# ELECTRIC ECO

Dept.of EEE Magazine , 2022-23 Issue-2

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (A)

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK, Kakinada

Accredited by NAAC with "A" Grade & NBA(CSE, IT, ECE, EEE, &ME) under Tier-I

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# Foreword

# Principal

I am delighted to present this edition of our Electrical and Electronics Engineering (EEE) department magazine, a testament to the creativity and hard work of our students and faculty. This publication not only showcases remarkable projects and achievements but also reflects our commitment to innovation and excellence in the ever-evolving field of engineering. I encourage everyone to engage with the content and celebrate the spirit of collaboration that defines our EEE community. Together, we can continue to inspire and shape the future of technology

## HOD

It is with immense pride that I introduce this edition of our Electrical and Electronics Engineering (EEE) department magazine. This publication is a celebration of the talent, innovation, and dedication that our students and faculty bring to the field. Inside, you will find an array of projects, research highlights, and insightful articles that showcase the dynamic learning environment we foster. As we navigate the challenges and opportunities in technology, this magazine reflects our commitment to academic excellence and collaboration. I encourage all readers to immerse themselves in the inspiring stories within these pages and to continue pushing the boundaries of knowledge and creativity in our field.

# About The Department

The department of Electrical and Electronics Engineering is one of the oldest and major departments of the Institute. Since its inception in 1998, the department has been actively engaged in teaching and research in diverse fields of Electrical and Electronics Engineering. The department offers B.Tech in EEE and M.Tech in Power Electronics and Drives programmes. All its programmes are approved by AICTE, New Delhi. The department is strong with few faculty members holding Ph.D degrees and expertise in various fields. Initially B.Tech program was started with an intake of 40 in 1998 and subsequently increased to 120 in the year 2012. M.Tech (PE & D) program was started in the year 2011 with an intake of 18 students. The department of EEE has adequate and well-qualified faculties spanning all major areas of Electrical Engineering like Power Systems, Power Electronics, Control Systems, Energy Systems, High Voltage Engineering etc

## VISION:

To contribute to the country and the world through technical education, research and consultancy in Electrical and Electronics Engineering.

## MISSION:

1. provide broad based education in Electrical and Electronics Engineering.
2. To keep the curriculum industry friendly.
3. To undertake sponsored research and provide consultancy services in industrial, educational and society relevant areas in Electrical and Electronics Engineering.
4. To promote ethical and moral values among the students so as to make them them emerge as responsible professionals

## Program Educational Objectives (PEOs):

**PEO1**:Design and develop innovative products and services in the field of Electrical and Electronics Engineering and allied engineering disciplines.

**PEO2**: Apply the knowledge of Electrical and Electronics Engineering to solve problems of social relevance, pursue higher education and research.

**PEO3**: Work effectively as individuals and as team members in multidisciplinary,projects.

**PEO4**: Engage in lifelong learning, career enhancement and adapt to changing professional and societal needs.

# CONTENTS

# ARTICLES

## Microgrid technology:

Microgrid technology represents a significant advancement in the field of energy management. A microgrid is a localized energy system that can function autonomously or be connected to the traditional power grid. It combines various energy sources, such as solar, wind, and conventional generators, to provide a reliable and sustainable power supply. One of the most notable benefits of microgrids is their ability to enhance energy security and resilience, particularly in remote or disaster-affected areas. In the event of a power outage, microgrids can quickly switch to island mode, ensuring continuous electricity supply.

This technology also supports the integration of renewable energy sources, reducing reliance on fossil fuels and minimizing carbon emissions. Additionally, microgrids can be customized to meet the specific needs of a community, offering a flexible and adaptable solution. With the increasing demand for clean and reliable energy, microgrid technology is poised to play a crucial role in the transition to a more sustainable and resilient energy future. Its potential to provide uninterrupted power, promote the use of renewable resources, and enhance the reliability of the energy grid makes it a key innovation in the quest for a greener world.

-K DEEPAK

# Three-phase power quality improvement:

Three-phase power quality improvement is crucial for ensuring the efficient and reliable operation of electrical systems. Three-phase power systems are widely used in industrial and commercial settings because of their ability to deliver more power and operate more efficiently than single-phase systems. However, these systems can experience various power quality issues such as voltage imbalances, harmonics, and transients. Improving power quality involves implementing measures to address these issues, thereby enhancing system performance and longevity.

One common approach to improving three-phase power quality is the use of power conditioning devices, such as surge protectors, harmonic filters, and voltage regulators. These devices help to mitigate voltage spikes, reduce harmonic distortion, and maintain a stable voltage level. Additionally, balancing the loads across all three phases can minimize voltage imbalances, leading to more efficient power distribution.

Another important strategy is the regular maintenance and monitoring of the power system. This includes periodic inspections, timely replacement of worn-out components, and the use of advanced monitoring tools to detect and diagnose power quality problems early.

-SAMEERAPETA ANUSHA

# Energy  Managment Technique:

Energy management techniques are essential for optimizing energy consumption, reducing costs, and minimizing environmental impact. One effective approach is the implementation of energy audits, which involve a thorough examination of energy use within a facility. These audits help identify areas of inefficiency and recommend measures to improve energy performance, such as upgrading to energy-efficient lighting and equipment, improving insulation, and optimizing HVAC systems.

Another key technique is the use of energy management systems (EMS). These systems monitor, control, and optimize energy use in real-time, enabling facilities to respond quickly to changes in energy demand. EMS can integrate with smart grids, allowing for better coordination between energy supply and demand, and facilitating the use of renewable energy sources.

Demand-side management (DSM) is another important strategy, which focuses on shifting energy consumption patterns to reduce peak demand and avoid costly energy charges. This can be achieved through load shifting, demand response programs, and energy storage solutions.

-ANDE HEMANTH KUMAR

# Latest Power Electronic Converters:

The latest advancements in power electronic converters are revolutionizing the way we manage and utilize electrical energy. One of the most significant trends is the development of wide bandgap (WBG) materials, such as silicon carbide (SiC) and gallium nitride (GaN). These materials offer superior performance compared to traditional silicon, including higher efficiency, faster switching speeds, and better thermal management. This makes them ideal for high-power and high-frequency applications, such as electric vehicles and renewable energy systems.

Another key trend is the increased use of digital control techniques. Digital control provides more precise and flexible management of power converters, allowing for real-time adaptation to changing conditions and maximizing performance. This includes the use of digital signal processors (DSPs) and advanced control algorithms, which enhance efficiency and reliability.

Innovative topologies, such as multi-level converters and resonant converters, are also gaining traction. These topologies reduce energy losses and improve efficiency, making power converters more sustainable and cost-effective. Additionally, the integration of energy storage systems with power converters is becoming more common, particularly in electric vehicles and renewable energy applications. This integration helps stabilize power supply and manage energy more effectively.

Overall, these advancements are paving the way for more efficient, reliable, and sustainable power electronic converters, driving innovation across various industries.

# FACULTY PUBLICATIONS

## K. Harinadha Reddy

The assessment of an integrated renewable energy system state through the VFMF (Variable Frequency Modulation Framework) approach represents a novel methodology aimed at enhancing the efficiency and reliability of renewable energy systems. This approach leverages advanced modulation techniques to dynamically adjust the frequency of the energy output, ensuring optimal performance even under varying load conditions. By integrating various renewable energy sources such as solar, wind, and hydro, the VFMF approach facilitates a seamless transition between different energy modes, thereby improving the overall stability and sustainability of the system.

The framework also incorporates real-time monitoring and predictive analytics to anticipate potential disruptions and implement corrective measures proactively. This ensures a consistent and reliable energy supply, reducing dependency on non-renewable sources and promoting a greener energy landscape. The VFMF approach is particularly beneficial in regions with high renewable energy penetration, where it can significantly enhance the efficiency of energy distribution and utilization. Overall, this innovative method marks a significant advancement in the field of renewable energy, paving the way for more resilient and sustainable energy systems.

Electric Power Systems Research 0378-7796 Mar-23 SCIE

# B.Pangedaiah

The Combined DC-Link Fed Parallel-VSI-Based DSTATCOM (Distribution Static Synchronous Compensator) is an advanced solution designed to enhance power quality in solar distributed generation (DG) integrated systems. This innovative approach employs parallel voltage source inverters (VSIs) with individual DC-links, which work together to mitigate power quality issues such as harmonic current distortions, reactive power control, power-factor correction, and load balancing. By utilizing the Instantaneous Real-Reactive Power (IRP) theory, the system generates suitable switching patterns for the VSIs, ensuring effective compensation under variable load conditions.

The DSTATCOM is connected in shunt at the point of common coupling (PCC) of the distribution system, providing dynamic support to maintain stable and efficient operation. This configuration is particularly beneficial in systems with high penetration of renewable energy sources, as it helps to address the challenges posed by fluctuating and non-linear loads. Overall, the Combined DC-Link Fed Parallel-VSI-Based DSTATCOM represents a significant advancement in improving the power quality of solar DG integrated systems, promoting a more reliable and sustainable energy infrastructure.

Electronics (M PDI) 2079 -9292 Jan -23 SCI

# M.S.Giridhar

The optimal placement and integration of renewable energy resources in unbalanced radial distribution systems (URDS) is crucial for enhancing system performance and reliability. By strategically positioning distributed generation (DG) units, such as solar panels and wind turbines, at optimal locations within the distribution network, it is possible to minimize power losses, improve voltage profiles, and enhance overall system stability. Advanced optimization techniques, such as gravitational search algorithms and multi-objective backtracking search algorithms, are employed to determine the best size and placement of these renewable resources.

These methods consider various factors, including real power loss minimization, voltage stability, and cost-effectiveness. The integration of renewable energy sources helps to balance the load, reduce dependency on non-renewable energy, and promote a more sustainable and resilient power distribution system. Studies have shown that incorporating renewable energy resources in URDS can lead to significant improvements in system performance, making it a promising approach for modern power distribution networks.

Microsystem Technologies 09467076. 23 Jan 2023 SCIE

## Mr. P. Srihari, Mr. K. Nagalinga Chary, Mr. A.V.Ravi Kumar & Mr. Imran Abdul

The Path Finder Optimization Algorithm Tuned 3DOFPID (Three-Degree-of-Freedom Proportional-Integral-Derivative) Controller is a sophisticated approach designed to stabilize the frequency of wind-integrated power systems under realistic conditions. This innovative controller leverages the Path Finder Optimization Algorithm (PFOA) to fine-tune the parameters of the 3DOFPID controller, ensuring optimal performance even during load uncertainties. By dynamically adjusting the control parameters, the PFOA-tuned 3DOFPID controller effectively mitigates frequency fluctuations, enhancing the overall stability and reliability of the power system.

The efficacy of this approach has been demonstrated through extensive simulations and comparisons with other control techniques, showcasing its superior performance in maintaining system frequency stability. Additionally, the integration of high-voltage DC (HVDC) lines further improves the system's performance, making it a robust solution for modern wind-integrated power systems.

This advanced control strategy represents a significant advancement in the field of power system stability, offering a reliable and efficient method for frequency stabilization.

International Journal of Renewable Energy Research 1309-0127 Jun 2023 SCOPUS

M.B.Chakravarthi

The impact of stress concentrated regions on MEMS-based piezoelectric energy harvesters is significant in optimizing their performance. These regions, often in the form of rectangles, squares, or circles, are strategically placed on the cantilever beams to enhance the induced electric potential. By applying boundary loads ranging from 50 to 200N, the efficiency of energy conversion can be maximized. For instance, simulations have shown that a square-shaped stress region on a quartz cantilever beam can produce an electric potential of 5.02V under a load of 200N. This method improves the overall efficiency of the energy harvester compared to other shapes and materials. The use of advanced modeling and simulation tools, such as COMSOL Multiphysics, helps in accurately predicting and optimizing these effects. This approach is crucial for developing efficient and reliable MEMS-based piezoelectric energy harvesters, which are essential for powering wireless sensor networks and other low-power devices.

Springer Conference March 2023 SCOPUS

# PROJECTS

**Name of the project:** Energy efficient Smart building and home security

**Description:**

This project is aimed at Energy Efficient Smart Building Devices and Home Security. Now - a- days the entire world has engaged with technology which helps us in many ways. The electricity system in smart cities is impacted by the Internet of Energy (IoE). IoT, or the Internet of Things, is being introduced into distributed energy systems with the goal of enhancing energy efficiency, preventing energy waste, and protecting the environment as well as our home.

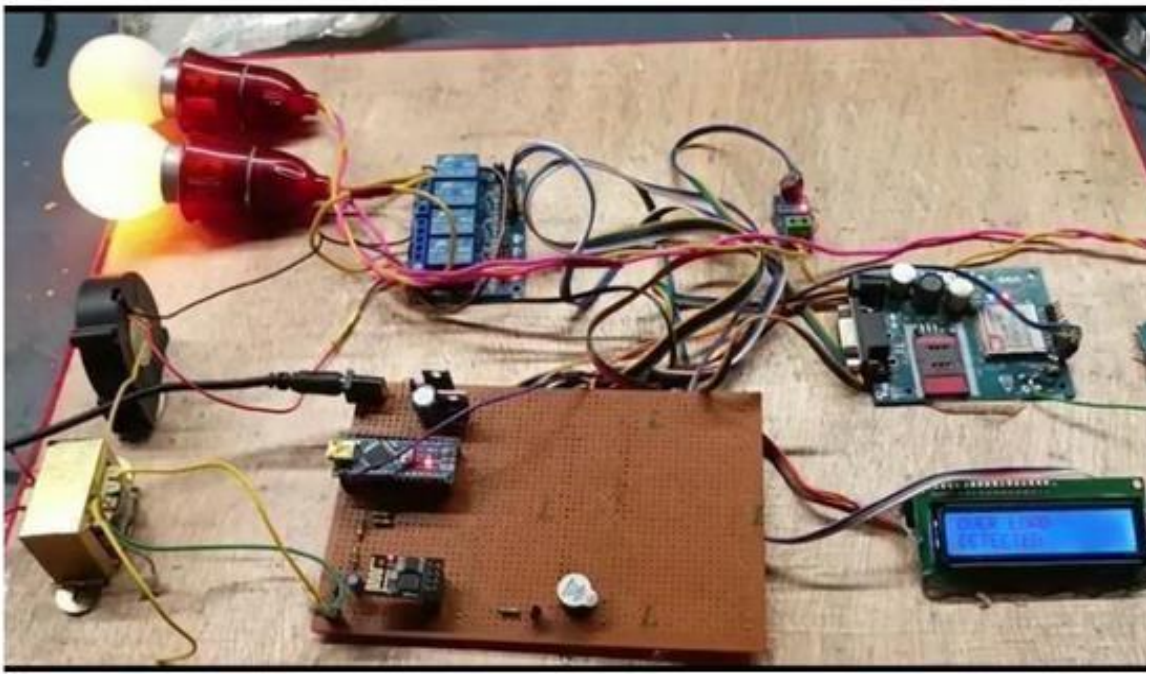
Smart home security is an exciting field that offers a wide range of benefits for homeowners. With advanced technology and customizable solutions, smart home security systems provide an enhanced level of security and convenience that traditional security systems cannot match. Whether you are looking to protect your home from intruders or save money on your utility bills,there is a smart home security solution that can meet your needs.

CH.

**Name of the project:** IOT BASED TRANSFORMER LOAD MONITORING AND CONTROLLING WITH ALERTING SYSTEM USING ARDUINO NANO AND GSM

**Description:**

The goal of this project is to collect remote electrical data such as voltage and current and broadcast these real-time values via the network, coupled with the temperature at the power plant. This project will also safeguard the electrical circuits by using a relay. When the electrical parameters surpass the specified levels, this relay is actuated. This technology can continually update the real time electrical parameters. This system may be programmed to transmit alarms when the relay trips or when the voltage or current exceeds predetermined limitations. It also has a cooling system (Cooling Fan). When the temperature of the transformer exceeds the prescribed limit, this cooling fan activates and blows cold air, bringing the temperature down to normal. This project makes use of an Arduino, and because this is a prototype of the planned idea, we have utilized an Arduino Nano for demonstration purposes. The Arduino can effectively communicate with the many sensors in use.



K. SRAVANTHI-19761A0278 P. HAVINASH-20765A0217 K. SAMPATH ROY-19761A0273
N. JUDIE-19761A0285

**Name of the project:** Smart EV Billing and charging station using IOT

**Description:**

In the world of emerging technologies, automobile manufacturers all over the world are currently developing electric vehicles with different features based on the requirements of the people. Electric vehicles are eco-friendly so people are showing interest in using electric vehicles for traveling. In this project, Smart Energy Meter (SEM) has been developed for power consumption and Smart Card based billing system along with Solara battery charging Station for electric vehicle. This provides current information to the user regarding the power level of the Batter-Bank and charging status of the vehicle in LCD Display, which has been enabled with IOT technology. We are using the MPPT(maximum power point tracking) circuit for to use the system in efficient manner.


RESHMA-19761A0227
R. GAYATHRI-19761A0236
M.YEBBEJU-20765A0207

# PATENTS

Name of Inventor : Dr.M.Umavani

Title of Patent : A Method of Preventing Malfunction and Distant Relay due to Power Swing in Multi-Machine Systems

Published Year & Month: Feb 2023

PATENT APPLICATION ID: 420972

Status : Granted

A method of preventing malfunction and distant relay operation due to power swings in multi-machine systems involves deploying an equivalent multi-machine system model. This method includes deriving measurements by obtaining voltage at a bus connecting an identified line and the powers fed into the line with the distance relay. These measurements are fed to an infinite bus through an arbitrary equivalent reactance. The power angle and reactance of the equivalent system generator are computed online from the output voltage of the connecting bus and the supplied power. The rate of change of the power angle is continuously monitored for consecutive time steps after fault clearance. A graphical representation of the rate of change values oscillating back and forth is generated, and the nature of the power swing is determined by marking the value of the rate of change which, if it attains zero for the first time, indicates a stable swing. This method blocks the operation of the distance relay to prevent malfunctioning.

Name of Inventor : Dr.G.Nageswara Rao

Title of Patent : An Electrical Muscle Stimulator Device or Unit

Published Year & Month: March 2023

PATENT APPLICATION ID: 356019-001

Status : Published

An Electrical Muscle Stimulator (EMS) device is a therapeutic tool designed to elicit muscle contractions using electrical impulses. These devices are commonly used for pain relief, muscle rehabilitation, and enhancing athletic performance. EMS units typically consist of electrodes that are placed on the skin over the targeted muscle groups. When activated, the device sends electrical currents through the electrodes, causing the muscles to contract. This can help improve blood circulation, reduce muscle soreness, and aid in muscle recovery. EMS devices are often used in physical therapy, sports training, and personal fitness routines. They come in various forms, including handheld units, wearable devices, and full-body systems. It's important to use EMS devices under the guidance of a healthcare professional to ensure safe and effective use.

# BOOKS WRITTEN

Name of the Author: Dr.A V G A Marthanda

Title of the Book / Chapter: Internet Of Things A New Age Era Of Technologies And Application

Name of the Publisher with Address: GCS Publishers India

ISBN number: 978-93-94304-12-3

The Internet of Things (IoT) marks a new age in technological advancement and application, connecting a vast network of devices, sensors, and systems to the internet. This interconnectedness enables seamless communication and data exchange between everyday objects, transforming industries and enhancing daily life. IoT applications span various sectors, including smart homes, healthcare, transportation, and agriculture. In smart homes, IoT devices like smart thermostats, security cameras, and voice assistants enhance convenience and security. In healthcare, wearable devices monitor patient health in real-time, improving diagnostics and treatment. IoT in transportation optimizes traffic management and vehicle maintenance, while in agriculture, it enhances crop monitoring and resource management. The proliferation of IoT technologies drives innovation, efficiency, and sustainability, shaping a future where interconnected devices improve living standards and operational effectiveness across diverse fields. The ongoing evolution of IoT promises even greater integration and transformative impact in the coming years.

# TEAM ELECTRICECO

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