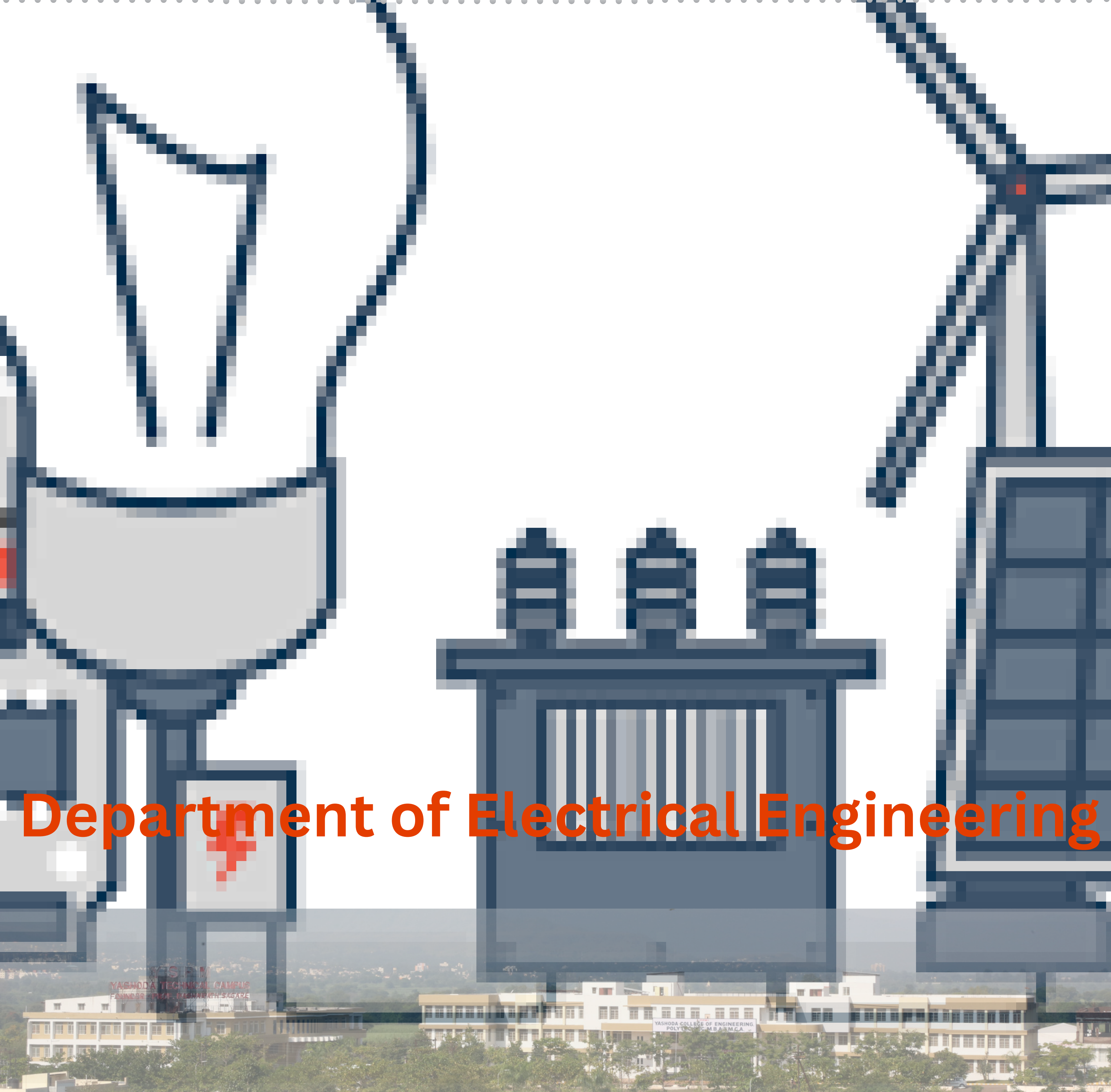
YASHODA SHIKSHAN PRASARAK MANDAL, SATARA
YASHODA TECHNICAL CAMPUS
DEPARTMENT OF ELECTRICAL ENGINEERING

|| ज्ञानम् जीवनस्य भूषणम् ||

ELECTRICAL MIRROR

DECEMBER 2022

....AN TECHNICAL MAGAZINE



Department of Electrical Engineering

YASHODA SHIKSHAN PRASARAK MANDAL, SATARA
YASHODA TECHNICAL CAMPUS
DEPARTMENT OF ELECTRICAL ENGINEERING

ELECTRICAL MIRROR

DECEMBER 2022

....AN TECHNICAL MAGAZINE

TODAY'S READER CAN BE A TOMORROW'S LEADER !

PRESIDENT'S DESK

I welcome you to YSPM's Yashoda Technical Campus, Satara, an Institution which inculcates true values while disseminating quality education for shaping the career of our students. All our institutes are approved by the concerned statutory bodies and fulfill all the norms and standards laid down by them. Our technical campus is located in a lush, green, pollution free, picturesque environment. Our institutes have well qualified, experienced and student caring faculty, well equipped laboratories, spacious lecture halls and tutorial rooms, well maintained rich library, e-library, Wi-Fi Campus, Computer with Internet Facility, and a play ground with sports facilities. We emphasize on overall personality development of our students. Our faculty pays attention to each students a platform to excel not only in academics but also in co-curricular and a multi disciplinary study culture. Amenities provided by our institutes include transport facility, hostel facility, reprographics facility, canteen, STD PCO, medical centre, sports centre etc.

We are committed to import value based quality education along with development of positive attitude, skills and abilities to apply knowledge in order to meet the challenges of future. I extend my best wishes for your bright and prosperous future.

Prof. Dasharath Sagare
Founder President
YSPM - YSS, Satara

EDITOR'S DESK

I am pleased to release 2022-23 first edition of technical magazine. The magazine will help you to update recent trends in electrical engineering. We are growing and our mission to improve the quality and utility of Teaching-learning mechanism.

HOD- Electrical Engineering

Overview of Department

Welcome to the Department of Electrical Engineering at YSPM's Yashoda Technical Campus, Satara. The department has been immensely active and professionally productive since its inception in 2011. The department offers 4 years Bachelor of Technology in Electrical Engineering.. The department undergoes several curricular and extra-curricular activities throughout the year. The department is having mixture of well experienced and young, enthusiastic faculty members who are involved in industry institute interaction besides their day to day teaching activities. The Electrical Engineering department has been established at Yashoda Technical Campus, Satara, in the academic year 2011–12 and offers Bachelor of Technology Degree. The Department of Electrical Engineering at Yashoda Technical Campus (YTC) delivers latest knowledge in Electrical Engineering along with the Computational Facilities including MATLAB, Mi- Power, and Turbo C+ programming Software. It prepares students for careers in industry, academia, and also create young entrepreneurs.

Strength of Department

- Well Qualified, Experienced staff.
- Well-Equipped laboratories.
- World class infrastructure.
- Excellent academic performance.
- E-Library, E-Books, Departmental Library facility for students.
- Girls and boys hostel with all facilities.
- College bus facility for students and staff.
- Wi-Fi, Computers, Software Facility.

Vision of the Department

To emerge as a center of excellence in Electrical Engineering education producing knowledgeable, employable, and ethical engineering graduates to serve industry/society.

Mission of the Department

We, at Department of Electrical Engineering, are committed to achieve our vision by-
M1: Preparing technically and professionally competent engineers by imparting quality education through effective teaching learning methodologies.
M2: Developing professional skills and right attitude among students that will help them to succeed and progress in their personal and professional career.
M3: Inculcating moral and ethical values in students with concern to society and environment.

Electric Vehicle Infrastructure Planning

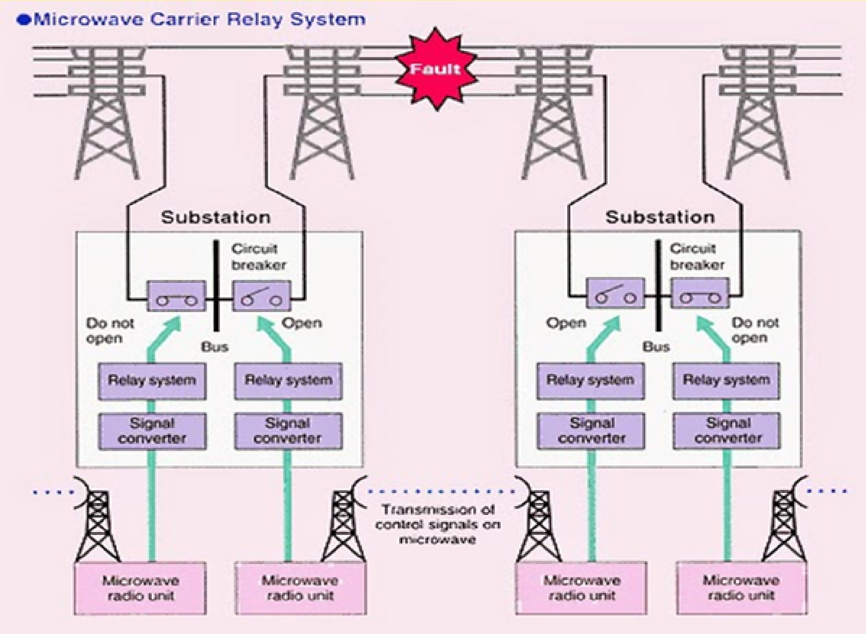
Planning an electric vehicle infrastructure involves meticulous consideration of various factors, including charging station locations, grid capacity, and user accessibility. Urban planners and electrical engineers collaborate to design EV-friendly cities, ensuring seamless integration of charging infrastructure into existing urban landscapes. Proper infrastructure planning promotes EV adoption, reduces range anxiety, and supports sustainable transportation initiatives. Strategic placement of charging stations is essential for encouraging EV usage. Charging stations are strategically located in public areas, commercial centers, parking lots, and highway rest stops, enabling convenient access for users. Urban planners analyze traffic patterns, population density, and transportation hubs to identify optimal locations for charging stations. Additionally, charging stations are deployed at workplaces, encouraging employees to charge their EVs during working hours, further enhancing accessibility. Integrating charging infrastructure into the existing electrical grid requires careful planning to avoid overloading the grid. Electrical engineers conduct load analysis to determine the impact of charging stations on the local grid. Smart grid technologies, such as demand response and load balancing, are employed to manage electricity distribution effectively. Advanced grid management systems monitor charging station usage in real-time, optimizing energy flow and preventing grid congestion during peak charging periods. User accessibility is a primary focus in infrastructure planning. Charging stations are equipped with user-friendly interfaces, allowing seamless authentication, payment processing, and charging initiation. Additionally, charging stations are designed to accommodate various charging connectors and power levels, ensuring compatibility with different EV models. Urban planners and engineers collaborate to create accessible charging infrastructure for all, including people with disabilities and individuals living in multi-unit dwellings.

Desai Pritam Adhik
Final Year

YASHODA SHIKSHAN PRASARAK MANDAL, SATARA
YASHODA TECHNICAL CAMPUS
DEPARTMENT OF ELECTRICAL ENGINEERING
ELECTRICAL MIRROR
DECEMBER 2022
....AN TECHNICAL MAGAZINE

Power System Protection and Relaying

Power system protection and relaying are critical aspects of electrical engineering, ensuring the reliability and safety of power grids. Protection devices, such as circuit breakers and relays, detect faults, such as short circuits and overloads, and isolate the faulty sections of the grid to prevent widespread outages and equipment damage. Protective relays continuously monitor electrical parameters and initiate appropriate responses, such as opening circuit breakers, when abnormalities are detected. Numerical relays, equipped with microprocessors, offer advanced features like communication capabilities and fault location algorithms, enhancing the accuracy and speed of fault detection. Power system protection also includes measures to mitigate the impact of external factors, such as lightning and geomagnetic storms, which can disrupt power supply. Comprehensive protection schemes and continuous research in fault detection algorithms are essential to ensuring the stability and resilience of power systems.



MULANI AMAN MUNIR
Third Year

YASHODA SHIKSHAN PRASARAK MANDAL, SATARA
YASHODA TECHNICAL CAMPUS
DEPARTMENT OF ELECTRICAL ENGINEERING

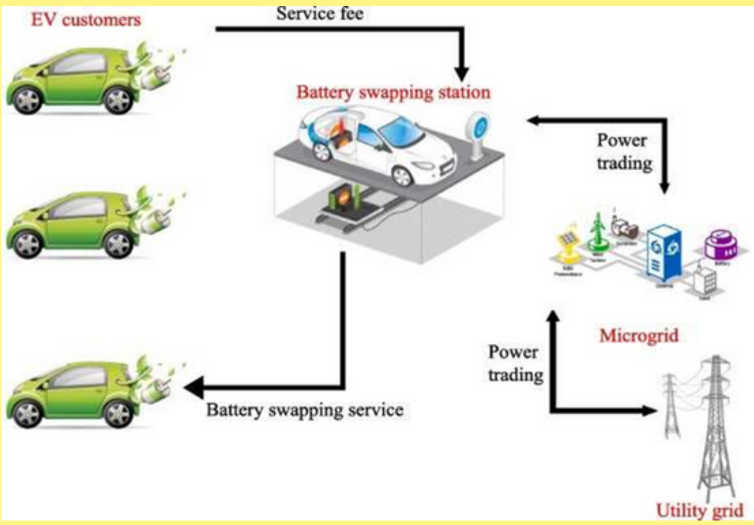
ELECTRICAL MIRROR

DECEMBER 2022

....AN TECHNICAL MAGAZINE

EV Battery Swapping Stations

Battery swapping stations offer an innovative solution to address the challenge of charging time, a significant concern for potential EV buyers. These stations enable users to replace depleted batteries with fully charged ones, eliminating the need to wait for the vehicle to charge. Battery swapping technology offers a quick and efficient alternative, reducing the time required for refueling and making EVs more comparable to traditional gasoline vehicles in terms of convenience. Standardization is a key factor in battery swapping stations. Engineers and industry stakeholders work towards establishing common battery designs and connectors across various vehicle manufacturers. Standardized batteries ensure compatibility, allowing users to swap batteries regardless of the EV brand they own. Standardization efforts also focus on safety protocols, ensuring secure battery handling and preventing accidents during the swapping process. Battery swapping stations employ robotic systems for efficient and precise battery replacement. Automated robotic arms access the vehicle's battery compartment, remove the depleted battery, and install a fully charged one. These systems are equipped with sensors and cameras, ensuring accurate alignment and secure attachment. Engineers design robust and reliable robotic systems, conducting extensive testing to validate their performance under various operating conditions. Additionally, battery swapping stations prioritize safety and user experience. Engineers develop advanced battery management systems to monitor the health and performance of each battery.

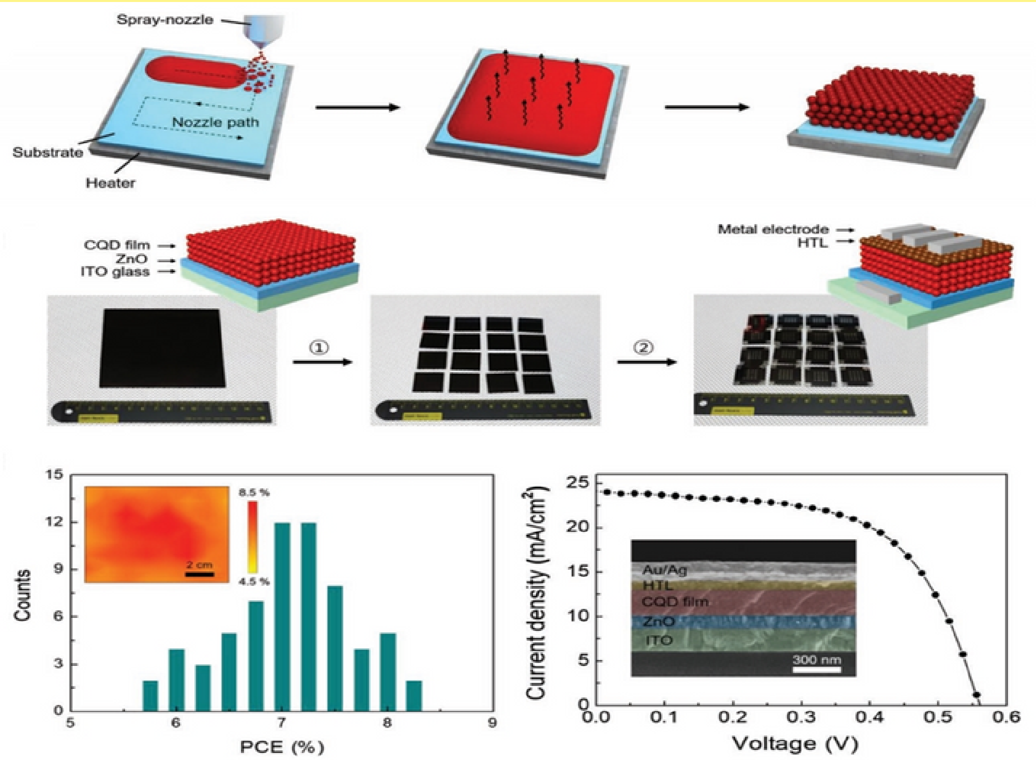


Sanas Rohan Sanjay
Final Year

YASHODA SHIKSHAN PRASARAK MANDAL, SATARA
YASHODA TECHNICAL CAMPUS
DEPARTMENT OF ELECTRICAL ENGINEERING
ELECTRICAL MIRROR
DECEMBER 2022
....AN TECHNICAL MAGAZINE

Quantum Dots in Optoelectronic Devices

Quantum dots, nanometer-sized semiconductor particles, exhibit unique optical and electrical properties, making them valuable in optoelectronic applications. These applications include displays, solar cells, and biological imaging. Quantum dot displays, also known as QLED (quantum-dot light-emitting diode) displays, utilize quantum dots to enhance color accuracy and brightness in televisions and monitors. Quantum dot solar cells enhance energy conversion efficiency by capturing a broader spectrum of light, leading to higher electricity generation. In biological imaging, quantum dots serve as contrast agents, enabling detailed imaging of cells and tissues in medical research and diagnostics. Ongoing research focuses on synthesizing quantum dots with improved stability, efficiency, and biocompatibility, driving advancements in optoelectronic technologies.



Pawar Kajal Pramodbhai
Final Year

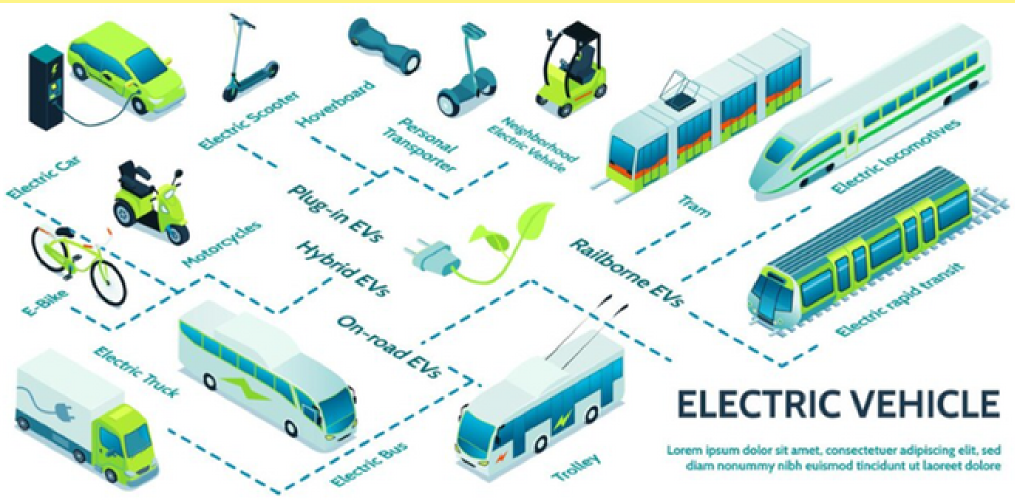
ELECTRICAL MIRROR

DECEMBER 2022

....AN TECHNICAL MAGAZINE

Electric Public Transportation

Electric public transportation, including buses and trains, plays a pivotal role in reducing greenhouse gas emissions, improving air quality, and promoting sustainable urban mobility. Transitioning from fossil fuel-powered vehicles to electric alternatives is a significant step towards creating environmentally friendly urban transportation systems. Engineers and transportation authorities collaborate to design, deploy, and optimize electric public transportation networks. Electric buses are a common sight in many cities, providing clean and quiet transportation for passengers. These buses are powered by electric motors and utilize large battery packs for energy storage. Engineers focus on optimizing the battery capacity to cover extensive routes without frequent recharging. Rapid charging infrastructure at bus depots ensures quick turnaround times, allowing buses to operate continuously throughout the day. Advanced energy management systems balance the power demand of the buses, ensuring efficient utilization of the available charging infrastructure. Electric trains, including trams and light rail vehicles, are essential components of urban public transportation networks. These trains run on electrified tracks, drawing power from overhead lines or third rails. Electrification technologies, such as pantographs and power substations, are engineered to supply high-voltage electricity to trains. Engineers work on developing efficient power distribution systems, minimizing energy losses and ensuring reliable operation of electric trains.



More Kajal Prabhakar
Final Year

YASHODA SHIKSHAN PRASARAK MANDAL, SATARA
YASHODA TECHNICAL CAMPUS
DEPARTMENT OF ELECTRICAL ENGINEERING

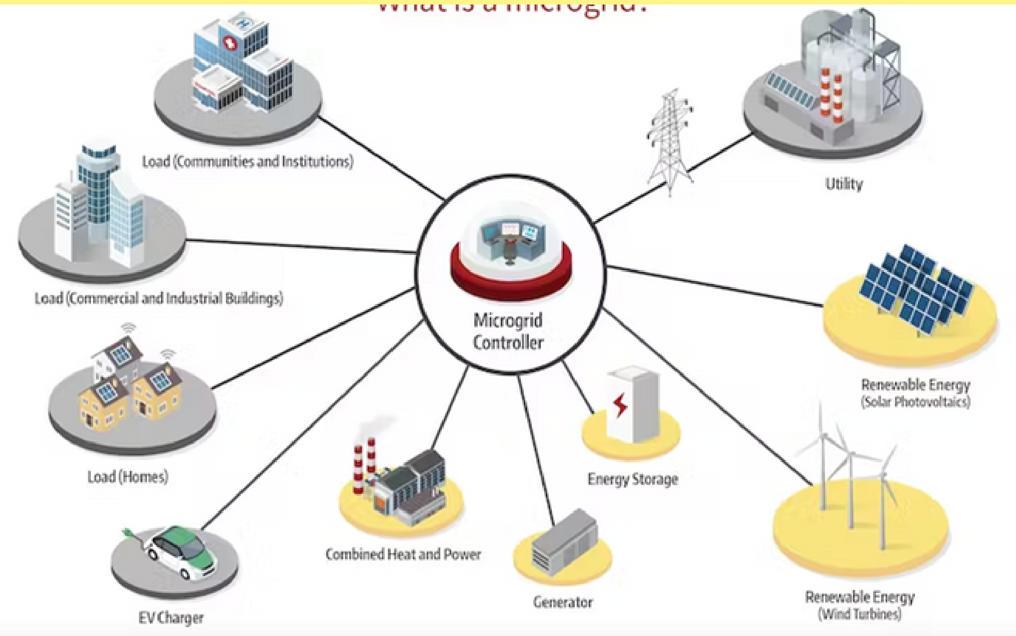
ELECTRICAL MIRROR

DECEMBER 2022

....AN TECHNICAL MAGAZINE

Microgrid Technologies and Decentralized Energy Systems:

Microgrid technologies empower communities, campuses, and industries to establish localized energy systems, reducing dependence on centralized grids and enhancing energy resilience. Microgrids consist of distributed energy resources (DERs), such as solar panels, wind turbines, and energy storage systems, connected to local loads. These systems can operate independently or in coordination with the main grid. Microgrids enhance energy reliability by providing backup power during grid outages and enable the integration of renewable energy sources, reducing greenhouse gas emissions. Advanced microgrid controllers manage the flow of electricity, balance supply and demand, and optimize energy usage based on real-time data. Decentralized energy systems, including community solar projects and off-grid electrification, provide sustainable energy solutions to remote areas and underserved communities. Research in microgrid technologies focuses on grid integration, energy management algorithms, and grid-forming inverters, enabling the widespread adoption of decentralized energy systems.



MEGHA VASANT PHALKE
Third Year

Commercial Electric Vehicles

Commercial electric vehicles, including trucks, vans, and delivery vehicles, are gaining popularity in the logistics and transportation sectors. These vehicles offer significant advantages, such as reduced operating costs, lower maintenance requirements, and compliance with environmental regulations. Engineers focus on developing high-capacity electric drivetrains capable of transporting heavy cargo while maintaining energy efficiency. Electric trucks are utilized for various applications, including regional and long-haul transportation. Engineers design powerful electric motors and high-capacity battery packs to support the heavy loads carried by trucks. Range optimization is a key focus, ensuring that electric trucks can cover long distances on a single charge. Advanced battery cooling systems are employed to maintain stable battery temperatures, especially during continuous operation. Electric delivery vans play a crucial role in urban logistics, transporting goods within cities and neighborhoods. These vans are designed for frequent stop-and-go driving patterns, requiring efficient energy management and regenerative braking systems. Engineers work on light weighting strategies, incorporating composite materials and advanced alloys to reduce vehicle weight without compromising cargo capacity. Additionally, route optimization software helps delivery companies plan efficient routes, minimizing travel time and energy consumption. Last-mile delivery vehicles, such as electric scooters and bicycles, are widely used for local deliveries.

LANDAGE PRANAV SHIVAJI
Third Year

YASHODA SHIKSHAN PRASARAK MANDAL, SATARA
YASHODA TECHNICAL CAMPUS
DEPARTMENT OF ELECTRICAL ENGINEERING

ELECTRICAL MIRROR

DECEMBER 2022

....AN TECHNICAL MAGAZINE

Computational Intelligence in Electrical Engineering

Computational intelligence (CI) techniques, such as neural networks, genetic algorithms, and fuzzy logic, empower electrical engineering applications with intelligent decision-making and problem-solving capabilities. Neural networks, inspired by the human brain's structure, are employed in pattern recognition, machine learning, and predictive modeling. Genetic algorithms mimic the process of natural selection to optimize complex systems and solve optimization problems. Fuzzy logic enables handling uncertainty and imprecision in decision-making processes, making it suitable for control systems and expert systems. CI techniques are applied in various electrical engineering domains, including power system optimization, fault diagnosis, and control system design. Research in computational intelligence explores hybrid approaches, combining multiple CI techniques, and develops algorithms for real-time applications, enhancing the efficiency and adaptability of electrical systems.

Sabale Shraddha Sanjay
Final Year

Electric Vehicle Policy and Regulation

Government policies and regulations play a pivotal role in shaping the electric vehicle market. Policymakers collaborate with engineers, environmental experts, and industry stakeholders to create effective regulations that promote EV adoption, reduce greenhouse gas emissions, and support sustainable transportation initiatives. Incentives, tax credits, emission standards, and public charging infrastructure investments are essential components of comprehensive EV policies. Incentives and Tax Credits: Governments offer incentives and tax credits to encourage consumers and businesses to adopt electric vehicles. These incentives may include direct cash rebates, tax credits, reduced vehicle registration fees, and access to carpool lanes. Financial incentives significantly lower the upfront costs of EVs, making them more attractive to potential buyers. Emission Standards: Stringent emission standards drive automakers to develop electric and low-emission vehicles. Government agencies collaborate with engineers to set emission reduction targets and establish deadlines for automakers to meet these standards. Electric vehicles play a crucial role in helping countries achieve their emission reduction goals, contributing to cleaner air and reduced environmental impact. Public Charging Infrastructure: Public charging infrastructure investments are essential for expanding the reach of electric vehicles. Government agencies work with electrical engineers to identify suitable locations for charging stations, especially in urban centers, highways, and public parking facilities. Public-private partnerships facilitate the deployment of charging infrastructure, ensuring convenient access for EV users. Research and Development Funding: Governments allocate funding for research and development initiatives related to electric vehicle technology. These funds support engineering research, innovation, and the development of advanced EV components. Engineers collaborate with research institutions and universities to conduct studies on battery technology, charging solutions, and vehicle efficiency improvements. Regulatory Support for Battery Recycling: Battery recycling regulations ensure proper disposal and recycling of used EV batteries. Engineers develop efficient recycling methods to extract valuable materials from batteries, such as lithium, cobalt, and nickel.

SNEHA SANTOSH CHAVAN
Third Year

YASHODA SHIKSHAN PRASARAK MANDAL, SATARA

YASHODA TECHNICAL CAMPUS

DEPARTMENT OF ELECTRICAL ENGINEERING

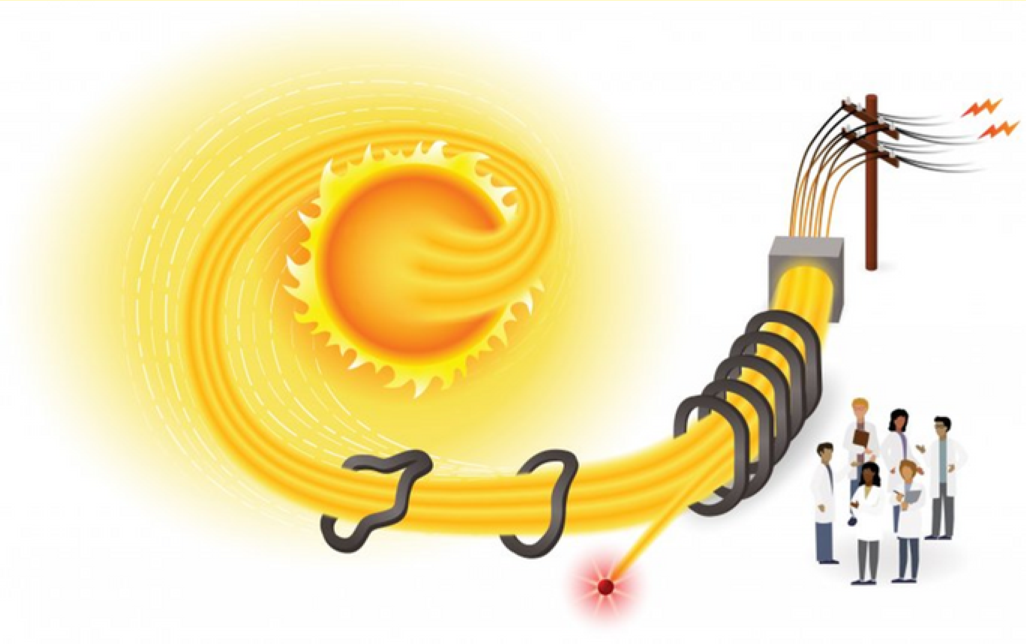
ELECTRICAL MIRROR

DECEMBER 2022

....AN TECHNICAL MAGAZINE

Plasma and Fusion Technologies

Plasma, the fourth state of matter, plays a central role in fusion technologies, offering a potential source of clean and abundant energy. Fusion, the process occurring in the sun and other stars, releases enormous energy by combining light atomic nuclei, such as hydrogen isotopes, to form helium. Fusion reactors aim to replicate this process on Earth, offering a virtually limitless supply of energy without greenhouse gas emissions or long-lived radioactive waste. Plasma confinement methods, including magnetic confinement and inertial confinement, are employed to create the extreme conditions necessary for fusion reactions. Magnetic confinement devices, such as tokamaks and stellarators, use magnetic fields to trap and stabilize the high-temperature plasma. Inertial confinement fusion involves compressing fuel pellets with intense laser or ion beams to achieve the required temperature and pressure. International collaborations, like the ITER project, are advancing fusion research, aiming to demonstrate the feasibility of sustainable fusion energy. Plasma technologies also find applications in materials processing, aerospace propulsion, and environmental remediation, showcasing the versatility of this unique state of matter



KADAM SAHIL SANJAY
Second Year

YASHODA SHIKSHAN PRASARAK MANDAL, SATARA
YASHODA TECHNICAL CAMPUS
DEPARTMENT OF ELECTRICAL ENGINEERING

ELECTRICAL MIRROR

DECEMBER 2022

....AN TECHNICAL MAGAZINE

Electric Vehicle Safety

Ensuring the safety of electric vehicles is paramount, encompassing various aspects of vehicle design, battery technology, and emergency response protocols. Engineers focus on developing robust safety features, effective battery enclosures, and advanced thermal management systems to prevent overheating and ensure the safe operation of electric vehicles. Battery Safety: Battery safety is a critical area of focus in EV engineering. Engineers design battery packs with reinforced enclosures, protecting the cells from impact and external damage. Battery management systems (BMS) monitor cell voltages, temperatures, and overall health, providing real-time data to prevent issues such as overcharging and thermal runaway. Additionally, research efforts aim to develop solid-state batteries with improved safety characteristics, reducing the risk of fire or explosion in extreme conditions. Crash Safety: Electric vehicles undergo rigorous crash testing to ensure passenger safety in the event of a collision. Engineers design vehicle structures with crumple zones and reinforced frames, absorbing impact energy and minimizing the force transferred to occupants. Battery placement and design considerations prevent damage to the battery pack during accidents, reducing the risk of leaks or electrical issues. Thermal Management: Efficient thermal management systems are crucial for preventing overheating in electric vehicles. Engineers design cooling systems that maintain optimal operating temperatures for the battery, electric motor, and power electronics. Liquid cooling solutions circulate coolant through the components, dissipating heat and ensuring consistent performance. Thermal simulations and testing validate the effectiveness of cooling systems under various operating conditions. Emergency Response Training: First responders receive specialized training to handle electric vehicle accidents safely. Training programs educate firefighters, police officers, and paramedics on EV battery systems, high-voltage components, and proper protocols for extrication and emergency shutdown. Awareness of potential electrical hazards and the location of high-voltage disconnect points ensures a swift and safe response to EV-related

KHOT SURAJ VILAS
Second Year

Environmental Impact and Sustainability

While electric vehicles produce zero tailpipe emissions, their overall environmental impact encompasses various factors, including battery production, electricity sources, and end-of-life disposal. Engineers collaborate with environmental scientists and policymakers to assess and mitigate the environmental footprint of electric vehicles, ensuring a sustainable transition to cleaner transportation. Battery Production and Raw Material Sourcing: The production of lithium-ion batteries involves mining for raw materials such as lithium, cobalt, and nickel. Engineers work on sustainable sourcing methods, ensuring ethical mining practices and minimizing the environmental impact of raw material extraction. Research focuses on recycling methods, extracting valuable materials from used batteries to reduce the demand for new raw materials. Electricity Sources: The environmental impact of electric vehicles depends on the sources of electricity used for charging. Engineers collaborate with energy experts to promote renewable energy sources such as solar, wind, and hydropower for charging infrastructure. Smart grid technologies enable efficient energy distribution, balancing the grid with renewable energy generation, and reducing reliance on fossil fuels. Battery Recycling and Repurposing: Battery recycling and repurposing initiatives are vital for reducing waste and conserving resources. Engineers develop advanced recycling methods to extract valuable metals and materials from used batteries. Repurposing retired EV batteries for stationary energy storage extends their useful life, supporting renewable energy integration and grid stability. Research efforts focus on efficient recycling processes and sustainable second-life applications, ensuring the responsible management of EV batteries. Life Cycle Assessments: Life cycle assessments (LCAs) quantify the overall environmental impact of electric vehicles, considering factors from raw material extraction to vehicle disposal. Engineers and environmental scientists conduct comprehensive LCAs, evaluating energy consumption, greenhouse gas emissions, and resource depletion. These assessments inform decision-making processes, guiding policymakers and manufacturers toward sustainable practices and technologies.

TONSHAL RUPESH RAJKUMAR
Third Year

YASHODA SHIKSHAN PRASARAK MANDAL, SATARA
YASHODA TECHNICAL CAMPUS
DEPARTMENT OF ELECTRICAL ENGINEERING

ELECTRICAL MIRROR

DECEMBER 2022

....AN TECHNICAL MAGAZINE

Electric Vehicle Adoption Challenges

Despite their numerous benefits, electric vehicles face challenges that hinder widespread adoption. Addressing these challenges requires a collaborative effort between engineers, policymakers, and industry stakeholders. Key challenges include range anxiety, limited charging infrastructure, high initial costs, and concerns about battery degradation. Range Anxiety: Range anxiety refers to the fear of running out of battery power before reaching a charging station. To alleviate this concern, engineers focus on extending the driving range of electric vehicles. Advances in battery technology, such as higher energy density and faster charging, contribute to longer ranges. Additionally, public awareness campaigns educate consumers about the actual driving ranges of modern electric vehicles, dispelling misconceptions and building confidence in EVs. Limited Charging Infrastructure: Limited charging infrastructure is a significant barrier to electric vehicle adoption, especially in rural areas and developing regions. Engineers collaborate with governments and private companies to expand charging networks, focusing on highways, urban centers, and remote locations. Standardized charging connectors and communication protocols ensure compatibility across different charging stations and EV models. Public-private partnerships play a crucial role in funding and deploying charging infrastructure, promoting EV accessibility.High Initial Costs: Electric vehicles often have higher upfront costs than traditional gasoline vehicles. Engineers work on reducing manufacturing costs through advancements in battery production techniques, materials, and economies of scale. Incentives and tax credits provided by governments significantly lower the initial purchase price, making EVs more affordable for consumers. Financial incentives, combined with lower operating costs (due to reduced fuel and maintenance expenses), enhance the overall cost-effectiveness of electric vehicles over their lifetime. Battery Degradation Concerns: Battery degradation, the gradual loss of battery capacity over time, raises concerns among potential EV buyers. Engineers focus on developing durable and long-lasting batteries, utilizing materials and chemistries that minimize degradation. Battery management systems (BMS) play a crucial role in optimizing charge and discharge cycles, prolonging the battery's lifespan. Additionally, manufacturers offer warranties and battery replacement programs, providing assurance to consumers about the longevity and performance of EV batteries.

Kokate Aman Sanjay

YASHODA SHIKSHAN PRASARAK MANDAL, SATARA
YASHODA TECHNICAL CAMPUS
DEPARTMENT OF ELECTRICAL ENGINEERING

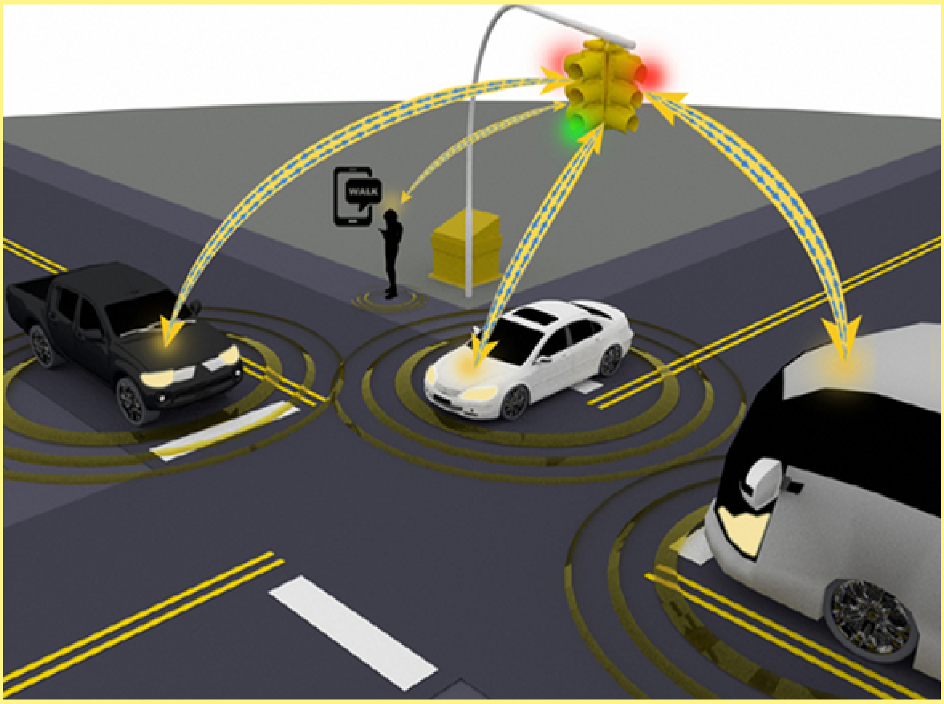
ELECTRICAL MIRROR

DECEMBER 2022

....AN TECHNICAL MAGAZINE

Intelligent Transportation Systems (ITS)

Intelligent Transportation Systems (ITS) integrate advanced technologies to enhance transportation safety, efficiency, and sustainability. ITS applications include traffic management, vehicle-to-vehicle communication, and autonomous vehicles. Traffic management systems utilize sensors, cameras, and data analytics to monitor traffic flow, detect congestion, and optimize signal timings. Vehicle-to-vehicle communication enables cars to exchange information, such as speed and position, promoting collision avoidance and enhancing road safety. Autonomous vehicles, equipped with sensors and artificial intelligence, can navigate and operate without human intervention, offering potential solutions to traffic congestion and reducing accidents caused by human error. ITS technologies also include smart traffic signals, adaptive cruise control, and real-time navigation systems, enhancing the overall transportation experience. Research in ITS focuses on developing reliable communication protocols, ensuring cybersecurity, and addressing ethical and regulatory challenges associated with autonomous vehicles, paving the way for intelligent and connected transportation systems.



Barge Aniket Sambhaji
Final Year