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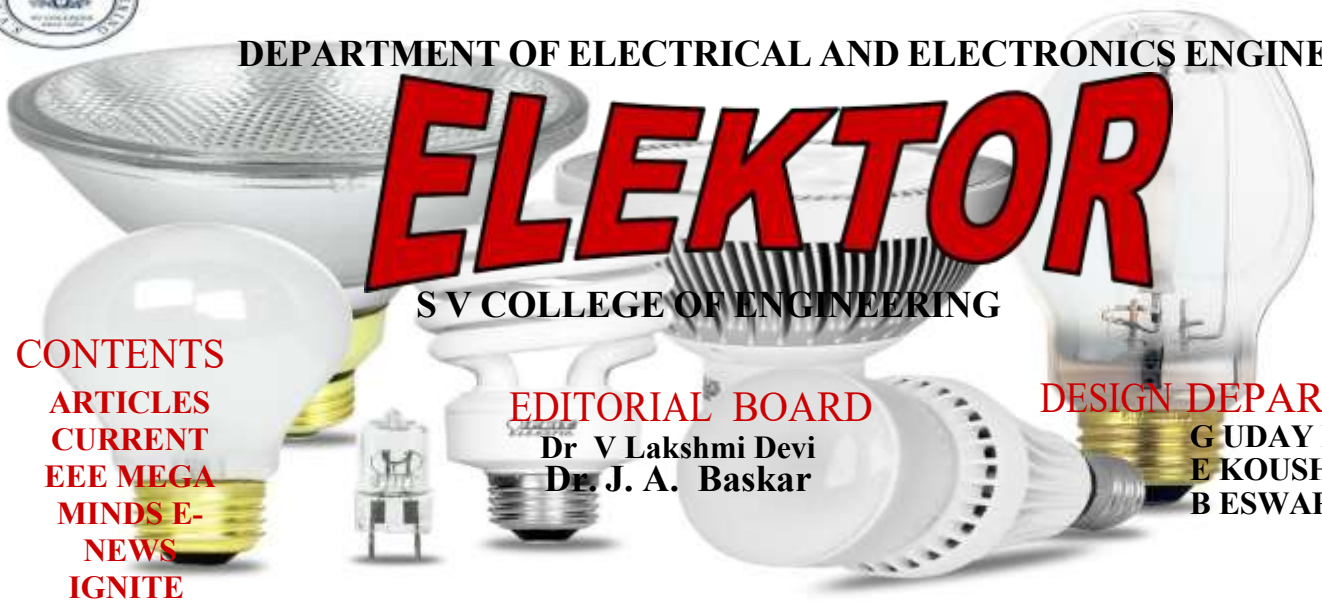
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING



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 ed- ucation, professional practice, research and technical consultancy competence ethical concern.

Mission of the Department

- To prepare the learners professionally deft and intellectually adept in the field of Electrical 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 education 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 im-part quality education and competitive spirit among students for academic excellence.

Message from Principal

I am delighted to convey my best wishes to the Department of Electrical and Electronics Engineering on the release of its technical magazine. This initiative is a commendable platform that encourages students and faculty to express their ideas, research, and innovations in the ever-evolving field of electrical and electronics engineering.

The EEE department has consistently demonstrated excellence in academics, research, and co-curricular activities. This magazine is a testament to the department's commitment to nurturing creativity, technical knowledge, and analytical thinking among students. It reflects the hard work, vision, and dedication of the entire team.

I congratulate the editorial board, faculty, and all the contributors for their efforts in making this publication a success. I am confident that this magazine will not only inform and inspire but also motivate readers to push the boundaries of learning and innovation.

Wishing the EEE department continued growth, success, and recognition in all its future endeavours.

With warm regards,

Happy Reading!

Dr. N. Sudhakar Reddy, Principal

Message from HOD

It brings me great joy to see your enthusiasm and talent reflected in the pages of this technical magazine. As your Head of Department, I take pride in watching you grow—not just as engineers, but as thinkers, innovators, and problem-solvers.

This magazine is a true representation of your dedication to learning beyond textbooks. The articles, projects, and ideas showcased here prove that the future of engineering is in capable hands.

Always remember: learning is a lifelong journey. Keep asking questions, keep building, and never be afraid to fail-that's where true innovation begins.

I congratulate all contributors, the editorial team, and the faculty mentors. Keep up the great work!

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Happy Reading.

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

Message from Faculty Advisor

It gives us great pleasure to bring the technical magazine Blaze, the department magazine of EEE. The name and fame of an institute depends on the caliber and achievements of the students and teachers. The role of a teacher is to be a facilitator in nurturing the skills and talents of students. We would like to place on record our gratitude and heartfelt thanks to all those who have contributed to make this effort a success.

We truly hope that the pages that follow will make an interesting read.

Dr. J. A. BASKAR, EEE

ARTICLES

SMART HELMET FOR RIDERS

Engineers have developed a **smart helmet** that ensures both **safety and communication** for motorcycle riders. This helmet includes **Bluetooth connectivity**, a **fall detection sensor**, and **GPS tracking** for real-time location monitoring.

The helmet connects wirelessly to a smartphone to enable hands-free calling and music. In case of a fall or collision, the helmet's **accelerometer and gyroscope sensors** detect impact force and trigger an alert to the rider's emergency contacts with GPS location. The system also has **an inbuilt speaker and microphone** for seamless communication.

The smart helmet is powered by a **rechargeable lithium-ion battery** and has **solar strips on top** to extend battery life during rides. As road safety becomes a growing concern, this innovation offers a blend of **comfort, technology, and critical safety**, especially for urban two-wheeler users.

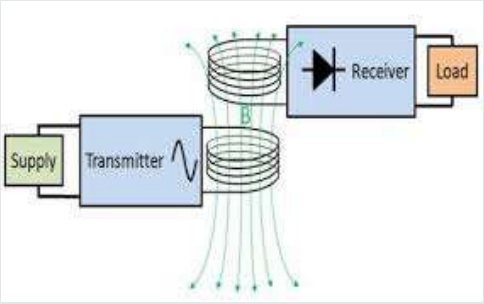
SOLAR WINDOW PANELS

Researchers have created **transparent solar panels** that can double up as **building windows**, offering a futuristic approach to energy generation. These panels are embedded with **organic photovoltaic (OPV) cells** that can capture **ultraviolet and infrared light**—while remaining clear to the human eye.

These solar windows are highly suitable for **skyscrapers and commercial buildings**, helping generate electricity without affecting aesthetics or visibility. A single square meter can generate up to **40-50 watts**, depending on light intensity. The panels are also designed with **anti-glare coating and self-cleaning surfaces**, improving efficiency and reducing maintenance. By integrating energy harvesting into everyday architectural structures, solar window panels pave the way toward **net-zero buildings** and **cleaner urban environments**.

WIRELESS ELECTRICITY TRANSFER

Scientists have taken a leap forward with **wireless electricity transfer**—a technology inspired by Nikola Tesla's early experiments. This system uses **magnetic resonance coupling** to transmit power without wires across short distances.

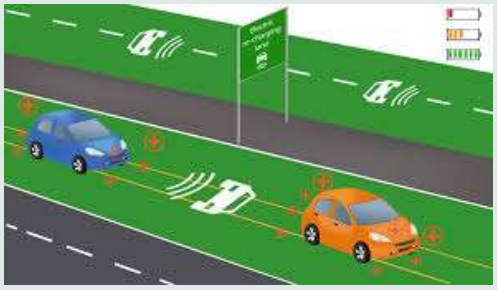


The setup includes a **transmitter coil** and a **receiver coil**, both tuned to the same resonant frequency. When electricity passes through the transmitter, a magnetic field is created that induces current in the receiver coil. This is useful for **charging phones, drones, and even electric vehicles (EVs)** wirelessly.

Current research aims to improve efficiency over longer distances. Wireless electricity could eliminate messy cables and make **smart homes and offices** cleaner and safer.

ELECTRIC ROADWAYS

Some cities are experimenting with **electric roadways**—streets equipped with **inductive charging technology** to charge EVs as they drive. Coils embedded beneath the road surface create an electromagnetic field that transfers energy to compatible vehicles above.



These **dynamic charging systems** reduce the need for frequent stops and heavy batteries. Vehicles must be equipped with a receiver coil, and the system activates only when authorized vehicles are detected.

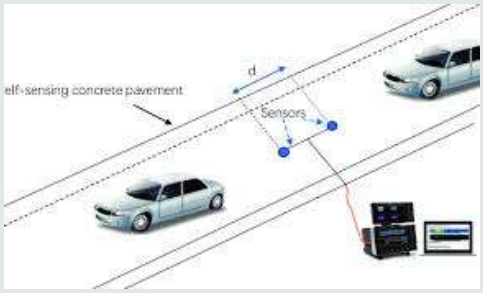
This innovative concept aims to **reduce range anxiety**, cut emissions, and enable a seamless **electric transit system** in smart cities of the future.

THERMOELECTRIC CLOTHING

A new breakthrough in **thermoelectric fabric technology** has enabled the creation of **self-powered clothing** that can generate electricity from body heat. These clothes contain **thermoelectric generators (TEGs)** stitched into the fabric that convert temperature differences between the body and ambient air into electricity.This electricity can power small devices such as **LEDs, fitness trackers, or health monitors**. Lightweight and flexible, this wearable tech is ideal for **outdoor workers, athletes, and**

MAGNETIC CONCRETE FOR TRAFFIC CONTROL

Engineers have developed a **magnetic concrete composite** that can interact with sensors in vehicles and road systems. By embedding **ferrite particles and magnetic strips** within concrete, roads can now relay position, speed, and vehicle count data to traffic systems.



This technology supports **smart traffic lights**, **dynamic tolling**, and **autonomous vehicle navigation**. As a vehicle passes over magnetic zones, it triggers data updates that help manage traffic flow in real time.

conventional semitransparent solar cells.

HYDROGEN-POWERED DRONES

Hydrogen fuel cell technology is being used to power next-generation **drones** that offer **longer flight times** and **zero emissions**. Unlike traditional lithium batteries, hydrogen cells generate electricity through a chemical reaction between hydrogen and oxygen, with **water vapor as the only byproduct**.

These drones can **fly for over 2 hours**, compared to the 20–30 minutes of battery-powered ones. Hydrogen refueling also takes just minutes, making them ideal for **surveillance, delivery, agriculture, and military applications**.

Lightweight and eco-friendly, hydrogen-powered drones represent a **clean aerial solution** for modern industry, combining endurance with sustainability.

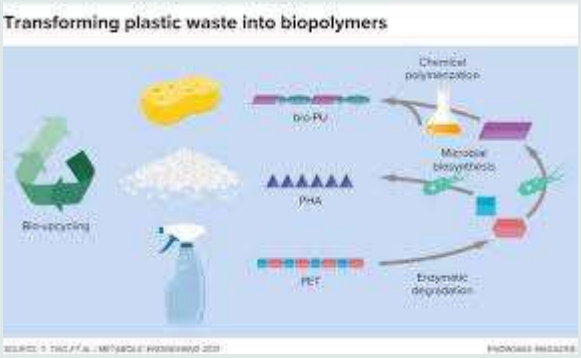
BRAIN-COMPUTER INTERFACE (BCI) HEADSET

Recent developments in **neurotechnology** have led to the creation of a **Brain-Computer Interface (BCI) headset** that enables users to control devices using only their brainwaves. These headsets use **electroencephalography (EEG) sensors** to detect electrical activity in the brain and convert it into digital commands.Applications range from **gaming and virtual reality** to assisting **paralyzed individuals** in operating wheelchairs or typing with thought. Advanced machine learning algorithms interpret brain signals with increasing accuracy.

BCIs are shaping a future where **thoughts can directly interact** with machines—revolutionizing healthcare, robotics, and even communication.

PLASTIC-EATING ENZYMES FOR WASTE MANAGEMENT

In an effort to solve the global plastic crisis, scientists have engineered **plastic-degrading enzymes** capable of breaking down **PET plastics (used in bottles and packaging)** into reusable materials in just a few days.



The enzyme, known as **PETase**, was originally found in bacteria living near plastic dumps. Through bioengineering, researchers enhanced its efficiency, making it industrially viable for **recycling centers and waste treatment plants**.

This technology could greatly reduce landfill waste and ocean pollution, offering an eco-friendly method of converting plastic back into **raw, reusable components**—an essential step towards a **circular economy**.

A ARUN KUMAR
(21BF1A0201)

CURRENT EEE

Design and Analysis of Bidirectional DC-DC Converters for Battery Management in EVs

Abstract:

Bidirectional DC-DC converters have emerged as an essential power electronic interface for energy storage systems in electric vehicles (EVs) and hybrid electric vehicles (HEVs). These converters enable power flow in both directions—from battery to load and vice versa, making them ideal for regenerative braking and battery charging.

Advanced control techniques such as pulse width modulation (PWM), sliding mode control, and fuzzy logic-based algorithms have been implemented to achieve fast dynamic response, voltage stability, and high efficiency under varying load conditions. The design also emphasizes galvanic isolation using high-frequency transformers for safety and compactness.

Recent innovations include multi-phase interleaved topologies and soft-switching methods to reduce switching losses, minimize ripple, and extend battery life. Bidirectional converters are expected to become even more vital as vehicle-to-grid (V2G) applications gain traction in smart grid ecosystems.

AI-Powered Predictive Maintenance Systems for Industrial Motors

Abstract:

The integration of **artificial intelligence (AI)** into predictive maintenance has transformed the operational reliability of **industrial electric motors**. Usi)ng real-time data from **vibration sensors**, **temperature monitors**, and **current analyzers**, AI algorithms predict faults such as **bearing wear**, **insulation failure**, or **rotor misalignment** before they escalate.

These systems employ **machine learning models** like **support vector machines (SVMs)** and **deep neural networks (DNNs)** to identify patterns in high-dimensional sensor data. Predictive alerts are generated with high accuracy, enabling **condition-based maintenance** (CBM) instead of reactive repairs.

In addition to reducing **unplanned downtimes** and maintenance costs, AI-driven systems offer **cloud-based dashboards** for centralized monitoring, remote diagnostics, and integration with **enterprise asset management (EAM)** software. The technology is scalable across sectors including **manufacturing, oil & gas, and utilities**, pushing industries toward **Industry 4.0 standards**.

Smart Grid Communication Protocols for Real-Time Energy Management

Abstract:

Smart grids rely heavily on **robust communication protocols** to enable **real-time monitoring, data acquisition**, and **adaptive control** of electrical power systems. Protocols such as **IEC 61850**, **DNP3**, and **Modbus TCP/IP** have been adopted for seamless interoperability between smart meters, substations, and control centers.

IEC 61850 supports **object-oriented data models** and **GOOSE messaging**, allowing **millisecond-level response times** essential for fault detection and protection. DNP3, known for its reliability in noisy environments, provides **secure SCADA communication** and efficient time-stamped data logging.

Recent advancements include **wireless mesh networks**, **LoRaWAN**, and **5G-enabled edge computing** to reduce latency and expand grid connectivity. These technologies are vital to integrate **renewable sources**, enhance **demand response**, and establish **resilient, self-healing power networks**.

M KAVYA REDDY
(21BF1A0240)

Mega Minds

Georg Simon Ohm (1789–1854)

Georg Simon Ohm was a German physicist and mathematician best known for formulating **Ohm's Law**, which defines the relationship between **voltage, current, and resistance** in an electrical circuit. Born in Erlangen, Bavaria, in 1789, Ohm began his career as a schoolteacher before conducting independent experiments with electric circuits.

In 1827, he published his landmark work, *Die galvanische Kette*, where he detailed his discovery. Although initially criticized, Ohm's findings gained recognition and became a fundamental principle in electrical engineering. The unit of electrical resistance, the **ohm (Ω)**, was named in his honor, symbolizing his lasting impact on electrical theory.

André-Marie Ampère (1775–1836)

André-Marie Ampère was a French physicist and mathematician regarded as a founder of classical electromagnetism. Born near Lyon in 1775, Ampère's major contribution was his work on the relationship between electricity and magnetism, which led to the creation of Ampère's LaHe formulated the theory of electrodynamics, showing how electric currents produce magnetic fields. Ampère's pioneering studies influenced the development of Maxwell's equations and the modern understanding of electromagnetic force.His name lives on in the unit of electric current, the ampere (A), paying tribute to his transformative contributions to science and engineering.

Alessandro Volt (1745–1827)

Alessandro Volta was an Italian physicist who invented the first true electrical battery, known as the Voltaic Pile, in 1800. This device produced a steady electric current and became the prototype for modern batteries. Born in Como, Italy, Volta's curiosity about electricity was sparked by the study of static charges and chemical reactions.His invention proved that electricity could be generated chemically, a discovery that laid the groundwork for electrochemistry. In recognition of his achievements, Napoleon made him a count, and the unit of electric potential (volt) was later named the volt (V) in his honor.

Heinrich Hertz (1857–1894)

Heinrich Hertz was a German physicist who confirmed the existence of **electromagnetic waves**, providing crucial evidence for James Clerk Maxwell's theories. Born in Hamburg in 1857, Hertz developed apparatus to generate and detect radio waves, proving they behaved like light through reflection, refraction, and polarization.

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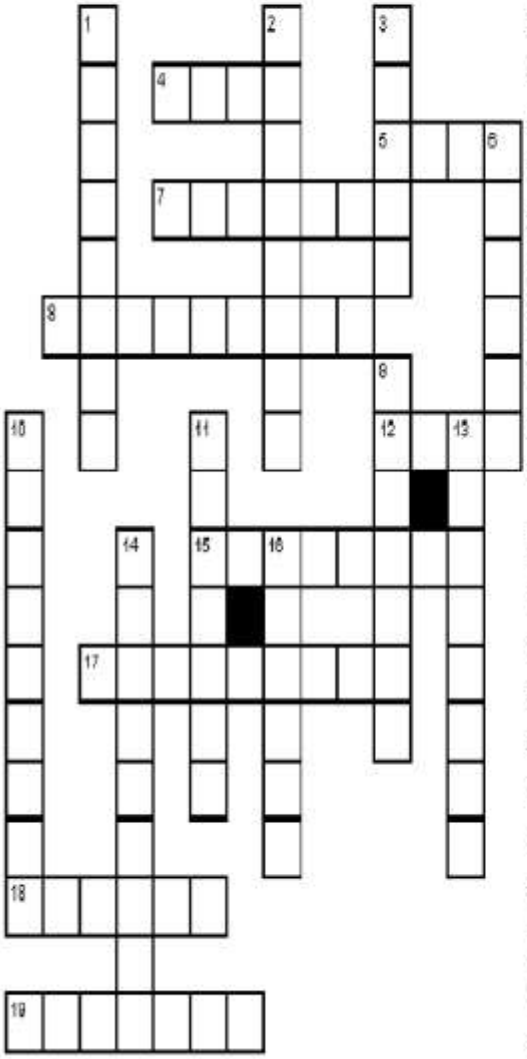
CROSS WORDS ON CIRCUITS



Across:

4. A safety device that break a circuit when too much current is flowing. (4)
5. The unit that resistance is measured in. (4)
7. A switch that open a circuit when too much current is flowing. (7)
8. An electric discharge from the sky to the ground during a storm. (9)
12. The unit that current is measured in (for short). (4)
15. A device that resists the flow of electricity in a circuit. (8)
17. A material that doesn't conduct electricity well. (9)
18. A device that will open or close a circuit. (6)
19. The flow of electrons through a material is called electric _____. (7)

Down

1. The charge on a proton. (8)
2. The charge on an electron. (8)
3. A type of circuit where current by passes most resistance and large, dangerous currents flow (5)
6. A circuit with only one path through which electrons flow. (6)
9. A voltage supply used in flashlights and many toys. (7)
10. Electricity is the movement of _____ through a conductor. (9)
11. A path through which electric current flows. (7)
13. A circuit with more than one path through which electrons can flow. (8)
14. A material that conducts electricity will. (9)
16. Kind of electricity resulting from a build up of charged particles. (6)

S MOHITH
(22BFA02178)