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DEPARTMENT OF ELECTRICAL AND ELELCTRONICS ENGINEERING

ELEKTOR

S V COLLEGE OF ENGINEERING

CONTENTS

Vision of the Department

To prepare the learners globally competent, dynamic and multi talented young leaders with skill set & knowledge in Electrical and Electronics Engineering field with a focus on higher education, professional practice, research and technical consultancy competence ethical con- cern.

Mission of the Department

- To prepare the learners professionally deft and intellectually adept in the field of Electri- cal and Electronics Engineering with an excellent infrastructure, core values and qualified & experienced teaching faculty.
- To inculcate skill, knowledge and behavior to cater the dynamic requirements in the field of Electrical and Electronics Engineering.
- To motivate and prepare the learners for career guidance, placements and higher educa- tion with a focus on MoUs with premier institutes and industries.

About the Department

The Electrical & Electronics Engineering department was started with UG programme in 2007 with an intake of 60. The department has well talented, qualified, experienced & dy- namic faculty along with skilled technical supporting staff who spearhead the process of achieving the vision of the department. The department has well equipped labs & infrastruc- ture. It is continuously striving to impart quality education and competitive spirit among students for academic excellence.

Strengths of the Department

1. In every semester Department of EEE conducts minimum of two workshops and there guest lecturers in the recent trends in Electrical Engineering to bridge the gap between Academics & Industries, and the students will be guided to do their Major & Minor projects on the same topics.
2. Every faculty member of the department attends a minimum of one faculty development program in eve- ry academic year. And most of the faculty members register for NPTEL online courses.
3. Department publishes a newsletter in every six months, which includes the activities that were done in the past two months; fortnight wall magazines based on recent advancements in the field of electrical engineer- ing prepared by students

Message from Principal

It is a moment of pride and joy to witness the Department of Electrical and Electronics Engineering bringing forth this technical magazine an excellent initiative to cultivate intellectual engagement and technical writing among students.

EEE is a dynamic discipline that continues to shape the future of sustainable energy, automation, smart technologies, and communication systems. I am confident that this magazine will serve as a mirror to the department's academic achievements, innovative thinking, and collaborative spirit.

I appreciate the sincere efforts of the editorial team, faculty, and students for curating this publication. May it continue to be a beacon of knowledge, inspiration, and academic excellence for years to come

Happy Reading!

Dr. N. Sudhakar Reddy, Principal

Message from HOD

It is with great pride and joy that I present this edition of the EEE Department's technical magazine. This publication symbolizes the innovative spirit, technical excellence, and collaborative effort that our department consistently nurtures.

Electrical and Electronics Engineering is the backbone of modern technology—from power systems to robotics, automation to IoT. Through this magazine, our students have demonstrated not only academic brilliance but also a keen awareness of current trends and a passion to be future-ready.

I applaud every student who has contributed with creativity, research, and dedication. Let this magazine serve as both a milestone and a motivator for even greater achievements ahead.

Best wishes to all our students - may you continue to question, innovate, and lead.

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Happy Reading.

Dr. V. Lakshmi Devi, HOD, Dept. of EEE

Message from Faculty Advisor

It is with great pride and immense satisfaction that I extend my heartfelt greetings to all readers of this edition. Serving as the Faculty Advisor, I have had the privilege of closely witnessing the creativity, passion, and technical brilliance that our students consistently bring to every activity and this magazine stands as a shining example of that commitment. I am confident that the readers will find this magazine both informative and inspiring.

Dr. J. A. BASKAR, EEE

FLEXIBLE WEARABLE BATTERIES FOR SMART CLOTHING

New lithium-polymer batteries that can **bend, stretch, and twist** are powering smart textiles. From athletic wear to medical monitoring outfits, these batteries offer safe and reliable energy for **body temperature sensors, heart-rate trackers, and GPS systems**

New battery designs using lithium-silicon or solid-state technology allow for thin, flexible energy storage solutions. These can be sewn into clothing to power sensors, fitness trackers, and medical devices. These batteries are stretchable and water-resistant, ideal for use in health monitoring garments that track heart rate, hydration levels, or posture. Commercial prototypes are expected to hit the market within 2 years.

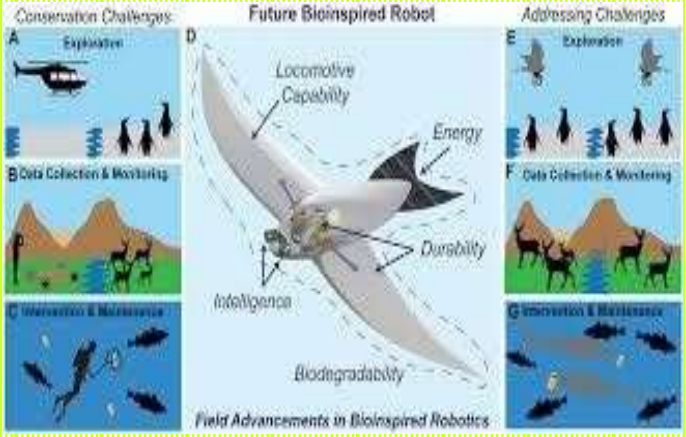
WIRELESS STREETLIGHTS POWERED BY AIRBORNE WIND TURBINES

Engineers have designed balloon-based wind turbines that float several hundred meters above ground to access high-altitude winds. These turbines transmit electricity wirelessly to streetlights below using inductive coupling or radio frequency beaming. Such systems are ideal for off-grid or disaster-prone regions and require minimal ground infrastructure.

Floating wind balloons or "aerostat turbines" are being deployed to **capture high-altitude winds** and transmit electricity wirelessly to smart streetlights. These systems work in remote and off-grid areas, offering a sustainable solution with minimal land use

BIO-INSPIRED POWER SYSTEMS IN ROBOTICS

Engineers are studying **plant and animal systems** to design efficient power mechanisms for robots. Some robots now mimic the **electric eel's bioelectric organs**, producing energy by controlling ion flows—offering a soft and silent power source for autonomousdevices.



Scientists are developing energy systems inspired by biological processes, such as the electric eel's ability to generate voltage. These artificial cells stack thin hydrogel membranes that produce current via ion exchange, powering soft robots or medical implants. These systems are silent, safe, and compact, representing a shift toward bio-mimicry in electronics. **Bio-Inspired Power Systems in Robotics** refer to energy generation, storage, and actuation mechanisms in robots that take cues from biological systems. These power systems are designed to mimic the efficiency, adaptability, and sustainability found in nature to improve robotic performance, especially in mobile, autonomous, or soft robots. **Challenges:**

- **Energy Density**: Bio-inspired systems often have lower power output than traditional batteries.
- **Scalability**: Hard to scale some systems beyond lab.

ENERGY HARVESTING FROM SMART CITY INFRASTRUCTURE

Smart poles, benches, and bus stops are being integrated with **solar panels, Wi-Fi, and charging stations**. These multifunctional structures collect and store energy from the sun to **power LED lighting, digital ads, and surveillance systems**—turning urban furniture into energy assets.

Smart poles and urban benches are being equipped with solar panels, kinetic tiles, and Wi-Fi routers. These structures can collect and store renewable energy to power public lighting, surveillance cameras, and digital information boards. Many also offer public USB charging ports and environmental monitoring systems. Cities like Barcelona and Dubai are leading in implementing this multifunctional infrastructure. It refer to energy generation, storage, and actuation mechanisms in robots that take cues from biological systems. A **smart city** integrates technology into urban infrastructure to enhance the quality of life, efficiency, and sustainability. Energy harvesting in this context refers to collecting energy from sources like:

- **Vibrations** from vehicles and pedestrians
- **Light** from the sun or artificial lighting
- **Heat** from buildings or roads
- **Electromagnetic waves** from radio and communication systems.

C VENKATESH
(21BF1A0212)

CURRENT EEE

SMART INSULATORS FOR POWER LINES USING NANOTECHNOLOGY

Abstract:

Traditional ceramic and polymer insulators on power transmission lines are vulnerable to pollution, weathering, and corona discharge. To address these challenges, recent innovations use nanomaterials like hydrophobic silica coatings to enhance surface resistance and reduce leakage currents. These smart insulators self-clean during rainfall and exhibit enhanced dielectric properties. Field trials in humid coastal regions have shown up to 40% improvement in insulation longevity, contributing significantly to grid reliability with lower maintenance.

WIRELESS POWER TRANSFER FOR ELECTRIC VEHICLES USING RESONANT INDUCTIVE COUPLING:

Abstract:

Wireless charging systems for electric vehicles (EVs) are emerging as a promising alternative to plug-in systems. This technology employs resonant inductive coupling using magnetic fields between two coils—one embedded in the ground and the other on the EV. Recent advancements have improved efficiency to over 90% at mid-range distances (20–30 cm). Experimental setups using LCC compensation networks and frequency-tuned controllers demonstrate safe and efficient power transfer for dynamic and static charging scenarios. An electrostatic wind energy converter or EWICON is also being explored for integration.

AI-BASED FAULT DETECTION IN SMART GRIDS USING DEEP LEARNING ALGORITHMS

Abstract:

Smart grids incorporate numerous data streams from sensors, meters, and substations. AI-based systems using deep learning—especially convolutional neural networks (CNNs) and recurrent neural networks (RNNs)—can detect anomalies and potential faults in real time. These algorithms process voltage, current, and frequency data to classify disturbances like short circuits, voltage sags, or load imbalances. A trained deep model can achieve over 95% accuracy in fault classification, reducing outage time and enhancing preventive maintenance.

IoT-BASED ENERGY MONITORING FOR SMART HOMES AND INDUSTRIES

Abstract:

The Internet of Things (IoT) allows real-time energy monitoring through interconnected sensors and devices. In smart homes, IoT platforms track electricity consumption, identify inefficient appliances, and suggest energy-saving actions. In industries, they monitor motors, HVAC systems, and lighting, contributing to predictive maintenance and lower operational costs. Cloud dashboards and mobile apps provide analytics, alerts, and remote control, while integration with AI systems ensures continuous optimizatization. This system uses interconnected smart sensors, meters, and controllers to collect detailed data on energy usage across various appliances, machines.

N JEEVANA
(21BF1A0265)

SMART STREET LIGHTING SYSTEMS USING LDR AND MOTION SENSORS

Abstract:

Modern street lighting integrates light-dependent resistors (LDRs) and PIR motion sensors to enhance energy efficiency. These systems automatically dim or switch off lights during low-traffic periods and activate when movement is detected. By using microcontroller-based circuits, municipalities can reduce energy consumption by up to 60%. Integration with solar panels further minimizes grid dependency.

. These systems use an LDR to detect ambient light levels, allowing the streetlights to automatically turn on at dusk and off at dawn, eliminating the need for manual operation or fixed timers. Additionally, motion sensors such as Passive Infrared (PIR) or ultrasonic sensors detect the presence of vehicles or pedestrians. When movement is detected, the system increases the brightness of the streetlights to ensure safety and visibility, and dims or turns them off when no activity is sensed, significantly reducing power consumption.

BIOELECTRICITY GENERATION USING MICROBIAL FUEL CELLS

Abstract:

Microbial fuel cells (MFCs) generate electricity using bacteria that break down organic waste. This biotechnological approach converts chemical energy into electrical energy in wastewater treatment plants. Researchers have optimized electrode materials and bacteria strains to increase power density and system stability, offering a renewable solution to manage waste while producing energy. These electrons are transferred

to an anode, travel through an external circuit, and reach the cathode, generating an electric current. MFCs offer a dual benefit: they not only generate clean electricity but also help in waste treatment by decomposing organic pollutants. This makes them highly attractive for use in remote sensors, low-power devices, and wastewater treatment plants. Although the power output of MFCs is currently limited compared to conventional sources, ongoing research is focused on improving efficiency, scalability, and cost-effectiveness

ADVANCED ENERGY STORAGE SYSTEMS USING FLOW BATTERIES

Abstract:

Unlike conventional batteries, flow batteries store energy in electrolyte liquids contained in external tanks. Vanadium redox flow batteries are gaining attention for grid-scale storage due to their long life cycle, fast response, and deep discharge capabilities. These batteries enable better integration of intermittent renewable sources like solar and wind. represent a promising solution for large-scale and long-duration energy storage, particularly in renewable energy applications. Flow batteries store energy in two separate liquid electrolytes contained in external tanks, which are pumped through a cell stack where electrochemical reactions occur to charge or discharge the system. Unlike conventional batteries, flow batteries offer independent scaling of energy capacity (tank size) and power output (cell stack size), making them highly flexible and suitable for grid-level storage. They are known for their long cycle life, high safety, rapid response time, and deep discharge capabilities. Vanadium redox flow batteries (VRFBs) are the most widely developed type, offering excellent chemical stability and the ability to support intermittent sources like solar and wind.

BILLU NAVEEN

(20BF1A0265)

Mega Minds

Charles-Augustin de Coulomb (1736-1806)

Charles-Augustin de Coulomb was an eminent French physicist. He formulated the Coulomb"s law, which deals with the electrostatic interaction between electrically charged particles. The coulomb, SI unit of electric charge, was named after him. He also developed the inverse square law of attraction and repulsion of unlike and like magnetic poles. Coulomb extensively worked on friction of machinery,

William Stanley (1858-1916) :

William Stanley was an inventor and engineer. He developed the first practical transformer (which spurred the development of AC power) as well as other developments; like an improved electric me- ter and the first metal thermos bottle (vacuum flask). He lived most of his life and ran his busi- nesses in Western Massachu- setts during the golden age of electric development.

Michael Faraday:

He was a pioneering English scientist whose groundbreaking work laid the foundation for much of modern electrical engineering. Born in 1791, Faraday made major discoveries in electromagnetism and electrochemistry, most notably the principles of **electromagnetic induction**, which led to the development of electric generators and transformers. He also discovered the laws of electrolysis and introduced key concepts such as the electric field and lines of force. Despite having little formal education, Faraday's experiments and intuitive understanding of electricity and magnetism revolutionized science and industry. His invention of the **Faraday cage**, still used today to block electromagnetic fields, further showcased his practical genius

M SONU DEVI
(20BF1A0273)

Wireless Charging Roads for EVs Underway in Sweden

Source: ElectReon & Swedish Transport Administration

Summary: Sweden has started implementing roads embedded with **inductive charging coils** to wirelessly charge electric vehicles as they drive. The technology enables **dynamic power transfer**, eliminating the need for frequent charging stops and reducing battery size. It represents a sustainable solution for public transport and logistics.

Smart Windows Generate Electricity and Adjust Transparency

Source: Nanyang Technological University, Singapore

Summary: Scientists have unveiled a dual-function smart window capable of generating solar energy and adjusting light transmission based on indoor conditions. Made with perovskite solar cells and electrochromic layers, these windows offer **energy efficiency, privacy control, and electricity generation** in one package—ideal for smart buildings and urban infrastructure.

Self-Healing Circuits Enhance Electronics Lifespan

Source: University of Colorado Boulder

Summary: Engineers have created flexible electronic circuits that **heal themselves** after being cut, punctured, or stretched. These circuits use liquid metal embedded in polymer matrices that reform electrical paths autonomously. Such materials can revolutionize **medical devices, wearables, and space electronics**, where maintenance is difficult or impossible

Revolutionary Sodium-Ion Batteries Challenge Lithium Dominance

Source: Indian Institute of Technology (IIT) Madras

Summary: Sodium-ion batteries have emerged as a cheaper, more abundant alternative to lithium-ion batteries. IIT researchers developed a **high-capacity sodium cathode** that maintains efficiency over 1000+ cycles. With rising lithium costs and geopolitical concerns, sodium-ion technology is poised to support **grid-scale storage and rural electrification**.

AI Models Predict Equipment Failures in Power Plants

Source: Siemens Energy & MIT

Summary: Advanced AI systems are being used to monitor real-time sensor data from turbines, transformers, and generators in thermal and nuclear plants. These models detect anomalies early, allowing **predictive maintenance** that cuts downtime and prevents catastrophic failures—enhancing **safety and operational efficiency** in the power sector

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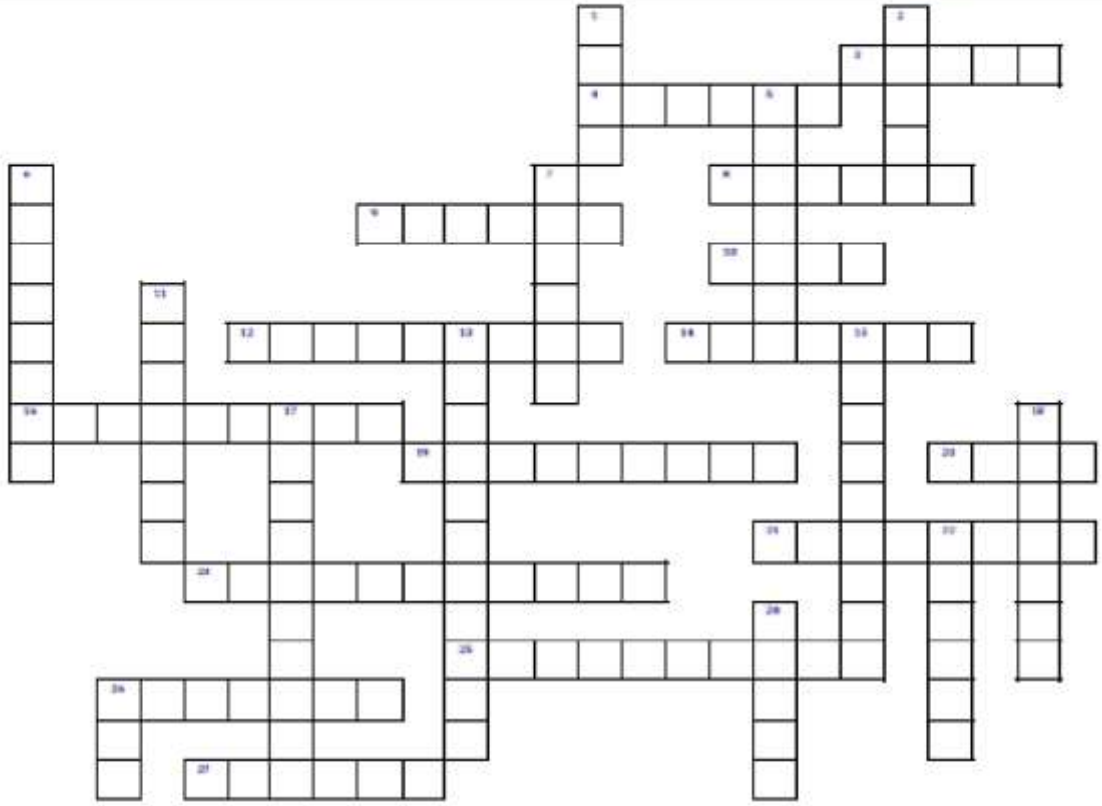

Clues across

3 What causes the resistance of a LDR to decrease?

4 A closed one allows the current to flow.

8 When a circuit is ..... , the current no longer flows.

9 A good conducting metal used in circuits.

10 A type of power source.

12 Adding resistors in series ..... the total resistance in the circuit.

14 This component provides electrical energy.

16 What would you use to measure the potential difference?

19 Adding a resistor in parallel ..... the total resistance in the circuit.

20 Resistance is measured in .....

21 The electric circuit of a car is in .....

23 Increasing this increases a wire's resistance.

25 Poor conductors of electricity.

26 Which component is used to measure current?

27 A battery supplies ..... current.

Clues down

1 Protects equipment from electrical surges.

2 Which component allows the current to flow one way through it?

5 A flow of electrons.

6 The flow of charge in a circuit moves from negative to ...?

7 In which type of circuit is the current the same all the way round?

11 Another word for the potential difference of a cell.

13 Domestic supply uses an ..... current.

15 An electric current is the flow of these.

17 Which component can be used as a temperature sensor?

18 The unit of current.

22 Resistance increases as the ..... of the wire increases.

24 Potential difference is measured in these.

26 To find the total resistance you need to ... the different resistances together.

H S AMISHA
(20BF1A0270)