(DEEMED TO BE UNIVERSITY)

CATEGORY 1 UNIVERSITY
BY MHRD, Govt. of India

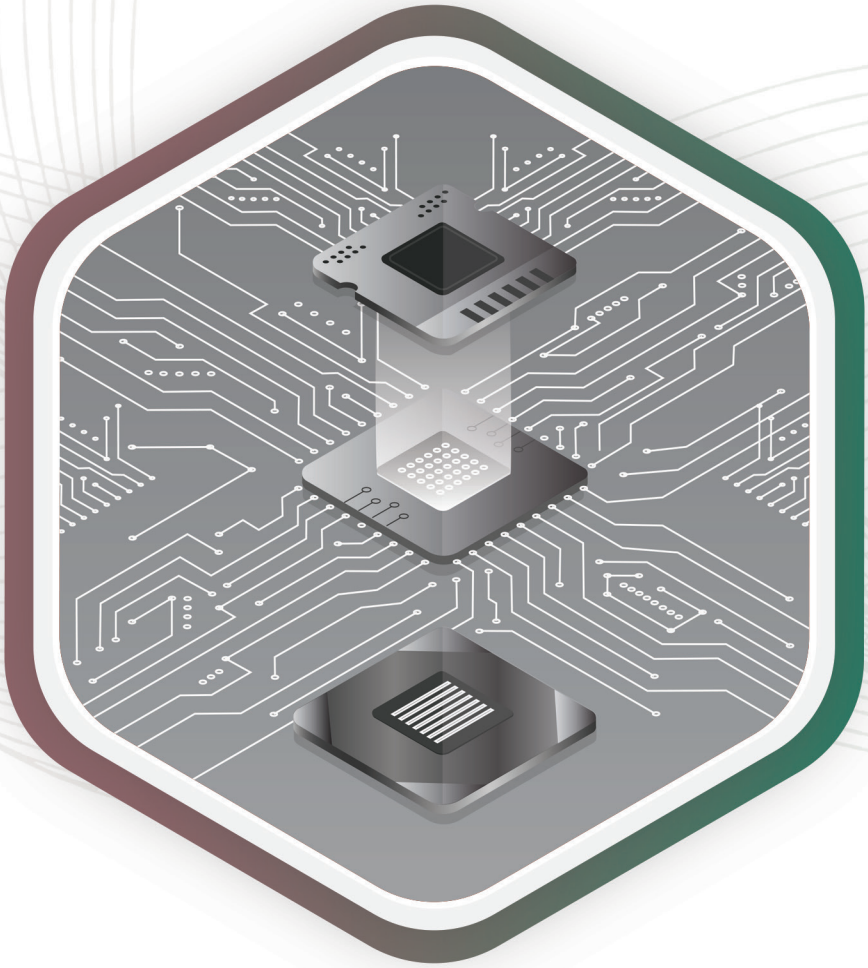
KL ACCREDITED BY NAAC WITH A++
GRADE

nirf 2024 NATIONAL INSTITUTIONAL RANKING FRAMEWORK

RANKED 22 AMONG ALL UNIVERSITIES

45 YEARS OF EDUCATIONAL LEADERSHIP

# ELECTRICAL AND ELECTRONICS ENGINEERING



# POWER ELECTRONICS

# POWER ELECTRONICS

## About the Power Electronics Research Center:

The Power Electronics Research Center at KLEF is dedicated to advancing research in power electronics, with a focus on applications such as renewable energy systems, electric and autonomous vehicles, and smart grids. The group specializes in the design and optimization of power electronic converters and multilevel inverters to improve energy efficiency and system performance. Leveraging advanced AI techniques like machine learning and Fuzzy Logic, the group enhances control strategies, particularly for power conversion and management in electric and autonomous vehicles. Their research also explores the integration of different controllers with AI algorithms for optimal control, aiming to push the boundaries of innovation in power electronics and modern energy systems. Through its innovative work, the group aims to revolutionize energy efficiency and control in power electronic systems, while collaborating with academic and industry partners to solve emerging challenges in power electronics and automation.

## Vision:

To advance energy efficiency and control in power electronic systems through innovative research

## Mission:

The Power Electronics Research Group at KLEF is dedicated to advancing research in power electronics, with a focus on applications such as renewable energy systems, electric and autonomous vehicles, and smart grids. The group specializes in the design and optimization of power electronic converters and multilevel inverters to improve energy efficiency and system performance

## Key Research Areas:

- Power Electronics in Power Systems
- Electric Drives and Control
- Power Electronics in Transportation System
- Power Converters
- Energy Conservation
- Heating and Lighting Control
- Renewable Energy Integration

# EQUIPMENT DETAILS

### Multi-point Clamped Inverter

**Description:** A Multi-point Clamped Inverter is a multilevel inverter that uses multiple voltage levels and clamping diodes or capacitors to reduce harmonic distortion and voltage stress, making it ideal for high-power applications like renewable energy and motor drives.

**Beneficiaries:** UG students, PG students and Research Scholars

### Matrix Converter

**Description:** A Matrix Converter in power electronics is an AC-AC converter that directly converts input AC voltage to output AC voltage without an intermediate DC link. It uses bidirectional switches in a matrix arrangement, offering efficient power transfer with sinusoidal waveforms and bidirectional power flow, ideal for motor drives and renewable energy systems.

Beneficiaries : UG students, PG students and Research Scholars

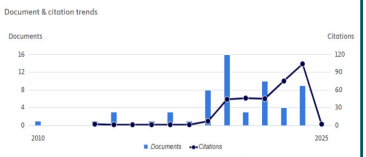
### Five level five phase cascaded h-bridge

**Description:** A five-level, five-phase cascaded H-bridge inverter is a type of multilevel inverter that uses a series of H-bridge units to generate a five-level output across five phases. This setup reduces harmonic distortion, improves power quality, and is often used in high-power applications like industrial motor drives and renewable energy systems.

**Beneficiaries:** UG students, PG students and Research Scholars

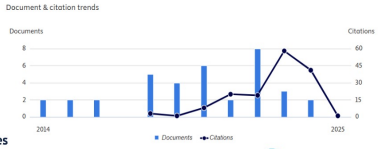
# ASSOCIATE MEMBERS

330 Citations by ***293 documents*** | 60 Documents | 9 *h*-index View *h*-graph



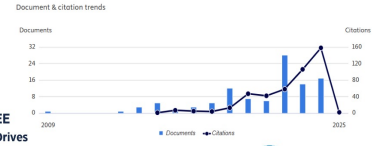

**Dr. A PANDIAN**
**Professor, Dept. of EEE**
**Research Area : Electrical Machines**

151 Citations by ***131 documents*** | 36 Documents | 7 *h*-index View *h*-graph



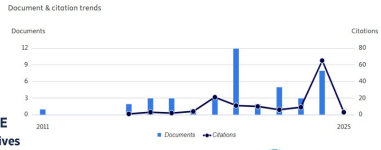

**Dr. K NARASIMHA RAJU**
**Professor, Dept. of EEE**
**Research Area : Power & Industrial Drives**

443 Citations by ***346 documents*** | 104 Documents | 10 *h*-index View *h*-graph



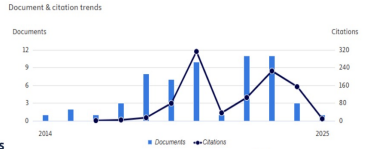

**Dr. M KIRAN KUMAR**
**Associate Professor, Dept. of EEE**
**Research Area : Power Electronics and Drives**

135 Citations by ***101 documents*** | 43 Documents | 6 *h*-index View *h*-graph



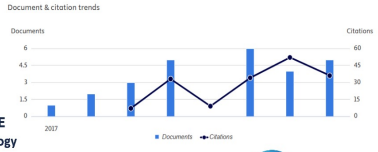

**Dr. B JYOTHI**
**Associate Professor, Dept. of EEE**
**Research Area : Power Electronics & Drives**

940 Citations by ***433 documents*** | 59 Documents | 20 *h*-index View *h*-graph



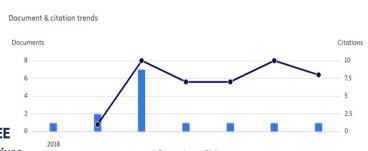

**Dr. T VIJAY MUNI**
**Assistant Professor, Dept. of EEE**
**Research Area : Power & Industrial Drives**

171 Citations by ***112 documents*** | 26 Documents | 8 *h*-index View *h*-graph



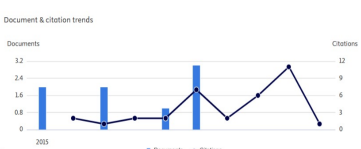

**Dr. D KALYAN**
**Assistant Professor, Dept. of EEE**
**Research Area : Sensor System Technology**

43 Citations by ***43 documents*** | 14 Documents | 3 *h*-index View *h*-graph




**Mr. S RAVI TEJA**
**Assistant Professor, Dept. of EEE**
**Research Area : Power Electronics & Drives**

34 Citations by ***33 documents*** | 8 Documents | 2 *h*-index View *h*-graph




**Mr. T TEJA SREENU**
**Assistant Professor, Dept. of EEE**
**Research Area : Power Electronics & Drives**

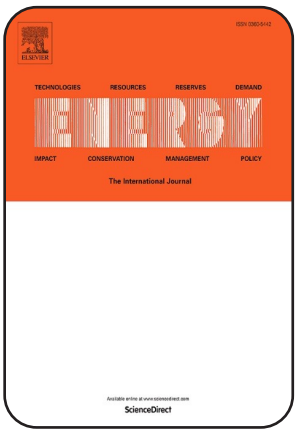
## Number of Publications by the Associate members:

| S.No | Name of the Group member | No. of SCI Publications | No. of Scopus Publications | Total No. of Publications |
|---|---|---|---|---|
| 1 | DR. A PANDIAN | 14 | 60 | 60 |
| 2 | DR. KUTHURI NARASIMHA RAJU | 02 | 36 | 36 |
| 3 | DR. MALLIGUNTA KIRAN KUMAR | 34 | 104 | 104 |
| 4 | DR. B JYOTHI | 07 | 43 | 43 |
| 5 | DR. TADANKI VIJAY MUNI | 07 | 59 | 59 |
| 6 | MR. D. KALYAN | Nil | 26 | 26 |
| 7 | MR. SRUNGARAM RAVI TEJA | 1 | 14 | 14 |
| 8 | MR. TADIVAKA TEJA SREENU | Nil | 8 | 8 |

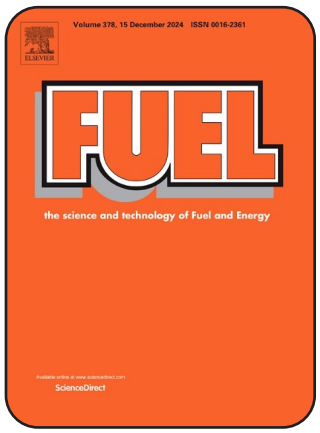
## Total Number of Publications:

| | |
|---|---|
| Scopus Indexed Publications | 291 |
| SCI Publications | 67 |

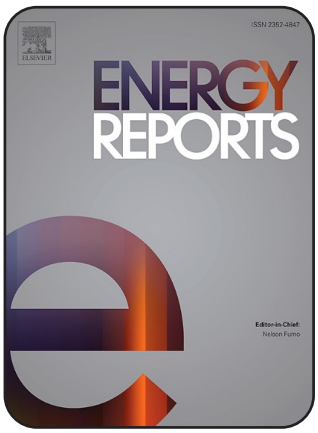
# PUBLICATIONS IN THE TOP RATED JOURNALS




Impact Factor - 9



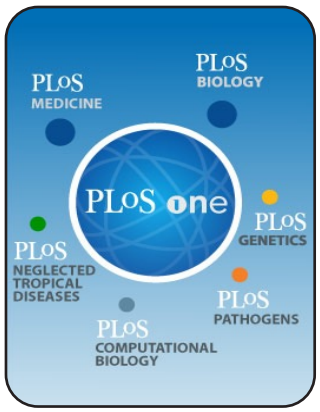

Impact Factor - 6.7



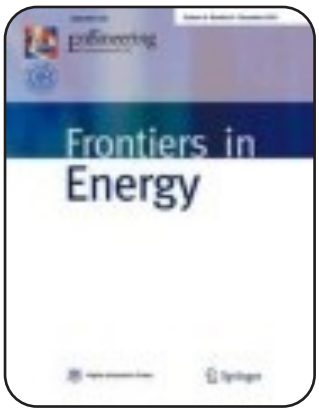

Impact Factor - 4.7


Impact Factor - 3.8

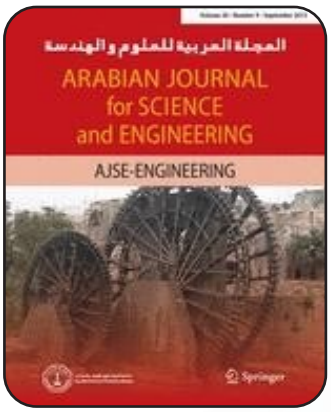

Impact Factor - 3.4




Impact Factor - 2.9




Impact Factor - 2.6




Impact Factor - 2.5

## Number of Patents by the Associate Members

| S.No | Name of the Group member | No. of Patents |
|---|---|---|
| 1 | DR. A PANDIAN | 07 |
| 2 | DR. MALLIGUNTA KIRAN KUMAR | 06 |
| 3 | DR. B JYOTHI | 04 |
| 4 | DR. TADANKI VIJAY MUNI | 05 |
| 5 | MR. D. KALYAN | 03 |
| 6 | MR. TADIVAKA TEJA SREENU | 01 |

# TOP-10 PUBLICATIONS

| S.No | Name of the Journal | Title of the Paper |
|---|---|---|
| 1 | Results in Physics | Numerical analysis of circularly polarized modes in coreless photonic crystal fiber |
| 2 | Scientific Reports | Sustainable power management in light electric vehicles with hybrid energy storage and machine learning control |
| 3 | Frontiers in Energy Research | Design of a bidirectional DC/DC converter for a hybrid electric drive system with dual-battery storing energy |
| 4 | Energy Reports | A novel framework for enhancing the power quality of electrical vehicle battery charging based on a modified Ferdowsi Converter |
| 5 | Energy | Energy recovery from waste animal fats and detailed testing on combustion, performance, and emission analysis of IC engine fueled with their blends enriched with metal oxide nanoparticles |
| 6 | International Journal of Photoenergy | An IOT Innovation of Smart Solar Energy Consumption Analysis and Control in Micro Grid |
| 7 | IEEE Access | Location Determination of Electric Vehicles Parking Lot With Distribution System by Mexican AXOLOTL Optimization and Wild Horse Optimizer |
| 8 | Electric Power Components and Systems | An Independently Controlled Two Output Half Bridge Resonant LED Driver |
| 9 | Energies | Comparative Design and Performance Analysis of 10 kW Rare-Earth and Non-Rare Earth Flux Reversal Wind Generators |
| 10 | Multiscale and Multidisciplinary Modeling, Experiments and Design | Enhancing EV charging predictions: a comprehensive analysis using K-nearest neighbours and ensemble stack generalization |

# RESEARCH COLLABORATIONS

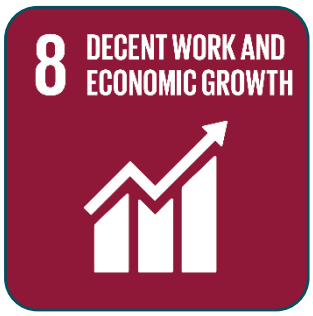
| Institute/Organization Name | Country Name |
|---|---|
| Hanjiang Normal University | China |
| Cardiff Metropolitan University | United Kingdom |
| Graphic Era (Deemed to be University) | India |
| Al-Ahliyya Amman University | Jordan |
| University of Business and Technology | Saudi Arabia |
| National Academy of Sciences of Ukraine | Ukraine |
| Applied Science Private University | Jordan |
| Addis Ababa Science and Technology University | Ethiopia |
| VSB—Technical University of Ostrava | Czech Republic |
| Alexandria University | Egypt |
| King Fahd University of Petroleum and Minerals (KFUPM) | Saudi Arabia |
| University of Buea | Cameroon |
| Al Ain University | United Arab Emirates |
| King Saud University | Saudi Arabia |
| Oguz Han Engineering and Technology University of Turkmenistan | Turkmenistan |
| Universiti Kebangsaan Malaysia | Malaysia |
| University of Cagliari | Italy |
| Kampala International University (Western Campus) | Uganda |
| New York University | United States |
| University of Seoul | South Korea |
| Lebanese American University | Lebanon |
| Blue Crest University | Liberia |
| St. Joseph University | Tanzania |
| Mizan-Tepi University | Ethiopia |
| Kyungpook National University | South Korea |

# PUBLICATION ANALYTICS – INCLUDING SDGS

**Analysis Summary**

- Publications aligned with SDGs: ~209 publications.
- Key SDGs addressed: SDGs 7, 8, 9, 12, 13 and 17


Documents - 162




Documents - 04


Documents - 15


Documents - 04


Documents - 09


Documents - 15

# PHD DEGREE RECIPIENT

| Sl. No. | Name of the Scholar | Thesis Title | Name of the Supervisor | Year of Award |
|---|---|---|---|---|
| 1 | B. Anil Kumar | Intelligent Power Management and Charging Behaviour For Efficient and Sustainable Electric Vehicle Charging Systems | Dr. B Jyothi | 2024 |
| 2 | Ch. S.V.Prasad Rao | Pereformance Improvement in EV Charging Station by Reducing Power Quality Issues | Dr. A Pandian | 2024 |
| 3 | D.Kalyan | Investigation and Evaluation of Mems Accelerometer Based Embedded Systems for Biomedical Applicatins | Dr. K. Narasimha Raju | 2024 |
| 4 | KVenkata Govardhanrao | Design and Development of High Efficiency DC-DC Converter Configurations for Industrial Applications | Dr. M Kiran Kumar | 2024 |
| 5 | E Sreelatha | Development interleaved Multi-Port converters for DC Microgrid Applications | Dr. A Pandian | 2024 |
| 6 | Mabu Sarif | Design and Analysis of Robust PID Controller for Time Delay Process Using Internal Modal Conrtrol | Dr. K. Narasimha Raju | 2023 |
| 7 | Rekha Mudundi | Optimal Sizingnand control of PV Assisted Single -Phase Fed Three Phase Induction Motor Drive For Rural Agricultural Application | Dr. M Kiran Kumar | 2023 |
| 8 | Srinivas Rao J | Performance Evaluvetion of A Noval Multi-level Inverter Toplogy with Reduced switch count | Dr. K. Narasimha Raju | 2023 |
| 9 | Srilatha A | Design of Off-Board Lithium-Ion Battery Charger for Electric Vehicles | Dr. A Pandian | 2023 |
| 10 | Chennapragada Amarendra | Swtiching State Selection for Direct Matrix Converter using PSO Techniques for Integrated Renewable Energy System | Dr. A Pandian | 2023 |

# PHD DEGREE RECIPIENT

| Sl. No. | Name of the Scholar | Thesis Title | Name of the Supervisor | Year of Award |
|---|---|---|---|---|
| 11 | Nagaraju Motaparthi | Design of Aligned Multilevel Inverter for a Hybrid Renewable Energy Source Application | Dr. M Kiran Kumar | 2023 |
| 12 | K Srinivasa Ravi Kumar | A Novel Non- Isolated Bidirectionl DC-DC Converter with Improved Relibility, Compactness, High Gain and Efficiency | Dr. A Pandian | 2023 |
| 13 | Venugopal Reddy Bodha | Mitigation pf Power Quality Issues for Transformer Less PMSG Based Wind Energy System | Dr. K. Narasimha Raju | 2023 |
| 14 | Amritha K | Design of a Fast-Performing Control Technique with Optimized Performance for An Isolated Wind Energy Conversion System | Dr. K. Narasimha Raju | 2023 |
| 15 | Jetty Rajesh Reddy | Efficient Passive Islanding Detection Techniques for Integrated DG System at Balanced Islanding | Dr. A Pandian | 2023 |
| 16 | Ashok Kumar Kolluru | Adaptive control of common high side switch converter fed SRM drive for Water pumping Applications | Dr. M Kiran Kumar | 2023 |
| 17 | Gambhire Shankar Janardhan | Design of Sliding Mode Based Control Techiques for Control System Applictions | Dr. M Kiran Kumar | 2022 |
| 18 | Anuradha Devi Tellapati | Design and Performance Evaluation of Cascaded Converter Fed Switched Reluctance Motor Based Electric Vehicle Drive | Dr. M Kiran Kumar | 2022 |
| 19 | Manne Bharathi | Micro and small scale design and performance evaluataio of medium-speed permanent magnet flux reversal wind generators | Dr. M Kiran Kumar | 2022 |
| 20 | Bodapati Venkata Rajanna | Modeling and Performance Analysis of Energy Storage Technologies | Dr. M Kiran Kumar | 2021 |
| 21 | Bandi Nagireddy | Analysis, Design and Implementation of Single Switch AC – DC Converter with Extended Voltage Conversion Ratio | Dr. A Pandian | 2020 |

# BOOKS PUBLISHED

| S.No | Name of the Associate member | Title of the Book | Publisher | Year of Publication |
|---|---|---|---|---|
| 1 | Dr. A Pandian | Learning Logic Circuits & Logic Design with VHDL | Evincepub Publishing, India | 2021-2022 |
| 2 | Dr. A Pandian | TRANSDUCER ENGINEERING | HSRA PUBLICATIONS, India. | 2021-2022 |
| 3 | Dr. M Kiran Kumar | Electrical Machines - Concepts and Fundamentals | Scientific International Publishing House (SIPH), India | 2022-2023 |
| 4 | | Hybrid Electric Vehicle | Gcs Publishers | 2022-2023 |
| 5 | Dr. B Jyothi | Electrical Five Phase Supply System Part – II | Notion Press | 2021-2022 |
| 6 | Dr. T Vijay Muni | FUNDAMENTALS OF ELECTRICAL CIRCUITS | Scientific International Publishing House (SIPH) | 2022-2023 |
| 7 | Dr. T Vijay Muni | Innovations in Smart Grid and Renewable Energy | IITSR | 2020-2021 |
| 8 | Dr. T Vijay Muni | Applications of Renewable Energy Sources | Notion Press | 2019-2020 |
| 9 | Dr. T Vijay Muni | Power Quality Controller in Microgrid | Scholar Press, Republic of Moldova | 2018-2019 |
| 10 | Dr. T Vijay Muni | Voltage Quality Improvement in Isolated Power System | Scholar Press, Republic of Moldova | 2017-2018 |
| 11 | Dr. T Vijay Muni | Interconnection of RES to Grid for Power Quality Improvement | Scholar Press, Republic of Moldova | 2015-2016 |

# SPONSORED PROJECTS (ONGOING PROJECTS)

## Fault Detection in Grid-Connected Solar PV Inverters Utilizing Supervised Learning and Data-Oriented Approaches

Name of PI : Dr. T Vijay Muni
Cost of the Project : 27.33 INR Lakhs
Funding Agency : SERB

## Development of PV Assisted Intelligent Electric Drive for Rural Agricultural Applications

Name of PI : Dr. M Kiran Kumar
Cost of the Project :16.840 INR Lakhs
Funding Agency : DST

AI4ICPS IIT Kharagpur

### Development of PV Assisted Intelligent Electric Drive for Rural Agricultural Applications

**Project Overview**

An intelligent energy saving single phase grid, PV source and battery bank hybrid power supply fed water pump drive for large scale agricultural water pumping application is being developed. The machine learning based control algorithms developed with the objectives of minimization of power consumption from single phase grid, maximum power extraction from PV source, scheduling of power sources, and direct torque control for three phase induction motor are being utilized for the drive. The project aims at saving in grid power consumption reduces to a maximum of 42 percent as compared to that of existing drives. Also, the sizing of drive components to be reduced by 30 percent. The machine learning based control aims at quick transient response for load changes.

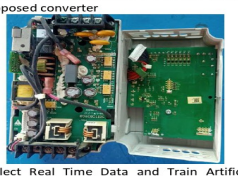
Dr. M. Kiran Kumar, Associate Professor, EEE Department, KLEF

**1 Goals and Challenges**

- PV energy and Soil Condition Estimation using Machine Learning.
- Energy Saving through Source selection algorithm for pump drive.
- Efficient power control through direct torque control of a drive.

Following are the implementation challenges to meet the goals:

- Reconfigure the existing PV pump drive with the proposed converter



- Collect Real Time Data and Train Artificial Neural Networks for PV energy estimation and soil condition assessment

**2 AI powered Solution Approach**

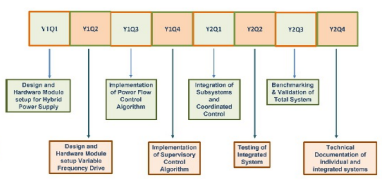
- AI for Water Delivery
- Implement pattern recognition reinforced ML for training and physical condition estimation.

**3 Outcome**

- Real time estimation of hourly PV energy availability
- Reduced Size of Drive
- Energy Delivery at Maximum Availability of PV Source
- 40 Percent Annual Energy Saving

Video Demonstration of Woking Laboratory Prototype and Real time data for machine learning in below link:

**4 Future Roadmap**




**5 Patents and Publications**

Patent Published: Development Of PV Assisted Intelligent Electric Drive for Rural Agricultural applications, 202341075409, M. Kiran Kumar, Koneru Lakshmaiah Education Foundation

# SPONSORED PROJECTS(COMPLETED PROJECTS)

**Three phase to five phase transformation using transformer and five leg inverter to drive the five phase induction motor.**

Name of PI : Dr. B Jyothi
Cost of the Project : 21.62 INR Lakhs
Funding Agency : SERB

**Development and Performance Evaluation of Controlled Techniques for Multi-Point Clamped Inverter fed Direct Torque Control Induction Motor Drive.**

Name of PI : Dr.Obbu Chandra Sekhar
Cost of the Project : 34.41 INR Lakhs
Funding Agency : SERB

**A topology for multiple generation system with doubly fed induction machines and indirect matrix converter.**

Name of PI : Ms.N. Lavanya
Cost of the Project : 23.48 INR Lakhs
Funding Agency : DST-WOS-A

# EVENTS CONDUCTED BY RESEARCH CENTER

## SGREEVC -2023 :

Department ofElectrical and Electrical Engineering of KL Deemed to be University organised a 3-day 2nd International conference on "Emerrging Trends in Smart Grid, Renewable Energy and Electric Vehicle Technologies" from 27th December to 29th December 2023, which was sponsored by DST-SERB, Govt. of India.



## SGREEVC -2022 :

Department of EEE, KLEF conducted "International Conference on Emerging Trends in Smart Grid, Renewable Energy, and Electric Vehicle Technologies, SGREEVC -2022" in hybrid mode. The conference is organized during December 27 – 29, 2022 which was sponsored by DST-SERB, Govt. of India.

## ICSGSM-2022 :

Department of EEE, KLEF conducted "4th International Conference on Smart Grids, Structures & Materials, ICSGM-2022" in virtual mode. The conference is organized during March 4 -5, 2022

## ICSGSM-2021 :

Department of EEE, KLEF conducted "3rd International Conference on Smart Grids, Structures & Materials, ICSGM-2022" in virtual mode. The conference is organized during April 9-10, 2021


KL
(DEEMED TO BE UNIVERSITY)

KL ACCREDITED BY NAAC WITH A++ GRADE

CATEGORY 1 UNIVERSITY
BY MHRD, Govt. of India

nirf 2024 NATIONAL INSTITUTIONAL RANKING FRAMEWORK
RANKED 22 AMONG ALL UNIVERSITIES

44 YEARS OF EDUCATIONAL LEADERSHIP