups	SAIC, Thapar University	2018
22.	Session Chair	IEEE SCOREd International Conference, Malaysia	2017
23.	International Travel Grant	IIT Roorkee	2017
24.	Resource person in a Faculty Development	MVGR College of Engineering	2017

	programme		
25.	Judges Choice award	TIDES-IITRHF	2017
26.	Bhaskara Advanced Solar Energy Fellowship	DST, India	2016
27.	MHRD scholarship for M.Tech	Ministry of Human Resource Development	2010-12
28.	MHRD scholarship for M.Tech	Ministry of Human Resource Development	2014-19

### **Seminars and Symposiums:**

1. Participated in Workshop on Advanced Control and computing technologies for reliable Industrial Electricity saving (acctries-2014) from 17-18 Feb. 2014 Organized by Department of Water Resources Development and Management & Indian Water Resources Society (IWRS) at Department of Water Resources Development and Management, IIT Roorkee.
2. Attended an AICTE recognized ICT based program 5 days' workshop, "The FDP on soft computing", NITTTR, Chandigarh, 11- 15 November 2013.
3. Attended a National Workshop on MATLAB and its Applications" conducted at GMR Institute of Technology in Dec 2008.
4. Organized an IEEE associated workshop 'CIRCUIT SAPIENS' on MATLAB and PCB Design for Engineers at Graphic Era University in Mar 2013.
5. Delivered a Seminar at IEEE International Conference at MNNIT, Bhopal
6. Delivered a Seminar at the IEEE International Conference at PSNA College of Engg.
7. Delivered a Seminar at the IEEE International Conference at PSNA College of Engg.
8. Delivered a Seminar at IEEE International Conference at Nagapatnam.

### **External Examiner (PhD Thesis): Nil**

### **Memberships:**

1. **IEEE** Member
2. Member, Subcommittee of "Resonant and Soft Switching Converters" of IES Power Electronics Technical Committee (IEEE IES PETC)
3. Full Member (**MEEC**) of the European Energy Centre

### **Review Works:**

#### **Reviewer for Journals**

1. [IEEE Transactions on Industrial Electronics](#) (Impact factor of 6.498)
2. [IEEE Transactions on Journal of Emerging and Selected Topics in Power Electronics](#) (Impact factor of 5.177)
3. [International Journal of Electrical Power and Energy Systems](#), Elsevier (Impact factor of 3.432)
4. [Journal of Solar Energy](#), Elsevier (Impact factor of 3.469)
5. [Power Electronics](#), IET (Impact factor of 1.6)
6. [Generation, Transmission & Distribution](#), IET (Impact factor of 1.353)
7. [International Transactions on Electrical Energy Systems](#) (Impact factor of 1.085)
8. [Renewable Power Generation](#), IET (Impact factor of 1.60)
9. [Electric Power Components and Systems](#) Journal, Taylor and Francis (Impact factor of 0.69)
10. Reviewer for [IETE Journal of Research](#) (Impact factor of 0.6)
11. Reviewer for [IEEE Access](#)
12. Reviewer for [Mathematics and Computers in Simulation](#) (Elsevier)
13. [Bulletin of Electrical Engineering and Informatics](#) (BEEI)
14. [Journal of TELKOMNIKA](#) (Telecommunication, Computing, Electronics and Control)
15. Indonesian Journal of [Electrical Engineering and Computer Science](#)
16. International Journal of [Electrical and Computer Engineering](#) (IJECE)
17. International [Journal of Advances in Applied Sciences](#) (IJAAS)
18. [Journal of Computing and Digital Systems](#)
19. [Journal of Trends in Computer Science and Information Technology](#)
20. [International Journal of Robotics and Automation](#) (IAES)
21. [International Journal of Computing and Digital Systems](#) (IJCDs)

22. [IETE Journal of Research](#)
23. [International Journal of Green Energy](#)
24. [International Journal of Emerging Electric Power Systems \(IJEPS\)](#)
25. [International Journal of Electrical Power and Energy Systems](#)
26. [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 [ARIET'2017] 2017 2nd [Advanced Research in Electrical and Electronic Engineering Technology \(ARIET\)](#)
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 \(ISCM-2019\)](#)
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 TENSYP](#) 2017 (2017 IEEE Region 10 Symposium (TENSYP))
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 \(IJCDs\)](#).

### **Visits Abroad:**

1. Visiting Researcher at NSF FREEDM System Center, North Carolina State University (NCSU), USA. This visitation program was funded by DST, Govt. India and IUSSTF.
2. Post-Doctoral Research Associate at Renewable Energy Research Center, American University of Sharjah, UAE. This visitation program was funded by Renewable Energy Research Center.
3. Session Chair at 10<sup>th</sup> IEEE SCORed International Conference, Malaysia. This Program was sponsored by IIT Roorkee and Zunik Energies (P) Ltd.