Technical Magazine

Sparkling Innovation

Where Electrical Engineering meets imagination

Pragya

state of wisdom

Department of Electrical & Electronics Engineering

G. NARAYANAMMA INSTITUTE OF TECHNOLOGY AND SCIENCE

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Contents

PRINCIPAL'S MESSAGE

Dr. K . Ramesh Reddy

It is with great pleasure that I extend a warm welcome to you all to the latest edition of our esteemed electrical engineering technical magazine. As we peruse through its pages, we embark on a journey of discovery, innovation, and collaboration that defines the essence of our department.

At the heart of our electrical engineering department lies a steadfast commitment to academic excellence, research prowess, and the relentless pursuit of innovation. This magazine stands as a testament to the remarkable achievements and groundbreaking contributions made by our faculty, students, and researchers.

I wish that this Trigger establishes to be a flint to fire the enthusiasm and excite their minds for many intrusive innovations among the students and inspire passion among the members of the faculty of Electrical and Electronics committee.

As you delve into the pages of this magazine, I encourage you to celebrate the accomplishments of our department, to be inspired by the groundbreaking research being conducted, and to envision the boundless possibilities that lie ahead. Together, let us continue to uphold the highest standards of excellence and to push the boundaries of what is possible in the field of electrical engineering.

I extend my heartfelt gratitude to all those who have contributed to the success of this magazine and commend the editorial team for their dedication and hard work in bringing this publication to fruition.

MESSAGE FROM HEAD OF THE DEPARTMENT

Dr. N. Malla Reddy

Dear Esteemed Readers,

It brings me great pleasure to welcome you to the latest edition of our electrical engineering technical magazine. As we delve into the pages of this publication, we embark on a journey of discovery, innovation, and excellence within our department.

It's with great pleasure that I introduce you to the latest issue of Pragya! As Head of the Electrical and Electronics Engineering department, I'm constantly impressed by the dedication and expertise of our team. But knowledge thrives on exchange, and that's precisely what Pragya facilitates.

This magazine serves as a bridge, connecting the cutting-edge advancements in our field with the passionate minds that drive those advancements forward. Whether you're a seasoned professional or just starting your journey, Pragya offers something for everyone.

In this issue, you'll find insightful technical articles. We've assembled a fantastic roster of contributors, including leading figures from within our own department. Their diverse perspectives ensure the content is both informative and thought-provoking.

This technical magazine isn't just about staying informed; it's about fostering a community of innovation. We encourage you to actively engage with the magazine. So, turn the page, explore the articles, and let your passion for Electrical Engineering ignite!

Warm Regards.

Highlights

- Mrs.K.V.Sowmya, Asst.Prof and Mrs. K.Swarnalatha, Asst.Prof has published a paper entitled “A 6-Switched 3-Level Inverter Based Smart Grid Hybrid Power System for Power Management using Zigbee” in theJournal of Interdisciplinary Cycle Research.

- Mrs.K.V.Sowmya, Asst.Prof and Mrs. K.Swarnalatha, Asst.Prof has published a paper entitled “Optimum Placing and Sizing of Renewable Energy Sources Using Qpso for Distributed Generation System” in theThe International journal of analytical and experimental modal analysis

- Mr. P.Siva Prasad, Asst.Prof as published a paper entitled “Design and Analysis of ZSI based DVR for Improving the voltage profile” in the Journal of contemporary Issues in Business and Government.

- Mrs. G. Annapurna, Associate Professor., has published a paper on “Speed Control Of Induction Motor Using Multilevel Inverter” in Journal of Engineering Sciences.

- Mr. Ramana Reddy G, Associate Professor has published a paper on ‘A novel 15 level symmetric multi level inverter with reduced switching devices and thd”, ’ in Journal of Engineering Sciences.

- Mr. V. Badri Rama Krishnan, Asst.Prof, Mr. Ch.Leela krishna asst.Prof and Mr. P.Buchibabu Asst.Prof., has published a paper on “Solar Power Forecasting Based On Fixed Parameter Weather Type Classification Using Svr”, in International Journal of Research in Electronics and Computer Engineering.

- Mr .P. Sai Niranjan Kumar, Asst.Prof has published a paper on “Highly efficient ZVS ZCS bidirectional DC DC converter for e vehicle”, inJournal of engineering science.

- Mrs. Ujwala Gajula, Asst.Prof., has published a paper on “Reduced Switch Multilevel Inverter Topologies And Modulation Techniques For Renewable Energy Applications”, in Turkish Journal of Computer and Mathematics Education which is indexed in Scopus.

- Mrs. Gouthami Eragamreddy, Asst.Prof., has published a paper on “Design Requirements of Solar Powered Plug In Hybrid Electric Vehicles”, in Turkish Journal of Computer and Mathematics Education which is indexed in Scopus.

- Mrs. P.V.S.S.A. Parimala, Asst.Prof., has published a paper on “D-STATCOM control using SRFT method for PQ improvement in a PV system”, in International Journal of Innovative Technology and Exploring Engineering (IJITEE) which is indexed in Scopus.

Novel three phase multilevel inverter with single DC link for induction motor drive applications

--- S.DIVYA
17251A02B7

This project proposes a novel three-phase multilevel inverter architecture designed for induction motor drive applications utilizing a single DC link. The proposed inverter configuration aims to overcome the limitations of traditional inverters by providing increased voltage levels, reduced harmonics, and improved efficiency. The topology employs a combination of series-connected power cells to generate multiple voltage levels, enabling finer control of the output waveform. A detailed analysis of the proposed topology, including modulation strategies and switching patterns, is presented. Simulation results demonstrate the feasibility and effectiveness of the proposed inverter in achieving high-quality output voltage waveforms with reduced harmonic distortion. The performance of the inverter is further validated through experimental verification using an induction motor drive setup. The experimental results confirm the superiority of the proposed topology in terms of output voltage quality, efficiency, and reliability, making it a promising solution for various induction motor drive applications requiring high-performance inverters with a single DC link.

1. Introduction:
   - Background information on the significance of multilevel inverters in motor drive applications.
   - Overview of the challenges faced by traditional inverters, such as harmonic distortion and voltage limitations.
   - Brief introduction to the concept of multilevel inverters and their advantages over conventional inverters.
2. Literature Review:
   - Summary of existing research on multilevel inverters for motor drive applications.
   - Discussion of various multilevel inverter topologies and their advantages/disadvantages.
   - Identification of gaps in current literature and the need for novel solutions.
3. Proposed Three-Phase Multilevel Inverter Topology:
   - Detailed description of the proposed inverter architecture, including schematic diagrams and operating principles.
   - Explanation of the series-connected power cell configuration and its role in generating multiple voltage levels.
   - Comparison with existing multilevel inverter topologies, highlighting the unique features and benefits of the proposed topology.
4. Modulation Strategy:
   - Description of the modulation technique used to control the output voltage waveform.
   - Explanation of the modulation algorithm and its implementation in the proposed inverter topology.
   - Analysis of the modulation strategy's effectiveness in achieving low harmonic distortion and high voltage quality.
5. Switching Pattern:
   - Discussion of the switching pattern employed by the inverter topology.
   - Analysis of the switching frequency and its impact on inverter performance.
   - Evaluation of the switching pattern's efficiency and reliability.

Comparison of Maximum power from a solar PV system between incremental conductance method and fuzzy controller based mppt technique

--- KOTA SITHA MANASVI
17251A02A3

This project abstract outlines a comparative study between two widely used Maximum Power Point Tracking (MPPT) techniques: the Incremental Conductance (IC) method and a Fuzzy Logic Controller (FLC) based MPPT technique, applied to solar photovoltaic (PV) systems. The objective of this study is to evaluate and compare the performance of these two MPPT techniques in terms of their ability to extract maximum power from a solar PV system under varying environmental conditions.

The Incremental Conductance method is a traditional perturb and observe algorithm widely used for MPPT in solar PV systems. It adjusts the operating point of the PV system based on the instantaneous change in power with respect to voltage. On the other hand, Fuzzy Logic Controllers offer a robust and adaptive control approach that can effectively track the maximum power point by dynamically adjusting the operating parameters based on linguistic rules and membership functions.

This project involves the simulation of both MPPT techniques using MATLAB/Simulink software. The simulation models incorporate a solar PV panel, DC-DC converter, and the respective MPPT controllers. Various environmental conditions such as irradiance and temperature are considered to assess the performance of each MPPT technique under dynamic operating conditions.

The comparative analysis focuses on key performance metrics such as tracking efficiency, response time, and steady-state oscillations. Additionally, the study investigates the impact of partial shading and rapid irradiance changes on the performance of both MPPT techniques.

The findings of this comparative study will provide valuable insights into the strengths and limitations of the Incremental Conductance method and Fuzzy Logic Controller-based MPPT technique in maximizing the power output of solar PV systems. These insights will aid in the selection and implementation of the most suitable MPPT technique based on specific application requirements and environmental conditions, ultimately contributing to the optimization of solar PV system performance and efficiency.

Modelling of grid connected PV system with Constant Current Controller

---AMBATI DEEPTHA MANISHA

18258A0201

Vehicle theft is a significant concern worldwide, leading to financial losses and safety risks for individuals and businesses. To address this issue, a system for vehicle theft detection and tracking based on GSM (Global System for Mobile Communications) and GPS (Global Positioning System) technologies is proposed. The system utilizes a combination of hardware and software components to monitor the vehicle's location in real-time and detect unauthorized movement.

1. Geo-fencing: The system allows users to define virtual boundaries, known as geo-fences, on a map. If the vehicle crosses these boundaries without authorization, an alert is triggered, notifying the owner or monitoring center.
2. Remote Immobilization: In the event of theft, the system enables remote immobilization of the vehicle by sending a command to the onboard MCU. This feature prevents the engine from starting or disables the vehicle's movement, aiding in recovery efforts.
3. Tamper Detection: The system includes sensors to detect tampering attempts, such as cutting wires or removing tracking devices. Upon detecting tampering, the system immediately notifies the owner and triggers additional security measures.
4. Battery Backup: To ensure continuous operation, especially in areas with unreliable power supply, the system is equipped with a backup battery. This battery provides power to essential components, such as the GPS and GSM modules, in case of main power failure.
5. Data Encryption: To safeguard sensitive information transmitted between the vehicle and the central server or user's device, the system employs encryption protocols. This prevents unauthorized access to location data and ensures the privacy and security of the vehicle owner.
6. Historical Data Logging: The system records and stores historical location data, allowing users to review the vehicle's past movements and routes. This feature can be valuable for analyzing patterns, optimizing routes, and providing evidence in legal proceedings related to theft or misuse.

By incorporating these advanced features, the proposed vehicle theft detection and tracking system offers a comprehensive solution to mitigate the risks associated with vehicle theft. Its combination of hardware and software capabilities provides robust security measures while offering convenience and ease of use for vehicle owners and fleet managers.

IOT Based Tampered Energy Meter Monitoring

--- CHELPUR BHAVANA

17251A0268

This work provides an overview of an IoT-based system designed for monitoring tampering activities in energy meters, ensuring the integrity of energy consumption measurements.

Tampering with energy meters is a significant concern in utility systems, leading to revenue loss and inaccurate billing. Traditional methods of detecting tampering are often labor-intensive and inefficient. To address this issue, this project proposes an innovative IoT-based solution for real-time monitoring and detection of tampering events in energy meters.

The system integrates IoT devices, such as sensors and microcontrollers, with the existing energy meter infrastructure to enable continuous monitoring of metering parameters. Sensors are deployed to measure various physical quantities, including voltage, current, and temperature, associated with energy consumption. These sensor readings are transmitted wirelessly to a central monitoring unit using IoT communication protocols.

At the central monitoring unit, advanced algorithms and machine learning techniques are employed to analyze the incoming data and detect anomalies indicative of tampering activities. These anomalies may include sudden fluctuations in energy consumption patterns, irregularities in voltage or current readings, or unauthorized access to the metering device.

Upon detecting a potential tampering event, the system triggers real-time alerts to relevant stakeholders, such as utility operators or maintenance personnel, enabling prompt intervention to address the issue. Additionally, historical data collected by the system can be utilized for trend analysis and predictive maintenance, further enhancing the reliability and efficiency of energy metering infrastructure.

The proposed IoT-based tampered energy meter monitoring system offers several advantages over traditional methods, including real-time monitoring, remote accessibility, and proactive detection of tampering events. By leveraging IoT technologies and data analytics, the system provides utilities with valuable insights into energy consumption patterns and enhances the integrity and security of metering infrastructure.

Estimation of Energy requirement based on Vehicle performance analysis using different drive cycles.

--- BADUGULA AKSHAYA
17251A0293

In recent years, the proliferation of mobile devices and the increasing dependency on them for communication, entertainment, and productivity have highlighted the need for convenient and accessible charging solutions, especially in environments where traditional power outlets may be scarce or unavailable. This paper proposes a Smart Power System utilizing Radio Frequency Identification (RFID) technology to enable mobile charging in diverse locations.

The system comprises RFID-enabled charging stations strategically deployed in public spaces, transportation hubs, educational institutions, and other high-traffic areas. Each charging station is equipped with RFID readers, power outlets, and a central control unit. Users can access the charging service by presenting RFID-enabled cards or mobile devices containing RFID tags.

Upon presenting their RFID credentials, users gain access to available charging ports, which are equipped with smart charging capabilities compatible with a wide range of mobile devices, including smartphones, tablets, and wearables. The system employs intelligent power management algorithms to optimize charging efficiency and prevent overcharging, ensuring the safety and longevity of connected devices.

Additionally, the Smart Power System incorporates a user-friendly mobile application that allows users to locate nearby charging stations, check availability, and reserve charging slots in advance. The application also provides real-time status updates, including charging progress and estimated completion times, enhancing user convenience and experience.

Furthermore, the system facilitates seamless integration with existing infrastructure and payment systems, enabling monetization through various models such as pay-per-use, subscription-based plans, or sponsored charging services. This flexibility allows for customization according to the preferences of venue owners, service providers, and end-users.

In conclusion, the proposed RFID-based Smart Power System offers a versatile and efficient solution for mobile charging in diverse environments, addressing the growing demand for convenient power access while leveraging RFID technology for secure authentication and user-friendly interaction. By combining innovation with accessibility, the system aims to enhance connectivity and productivity for mobile users while contributing to sustainable and inclusive urban development.

Comparative study of P&O and incremental conductance algorithm using MPPT for photovoltaic array/cell

--- MITHRA LEKHA THOTA
17251A0277

This abstract introduces a comparative study aimed at evaluating the performance of two widely used Maximum Power Point Tracking (MPPT) algorithms, Perturb and Observe (P&O) and Incremental Conductance (IC), for photovoltaic (PV) arrays or cells. The primary objective is to analyze and compare the efficiency, accuracy, and dynamic response of these algorithms in maximizing the power output of PV systems under varying environmental conditions.

MPPT algorithms play a crucial role in optimizing the energy conversion efficiency of PV systems by continuously adjusting the operating point of the PV array to track the maximum power point (MPP) regardless of changes in irradiance and temperature. P&O and IC algorithms are among the most commonly employed techniques due to their simplicity and effectiveness.

In this study, a comprehensive analysis of the P&O and IC algorithms is conducted through simulation studies using MATLAB/Simulink software. The simulation models incorporate a PV array model, DC-DC converter, and the respective MPPT controllers based on P&O and IC algorithms. Various environmental conditions such as solar irradiance and temperature variations are simulated to assess the performance of each algorithm.

Key performance metrics including tracking efficiency, tracking speed, steady-state oscillations, and sensitivity to environmental changes are evaluated and compared between the P&O and IC algorithms. Additionally, the impact of partial shading and rapid changes in irradiance on the performance of both algorithms is investigated to provide insights into their robustness and reliability.

The comparative analysis aims to identify the strengths and limitations of each MPPT algorithm and provide valuable insights for selecting the most suitable algorithm based on specific application requirements and environmental conditions. The findings of this study will contribute to advancing the understanding of MPPT techniques for PV systems and aid in the development of optimized control strategies to enhance the efficiency and reliability of solar energy harvesting systems.

Smart digital water management

--- AMUDALA DEEPIKA

18255A0223

This work presents a novel approach to water management through the integration of smart digital technologies, aiming to address the challenges associated with water scarcity, inefficiency, and quality control. The proposed solution leverages the capabilities of Internet of Things (IoT), data analytics, and advanced sensing technologies to create an intelligent water management system capable of optimizing water usage, detecting leaks, and ensuring water quality.

Water scarcity is a pressing global issue exacerbated by factors such as population growth, urbanization, and climate change. Traditional water management systems often lack real-time monitoring and control capabilities, leading to inefficiencies and resource wastage. In response, this project proposes a smart digital water management system that enables proactive monitoring, analysis, and optimization of water distribution networks.

The core components of the smart digital water management system include IoT-enabled sensors deployed throughout the water infrastructure to collect real-time data on water flow, pressure, temperature, and quality parameters. These sensors continuously monitor the condition of pipelines, reservoirs, and water treatment facilities, providing valuable insights into system performance and identifying potential issues such as leaks or contamination events.

The collected data are transmitted to a centralized data management platform where advanced analytics and machine learning algorithms are employed to analyze patterns, detect anomalies, and predict future water demand. By processing and interpreting large volumes of data in real time, the system can dynamically adjust water distribution, optimize pumping schedules, and prioritize maintenance activities to improve efficiency and reduce water losses.

Furthermore, the smart digital water management system incorporates user interfaces and mobile applications to provide stakeholders, including water utilities, regulators, and consumers, with access to real-time information, alerts, and insights regarding water usage and quality. This transparency and accessibility empower users to make informed decisions and actively participate in water conservation efforts.

In summary, the proposed smart digital water management system offers a holistic approach to addressing the complex challenges of water management by leveraging IoT, data analytics, and advanced sensing technologies. By integrating real-time monitoring, predictive analytics, and stakeholder engagement, the system aims to enhance water efficiency, reduce losses, and ensure the sustainable use of this vital resource.

Design of hybrid forward boost converter for renewable energy powered electric vehicle charging applications

---YALAKAMANI SUNITHA

17251A0294

This work introduces the design and development of a hybrid forward boost converter tailored for electric vehicle (EV) charging applications powered by renewable energy sources. The proposed converter architecture integrates the benefits of both forward and boost converter topologies to optimize the charging process, enhance efficiency, and accommodate the variability of renewable energy inputs.

As the adoption of electric vehicles continues to grow, there is a growing need for efficient and sustainable charging solutions that utilize renewable energy sources such as solar and wind. However, the intermittent nature of renewable energy generation poses challenges for EV charging systems, including voltage fluctuations and inconsistent power delivery.

The hybrid forward boost converter presented in this research addresses these challenges by combining the voltage step-up capabilities of a boost converter with the isolation and voltage regulation features of a forward converter. This hybrid architecture enables seamless integration with renewable energy sources while ensuring stable and efficient charging for electric vehicles.

The design process involves the selection of appropriate components and control strategies to achieve optimal performance and reliability. Simulation studies are conducted using software tools such as MATLAB/Simulink to evaluate the converter's efficiency, power density, and transient response under various operating conditions.

Furthermore, experimental validation of the hybrid forward boost converter is performed using a prototype setup connected to a renewable energy source and an electric vehicle charging station. Real-world testing allows for the assessment of system performance, efficiency, and compatibility with EV charging standards.

The results of this research demonstrate the feasibility and effectiveness of the hybrid forward boost converter for renewable energy-powered electric vehicle charging applications. The converter's ability to efficiently utilize renewable energy sources while providing stable and reliable charging contributes to the advancement of sustainable transportation infrastructure.

In conclusion, the hybrid forward boost converter presents a promising solution for enhancing the integration of renewable energy in electric vehicle charging systems, promoting energy efficiency, environmental sustainability, and the widespread adoption of electric vehicles.

Renewable Energy Sources Integration and Control in Railway Microgrid

---KONDAKALLA HRITHIKA REDDY

17251A0245

This work presents a comprehensive study on the integration and control of renewable energy sources (RES) within a railway microgrid, aiming to enhance the sustainability and resilience of railway electrification systems. With the increasing demand for eco-friendly transportation solutions, railway operators are exploring ways to incorporate renewable energy into their power supply infrastructure to reduce carbon emissions and dependency on fossil fuels.

The proposed research focuses on the design, optimization, and control strategies for integrating various renewable energy sources, including solar photovoltaic (PV), wind turbines, and energy storage systems, into the railway microgrid. The objective is to maximize the utilization of renewable energy while ensuring reliable and stable power supply for railway operations.

Key aspects of the research include:

1. Renewable Energy Resource Assessment: Comprehensive analysis and evaluation of available renewable energy resources at railway sites, including solar irradiance, wind speed, and site-specific environmental conditions.
2. Microgrid Design and Configuration: Development of an optimal microgrid configuration considering the spatial and temporal variability of renewable energy sources, load profiles, and operational requirements of the railway system.
3. Control and Optimization Strategies: Implementation of advanced control algorithms and optimization techniques to manage the power flow, balance supply and demand, and maintain grid stability within the railway microgrid. This includes real-time monitoring, forecasting, and adaptive control mechanisms to maximize renewable energy penetration and minimize dependency on grid power.
4. Integration with Railway Operations: Seamless integration of renewable energy sources and microgrid control systems with railway electrification infrastructure, traction power supply, and signaling systems to ensure compatibility, reliability, and safety of railway operations.
5. Performance Evaluation and Case Studies: Simulation studies and case analyses to assess the performance, economic viability, and environmental benefits of the proposed renewable energy integration and control strategies in railway microgrid applications.

Solar-based automatic control of light illumination intensity using high boost DC to DC converter.

--- BURAGONI NIKHILA

17251A0296

This introduces a novel approach to automatically controlling light illumination intensity using solar energy, facilitated by a high boost DC to DC converter. The proposed system aims to optimize energy utilization and enhance lighting efficiency in various applications such as outdoor lighting, street lighting, and indoor illumination.

Solar energy presents a sustainable and renewable source of power for lighting applications. However, variations in solar irradiance levels throughout the day pose challenges for maintaining consistent illumination intensity. To address this challenge, the proposed system integrates a high boost DC to DC converter with solar panels to efficiently harness solar energy and regulate the output voltage to meet lighting requirements.

The core components of the system include solar panels for energy harvesting, a high boost DC to DC converter for voltage regulation, and LED lighting fixtures for illumination. The high boost converter employs advanced control algorithms to dynamically adjust the output voltage based on real-time solar irradiance levels, ensuring optimal power conversion and consistent illumination intensity.

Key features of the proposed system include:

1. Solar Energy Harvesting: Utilization of photovoltaic solar panels to capture solar energy and convert it into electrical power, providing a sustainable and environmentally friendly energy source for lighting applications.
2. High Boost DC to DC Conversion: Implementation of a high boost DC to DC converter capable of efficiently boosting the low voltage output from solar panels to the required voltage levels for LED lighting, enabling effective utilization of solar energy even under low irradiance conditions.
3. Automatic Control of Light Intensity: Integration of control algorithms to adjust the output voltage of the boost converter in response to changes in solar irradiance levels, ensuring consistent and adaptive control of light illumination intensity throughout the day.
4. Energy Efficiency and Cost Savings: Optimization of energy utilization through intelligent control of light intensity, leading to reduced energy consumption, lower operational costs, and extended lifespan of LED lighting fixtures.

The proposed solar-based automatic control system offers a sustainable and energy-efficient solution for lighting applications, particularly in off-grid or remote locations where access to conventional power sources may be limited. By harnessing solar energy and dynamically adjusting light intensity, the system contributes to environmental conservation and enhances lighting reliability and performance.

Controller and Design Implementation of solar panel companion inverters

---SANKA KRISHNA SRIHITHAI

17251A0224

The proposed research encompasses the design, modeling, and control strategies for companion inverters, aiming to achieve high efficiency, reliability, and grid stability. Key aspects of the research include:

1. Controller Design: Development of advanced control algorithms tailored to the specific characteristics of companion inverters, including maximum power point tracking (MPPT), voltage regulation, and grid synchronization. The controllers are designed to maximize energy harvesting from solar panels while ensuring stable and efficient operation under varying environmental conditions.
2. Power Conversion Topology: Exploration of various power conversion topologies, such as single-stage or multi-stage inverters, to achieve optimal efficiency and performance. The selection of suitable topologies considers factors such as cost-effectiveness, scalability, and compatibility with solar panel configurations.
3. Grid Integration and Compliance: Integration of companion inverters with the grid infrastructure, including synchronization with grid frequency and voltage levels, compliance with grid codes and standards, and implementation of anti-islanding protection mechanisms to ensure safe and reliable grid interaction.
4. Hardware Implementation and Testing: Practical implementation of the designed controllers and inverters using hardware-in-the-loop (HIL) simulation or prototype testing setups. Performance validation involves assessing key metrics such as efficiency, power quality, dynamic response, and fault tolerance under real-world operating conditions.
5. Optimization and Scalability: Investigation of optimization techniques and scalability considerations to adapt companion inverters for various solar panel configurations, system sizes, and application scenarios. This includes exploring modular design approaches, adaptive control strategies, and integration with energy storage systems for enhanced flexibility and resilience.

The findings of this research contribute to advancing the state-of-the-art in solar panel companion inverters, offering insights into controller design, power conversion topology selection, and grid integration strategies. The optimized companion inverters enable efficient utilization of solar energy, facilitate grid integration, and support the transition towards renewable energy-based power systems.

Smart IoT based Energy Metering System with Load Management Algorithm

---CHANDA RAJA RAJESHWARI

17251A0209

The proliferation of IoT devices and sensors presents an opportunity to transform traditional energy metering systems into intelligent, connected platforms capable of delivering actionable insights and facilitating dynamic load management. The proposed system consists of smart energy meters equipped with wireless communication capabilities, centralized data processing units, and cloud-based analytics platforms.

Key features of the Smart IoT-based Energy Metering System include:

1. Real-time Monitoring and Metering: Integration of smart energy meters equipped with advanced sensors to continuously monitor electricity consumption at individual appliances, circuits, or building-levels. Real-time data is transmitted wirelessly to a centralized data processing unit for analysis and visualization.
2. Load Management Algorithm: Implementation of a Load Management Algorithm that dynamically controls electrical loads based on predefined criteria such as time-of-use pricing, demand response signals, or user preferences. The algorithm optimizes load scheduling to minimize peak demand, reduce energy costs, and improve grid stability.
3. Predictive Analytics and Insights: Utilization of cloud-based analytics platforms to analyze historical energy consumption data, identify patterns, and predict future demand trends. Machine learning algorithms are employed to generate actionable insights and recommendations for optimizing energy usage and improving efficiency.
4. Remote Control and Automation: Provision of remote control capabilities through mobile applications or web interfaces, allowing users to remotely monitor energy consumption, adjust load settings, and schedule automated actions such as turning appliances on/off or adjusting thermostat settings.
5. Scalability and Interoperability: Designing the system to be scalable and interoperable with existing infrastructure, enabling seamless integration with smart grid technologies, renewable energy sources, and energy storage systems.

Department of Electrical and Electronics Engineering

Vision

To impart quality education in Electrical and Electronics Engineering for women empowerment

Mission

The vision can be accomplished by

1. Imparting fundamental knowledge in Electrical and Electronics Engineering through well-qualified faculty

2. Providing exposure to current technologies

3. Providing hands-on experience to meet the expectations of the industry

4. Facilitating individual and team activities to enhance personality and soft skills

Program Educational Objectives (PEOs)

PEO1: To Excel in chosen career

PEO2: To work effectively as an individual and as a team member, keeping in mind the high importance currently being given to sustainability and emerging Green Energy Technologies in the current scenario

PEO3: To contribute to the community/society development through acquired knowledge and skills

PEO4: Continuous up gradation of knowledge and skills