ELECTRICA

DEPARTMENT OF ELECTRICAL ENGINEERING

Aryan Institute of Engineering and Technology

Arya Vihar Colony, Bhubaneswar, Barakuda, Odisha 752050

ARYAN
INSTITUTE OF ENGINEERING & TECHNOLOGY

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ABOUT THE INSTITUTE

Established in the year 2009, Aryan Institute of Engineering and Technology (AIET) is one of the premier engineering colleges in the self-financing category of engineering education in eastern India. It is situated at temple city Bhubaneswar, Odisha and is a constituent member of Aryan Educational Trust. The institute is approved by the All India Council for Technical Education (AICTE) under the Ministry of Human Resource Development, Government of India; recognized by the Government of Odisha; and affiliated with Biju Patnaik University of Technology (BPUT), Rourkela, Odisha.

AIET aims to create disciplined and trained young citizens in the field of engineering and technology for holistic and national growth. The college is committed towards enabling secure employment for its students at the end of their four-year engineering degree course. (The NAAC accreditation in the year 2018 vouches for the college's determination and dedication for a sustainable learning environment). The academic fraternity of AIET is a unique blend of faculty with industry and academic experience. This group of facilitators work with a purpose of importing quality education in the field of technical education to the aspiring students. Affordable fee structure along with approachable location in the smart city of Bhubaneswar makes it a preferred destination for aspiring students and parents.

AIET serves as a deep of knowledge for students pursuing program ranging from diploma to B.Tech courses equipped with an excellent infrastructure for academics, co-curricular and extracurricular activities. AIET secured its compliance certificate for ISO 9001:2015 QMS standards from the prestigious INNOVATIVE SYSTEMCERT PVT. LTD Accredited by EGAC, a member of International Accreditation Forum, Ghaziabad, Up, India

VISION AND MISSION OF THE INSTITUTE

Vision

➢ To become a leading engineering institution of the state by impacting quality technical education at affordable costs to create skilled and motivated engineers to serve the technological requirements of society in different ways.

Mission

AIET will strive continuously to
➢ To impart contemporary technical education and skills to students of different socio-economic background.
➢ To equip students with analytical learning and real life problem solving.
➢ To make learning a continuous endeavour compatible with market needs.
➢ To promote the spirit of leadership, entrepreneurship, innovation and ethics

ABOUT THE DEPARTMENT

The Department of Electrical Engineering was established in the year 2009. It aims at producing qualified engineers in the areas of electrical machine, power electronics, control system, power system, and instrumentation. The field of Electrical and Electronics is advancing at a very rapid pace. Power electronics has taken the centre stage in every area be it power systems, control systems, power quality, etc. The department is well equipped with a group of highly qualified and dynamic teachers. It boasts of laboratory facility to be one of the best in the state. The students are encouraged and motivated to take up challenging projects. Summer training, industrial visit and projects are carefully planned for the students to remain updated with the technology trend. Seminars and short courses are regularly organized to update the students with the latest in the education and industry trends.

Vision

➢ To be a leader in the field of electrical engineering education and training by creating graduates who are globally competent, successful in their chosen fields of endeavour, engaged in innovative research and entrepreneurship, and deeply committed to social advancement.

Mission

➢ To impart the fundamentals of electrical engineering so that students may develop new products and solutions to solve issues in the real world.

➢ To enable students to pursue a prosperous career in the cognitive electrical engineering professions and to become ethical technologists.

➢ Through continuous improvement of faculty and lab facilities, to strive for excellence in academics and research works by developing a rich electrical engineering based research centre for industrial growth of the nation.

ELECTRICA

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Chairperson's Message

Today's technical world is expanding at the speed of thought and has opened numerous options of excellence. Perfection and quality in educational field enhances one's ability to formulate new ideas & look beyond the obvious which is necessary to succeed in today's technical era. I am gratified to know that the Department of Electrical Engineering is bringing out the first issue of their technical magazine "ELECTRICA" of this academic year (2023-2024). This magazine is providing great space for the faculty and students to pen down their innovative ideas, imagination and perceptions to show case their creativity. So, I take the opportunity to congratulate the Department of EE and its editorial team to successful release of this issue.

Dr. Madhumita Parida
Chairperson
AIET, Bhubaneswar

Director's Message

It is a noble task on the part of the Department of Electrical Engineering to once again make it with their frequent issue "ELECTRICA". I wish that this technical magazine establishes to be a flint to fire the enthusiasm and excite their minds for many intrusive innovations among the students and inspire passion among the members of the faculty of Electrical Engineering committee. My greeting to the editorial board and department.

Mrs. Sasmita Parida
Director
AIET, Bhubaneswar

Principal's Message

It gives me immense pleasure to note that, department of EE has been publishing their bi-annual magazine "ELECTRICA" and I am sure this will provide an opportunity for the faculty and students to share their knowledge and beacon the information about various issues and activities that are being taking place in the department. I look forward for more activities and achievements for the department to march towards excellence in the future. I would like to thank all teaching, supporting staff and our beloved students for their active participation in publishing this magazine. My special compliments and congratulation to the editorial team of the department for their consistent effort in publishing this magazine.

Prof. (Dr.) Bimal Sarangi
Principal
AIET, Bhubaneswar

Dean Academic's Message

I am glad to know that the Department of Electrical Engineering is bringing out its technical magazine "ELECTRICA" which will mount creativity in the minds of the students as well as the staff members. The release of this spectacular first issue of ELECTRICA has added value to their constant efforts. Through this message, I wish them "All the very Best" for their future endeavors to and hope the students of EE bring more achievements to the college on the whole.

Prof. (Dr.) P K Swain
Dean Academics
AIET, Bhubaneswar

Vice Principal's Message

I am glad to pen for this wonderful magazine "ELECTRICA" as an appreciation of the commendable efforts put forth by the team of Electrical Engineering department for its first issue in the academic year 2023-24. The efforts taken to bring about innovative content is appreciable. I wish all the students who have involved in bringing out the magazine for their greater success and career ahead.

Prof. (Dr.) A K Sahoo
Vice Principal
AIET, Bhubaneswar

HOD's Message

I feel privileged in presenting the first issue of departmental magazine "ELECTRICA" once again successful for this academic year 2023-24. This magazine is intended to bring out the unseen fictitious talents among the students and the faculty and also to inculcate leadership skills among them. I'm confident that it will inspire the students who aspire to be poets and writers and push their imaginations to explore new avenues. I acknowledge my gratitude to our principal for their continuous support to prepare these issues of magazine. I extend my sincere thanks to the editorial team for their constant effort and support in bringing out the magazine in the present form.

Prof. (Dr.) P C Nayak
HOD EE
AIET, Bhubaneswar

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FACULTY CORNER

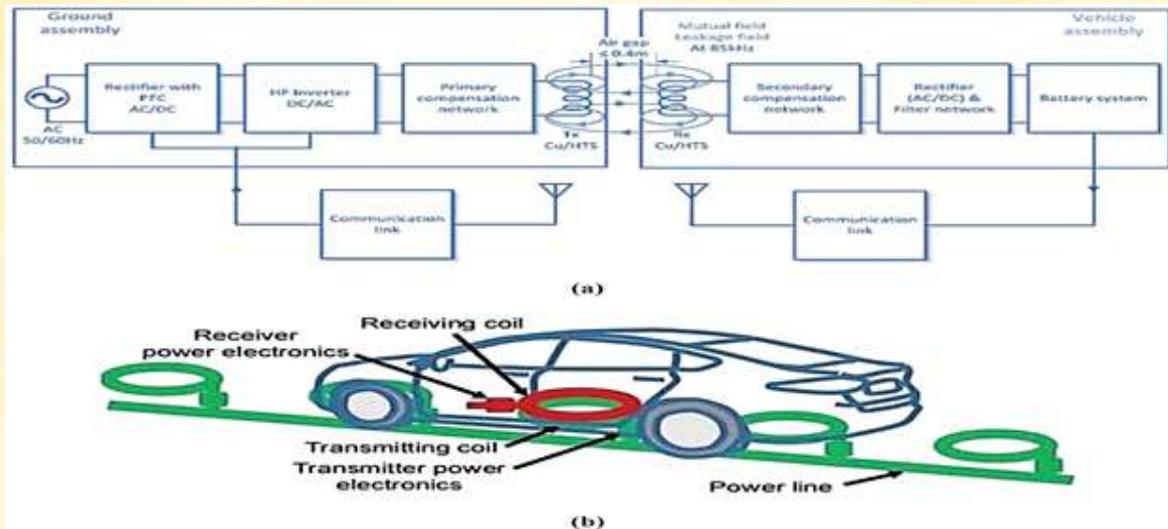# WIRELESS CHARGING FOR ELECTRIC VEHICLES

Figure 1. Wireless power charging in electric Vehicle

In recent years with the rapid development of the electrical vehicle (EV) of new energy industry, higher requirements are put forward for convenience, safety and reliability of the charging of electric vehicles. Wireless power charging is done by inductive coupling. Inductive coupling can be done in both stationary and dynamic conditions. By reconfiguring the transformer and altering high frequency, energy is being transferred with low energy loss and fewer demands on the primary circuit. Sufficient power for the battery can be transferred by the primary to the secondary without sufficient energy loss. Electric power is then transmitted to the chargeable battery which is electrically coupled to the secondary circuit through the air core transformer. In case of shuttle bus services, buses can be charged when it waits at bus station. It can also be implemented in rental taxi parking. Thus, the battery in electric buses only needs enough charge to go to the next stop. This decreases the battery size and promotes significant cost saving in electric vehicles.
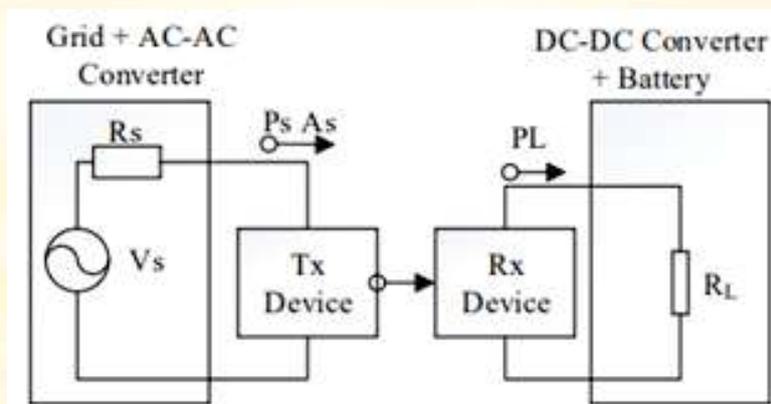

Figure 2. A general depiction of a wireless charging system for an electric vehicle.

This technology enables efficient opportunities in charging stations, for predefined routes and planned stops reducing down the time of charging. The dynamic charging will promote the use of electric vehicles and reduce petroleum fuel consumption. Delays in traffic signals can now be provided with longer periods of charging and even when the electric vehicle is in movement. Bad weather conditions like rain and snow do not affect the charging capabilities of electric vehicles.

There is an air gap between the transmitting and the receiving sides, and the power transfer between the two sides is due to the coupling between them. Transmitter and receiver are the two basic modules of this system. The transmitting i.e. the primary, and the receiving i.e. the secondary coils are coupled and there is an air gap between these coils. Power conversion circuit is installed on both sides. The primary coil is energized by the grid by using a diode rectifier that is connected in series with an inverter. The operational frequency of the inverter is high. The inverter, the rectifier and the grid are used for setting up of the power supply to the primary coil. This power supply is equivalent to that which is provided by a power source with a voltage and an internal resistance. One of the main parameters for the energy transfer is the voltage provided by the power source or the generator. Therefore, selection of the generator is also important, which should provide a sinusoidal output. The voltage induced by the secondary coil is fed to a rectifier circuit which is connected in series with a DC-to-DC converter. The output is provided to the battery charging circuit. The output voltage and the current can be adjusted according to the charging requirements of the battery. The charging process of the EV batteries involves two modes. In one mode, the charging current is constant and the charging voltage is allowed to vary. It is referred to as the constant current (CC) charge. In the other mode, the charging voltage is kept fixed and the charging current is allowed to change.

Wireless charging is considered a better alternative to traditional wired charging systems as it is user and environment friendly. Furthermore, it eliminates the need for wires and mechanical connectors, and therefore, avoids the associated Muhammad Amjad et al. Page 19 of 29 Wireless charging systems for electric vehicles hassles and hazards. Wireless charging systems also reduce the range anxiety and enhance the system efficiency

Mr. Deepak Kumar Sahoo

Assistant Professor

AIET, Bhubaneswar

WIRELESS POWER TRANSFER USING ELECTROMAGNETIC INDUCTION CHARGING FOR FUTURE HYBRID VEHICLE
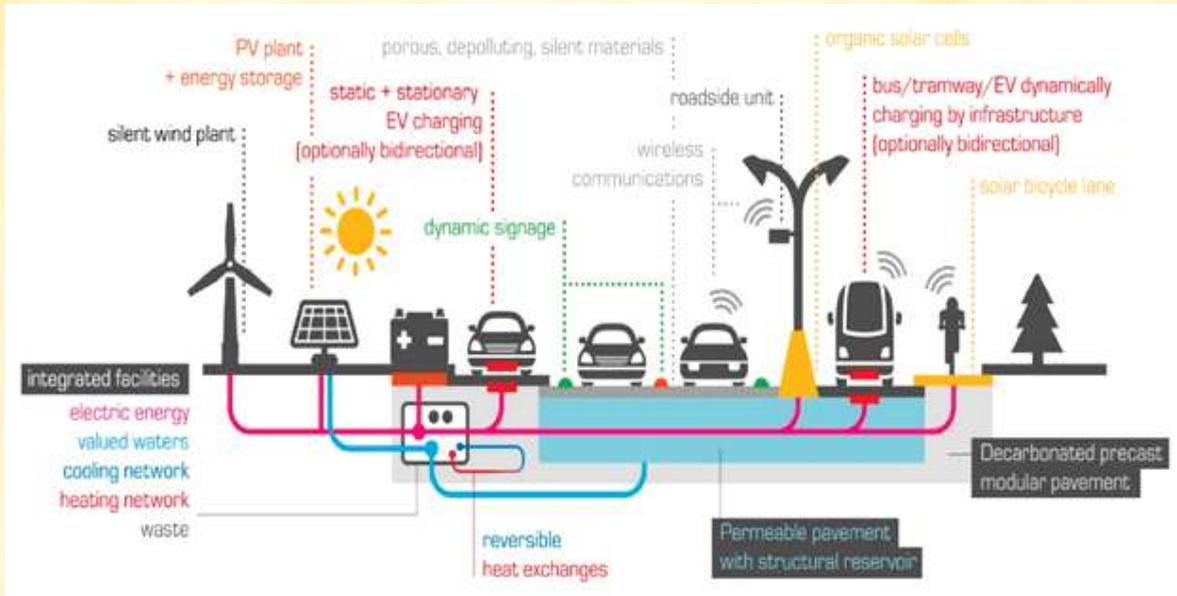

Figure 1. Dynamic Wireless Power Transfer Charging Infrastructure

Due to barriers of low electricity density, high feel and heavy weight etc., the development and software of battery-powered devices is dealing with remarkable technical challenges. As a singular pattern of energization, the wireless energy switch (WPT) offers a brand-new way to the strength acquisition for electric powered-driven devices, therefore assuaging the over-dependence on the battery. This article gives an overview of WPT strategies with emphasis on working mechanisms, technical challenges, metal materials, and classical programs. Wireless power transfer (WPT) using electromagnetic induction (EMI) is a technology that can charge electric vehicles (EVs) without the need for a power cord. WPT uses two coils, one as a transmitter and one as a receiver, to transfer power between them:

· **Inductive coupling**

The most common type of WPT, this technique uses an alternating current in the transmitter coil to create a magnetic field. When the receiver coil is brought close to the transmitter coil, the magnetic field induces a voltage in the receiver coil.

· **Resonant inductive coupling**

An advanced form of inductive coupling where the transmitter and receiver coils resonate at the same frequency. This allows for more efficient power transfer over greater distances.

Dynamic or quasi-dynamic IPT can be used to charge EVs while they are moving or stopped at a red light. Wireless EV charging is nearly as efficient as plugged EV charging, with both methods

having a 90% efficiency rate. Pilot projects are underway to test WPT for passenger and commercial vehicles. SAE International is working on standardization efforts to boost the adoption of dynamic wireless charging.
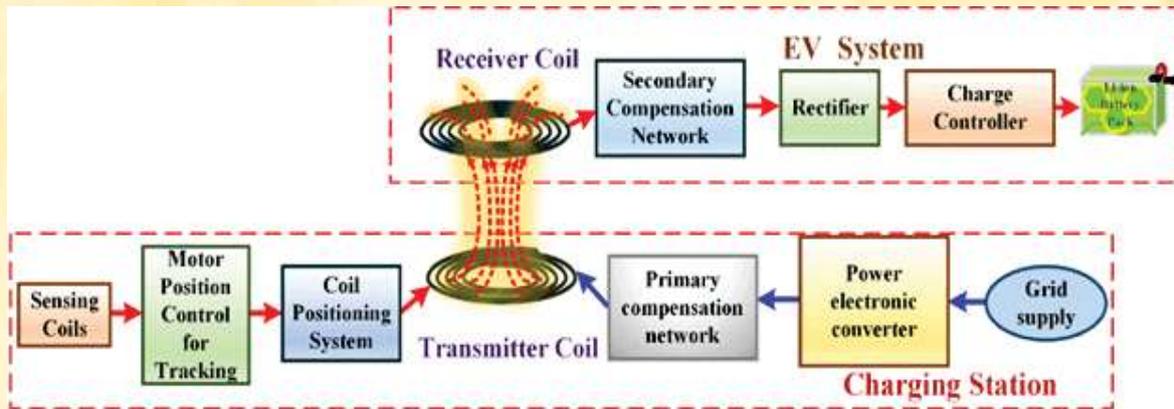
Figure 2. Design And Implementation of Wireless Charger for EVS

The study involves the design and analysis of a coil, considering factors such as mutual inductance and efficiency. Wireless coils with angular misalignment are modelled in Ansys Maxwell simulation software. The proposed practical EV system aims to align the coils using angular motion, effectively reducing misalignment during the parking of two-wheelers. This is achieved by tilting the transmitter coil in the desired direction. Furthermore, micro sensing coils are employed to identify misalignment and facilitate automatic alignment. Additionally, adopting a power control technique becomes essential to achieve both constant current (CC) and constant voltage (CV) modes during battery charging. Integrating CC and CV modes is crucial for efficiently charging lithium-ion batteries, ensuring prolonged lifespan and optimal capacity utilization. The developed system can improve the efficiency of the wireless charging system to 90.3% with a 24 V, 16 Ah Lithium-Ion Phosphate (LiFePO4) battery at a 160 mm distance between the coils.

Several automobile companies, including Audi, Nissan, Toyota, Mitsubishi, and Rolls-Royce, are working on WPT for EVs. Focusing on WPT systems, this paper elaborates on cutting-edge principal studies topics and discusses approximately future improvement traits. This novel energy transmission mechanism indicates considerable meanings on the pervasive software of renewable energies in our day-by-day existence, and then using to a battery charger to be operate in f unction has been finally charge level.

Mrs. Smitasree Jena

Assistant Professor

AIET, Bhubaneswar

INTELLIGENT ROAD LIGHT FOR CONTROLLING ENERGY UTILIZATION

Figure 1. Street Light Control System Infrastructure

Street lights are among the most common infrastructure in cities & rural areas. Solar energy is the most direct, common, and clean energy on our planet we have already found until now. Total solar energy absorbed by the Earth is about 3,850,000 exajoules (EJ) in one year, which is even twice as much as all the non-renewable resources on the earth found and used by human being, including coal, oil and uranium etc. When energy crisis is a big threat and unscheduled power cuts are the order of the day, street lights can be seen burning during daytime in many parts of the city & rural areas. so that the stand-alone street lamp is a fine solution to save the energy and also the use of non – conventional energy source. This highly efficient system configuration solves the lane lamp issues both highway & pedestrian roads. The configuration having intensity controller & pedestrian/Vehicle identifying systems to managing the street lights. By using this system energy consumption is also reduced because nowadays the manually operated street lights are not switched off even the sunlight comes and also switched on earlier before sunset. In this project, no need of manual operation like ON time and OFF time setting. In the present project solar street lights are taken into consideration where the above discussed factors are rectified in them.
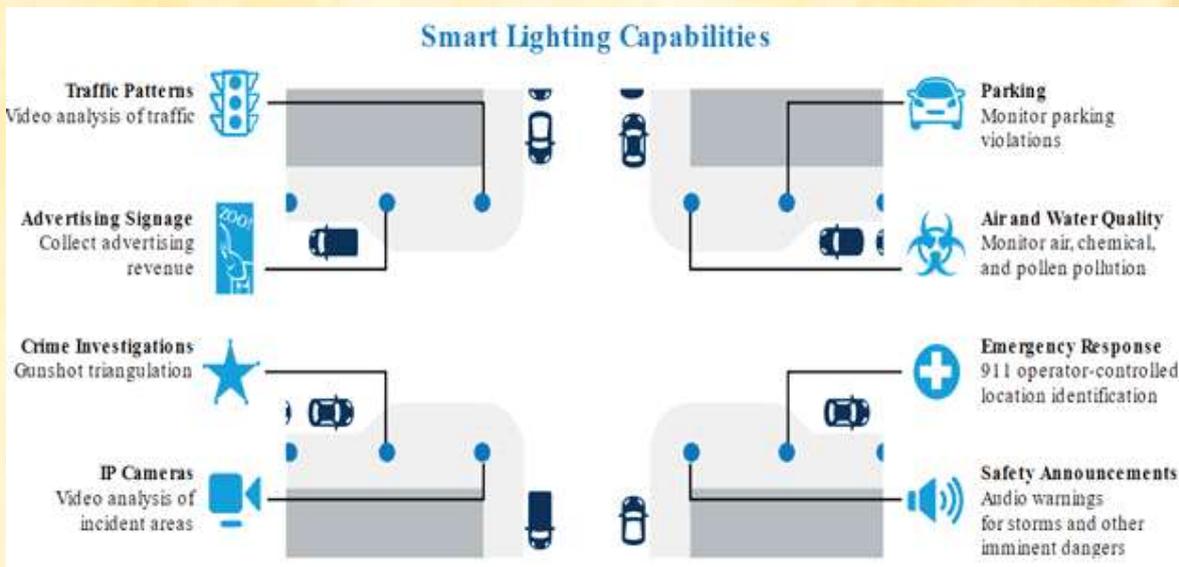
Figure 2. Structure of Intel Smart Lighting

Intelligent street lights change the way municipalities manage cities while delivering exceptional energy savings. 'Public lighting accounts for up to 40 percent of many cities electricity bills. Furthermore, electricity usage is expected to grow by 50 percent in the next two decades as more and more people will be shifting to urban areas. By switching from halogen to LED, municipalities can achieve up to 50 percent reduction in energy usage. Adding smart street light controllers, which help adjust luminaire brightness based on predefined schedules, calendar events of ambient light levels, can yield an additional 20 to 30 percent energy savings. A total of up to 80 percent energy savings can also be achieved if municipalities opt for motion sensor smart street lights, which trigger luminaires output based on movement. Apart from saving money, cities can gain enhanced functionalities and capabilities. By using the existing street lighting poles, cities and utility providers can economically and easily add a variety of IoT and Smart City sensors. Intelligent street lights can help monitor public activities, weather conditions, traffic flow, or parking availability. Such street lights can be equipped with acoustic sensors to identify gunshots and alert the police or with automated license plate readers for street-level surveillance. With these capabilities, municipalities can improve operational efficiency, decrease cost, and increase citizen satisfaction. Municipalities can also create new revenue opportunities with intelligent street lights. For instance, leasing poles for EV charging or digital signage and other services.

Intelligent street lights are the future of public lighting. Many cities across the globe have already adopted smart lighting and are appreciating the benefits it delivers. Would you like to make your city safer, smarter and efficient? Contact us. We are a smart street lighting specialist. More than 800 towns and cities trust our intelligent street lighting solution.

Ms. Divya Das

Assistant Professor

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OPTIMIZATION AND INTELLIGENT POWER MANAGEMENT CONTROL FOR AN AUTONOMOUS HYBRID POWER SYSTEM
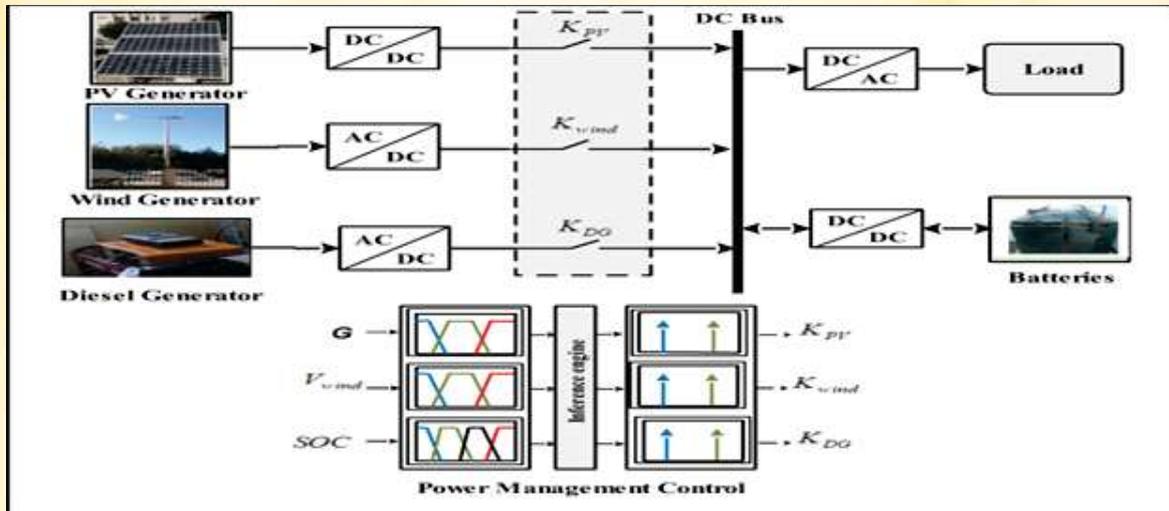

Figure 1. Proposed power system with power management control

Challenges in optimizing the performance of energy sources and backup systems are proposed, especially under conditions of heavy loads or low renewable energy output. The problem lies in the need for an efficient control mechanism that can enhance power availability while protecting and extending the lifespan of the various power sources in the system. Furthermore, it is necessary to adapt the system's operations to variations in climatic conditions for sustained effectiveness. To address the identified problem. It is proposed the use of an intelligent power management control (IPMC) system employing fuzzy logic control (FLC). The IPMC is designed to optimize the performance of energy sources and backup systems. It aims to predict and adjust the system's operating processes based on variations in climatic conditions, providing a dynamic and adaptive control strategy. The integration of FLC is specifically emphasized for its effectiveness in balancing multiple power sources and ensuring a steady and secure operation of the system. The proposed IPMC with FLC offers several advantages over existing strategies. Firstly, it showcases enhanced power availability, particularly under challenging conditions such as heavy loads or low renewable energy output. Secondly, the system protects and extends the lifespan of the power sources, contributing to long-term sustainability. The dynamic adaptation to climatic variations adds a layer of resilience to the system, making it well-suited for diverse geographical and climatic conditions. The use of realistic data and simulations in MATLAB/Simulink, along with real-time findings from the RT-LAB simulator, indicates the reliability and practical applicability of the proposed IPMC strategy.
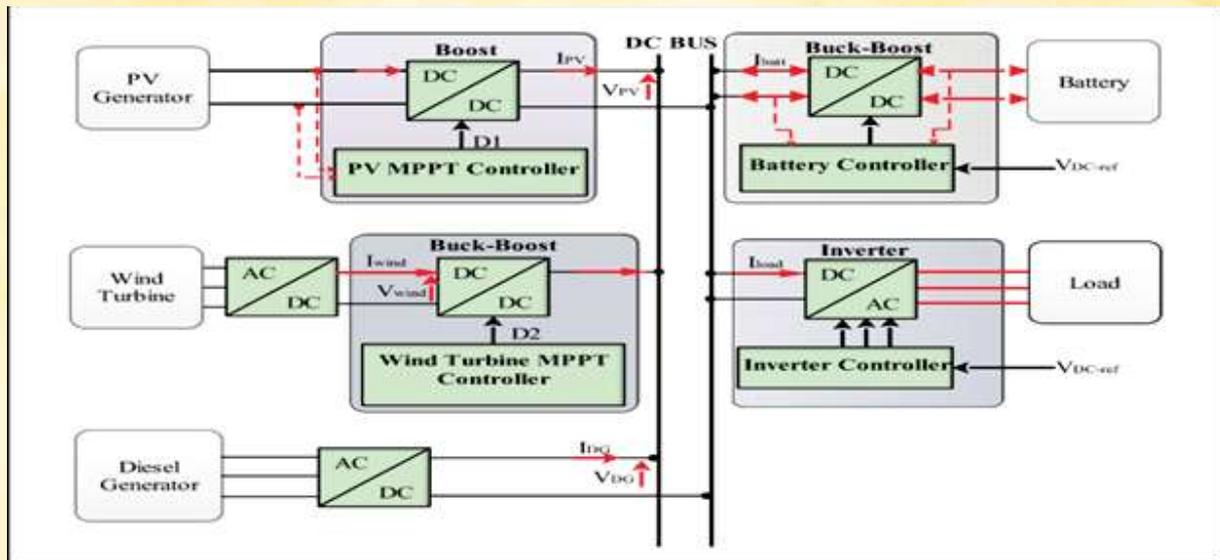
Figure 2. Proposed Control Scheme

The management method for autonomous hybrid systems is designed to fulfill load demand and control the power flow while offering the efficient operation of all energy sources. The IPMC approach prioritizes the use of photovoltaic and wind powers to meet the load requirement and relies on the use of long-term storage to supply the load. This helps reduce the start/stop cycles of a diesel generator which can indeed lead to lower fuel consumption and improve the energy balance of the system. By operating the generator for larger periods of time at a steady state, the energy losses that occur during the start-up and the shutdown can be minimized. Additionally, the load profile of the generator can be optimized to match the electricity demand, which can further improve fuel efficiency and reduce wear and tear on the generator.

The study presents a promising approach to managing an autonomous hybrid energy system with a fuzzy logic controller. The novelty of the proposed IPMC lies in its dynamic and adaptive nature, leveraging fuzzy logic control to efficiently balance multiple power sources. Unlike traditional strategies, this approach considers variations in climatic conditions, contributing to improved system resilience. The dual-goal approach, emphasizing immediate power needs and long-term stability, adds a unique dimension compared to existing methods.

Mr. Jyoti Prakash Mohapatra

Assistant Professor

AIET, Bhubaneswar

BATTERY MANAGEMENT SYSTEMS FOR ELECTRIC VEHICLES

As electric vehicles (EVs) gain momentum in the shift towards sustainable transportation, the efficiency and reliability of energy storage systems become paramount. Lithium-ion batteries stand at the forefront of this transition, necessitating sophisticated battery management systems (BMS) to enhance their performance and lifespan. Battery management systems (BMS) play a pivotal role in the operational integrity and efficiency of battery packs utilized across a broad spectrum of applications, from portable electronics to large-scale renewable energy storage solutions. While considerable progress has been made in the development of BMS technologies, current systems often fail to fully address the complex dynamics and unpredictability associated with battery usage. This study identifies a significant research gap: the integration of advanced computational intelligence in BMS, which is essential for enhancing real-time decision-making and overall system efficacy. Traditional BMS approaches have focused predominantly on static algorithms that monitor and control battery parameters based on predefined models. These methods, however, do not adequately account for the nonlinear behavior of batteries under varying load conditions and environmental influences, leading to suboptimal performance and reduced battery life. Recent studies have emphasized the need for BMS frameworks that can dynamically adapt to changing conditions and accurately predict battery performance to prevent failures and maximize operational efficiency.

Features	Traditional BMS methods	Modern BMS methods
Methodology	Static models based on voltage -to-charge correlation and simple integration of current	Dynamic algorithms including VFFRLS and machine learning models
Adaptability	Low; struggles with varying operational conditions and environmental factors	High; adapts to changes in real -time, accommodating various conditions
Accuracy	Moderate; effective under stable conditions but prone to errors under variability	High; employs complex algorithms to ensure high precision under diverse scenarios
Real-time Data Handling	Limited; typically uses predefined data sets and lacks real-time processing capabilities	Robust; utilizes real-time data to dynamically adjust SOC and SOH estimations
Technological Integration	Minimal; often isolated to specific functions within the BMS	Comprehensive; integrates across multiple aspects of battery management
Predictive Capabilities	Basic; mai nly reactive systems with limited forecasting ability	Advanced; predictive analytics enable proactive management and fault detection

Implications for BMS Design

1. Algorithm Complexity: The comparison between a simple linear model and a more complex nonlinear model highlights the necessity of incorporating advanced algorithms in BMS. Renewable energy storage systems often face variable loads and environmental conditions that a simple linear model cannot accurately account for.

2. Real-World Battery Behavior: The advanced BMS algorithm, which accounts for the nonlinear discharge characteristics of batteries, more accurately reflects real-world battery behavior. This consideration is crucial for designing a BMS that can reliably predict the SoC and manage the battery to prevent over discharge, which can harm battery life and performance.

3. Predictive Maintenance: The nonlinear model used in the advanced BMS algorithm could be further developed for predictive maintenance. By understanding how the battery behaves under different conditions, a BMS can predict when a battery will need servicing or replacement, which is vital for maintaining the reliability of renewable energy storage systems.

4. Efficiency Optimization: The advanced BMS algorithm shows a more realistic rate of SoC depletion, which can be used to optimize the efficiency of the battery pack. By accurately estimating the SoC, a BMS can make informed decisions about when to charge the battery from renewable sources, such as during peak solar or wind production periods, thereby enhancing the overall efficiency of the energy storage system.

This investigation has rigorously demonstrated the superiority of sophisticated battery management system (BMS) frameworks over traditional linear paradigms, particularly within the context of electric vehicles. Through meticulous simulations, we confirmed that advanced BMS algorithms significantly enhance the accuracy of state of charge (SoC) predictions, achieving a notable reduction in error margins by approximately 5–10% compared to linear methodologies. This advancement not only meets our initial research objective of improving SoC and state of health (SoH) predictions through computational models but also sets a new standard for the evolution of BMS solutions tailored for lithium-ion batteries—key components in electric vehicle technology due to their exceptional energy density and operational efficacy. Furthermore, the adoption of nonlinear BMS algorithms within our simulation framework has facilitated a more accurate representation of battery dynamics under varied load conditions, exhibiting a mere 2–3% deviation in SoC predictions as opposed to the 12–15% variance observed with linear models. This precision is instrumental in refining charging protocols and enhancing battery longevity—potentially extending it by 20–25%. These enhancements directly address our second objective, which focused on increasing the operational efficiency and safety of BMS. They are critical for advancing electric vehicle performance and align with the ongoing pursuit of optimized energy management and sustainable automotive technologies.

Mr. Jitamitra Mohanty

Assistant Professor

AIET, Bhubaneswar

STUDENTS CORNER

# A REVIEW OF RECENT TRENDS IN
HIGH-EFFICIENCY INDUCTION MOTOR DRIVES
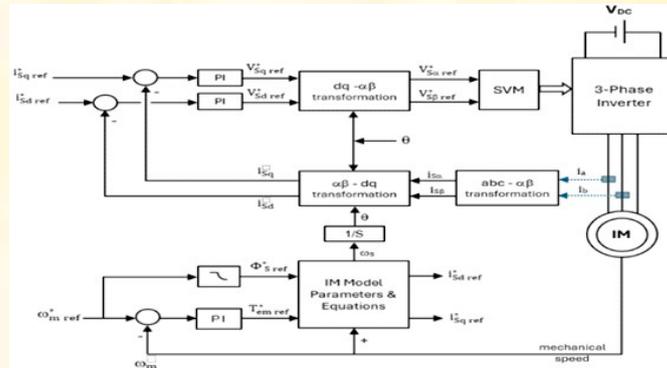
The article A Review of Recent Trends in High-Efficiency Induction Motor Drives examines modern developments in induction motor drive technologies aimed at reducing energy consumption and improving overall efficiency across industrial applications. Induction motors remain among the most widely used electrical machines due to their rugged construction, reliability, and ease of use. The power equipment in manufacturing, material handling, processing, pumping, fans, compressors, and other industrial functions. However, traditional designs can incur significant energy losses, making efficiency improvements both economically and environmentally important.

Advances in power electronic converters have significantly impacted the performance of induction motor drives. Wide bandgap semiconductor devices, such as silicon carbide and gallium nitride components, enable higher switching frequencies, reduced conduction losses, and more compact converter designs. These devices support efficient power conversion, minimize heat dissipation, and enhance the overall responsiveness of motor drives. By using advanced inverter topologies, such as multi-level or modular designs, engineers can achieve higher power quality and lower harmonic distortion, contributing to improved drive performance. Control strategies also play a key role in achieving high efficiency in induction motor drives. Techniques such as field-oriented control, direct torque control, and model predictive control provide precise regulation of motor torque and speed over varying load conditions. These algorithm-based methods enable motors to operate closer to their optimal performance points, reducing unnecessary energy draw and improving dynamic response. Emerging control approaches also incorporate energy-saving algorithms and adaptive schemes that adjust performance based on operating conditions.

In summary, recent trends in high-efficiency induction motor drives encompass innovations in motor design, power electronics, control algorithms, and thermal management. These advances collectively improve energy use, reduce operational losses, and support sustainability goals. As industries continue to prioritize efficiency and performance, induction motor drive technologies are evolving to meet the demands of modern electrical energy systems.

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2nd Year, EE, AIET, BBSR

A COMPREHENSIVE EXAMINATION OF VECTOR-CONTROLLED INDUCTION MOTOR DRIVE TECHNIQUES

IM control system design.
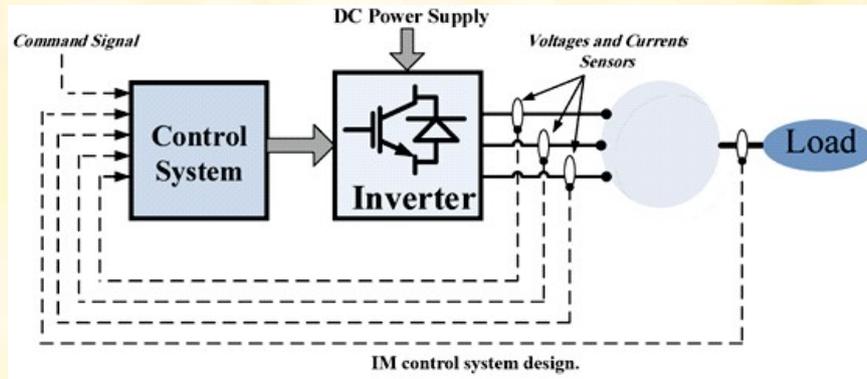
The article A Comprehensive Examination of Vector-Controlled Induction Motor Drive Techniques presents an in-depth study of modern control strategies used to improve the performance of induction motor drives. Induction motors are fundamental in industrial applications due to their robustness, efficiency, and low cost. However, achieving high dynamic performance and precise control under varying loads and speeds remains a challenge. Vector control, also known as field-oriented control, is a technique that decouples the torque and flux components of motor currents, enabling improved speed regulation, rapid response, and high efficiency. This comprehensive examination explores different vector control methodologies, their underlying principles, and their performance advantages in industrial drive systems. Vector control techniques treat the induction motor similarly to a direct current (DC) motor by creating orthogonal components of the stator current. These components independently manage torque and magnetic flux, which enhances control accuracy and dynamic responsiveness. In traditional scalar control methods, motor currents are controlled in magnitude only, limiting performance under dynamic conditions. In contrast, vector control aligns current components along specific axes relative to the rotor flux, enabling precise control over motor torque and speed. This approach improves steady-state performance and allows rapid adjustment to transient load changes, which is essential in advanced automation and manufacturing environments. The examination covers practical implementations of vector control, including voltage source inverter (VSI) systems and digital signal processing platforms. These hardware implementations rely on control algorithms that convert desired speed commands into voltage references for inverters. Advanced sensors and estimation techniques ensure that rotor flux and speed are tracked accurately. Moreover, adaptive tuning of control parameters plays a critical role in maintaining stability and performance, especially when motor characteristics change due to temperature variations or load stress. The article also highlights the role of modern computational methods, such as artificial intelligence and neural network-based estimation, which can enhance traditional vector control schemes. Neural networks, for example, can estimate rotor flux and motor parameters without requiring direct measurement, reducing hardware cost and complexity. These intelligent enhancements support improved robustness against noise and parameter drift. In conclusion, vector control techniques represent a significant advancement in induction motor drive technology. By decoupling torque and flux control, enhancing dynamic response, and enabling intelligent adaptations, these methods support the evolving needs of high-performance industrial applications. Continued research and development in this field are likely to yield even more efficient and reliable drive systems for future electrical engineering challenges.

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MODELING, CONTROL AND MONITORING OF POWER DRIVE SYSTEMS
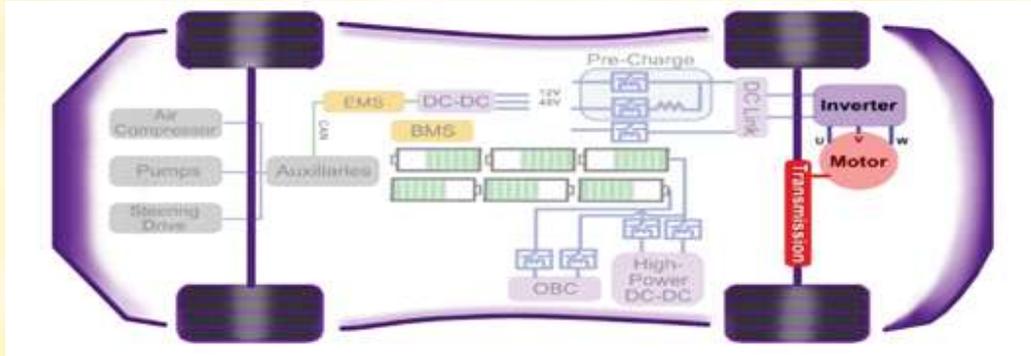
The rapid growth of electrified systems has increased the importance of advanced power drive technologies. Modern electrical drive systems require accurate modeling, efficient control strategies, and intelligent monitoring techniques to ensure high performance, safety, and reliability. This article discusses the integrated approach of modeling, control, and monitoring in power drive systems, highlighting their role in improving operational efficiency and system lifespan.

General architecture of an automotive power drive system (APDS). The high-voltage battery supplies energy through DC/DC converters and a pre-charge circuit to the DC link, which in turn feeds the inverter driving the synchronous traction motor via field-oriented or predictive control algorithms. Auxiliary components such as pumps, compressors, and steering actuators are supplied through dedicated converters. The figure highlights the interplay between energy storage, power conversion, and the traction drive, emphasizing the interfaces where modeling, control, and monitoring strategies are applied.

Power drive systems form the backbone of many modern applications, including industrial automation and electrified transportation. These systems consist of electric machines, power electronic converters, and control units that work together to deliver precise speed and torque control. As system complexity increases, isolated design approaches are no longer sufficient. Instead, a coordinated framework that integrates modeling, control, and monitoring is essential.

Accurate modeling is the foundation of advanced drive system design. Mathematical and physical models represent the electromagnetic, thermal, and mechanical behavior of system components. These models help engineers predict system performance under varying operating conditions, including load changes and disturbances. High-fidelity models are also crucial for simulation and virtual testing before physical implementation.

Ashish Kumar Mallick
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3rd Year, EE, AIET, BBSR

STORY

LOST AND FOUND

The lost-and-found box near the security office overflowed with umbrellas, notebooks, and forgotten intentions. Most items were never reclaimed.

When Priya lost her diary, panic struck. It held poems, confessions, and doubts. Days passed. Hope thinned.

One evening, she found the diary neatly wrapped with a note: "Your words matter. Keep writing." No name. No explanation.

Priya never discovered who returned it. But she wrote again—braver this time.

Some things are lost only to be found stronger.

AJIT KUMAR MALLIK

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4th Year, EE, Aiet, Bbsr

THE FIRST FAILURE

The word FAIL was printed in red, unapologetic and final. Aman stared at the notice board longer than necessary, as if the letters might rearrange themselves out of pity. Around him, celebration and disappointment moved side by side, but his world narrowed to a single result.

He had always been the dependable one—the student teachers nodded at, the name relatives quoted with pride. Failure felt like a foreign language spoken fluently by everyone except him. He walked back to the hostel slowly, avoiding phone calls, avoiding mirrors.

That night, his roommate Rahul placed two cups of tea on the table. No advice, no lecture. Just silence. Eventually, Aman spoke. Words came out broken, ashamed, relieved. Rahul listened.

Over the next weeks, Aman attended classes differently. Not to impress, but to understand. He asked questions he once feared sounded foolish. He discovered gaps he never knew existed. Learning felt raw, honest.

When the next results came, he passed. Modestly. But this time, the paper didn't define him. Failure had taught him something success never did—how to begin again.

ASHOK SETHI

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4th Year, EE, Aiet, Bbsr

HOSTEL BALCONY NO. 3

Hostel Balcony No. 3 faced the railway tracks. Trains passed every night at 2:17 a.m., punctual and loud. For Neel, that sound marked survival. It meant another day endured.

Balcony No. 3 became a gathering place for insomniacs—an economics topper battling anxiety, a sports quota student hiding an injury, a literature major unsure of her future. They didn't introduce themselves formally. They shared snacks, stories, and silences.

One night, power went out across campus. Darkness erased labels. Conversations deepened. They spoke about pressure, expectations, and the fear of disappointing people back home.

By semester's end, the group drifted apart naturally, as schedules changed. But whenever Neel heard a distant train, he remembered that balcony—a place where strangers helped each other breathe.

ASHISH PATRA

Regd. No. : 2001320211

4th Year, EE, Aiet, Bbsr

THE SUBSTITUTE PROFESSOR

The regular professor was on leave, replaced by someone no one recognized. Students expected an easy week. They were wrong.

The substitute professor didn't use slides. He asked questions. Hard ones. He made students uncomfortable, forcing them to explain ideas instead of memorizing them.

At first, the class resisted. Attendance dipped. Complaints circulated. Still, he continued.

On the final day, he revealed he was an alumnus who once failed the same course. "This place taught me resilience," he said. "I returned to pass it on."

Years later, students remembered him—not for grades, but for awakening curiosity.

RATALA UPENDRA

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3rd Year, EE, Aiet, Bbsr

POEM

THE LIBRARY THAT WATCHED US GROW

The Library That Watched Us Grow

The library opens before we do.

It waits with patient lights

and chairs that remember our weight.

Here, silence is not empty—

it is crowded with ambition.

Some students enter like warriors,

armed with notes and confidence.

Others slip in quietly,

carrying doubt like a second bag.

Books do not judge.

They have seen toppers fail

and average students bloom late.

A boy studies engineering

to outrun poverty.

A girl studies literature

to outrun loneliness.

Pages turn like quiet applause.

Time slows down,

as if respecting effort.

Outside, the world demands success.

Inside, we learn survival.

When we leave,

the library stays—

holding our unfinished dreams

between chapters

we swear we'll return to.

ASHIS KUMAR MAJHI

Regd. No. : 2201320303

2nd Year, EE, Aiet, Bbsr

HOSTEL NIGHTS ARE A DIFFERENT COUNTRY

Hostel Nights Are A Different Country

At night, the hostel changes citizenship.

Rules soften.

Walls listen.

Someone laughs too loudly

to hide heartbreak.

Someone scrolls endlessly

to avoid thinking.

Midnight noodles taste like freedom.

Shared chargers become trust treaties.

Music leaks through doors,

carrying memories of home.

We talk about everything—

politics, purpose, parents.

We solve life at 2 AM

and forget by breakfast.

In these corridors,

friendships are born without resumes.

Loneliness sits beside us,

uninvited but familiar.

Years later,

success will feel quiet.

But these nights—

these nights will echo forever.

SURYAKANTA MURMU

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2nd Year, EE, Aiet, Bbsr

THE LAST BENCH PHILOSOPHY

From the last bench,

the world looks negotiable.

Teachers speak of certainty.

We question quietly.

Here, boredom breeds creativity.

Doodles become declarations.

Whispers turn into revolutions.

We are labeled careless,

but we observe deeply.

We know who pretends,

who fears,

who dreams silently.

The last bench does not reject learning.

It rejects fear.

Many will stand ahead of us today.

But some of us

will walk further tomorrow.

YASHARAJ SAHOO

Regd. No. : 2101320141

3rd Year, EE, Aiet, Bbsr

ANXIETY WRITES MY TIMETABLE

Anxiety Writes My Timetable

I wake up tired

from dreams of deadlines.

My mind runs marathons

while my body begs for rest.

Even happiness feels temporary,

like borrowed time.

I rehearse conversations

that never happen.

I fear failure before success arrives.

They call me capable.

They don't see the shaking.

Still, I show up.

Still, I submit.

Still, I breathe.

Survival is my silent achievement.

One day,

peace will arrive unannounced—

and I will finally believe

I deserve it.

SUJIT HEMROM

Regd. No. : 2101320138

3rd Year, EE, Aiet, Bbsr

PHOTO GALLERY
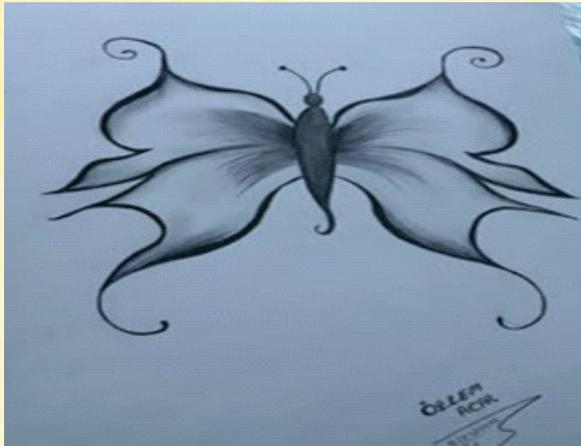
Biswabhusan Swain
Regd. No: 2001320224
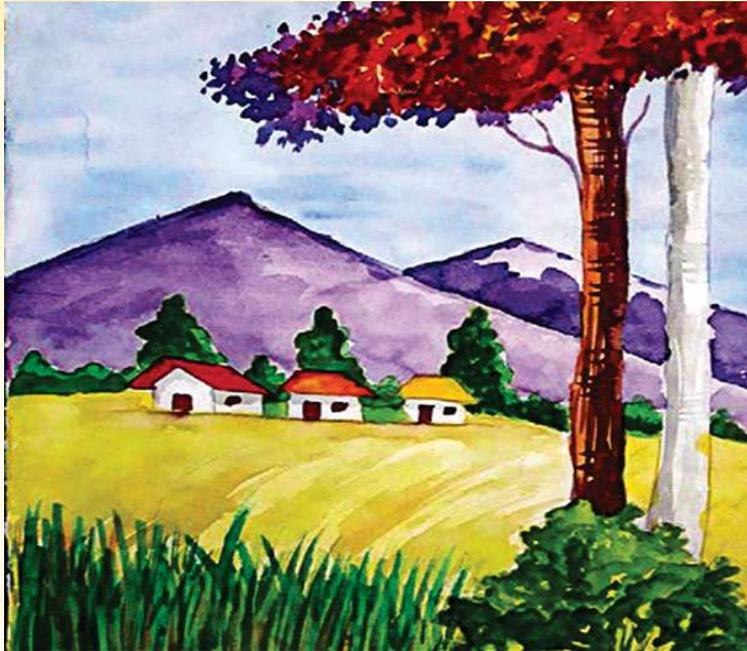4th Year, EE, AIET, BBSR

MANAS RANJAN DAS
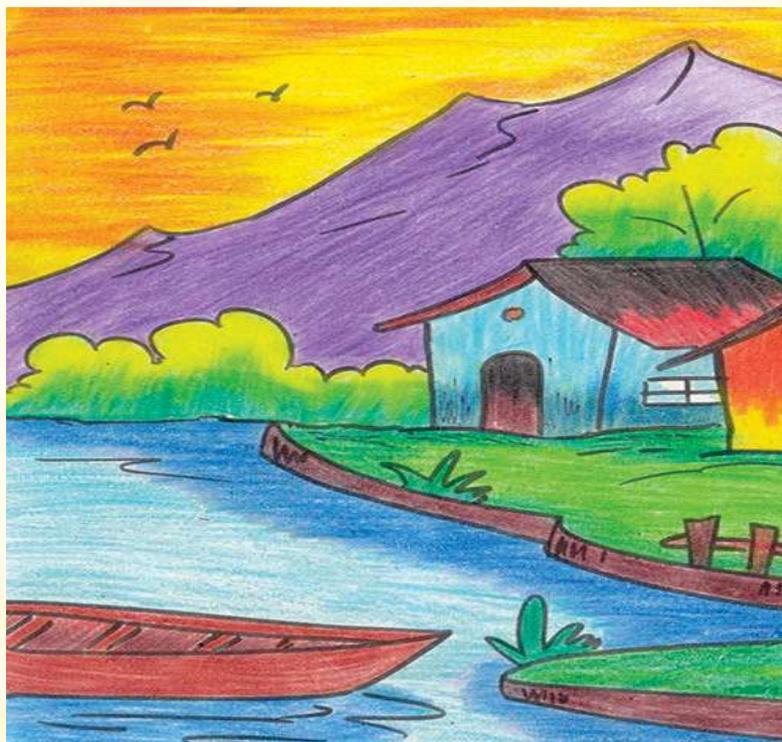Regd. No. : 2001320232
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World Aids Day 2023-24

National pollution control day 2023-24

International day against corruption 2023-24

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World energy conservation day 2023-24