



# **MALLA REDDY ENGINEERING COLLEGE FOR WOMEN**

**Autonomous Institution – UGC, Govt. of India**

**Accredited by NBA & NAAC with 'A' Grade**

NRF Indian Ranking, Accepted by MHRD, Govt. of India | Band - Excellent, National Ranking by ARIIA  
Maisammaguda, Dhulapally, Secunderabad - 500 010, Telangana

**A.Y : 2023-24 VOL.1**

Under  
Student Chapter IEEE, IETE & Technical Association Electropheenix

# **ELEKTOR**

**QUARTERLY TECHNICAL MAGAZINE**

**DEPARTMENT OF  
ELECTRICAL & ELECTRONICS ENGINEERING**

**EEE**

### DEPARTMENT VISION

- Our vision is to empower future engineers with advanced technologies and innovative training, cultivating a dynamic learning environment that nurtures creativity, teamwork, and critical thinking. To equip students with the essential skills and knowledge to drive technological advancements, foster a sustainable future, and ensure their success while contributing to societal well-being.

### DEPARTMENT MISSION

**M1:** To establish a dynamic learning ecosystem that prioritizes experiential learning and interdisciplinary collaboration.

**M2:** To equip future engineers with the skills and innovative solutions for success in industry, startups, and entrepreneurship, fostering creativity, critical thinking, and teamwork to drive progress and sustainability

**M3:** To provide a holistic technical education that fosters not only technical excellence but also instills values of decency, dignity and discipline shaping engineers who contribute ethically to society and the profession.

### Vision



### Mission



### ABOUT THE DEPARTMENT

The Department of Electrical & Electronics Engineering is accredited by NBA, with an intake of 60 students. The Dept. has state of the art laboratories with latest software's like MATLAB, ORCAD, SCI LAB, PSPICE and Multisim. We have well qualified faculty members. Several faculty members have received their best teacher awards from institutions of International repute and have been working on research and development projects and regularly publish their work in international journals and conferences. EEE department faculty teams attained patent rights for their technological innovations. The Dept. established IEEE, ISTE student chapters under which it organizes National Level Technical Symposium -FUTURE SASTRA & State Level Technical Symposium- MEDHA every academic year. The Dept. organized National conference on "Emerging Trends in Electrical Systems & Engineering" NCETESE, International Conference on "Emerging Trends in Electrical Systems & Engineering"(ICETESE) every year since 2014, The Dept. organizes Faculty Development Programmes, Refresher courses and workshops in different streams and Student Development Programmes like Workshops, intra college conferences, Industrial visits , Guest lectures and our students actively participate in hackathon programmes conduct at state and National level. Our students are actively participated and won prizes in curricular activities organized by other colleges. The Dept. also organizes regular student seminar sessions of two hours per week for I to IV B.Tech student to enhance their all-round performance.

The Dept. also offers value added certification Courses on oxford, Microsoft, CISCO certification through Oxford University, Microsoft Innovation Centre and CISCO Networking Academy respectively. The College Offers Campus Recruitment Training Programmes in collaboration with TIME and FACE Institutions. The Department also publishes the Registered Journal "International Journal of Research in Signal Processing, Computing and Communication-System Design (IJRSCSD) with an ISSN: 2395-3187.

## PO'S

<b>PO1</b>	<b>Engineering knowledge</b>	An ability to apply knowledge of mathematics (including probability, statistics and discrete mathematics), science, and engineering for solving Engineering problems and modeling
<b>PO2</b>	<b>Problem analysis</b>	An ability to design, simulate and conduct experiments, as well as to analyze and interpret data including hardware and software components
<b>PO3</b>	<b>Design / development of solutions</b>	An ability to design a complex electronic system or process to meet desired specifications and needs
<b>PO4</b>	<b>Conduct investigations of complex problems</b>	An ability to identify, formulate, comprehend, analyze, design synthesis of the information to solve complex engineering problems and provide valid conclusions.
<b>PO5</b>	<b>Modern tool usage</b>	An ability to use the techniques, skills and modern engineering tools necessary for engineering practice
<b>PO6</b>	<b>The engineer and society</b>	An understanding of professional, health, safety, legal, cultural and social responsibilities
<b>PO7</b>	<b>Environment and sustainability</b>	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and demonstrate the knowledge need for sustainable development.
<b>PO8</b>	<b>Ethics</b>	Apply ethical principles, responsibility and norms of the engineering practice
<b>PO9</b>	<b>Individual and team work</b>	An ability to function on multi-disciplinary teams.
<b>PO10</b>	<b>Communication</b>	An ability to communicate and present effectively
<b>PO11</b>	<b>Project management and finance</b>	An ability to use the modern engineering tools, techniques, skills and management principles to do work as a member and leader in a team, to manage projects in multi-disciplinary environments
<b>PO12</b>	<b>Life-long learning</b>	A recognition of the need for, and an ability to engage in, to resolve contemporary issues and acquire lifelong learning

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PSO'S

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The graduates of the department will attain:

**PSO1:** Analyze, Design and Implement application specific electrical system for complex engineering problems, Electrical And Electronics Circuits, Power Electronics and Power Systems by applying the knowledge of basic science, Engineering mathematics and engineering fundamentals

**PSO2:** Apply modern software tools for design, simulation and analysis of electrical systems to engage in life- long learning and to successfully adapt in multi disciplinary environments

**PSO3:** Solve ethically and professionally various Electrical Engineering problems in societal and environmental context and communicate effectively

## PEO'S

**PEO1-PROFESSIONAL KNOWLEDGE AND APPLICATION**

To develop a strong foundation in Mathematics, Science, and Engineering, and effectively apply this knowledge to real-world challenges while considering economic, environmental, social, political, ethical, health, safety, manufacturability, and sustainability constraints.

**PEO2-ENGINEERING COMPETENCE:**

To enhance their ability to identify, formulate, analyze, and solve complex engineering problems, gaining practical experience in various technologies and utilizing modern tools to meet societal and industrial needs.

**PEO3- TECHNICAL EXPERTISE**

To be proficient in designing, simulating, experimenting, analyzing, optimizing, and interpreting engineering data using multidisciplinary approaches and contemporary learning, while fostering innovation and research to ensure they are well-prepared for industry roles.

**PEO4- PROFESSIONAL AND ETHICAL DEVELOPMENT**

To be equipped with soft skills and professional attitudes, enabling them to work effectively in teams, address ethical issues responsibly, and contribute to multidisciplinary projects, with a keen understanding of the broader societal impact of their work.

**PEO5- LEARNING AND LEADERSHIP**

To thrive in an academic environment that fosters creativity, discovery, and a passion for learning, while being equipped with leadership skills, ethical guidelines, and a commitment to lifelong learning, ensuring their success in Electrical and Electronics Engineering

## MESSAGES

## Founder Chairman's Message

**Ch. Malla Reddy**

Founder Chairman, MRGI  
Hon'ble Minister, Govt. of Telangana State

MRECW has made tremendous progress in all areas and now crossing several milestones within a very short span of time and now I feel very happy to know that the students and faculty of the ECE department of MRECW are bringing out the volume-1 of the Technical magazine Elektor in A.Y 2023-24. As I understand this magazine is intended to bring out the inherent literary talents in the students and the teachers and also to inculcate leadership skills among them. I am confident that this issue will send a positive signal to the staff, students and the persons who are interested in the educational and literary activities

## Principal's Message

I congratulate the department of EEE, MRECW for bringing out the first issue of the prestigious quarterly department technical Magazine Elektor in A.Y 2023-24, I am sure that the magazine will provide a platform to the students and faculty members to expand their technical knowledge and sharpen their hidden literary talent and will also strengthen the all-round development of the students. I am hopeful that this small piece of literary work shall not only develop the taste for reading among students but also develop a sense of belonging to the institution as well. My congratulations to the editorial board who took the responsibility for the arduous task most effectively. I extend best wishes for the success of this endeavor.

**Dr. Y. Madhatee Latha**

Principal

## HOD'S MESSAGE

It is an occasion of great pride and satisfaction for the department of EEE, MRECW to bring out the first issue of the half yearly of the Technical magazine Elektor in A.Y 2023-24, it gives me immense pleasure to note that the response to the magazine has been over whelming. The wide spectrum of articles gives us a sense of pride that our students and faculties possess creative potential and original thinking in ample measures. Each article is entertaining interesting and absorbing. I applaud the contributors for their stimulated thoughts and varied hues in articles contributed by them.

**Dr. S. Vijaya Madhavi**

HOD



## SCIENTIST OF THE QUARTER YEAR



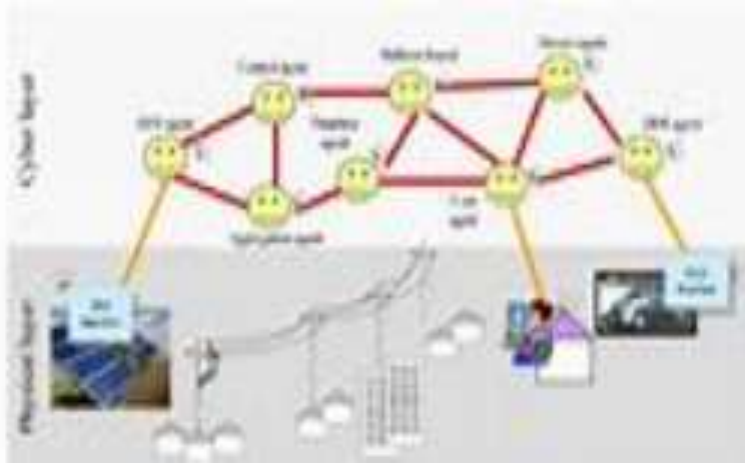
## Michael Faraday

**Michael Faraday** (September 1791 – 25 August 1867) was an English physicist and chemist who contributed to the study of electromagnetism and electrochemistry. His main discoveries include the principles underlying electromagnetic induction, diamagnetism and electrolysis. Although Faraday received little formal education, as a self-made man, he was one of the most influential scientists in history. It was by his research on the magnetic field around a conductor carrying a direct current that Faraday established the concept of the electromagnetic field in physics. Faraday also established that magnetism could affect rays of light and that there was an underlying relationship between the two phenomena. He similarly discovered the principles of electromagnetic induction, diamagnetism, and the laws of electrolysis. His inventions of electromagnetic rotary devices formed the foundation of electric motor technology, and it was largely due to his efforts that electricity became practical for use in technology.

As a chemist, Faraday discovered benzene, investigated the clathrate hydrate of chlorine, invented an early form of the Bunsen burner and the system of oxidation numbers, and popularized terminology such as "anode", "cathode", "electrode" and "ion". Faraday ultimately became the first and foremost Fullerian Professor of Chemistry at the Royal Institution, a lifetime position.. On Faraday's uses of lines of force, Maxwell wrote that they show Faraday "to have been in reality a mathematician of a very high order – one from whom the mathematicians of the future may derive valuable and fertile methods."<sup>[5]</sup> The SI unit of capacitance is named in his honor: the farad. Albert Einstein kept a portrait of Faraday on his study wall, alongside those of Isaac Newton and James Clerk Maxwell. Physicist Ernest Rutherford stated, "When we consider the magnitude and extent of his discoveries and their influence on the progress of science and of industry, there is no honor too great to pay to the memory of Faraday, one of the greatest scientific discoverers of all time.

## FACULTY ARTICLES

## Static synchronous compensator in grid-connected photovoltaic systems



The use of standalone microgrids has increased because they are more flexible to supply energy as per consumer needs and increase pollution. Integrating renewable energy sources with different loads will increase power quality issues in grid-connected systems. Therefore, this paper proposes a novel control strategy to reduce the power quality problems in microgrids. A standalone solar photovoltaic (PV) system is used in this work for generating input power. The seven-level modular multilevel converter is designed to work with grid-tied renewable sources, with the DC supply powered by a solar-connected power generation system. Power quality issues are solved with the help of a seven-level modular multilevel converter (MMC)-based static synchronous compensator (STATCOM) device. The performance of STATCOM is improved by integrating the tilt integral–tilt derivative (TI-TD) controller with an improved puma optimization algorithm. This controller in a shunt active power filter diminishes current and voltage power quality issues. The Simulink platform is used for the implementation of the proposed work. The performance of the proposed work is validated by including disturbances in the system. The total harmonic distortion (THD) obtained for the proposed model is 0.52%. Performance of the proposed controller is evaluated using different controllers and optimization algorithms. Findings of the simulation and the experiment show better performance of the proposed method.

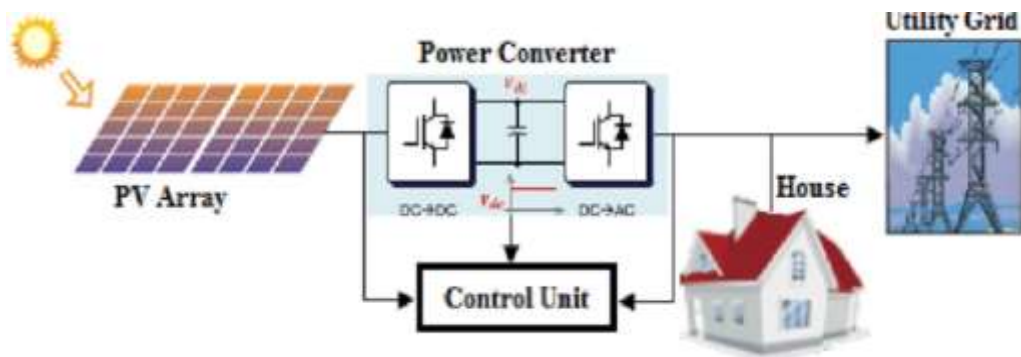
**Mrs. Bhuvaneshwari.T.R**

Department of EEE





## Power quality improvement of PV fed grid connected system



In today's fast-paced world of electrical power systems, it is extremely important to maintain reliable and high-quality electricity. However, as more and more non-linear loads, renewable energy sources, and advanced electronic gadgets expand their influence into all sectors of modern life various problems caused by harmonic distortion, low power factor, and voltage fluctuations have appeared in front of us. To address these difficulties now a new approach has been proposed that involves the use of the Shunt Active Power Filters. SAPF, an advanced pupil in power electronics, has always been deliberately designed to handle all sorts of undesired happenings to enhance the quality of electrical power. These phenomena which include reactive power, voltage sags, swells, and harmonic waves, in addition to electric particulars can impair sensitive equipment and the overall effectiveness of the electrical distribution system likewise will disturb normal operation. The SAPF basically is working as a control system that responds dynamically to any abnormality in electricity waveform, whether detected at the point of use or in transmission and distribution networks. Shunt Active Power Filters (SAPF) introduce controlled currents - all in phase with each other and large enough to cancel out the unwanted contributions - back into the electrical systems for them to normalize. The problems are resolved by following a step by-step approach that aims at getting these parameters back to their desired conditions

Harmonics are common in integrated power systems, especially with the increasing use of nonlinear loads (NLL), such as those found in photo voltaic (PV) systems connected to the grid. Traditional LC filters Shunt active power filters (SAPF) have been developed to effectively correct harmonics and improve power quality performance. This study presents a three-phase voltage-fed SAPF implementation to mitigate harmonics using an artificial neural network (ANN) controller. The SAPF control system focuses on generating reference source currents to counterbalance the harmonic effects caused by NLL

**Dr. Ganga Dinesh Kumar**  
Department of EEE



## STUDENT ARTICLES

**SMART SOLAR POWERED GRASS CUTTER**

Smart Solar-Powered Grass Cutter designed for automated and energy-efficient lawn maintenance. It features an automated height adjustment system, allowing the blade to adapt to different grass levels for precise and uniform cutting. The cutter is powered by solar energy, enabling self-charging during the day, while a battery backup ensures continuous operation even in low sunlight conditions.

The system integrates smart control mechanisms, making it user-friendly and reducing manual effort. Additionally, its environmentally friendly design minimizes reliance on non-renewable energy sources, contributing to sustainable lawn care. With its automated, cost-effective, and low-maintenance features, this grass cutter is suitable for both residential and commercial applications.

**Attepally Navyasri**  
(21RH1A0204)



## SOLAR BASED GARBAGE COLLECTOR BOAT



As we know the population of India increasing day by day and due to this the pollution also gets increase. The garbage with are produce by the peoples are the main cause of pollution. The most of the garbage are dumped or just thrown in the lake, river of other water resources. The garbage which are thrown in the water such as lakes, rivers and other water resources due to which the water get polluted because of which we cannot use that water for our daily use and the water will also get wasted. In many of cities of India this is the major problem. To overcome this water pollution our project "Solar power water surface cleaning boat" is very helpful by collecting the garbage which are floating on the surface of water. This works automatically and saves the manpower and also very efficient and work on the solar energy no external power supply is required. A battery of 12v is use to store the energy which collected by the solar plate, then this battery will use this stored energy to operate complete boat.

The Water is the most important resource for living organisms. Therefore, clean water is a basic need. But the water in the lake or river is polluted by human beings, most of the waste is dumped into the lake and river. The wastes are thrown into the water so it pollutes the lakes and rivers, because of this we cannot use this water for daily use. To overcome this water pollution garbage collection boats have been introduced. We can widely use them for the purpose of cleaning up water bodies. "Solar based Garbage Collecting Boat" is very helpful by collecting garbage floating on the water. In this project, smaller sized garbage collection boats have been designed to collect garbage and floating solids in narrow and small areas such as streams and drainage systems.

**Katta Poojitha**

22RH5A0211

III EEE



## AUTOMATIC MOVABLE PLATFORM



Movable Platform features a movable slide connected to the platform, initially positioned vertically. The system automatically moves a railway platform using sensors to detect approaching trains and avoid accidents. When a train is detected, the platform moves away from the tracks. An LCD display informs passengers of the train's status and platform position.

Ultrasonic sensors placed at the platform's edge detect an approaching train. Upon detection, the sensors send a signal to a servomotor, which shifts the slide from a vertical to a horizontal position, aligning it with the train door, which means it eliminates the gap between the train and platform. This ensures smooth and safe transfer between the platform and the train. Once the train departs, the slide returns to its vertical position. The system enhances safety, accessibility, and efficiency, making it ideal for railway platforms and similar applications.

**K.Sindhuja**  
20RH5A0215  
III EEE



## AUTOMATIC HARVESTED GRAIN PROTECTION SYSTEM



In today's unpredictable agricultural landscape, protecting harvested crops from the elements is crucial. Rain, moisture, and humidity can quickly ruin a perfect harvest, leading to spoiled grains and financial losses for farmers. Enter the **Automatic Harvested Grain Protection System**—a groundbreaking innovation designed to safeguard grains, particularly rice, from the damaging effects of adverse weather.

This system integrates weather-monitoring sensors, a smart control unit, and a retractable protective covering. The sensors track rain, humidity, and temperature, and when unfavorable conditions are detected, the system automatically deploys a cover to shield the grains. Once the weather improves, the cover retracts, allowing the grains to air out and preventing excess moisture from causing spoilage.

The system offers several key benefits: it prevents grain spoilage by keeping harvested crops dry, saving farmers time and labor by automating protection during rainstorms, and promoting sustainability by using solar power. It also helps improve food security by reducing crop losses, ensuring more grains are available for trade and consumption.

As climate change brings more unpredictable weather, innovations like this one are essential for ensuring the quality of crops and safeguarding farmers' livelihoods. With the potential for integration into broader smart farming technologies, the Automatic Harvested Grain Protection System is a step toward a more efficient, sustainable agricultural future.

**Ashlesha**

22RH1A0244  
II EEE





## Quiz Based Alarm System



In today's fast-paced world, snooze buttons and mindless scrolling are the enemies of productivity. The standard alarm clock—blaring loudly in the morning—has become an accepted nuisance, one we often silence and return to sleep. However, a new technological twist on traditional alarms is changing the way we start our day: the **Quiz-Based Alarm System**.

The concept is simple yet effective: instead of a monotonous beep, your alarm rings with a challenge. To turn it off, you must answer a question, solve a puzzle, or complete a short quiz. This system encourages mental engagement from the moment you wake up, ensuring that you are fully alert and ready to face the day. By incorporating brain exercises into the waking process, it stimulates cognitive function, making it easier to transition from sleep to alertness.

The quiz can be tailored to your interests—ranging from trivia and general knowledge to more specific topics like language learning, math problems, or even personal goals for the day. Some apps even integrate quizzes that help you review important tasks or upcoming meetings, offering a personalized approach to your morning routine. What sets the Quiz-Based Alarm System apart is its power to eliminate the temptation to sleep in. By requiring active participation to stop the alarm, it forces users to engage their minds and avoid the passive, autopilot routine many fall into. It's a gentle way of preventing procrastination, ensuring that your mind wakes up as quickly as your body.

Moreover, this innovation can be a game-changer for people who struggle with traditional alarms, especially those with hearing impairments. Customizable visual cues or vibrations can complement the quizzes to ensure everyone gets a gentle yet effective wake-up call.

Whether you're trying to break your snooze button habit, boost your productivity, or simply add a bit of fun to your morning, the Quiz-Based Alarm System could be the perfect tool for jumpstarting your day!

**DEEPIKA**  
22RH1A0257  
II EEE





## Voice-Controlled Wheelchair: Empowering Mobility Through Innovation



Advancements in technology have continuously transformed the lives of individuals with disabilities, and one such breakthrough is the **voice-controlled wheelchair**. This innovative solution is enhancing mobility for those with limited physical abilities by offering a hands-free way to navigate the world around them. Using voice commands, users can control their wheelchair's movement, direction, and speed, providing them with greater independence and convenience.

The voice-controlled system works by integrating sophisticated speech recognition software into the wheelchair, enabling it to respond to simple vocal commands like "move forward," "turn left," or "stop." With the addition of customizable features, users can even adjust speed, activate emergency brakes, or navigate specific routes with ease. This voice interface eliminates the need for manual controls, allowing individuals to focus on other tasks or simply enjoy a more comfortable experience without the strain of physical effort.

Beyond just convenience, the voice-controlled wheelchair also promotes safety. In scenarios where the user may be unable to operate a traditional joystick or control system due to injury or dexterity issues, the voice-activated system serves as a reliable alternative. For example, a person with limited hand mobility can still easily move the chair by speaking commands, empowering them to regain some autonomy and confidence in their everyday activities.

Furthermore, voice-controlled wheelchairs can be integrated with smart home systems, making it easier for users to manage their environment. A simple voice command can open doors, adjust lighting, or operate appliances, offering a seamless connection between mobility and daily tasks. As this technology continues to evolve, we can expect even more features that not only improve independence but also ensure the highest standards of comfort and control for wheelchair users everywhere.

**Spoorthy Reddy**  
22RH1A0261  
II EEE



## AUTOMATIC RAILWAY GATE CONTROL SYSTEM



In today's fast-paced world, security and convenience are top priorities for both residential and commercial properties. The **Automatic Gate Control System** has become a key player in meeting these demands, offering a seamless and secure way to manage access to homes, businesses, and restricted areas. These advanced systems combine technology and automation to ensure that gates open and close efficiently, without the need for manual intervention.

The system typically operates through sensors, remote controls, or keypads, enabling users to open gates with the push of a button, a swipe of a card, or even a voice command. It can be programmed to recognize authorized users, enhancing security by ensuring that only approved individuals gain access. The integration of features like biometric scanning, mobile app control, and intercom systems further adds a layer of convenience and security, making it easy for users to monitor and control their gates from anywhere.

Beyond security, automatic gate systems offer practical benefits. They help reduce wear and tear on gates by ensuring smooth operation, prevent unauthorized entry, and increase privacy. Additionally, many modern systems are designed to be energy-efficient, requiring minimal maintenance while providing long-lasting durability.

As technology continues to evolve, the **Automatic Gate Control System** is becoming an integral part of smart homes and businesses, offering enhanced security, ease of use, and peace of mind. Whether it's for a residential driveway, commercial parking lot, or a private estate, these systems are reshaping the way we think about access control.

**K.Vyshnavi**

22RH1A0229

II EEE



## THE RISE OF SMART GRIDS: REVOLUTIONIZING ENERGY DISTRIBUTION



The evolution of the electrical grid is undergoing a transformative shift with the rise of **smart grids**, offering a glimpse into the future of energy distribution. Traditional grids are becoming outdated in meeting the demands of modern society, which increasingly relies on renewable energy sources, electric vehicles, and digital technologies. Smart grids are set to solve these challenges by integrating advanced communication, automation, and control technologies into existing infrastructure.

Unlike conventional grids, smart grids use real-time data from sensors and meters to monitor and manage electricity flow efficiently. This allows for better decision-making, faster response times, and the ability to integrate renewable energy sources like solar and wind seamlessly. In addition, smart grids enable consumers to track their energy usage and reduce waste through smart meters, leading to lower energy bills and a more sustainable lifestyle.

The benefits of smart grids extend beyond just energy efficiency. They enhance grid reliability by detecting and responding to faults quickly, reducing power outages. Furthermore, they support the growing demand for electric vehicles (EVs) by facilitating vehicle-to-grid technologies, where EVs can not only draw power but also supply energy back to the grid during peak times.

In a world moving towards sustainability and interconnected technologies, smart grids are revolutionizing how we generate, distribute, and consume electricity. The future promises a more resilient, efficient, and greener energy system, powered by the innovations of electrical engineers and the advent of smart grids.

**J.Himabindu**  
21RH1A0213  
III EEE



## AI AND MACHINE LEARNING IN ELECTRICAL SYSTEMS



Artificial Intelligence (AI) and Machine Learning (ML) are transforming the landscape of electrical engineering, driving advancements in system optimization, fault detection, and predictive maintenance. By leveraging data-driven algorithms, engineers can enhance the efficiency, reliability, and sustainability of electrical systems across various sectors.

### **Revolutionizing Energy Management**

AI-powered algorithms are reshaping energy management systems by optimizing power distribution and balancing supply and demand in real time. Smart grids, for instance, use ML to predict energy consumption patterns, integrate renewable energy sources seamlessly, and reduce energy losses. These advancements help in creating a more sustainable and resilient energy infrastructure.

### **Fault Detection and Predictive Maintenance**

Traditionally, electrical systems relied on periodic inspections, often missing early warning signs of failure. With ML, engineers can analyze vast amounts of sensor data to detect anomalies and predict equipment failures before they occur. This not only minimizes downtime but also reduces maintenance costs, ensuring smoother operations.

### **Enhancing Grid Security**

Cybersecurity is a growing concern in modern electrical systems. AI-driven tools can identify and mitigate potential cyber threats by analyzing patterns and detecting anomalies in real time. This proactive approach strengthens grid security and safeguards critical infrastructure from malicious attacks.

### **Future Prospects**

The integration of AI and ML in electrical systems holds immense potential. From autonomous energy management to the development of intelligent microgrids, these technologies are paving the way for a smarter, greener future.

**K.Yasaswini Vajra**

21RH1A0215

III EEE



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**IMPORTANT WEBSITES**

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- <http://www.electrical4u.com>
- [www.allaboutcircuits.com](http://www.allaboutcircuits.com)
- [www.powerstream.com](http://www.powerstream.com)
- [www.circuitlab.com](http://www.circuitlab.com)
- [www.ieee.org](http://www.ieee.org)
- [www.falstad.com](http://www.falstad.com)
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# ELEKTOR



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