GOLDEN VALLEY EDUCATIONAL TRUST

Dr. T. THIMMAIAH INSTITUTE OF TECHNOLOGY

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

TECHNICAL MAGAZINE E-MERGE 2023

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Principal's Message

DR. SYED ARIFF
Principal
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It gives me great pleasure to present E-Merge 2023, the technical magazine of the Department of Electrical & Electronics Engineering. This magazine serves as a platform to showcase the knowledge, creativity, and research contributions of our students and faculty. Their dedication to exploring emerging technologies and solving real-world engineering challenges is truly commendable.

At Dr. TTIT, we strive to create an environment that nurtures innovation, critical thinking, and hands-on learning. I hope E-Merge 2023 encourages students to continue pushing the boundaries of knowledge and applying their skills to advance the field of electrical engineering. Wishing everyone success in their academic and professional journey.

HOD's Message

DR. N. LAKSHMIPATHY
HOD of EEE

I am proud to present E-Merge 2023, a reflection of the passion and technical expertise of our students and faculty. This magazine captures innovative ideas, research developments, and technical explorations that define the spirit of the Department of Electrical & Electronics Engineering.

The field of electrical engineering is evolving rapidly, and staying ahead requires continuous learning, experimentation, and adaptation.

I extend my best wishes to all students and faculty and encourage them to keep striving for excellence in their academic and professional pursuits.

ABOUT THE DEPARTMENT

The Department of Electrical & Electronics Engineering was established in 1986 and has since grown into a hub of academic and research excellence. With a team of nine dedicated and highly qualified faculty members, who have completed their undergraduate and postgraduate degrees from prestigious universities, the department is committed to provide students with a solid foundation in Electrical and Electronics Engineering.

Over the years, the department has expanded its expertise to address the evolving needs of society, offering cutting-edge teaching and research in areas such as power systems, renewable energy, embedded systems, and wireless power transmission.

TECH INSIGHT

WIRELESS POWER TRANSMISSION

Wireless Power Transmission (WPT) has seen significant advancements, making it more efficient and adaptable for various applications. One of the key aspects of WPT design is optimizing coil geometry and selecting high-Q factor materials to minimize energy losses. For power transmission at 50 Hz, using ferrite or silicon steel cores helps enhance magnetic flux linkage while reducing eddy current losses. In high-frequency applications, careful consideration of the skin effect and proximity effect is crucial for minimizing resistive losses. Advanced control techniques, such as Maximum Power Transfer Tracking (MPTT) and adaptive impedance matching, improve efficiency by dynamically adjusting system parameters. The use of high-efficiency rectifiers, including synchronous rectifiers, and GaN-based power electronics further enhances energy conversion. Safety is another critical aspect, requiring proper electromagnetic shielding and frequency tuning to reduce interference with communication systems. Integrating AI-based predictive maintenance and IoT-enabled monitoring allows for real-time system optimization and fault detection. Emerging hybrid approaches, combining inductive and capacitive coupling, or exploring microwave and laser-based WPT, offer promising solutions for long-range power transfer, including applications in drones and space-based solar power. Compliance with IEEE and IEC standards ensures the safety and reliability of WPT systems, making them viable for widespread adoption in the modern world.

Prof. B. Somashekar
Sr. Assistant Professor, EEE

TECHNICAL PAPERS CONTRIBUTIONS

WIRELESS POWER TRANSMISSION USING FINITE DIFFERENCE TIME-DOMAIN ANALYSIS

We present a way to simulate a wireless power transfer (WPT) device of the electromagnetic induction kind. The time-domain finite-difference approach served as the foundation for this simulator. The simulation and experimental findings agreed well enough to cut down on computing time. With this simulation, it is anticipated that a transient response study of WPT devices will be available in the future. In order to conduct the electromagnetic (EM) analysis required to ascertain the proper transmitter geometry and electrical field and magnetic field distribution for wireless power transmission, this paper describes the creation of a numerical simulation approach. Limited-Difference Complex electromagnetic issues can be solved with a strong computational approach called Time-Domain (FDTD) analysis. This study implements FDTD analysis using MATLAB programming to assess wireless power transmission (WPT) systems.

Finite-Difference Time-Domain (FDTD) analysis is a powerful computer tool for solving complicated electromagnetic issues. This study leverages MATLAB programming to perform FDTD analysis on wireless power transmission (WPT) systems running at utility frequency (50Hz). The major focus is on the propagation properties of electromagnetic fields within several core materials—ferrite and silicon—and how they affect power transfer efficiency. The MATLAB-based FDTD study shows considerable changes in electromagnetic field distribution and intensity between ferrite and silicon cores. Ferrite cores outperform silicon cores in terms of power losses and transfer efficiency, because to their higher magnetic permeability and lower conductivity. Although silicon cores have larger losses, they give useful insights into material behavior under utility frequency operations.

Prof. B. Somashekar
Sr. Assistant Professor, EEE

Dr. N.Lakshmipathy
Professor & HOD, EEE

SMART CHARGING SYSTEM FOR ELECTRIC VEHICLES USING WIND ENERGY

In order to provide a sustainable and renewable energy source for EV charging, this article proposes the design of a wind-powered EV battery charging unit. The suggested technology converts and stores electricity produced by a wind turbine in a battery bank. The stored energy is transformed into a form that may be used to charge EV batteries by a charging unit. In order to ensure effective and dependable charging, the design takes into consideration both the requirements of EV batteries and the unpredictability of wind energy. Reduced reliance on fossil fuels, lower greenhouse gas emissions, and lower operational costs are only a few advantages of the suggested method. The concept is a workable option for EV charging infrastructure since it may be expanded for commercial use. According to simulation results, the suggested method may effectively use wind energy to charge EV batteries, indicating its potential as a renewable and sustainable energy source for the transportation industry. Furthermore, to maximize energy harvesting, storage, and charging, the suggested system integrates sophisticated control algorithms. To guarantee dependable and safe operation, the system also has safety features like short-circuit and overcharge prevention. The suggested system's design and simulation results show that it is both feasible and efficient in offering a renewable and sustainable energy source for EV charging.

Mr. Lokananda S
Mr. Chandan A S
Mr. Saif Ahmed A
Mr. Anjaneya Reddy M

Guided by:
Prof. B. Somashekar
Sr. Assistant Professor, EEE

DESIGN AND IMPLEMENTATION OF CHARGING UNIT FOR MARITIME APPLICATIONS

Our research endeavors to tackle the formidable challenges inherent in Underwater Wireless Power Transfer (UWPT), with a primary focus on optimizing charging efficiency and seamlessly adapting to the demanding underwater conditions. Leveraging solar power energy as the primary source, our system seamlessly switches to grid energy when solar energy levels are insufficient. The core objective revolves around designing a WPT system that achieves remarkable efficiency and unity power factor, critical for ensuring seamless power transmission in underwater environments. Through extensive prototyping and testing, our WPT system demonstrates the ability to transmit an output voltage of approximately 9V over an 6cm inside water gap, covering a maximum sliding distance of 8cm. This significant achievement underscores the system's capability to surmount the barriers of underwater power transfer, paving the way for sustainable operations in challenging aquatic environments. Moreover, our approach integrates diverse energy sources, including solar and grid energy, to enhance adaptability and energy generation capabilities, enabling consistent and optimized power generation vital for prolonged and reliable underwater applications. By amalgamating cutting-edge technologies and innovative design paradigms, our research endeavours to properly the advancement of underwater WPT. This integration of diverse energy sources not only ensures adaptability but also lays the groundwork for transformative solutions in underwater power transmission. Our work represents a significant step forward in addressing the challenges of underwater power transfer, offering promising prospects for sustainable and efficient energy transmission in aquatic environments.

Gokul S
Mohammed Zaki Ul Iyan
Vignesh R
Rahul B V

Guided by:
B Somasheakar,
Sr. Assistant Professor

SLAM ROBOT USING LIDAR TECHNOLOGY

The demand for construction site automation with mobile robots is increasing due to its advantages in potential cost-saving, productivity, and safety. To be realistically deployed in construction sites, mobile robots must be capable of navigating in unstructured and cluttered environments. Furthermore, mobile robots should recognize both static and dynamic obstacles to determine drivable paths. However, existing robot navigation methods are not suitable for construction applications due to the challenging environmental conditions in construction sites. This study introduces an autonomous as-is 3D spatial data collection and perception method for mobile robots specifically aimed for construction jobsites with many spatial uncertainties. The proposed Simultaneous Localization and Mapping(SLAM)-based navigation and object recognition methods were implemented and tested with a custom-designed mobile robot platform, Ground Robot of Mapping Infrastructure(GROMI), which uses multiple laser scanners and a camera to sense and build a 3Denvironment map. Since SLAM, itself, did not detect uneven surface conditions and spatiotemporal objects on the ground. An obstacle detection algorithm was developed to recognize and avoid obstacles and the highly uneven terrain in real time. Given the 3D real-time scan map generated by 3D laser scanners, a path-finding algorithm was developed for autonomous navigation in an unknown environment with obstacles. Overall, the 3D color mapped point clouds of construction sites generated by GROMI were of sufficient quality to be used for many construction management applications such as construction progress monitoring, safety hazard identification, and defect detection.

Ms. Monal Yadav A,
Ms. Sangeetha KR,
Ms. Shreya Yadav MS,
Ms. Lavanya N

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EV BMS WITH CHARGE MONITOR AND FIRE PROTECTION

Electric vehicles surely are the future of transportation, but EV technology has not been fully developed with respect to efficiency and safety as of 2022. We come across electric vehicle battery fire and similar incidents as the EV market expands. Most electric vehicle fire incidents occur due to battery blast or fire. So here we attempt to solve the problem by using some sensors and battery pack-based system powered by an STM32 controller. The system is designed to protect batteries from various parameters that may incite a fire. The system is designed to constantly monitor battery voltage current temperature and instantly cut off the input or output from battery as soon as any unusual behaviour is detected. This System provides the following advantages:

- Battery Status Monitoring and Display.
- Charging of Battery as per required input parameters.
- Temperature monitoring with auto cut-off.

The system makes use of a li ion Battery, Battery charging and monitor system, Push Buttons, LCD Display, current sensor, voltage sensor, temperature sensor to develop this system. The system monitors as well as always protects an EV battery. We here develop the system as per a 3S li ion battery. The system we design will not only monitor the battery and charge it safely but also protect it to avoid accidents from occurring. The system when turned on uses its charging and monitoring circuitry that allows user to safety charge the 3S battery. While charging the voltage sensor is used to check voltage and limit the flow of current too to the battery using charging circuitry. The LCD display also displays the current voltage level of battery. As soon as the battery is fully charged, the system cuts off the supply and displays Battery fully charged on LCD Display. When connected to a load the current sensor keeps track of current drawn from battery and displays the parameter on LCD Display. The temperature sensor is used to monitor the temperature of battery while charging as well as discharging. If the battery temperature is observed to deviate from standard values, the system automatically cuts off input as well as output supply and displays the temperature as well as a buzzer alert on the LCD display.

Mr. Yashwanth kumar G
Ms. Haritha S
Ms. Vyshnavi K

Guided by:
Prof. Ronald Lawerence. J
Assistant Professor, EEE

DESIGN AND DEVELOPMENT OF BATTERY CHARGER

A 12V 10A battery charger is a device designed to charge 12V batteries with a maximum charging current of 10A. It is commonly used for charging automotive batteries, as well as other types of lead-acid batteries, including deep cycle and sealed lead-acid batteries. When selecting a 12V 10A battery charger, it's important to choose a model that is compatible with the type of battery you need to charge. Some chargers are designed specifically for lead-acid batteries, while others may be suitable for other battery chemistries, such as lithium-ion. It's also important to choose a charger with the appropriate safety features, such as overcharge protection and short circuit protection, to prevent damage to the battery and the charger itself. When using a 12V 10A battery charger, it's important to follow the manufacturer's instructions and safety guidelines, as charging a battery improperly can be dangerous and potentially cause damage to the battery or the charger. Fast charging of industrial batteries has become a main stream charging technology due to the operational savings, increased productivity and safety that this technology offers. Users have realized the benefits of fast charging and continue to realize the benefits at manufacturing plants and distribution centers. The basic cell construction of a fast charge battery is the same as that of a conventional battery. What differentiates a fast charge battery from a conventional one is the final construction of the battery tray, as well as the accessories installed on the battery. Fast charge batteries are commonly equipped with dual intercell connectors and dual cables. In some instances, the batteries are also equipped with copper post inserts which tend to reduce the contact resistance of the post. Finally, some fast charge batteries are built with vents in between the battery cells to allow for improved cooling.

Mr. Adarsh S Gowda
Mr. Afreed Khan A

Guided by:
Dr. N. Lakshmipathy
Professor & HOD, EEE

DESIGN AND DEVELOPMENT OF WIND TURBINE

Renewable are seen as next generation sources of energy for meeting rising energy demands and depleting fossil fuels. Solar, biomass, geothermal, hydro-electric and wind are the renewables which can produce huge megawatts of power. Among all this, wind is the cheapest renewable source of energy. This fast growing wind energy source needs to be utilized. On the basis of structure, wind turbines are broadly classified as Horizontal Axis Wind Turbine (HAWT). Vertical Axis Wind Turbine(VAWT) can tap wind energy from any direction, while HAWT can tap wind from only one direction. But still HAWT are being researched upon and used more as it taps more wind energy as compared to VAWT. Traditional HAWT have unreasonable efficiencies. Economically HAWT are better than VAWT but VAWT are more portable in nature. This paper deals with the different classification of turbines, relative comparison between them and development of mathematical modeling of HAWT wind turbines.

Mr. Dinesh C
Mr. Firose pasha R
Mr. Shiva kumar K

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DEPARTMENT ACTIVITIES

IETE SPONSORED POLIAH BOJJA SEMINAR ON ARTIFICIAL INTELLIGENCE

Hosted at the e-Shikshana Centre, Dr.TTIT, an IETE-sponsored one-day seminar on "Classification and Prediction of MRI Images with Machine Learning Approach" was conducted on 17th November 2023.The Chief Guest Dr. Polaiah Bojja, a renowned expert and Dean at the Institute of Aeronautical Engineering, Hyderabad, shared valuable insights into AI techniques and their applications in medical image processing. Students and faculty of EEE and ECE participated.

Dr. Bhuvanendiran, Prof. Deepa, Prof. Jeevika Mary, and Dr. Lakshmipathy. N, coordinated the session.

INDUSTRIAL VISIT | DECCAN HYDRAULICS

On August 12th, 2023, an industrial visit was organized for the 4th semester students of Mechanical Engineering and Electrical & Electronics Engineering to Deccan Hydraulics Pvt Ltd.

Approximately 50 students had the opportunity to participate in this enriching experience. During the visit, the students were guided through different departments of the company, providing them with a firsthand exposure to practical aspects and real-world applications. This visit aimed to bridge the gap between theoretical knowledge and practical implementation.

Dr. Manjunatha Babu N S, HoD, Mechanical Engineering and Prof. Subhashini S, Asst. Prof., EEE Coordinated. course took place at Dr TTIT Students Centre. The course was organized in collaboration with The Institution of Engineers (India) Kolar Local Centre, IETE, IQAC, and Institution Innovation Council.

The course aimed to equip students with practical knowledge and applications of Python libraries. Mr. Md Azhar Hussain, the CEO, and Mr. Vijay Kumar, Assistant Instructor, both from Indoskill (Aqmenz Automation Pvt Ltd.) in Bangalore, served as the expert instructors for the program. Dr. Manjunatha Babu N S, the HOD of Mechanical Engineering, coordinated.

The hands-on sessions during the course proved to be highly beneficial for the students, as they provided a deeper understanding of the concepts through practical experience.

The students of Electrical & Electronics Engineering and Mechanical Engineering streams participated.

Skill Development course on Deep Drive into Python Libraries with Application Projects

ELECTRICAL NEWS AROUND THE WORLD

During the 2023-24 academic year, the electrical engineering sector experienced significant developments across various domains. Here's an overview of key events and trends:

Industry Restructuring

Aptiv's Strategic Division: In January 2025, automotive supplier Aptiv announced plans to split into two separate entities. One will focus on electrical distribution systems, while the other will concentrate on advanced technologies such as autonomous driving software. This move aims to enhance specialization and value creation within the company.

Market Dynamics

Germany's EV Market Decline: In 2024, Germany witnessed a 16.4% decrease in electric vehicle sales during the first half of the year. This downturn is attributed to the removal of government subsidies and has raised concerns about its impact on the European battery industry.

Educational Advancements

AICTE's Updated Curriculum: The All India Council for Technical Education (AICTE) introduced a new model curriculum for undergraduate electrical engineering courses. Emphasizing practical training and industry exposure, the curriculum incorporates emerging technologies like artificial intelligence and renewable energy to better prepare students for evolving industry demands.

Technological Innovations

Top 10 Innovations in Electrical Engineering for 2024: The field of electrical engineering is witnessing groundbreaking advancements in areas such as advanced energy storage solutions, wide bandgap semiconductors, quantum computing, 5G and beyond, flexible and wearable electronics, artificial intelligence and machine learning, microgrids and smart grids, high-efficiency solar cells, electric vehicle advancements, and biodegradable electronics. These innovations are set to shape the future of the industry.

Global Challenges

Ukraine's Power Infrastructure Resilience: Amid ongoing conflicts, Ukrainian electricians have been working under hazardous conditions to maintain the country's power supply. Their efforts have been crucial in sustaining electricity access despite significant infrastructure damage.

-Editorial Team

VISION OF THE DEPARTMENT

To produce competent engineers having technical skills oriented towards sustainable development, human values, and professional ethics through comprehensive education in electrical engineering.

MISSION OF THE DEPARTMENT

M1 : To provide a conducive environment in which students can think, learn, and apply.

M2 : To provide technical expertise through hands-on experience on real world projects with a focus on sustainable development and professional ethics.

M3 : To inculcate a positive attitude and leadership qualities in students through co-curricular activities.

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

PEO-1: Graduates will be successful in Electrical Engineering and trans-disciplinary areas by pursuing a career in industry and higher education.

PEO-2: Graduates will have the ability to solve societal and industrial problems with cutting-edge technologies in Electrical Engineering to achieve sustainable development in their professional careers.

PEO-3: Graduates will have the ability to apply technical, analytical, communication and ethical skills to ensure technological progress in their careers.

PROGRAM SPECIFIC OBJECTIVES (PSO)

PSO-1: Ability to model, simulate, and analyze electrical and electronic components and systems using logical, technical, and programming skills.

PSO-2: Ability to identify optimal solutions for industrial and domestic energy requirements using specific design and control strategies.