YASHODA SHIKSHAN PRASARAK MANDAL, SATARA

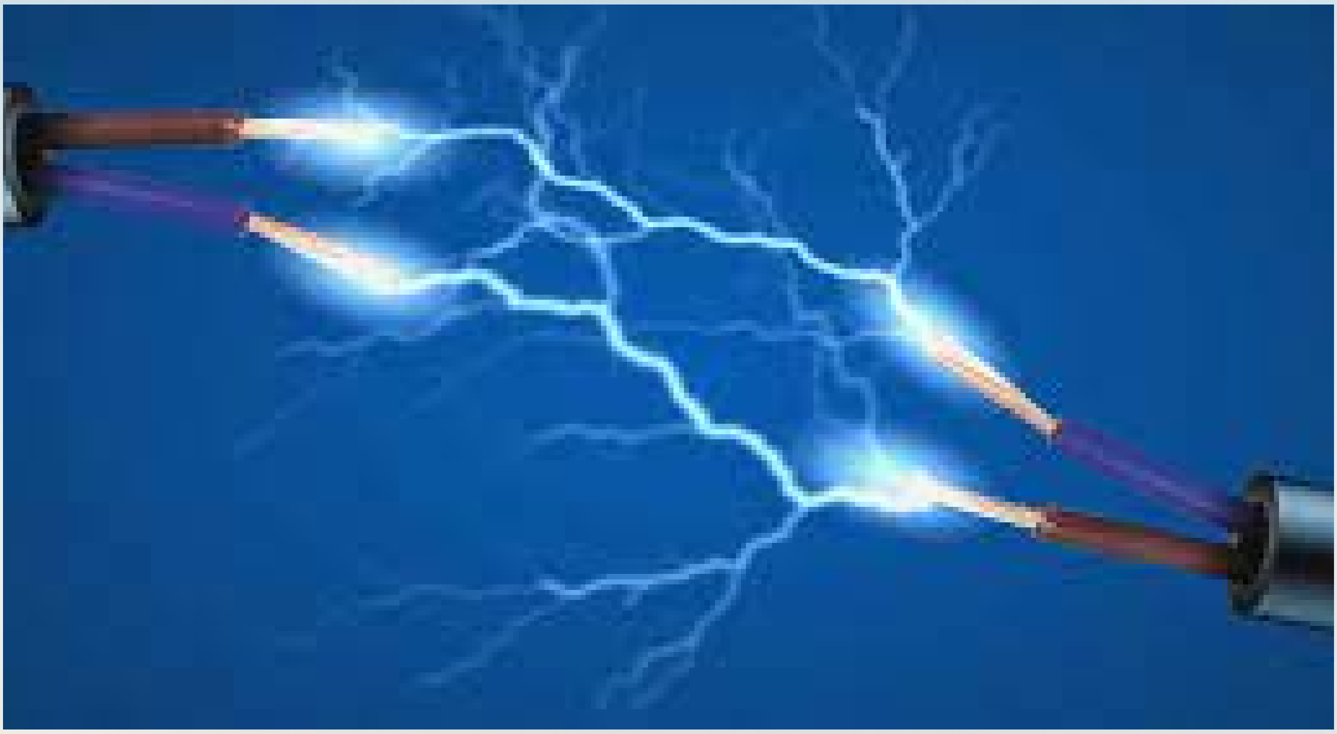
YASHODA TECHNICAL CAMPUS

DEPARTMENT OF ELECTRICAL ENGINEERING

ELECTRICAL MIRROR

MAY 2022

....AN TECHNICAL MAGAZINE



Department of Electrical Engineering

YASHODA SHIKSHAN PRASARAK MANDAL, SATARA
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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 2021-22 second 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

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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.

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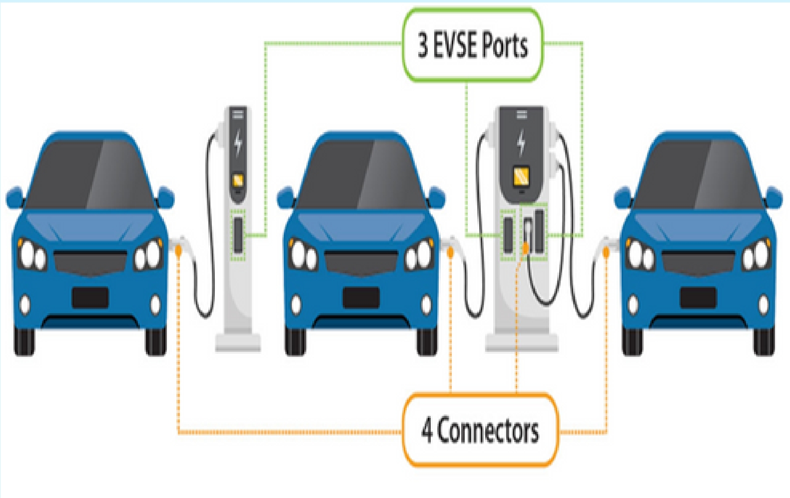
Charging Infrastructure

Establishing a robust and widespread charging infrastructure is paramount for the mass adoption of electric vehicles. Charging stations come in various levels, catering to different charging needs. Level 1 chargers utilize standard household outlets and are suitable for overnight charging. Level 2 chargers, commonly found in public places and commercial areas, provide faster charging, reducing the charging time significantly. Level 3 chargers, also known as DC fast chargers, offer rapid charging, ideal for long-distance travel or quick top-ups. Engineers focus on enhancing charging station technology to provide faster and more efficient charging experiences. High-power chargers, capable of delivering hundreds of kilowatts, dramatically reduce charging times, making EVs more convenient for users. Standardization of charging connectors and communication protocols is essential to ensure compatibility across different vehicle models and charging stations. Advancements in plug-and-charge technology enable seamless authentication and billing processes, simplifying the user experience and encouraging more people to adopt electric vehicles. Smart charging solutions are another area of innovation. These systems optimize energy distribution, taking into account factors such as grid demand, electricity prices, and renewable energy availability. Smart charging helps balance the load on the electrical grid, reducing peak demand and minimizing strain on the infrastructure. Additionally, it allows users to schedule charging sessions during off-peak hours when electricity rates are lower, offering cost savings to EV owners



TIWATANE UTKARSH RAKESH
Second Year

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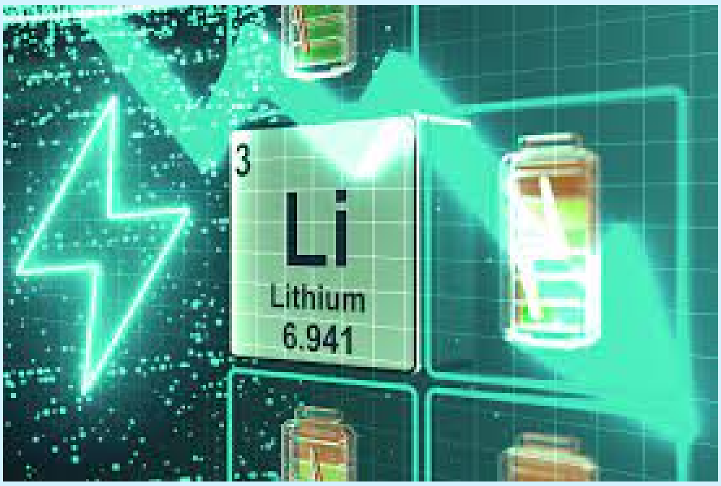
Battery Technology

Battery technology is a cornerstone of electric vehicles, directly impacting factors such as driving range, charging speed, and overall vehicle performance. Researchers continually explore new materials and battery architectures to improve energy density, extend lifespan, and enhance safety. Solid-state batteries, for instance, represent a promising advancement. Unlike traditional liquid electrolytes, solid-state batteries use solid electrolytes, offering higher energy density, faster charging, and reduced risk of thermal runaway. Engineers focus on developing scalable production methods for solid-state batteries, aiming to make them commercially viable for widespread EV applications. Moreover, research efforts are directed towards recycling and second-life applications for EV batteries. Recycling methods are being refined to extract valuable materials like lithium, cobalt, and nickel from used batteries. Efficient recycling processes reduce the environmental impact of battery production and minimize the demand for raw materials, contributing to a more sustainable battery ecosystem. Second-life applications involve repurposing used EV batteries for stationary energy storage. While these batteries might no longer meet the high-performance demands of electric vehicles, they still have significant capacity for stationary applications. These applications include grid energy storage, renewable energy integration, and emergency backup systems. Engineers work on developing battery management systems that optimize the use of retired EV batteries, ensuring their extended usefulness in supporting renewable energy initiatives and grid stability.



BHOSALE KUNAL NILESH
Final Year

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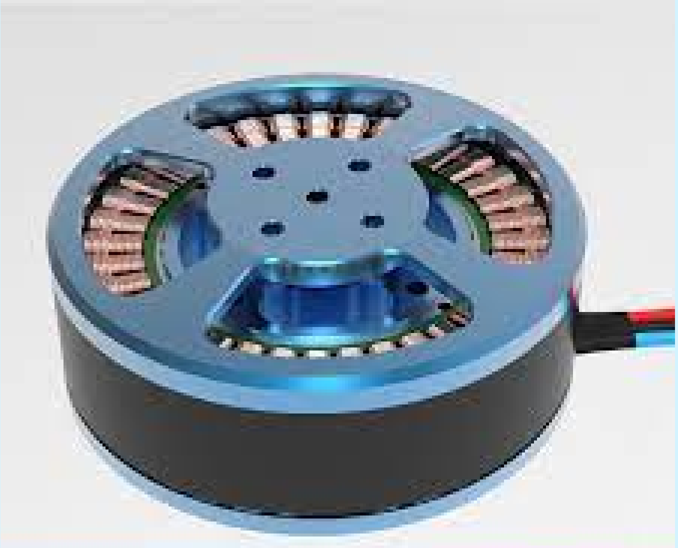
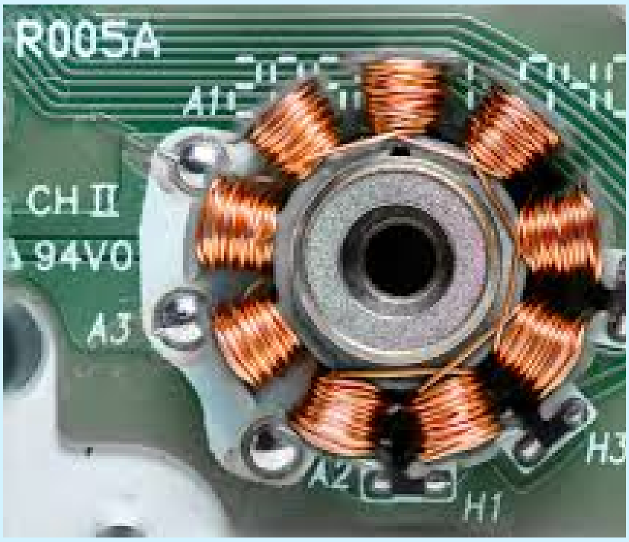
Electric Vehicle Motors

Electric vehicle motors, typically Brushless DC (BLDC) or Induction motors, are critical components determining the vehicle's performance and efficiency. Engineers focus on motor design enhancements to improve efficiency, reduce weight, and enhance overall power output. Lightweight materials, advanced cooling systems, and precise manufacturing techniques are integrated to create high-performance electric motors. Additionally, thermal management is a significant area of research. Efficient cooling systems are essential to maintain the motor's temperature within optimal ranges, ensuring consistent performance and longevity. Thermal simulations and innovative cooling solutions, such as liquid cooling or advanced heat sinks, are employed to manage the heat generated during operation effectively. Furthermore, researchers delve into motor control algorithms and software. Advanced control systems optimize torque delivery, ensuring smooth acceleration and responsiveness. Regenerative braking algorithms are refined to capture as much kinetic energy as possible during deceleration, maximizing energy efficiency and extending the driving range.





CHAVAN PRATIKSHA PRAKASH
Final Year

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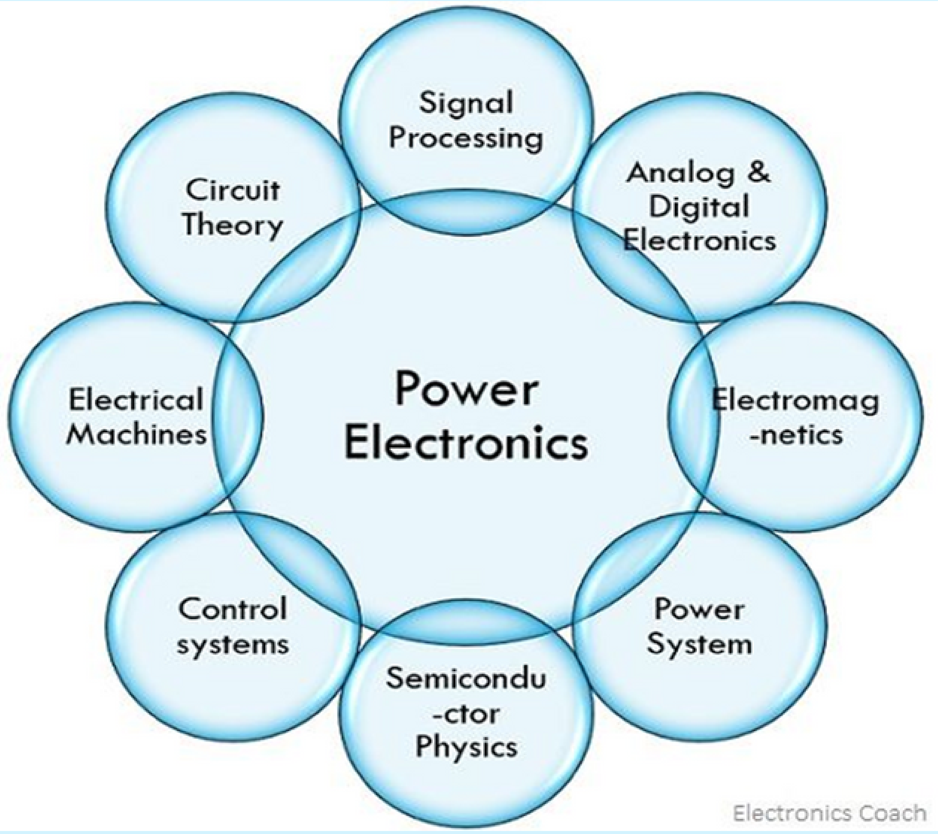
Power Electronics and Its Applications

Power electronics is a specialized field in electrical engineering that deals with the conversion and control of electrical power. It plays a crucial role in various applications, including renewable energy systems, electric vehicles, and consumer electronics. Power electronic converters, such as inverters and rectifiers, transform electrical energy between different forms, voltages, and frequencies. In renewable energy systems, inverters convert direct current (DC) generated by solar panels or wind turbines into alternating current (AC) suitable for the grid. Electric vehicles rely on power electronics for efficient battery charging and motor control. Power electronic devices, including transistors and thyristors, are continually evolving to improve efficiency, reduce losses, and enhance the overall performance of electrical systems.



BAGAL GANESH BAJIRAO
Third Year

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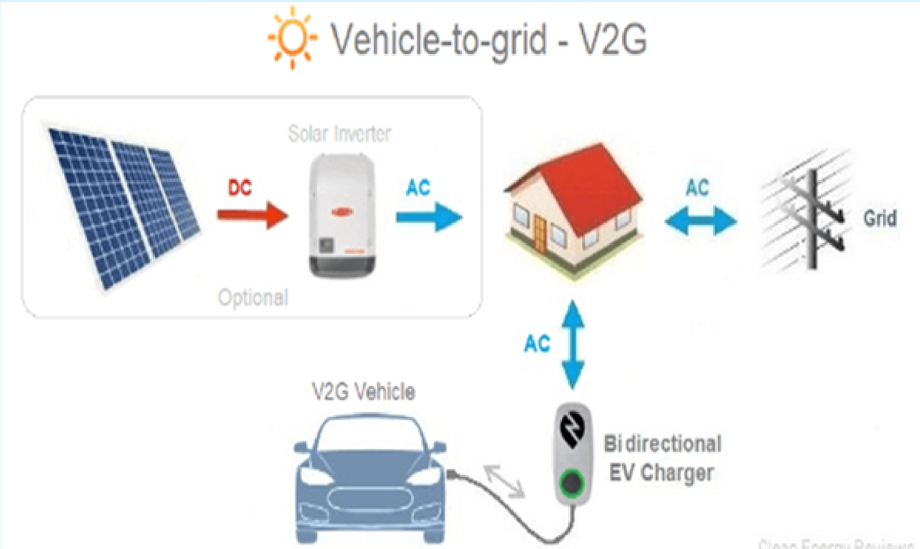
Vehicle-to-Grid (V2G) Technology

Vehicle-to-Grid (V2G) technology represents a paradigm shift in the way electric vehicles interact with the electrical grid. Traditionally, EVs draw electricity from the grid to charge their batteries. With V2G technology, the interaction becomes bidirectional, allowing EVs to discharge electricity back into the grid when needed. This bidirectional flow of energy transforms EVs into mobile energy storage units, playing a crucial role in grid stability, renewable energy integration, and demand response programs. V2G technology relies on advanced control systems and communication protocols. These systems enable seamless communication between the vehicle, charging station, and the grid. Smart algorithms determine optimal charging and discharging schedules, considering factors such as grid demand, electricity prices, and the vehicle owner's preferences. Real-time data analysis and predictive modeling are utilized to forecast grid demand, allowing EVs to supply energy precisely when it's needed most. Moreover, V2G technology plays a vital role in renewable energy integration. As the production of renewable energy, such as solar or wind power, fluctuates based on weather conditions, V2G-enabled EVs can supply energy during periods of low renewable generation. This capability ensures a stable energy supply, even when renewable sources are not generating electricity, promoting the widespread adoption of clean energy.



JADHAV TUSHAR RAJENDRA
Final Year

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Biomedical Electronics

Biomedical electronics integrates principles from electrical engineering and biology to develop devices and systems for healthcare applications. It encompasses a wide range of technologies, including medical imaging, wearable devices, and bioinformatics. Medical imaging devices, such as X-ray machines, MRI scanners, and ultrasound systems, utilize advanced electronics to capture detailed images of the human body. Wearable devices, like heart rate monitors and smart prosthetics, incorporate sensors and microcontrollers to monitor vital signs and enhance mobility. Bioinformatics, a computational biology field, employs algorithms and data analysis techniques to interpret biological data, aiding in genetic research and drug discovery. Biomedical electronics contribute significantly to improving patient care, disease diagnosis, and medical research.

KARCHE SURAJ DADASAHEB
Final year

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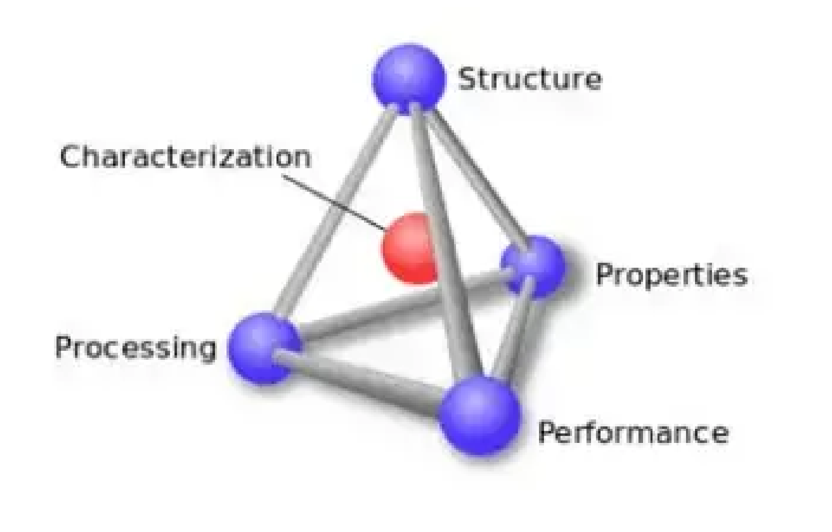
Advanced Materials in Electrical Engineering

Advanced materials, including semiconductors, nanomaterials, and metamaterials, have revolutionized electrical engineering by enabling the development of high-performance electronic devices. Semiconductors, such as silicon and gallium arsenide, form the basis of integrated circuits (ICs) used in computers, smartphones, and other electronic devices. Nanomaterials, like carbon nanotubes and graphene, exhibit unique electrical and mechanical properties, making them ideal candidates for future electronics and energy storage applications. Metamaterials are engineered materials with properties not found in natural materials, enabling the creation of devices like invisibility cloaks and high-efficiency antennas. Ongoing research in advanced materials focuses on improving their synthesis methods, scalability, and integration into practical electronic systems, paving the way for innovative technologies.

Electrical Engineering Materials

- Conductors – i.e. Silver, Copper, Gold, Aluminum etc.
- Semiconductors – i.e. Germanium, Silicon, GaAs etc.
- Insulators – Plastics, Rubbers, Mica, Insulating Papers etc.
- Magnetic materials – Iron, Silicon steel, Alnico, ferrites etc.



GARDI SURAJ DILIP
Third Year

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Autonomous Electric Vehicles

The convergence of electric vehicle technology and autonomous driving capabilities holds the promise of revolutionizing transportation. Autonomous Electric Vehicles (AEVs) combine electric propulsion with advanced sensors, Artificial Intelligence (AI), and connectivity to navigate and operate without human intervention. These vehicles utilize technologies such as LiDAR (Light Detection and Ranging), cameras, radar, and GPS to perceive their surroundings and make real-time decisions. AEVs rely on AI algorithms to process sensor data and make complex driving decisions. Machine learning models enable the vehicle to recognize and respond to various objects, such as pedestrians, cyclists, and other vehicles. Deep learning techniques enhance object detection and improve the vehicle's understanding of its environment. Engineers work on developing AI systems that can adapt to diverse driving conditions, ensuring the safe and reliable operation of AEVs in urban environments, highways, and challenging weather conditions. Connectivity is a key enabler for AEVs. Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) communication systems allow AEVs to exchange information with other vehicles and infrastructure elements. This communication enhances situational awareness, enabling collaborative behaviors such as coordinated lane changes and merging. Additionally, it supports traffic management by providing real-time data to traffic lights and road signs, optimizing traffic flow and reducing congestion. Safety is a paramount concern in autonomous driving. Engineers focus on developing redundancy in sensor systems and AI algorithms to ensure fail-safe operation.

PATIL SURAJ SADASHIV
Third Year

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Robotics and Automation in Electrical Engineering

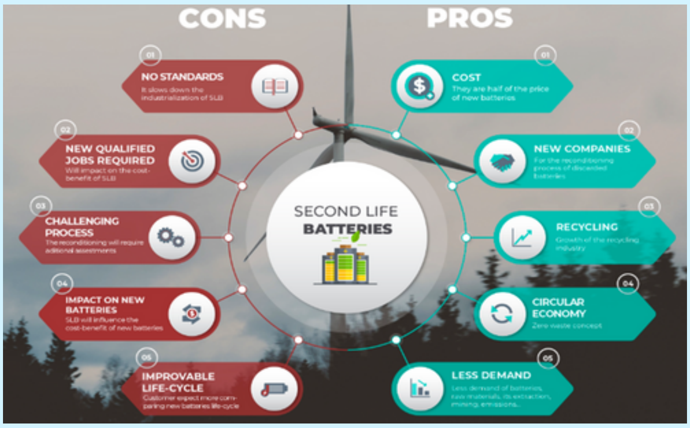
Robotics and automation technologies enhance efficiency and precision in various industries, including manufacturing, healthcare, and space exploration. Robots, equipped with sensors, actuators, and artificial intelligence algorithms, perform tasks ranging from assembly and welding to surgery and exploration. Industrial robots streamline manufacturing processes, increasing productivity and product quality.

Collaborative robots (cobots) work alongside human operators, enhancing safety and efficiency in manufacturing environments. Surgical robots assist surgeons in performing minimally invasive surgeries, reducing patient recovery times and complications. Space exploration robots, such as Mars rovers, gather data from distant planets, expanding our understanding of the universe. Advancements in robotics and automation continue to revolutionize industries, making them more competitive, safer, and technologically advanced.

KATE RISHIKESH ASHOK
Third Year

Energy Storage and Second-Life Batteries

Energy storage systems, particularly those utilizing second-life EV batteries, play a crucial role in the integration of renewable energy sources and grid stability. Used EV batteries, although no longer suitable for high-demand automotive applications, still retain a significant portion of their energy storage capacity. These retired batteries find new life in stationary energy storage applications, supporting renewable energy initiatives and providing backup power during grid outages. Researchers focus on developing efficient battery management systems for second-life applications. These systems ensure that the energy stored in retired EV batteries is utilized optimally, balancing charge and discharge cycles to prolong the battery's lifespan. Smart algorithms continuously monitor the battery's health, adapting the charging and discharging strategies based on its state of charge and overall condition. Proper management extends the operational life of second-life batteries, maximizing their usefulness in supporting grid stability and renewable energy integration. Second-life batteries are deployed in various stationary applications, ranging from residential energy storage systems to grid-scale installations. In residential settings, these batteries store excess energy generated from rooftop solar panels, enabling homeowners to use clean energy during periods of high demand or when renewable sources are not generating electricity. Grid-scale installations utilize retired EV batteries to provide large-scale energy storage, stabilizing the grid and ensuring a consistent power supply during peak demand.



NIHAR SANJAY THORAT
Second Year

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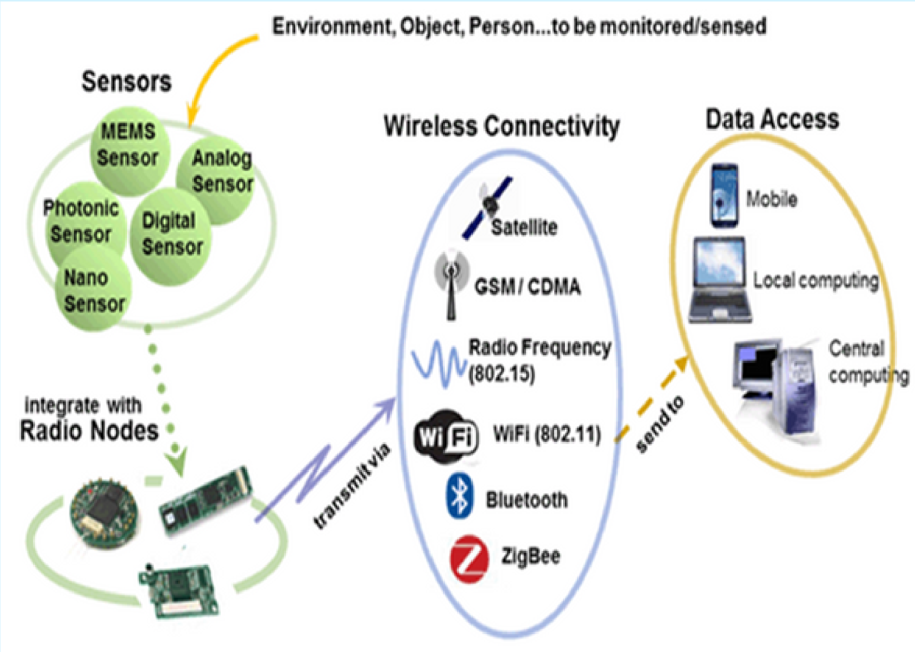
Smart Sensors and Sensor Networks

Smart sensors, equipped with microcontrollers and communication interfaces, collect data from the physical environment and transmit it for analysis and decision-making. These sensors find applications in diverse fields, including environmental monitoring, healthcare, and industrial automation. Environmental sensors measure parameters such as temperature, humidity, and pollution levels, aiding in climate research and urban planning. Healthcare sensors, like glucose monitors and wearable fitness trackers, provide real-time health data, empowering individuals to monitor and manage their well-being. Industrial sensors monitor equipment performance, detect faults, and optimize production processes. Sensor networks, consisting of interconnected sensors, enable data collection on a larger scale, facilitating smart cities, precision agriculture, and disaster management. Research in smart sensors focuses on miniaturization, energy efficiency, and data fusion techniques, enhancing their capabilities and applicability.



RUDRUKE SANIKA KISHOR
Second Year

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Flexible and Wearable Electronics

Flexible and wearable electronics represent a paradigm shift in electronic device design, enabling lightweight, bendable, and conformable devices. These electronics find applications in flexible displays, electronic textiles, and health monitoring devices. Flexible displays, based on organic light-emitting diodes (OLEDs) and other flexible materials, enable the creation of curved and rollable screens used in smartphones and televisions. Electronic textiles, incorporating conductive fibers and sensors, transform fabrics into interactive interfaces, paving the way for smart clothing and wearable tech. Health monitoring devices, like smart bands and patches, continuously monitor vital signs and transmit data to smartphones or cloud platforms. Research in flexible and wearable electronics focuses on developing stretchable materials, efficient energy storage solutions, and biocompatible sensors, expanding the possibilities for innovative, user-friendly devices.

SAHIL ABHIJIT KADAM
Second Year

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Material Science for Light weighting

Light weighting, the strategic use of lightweight materials in vehicle design, is a fundamental aspect of electric vehicle engineering. Lighter vehicles require less energy to operate, leading to extended driving ranges and improved energy efficiency. Engineers explore advanced materials such as carbon fiber composites, aluminum alloys, and high-strength steel to reduce vehicle weight while maintaining structural integrity and safety. Carbon fiber composites are exceptionally lightweight and robust, making them ideal candidates for light weighting initiatives. These materials offer high tensile strength and excellent fatigue resistance, ensuring durability while significantly reducing the vehicle's weight. Automotive engineers leverage carbon fiber composites in components like body panels, chassis elements, and interior structures, contributing to overall weight reduction and improved energy efficiency. Aluminum alloys are another key focus in light weighting efforts. Aluminum is significantly lighter than steel and exhibits excellent corrosion resistance. It is widely used in various vehicle components, including body panels, suspension systems, and powertrain components. Engineered aluminum alloys offer exceptional strength-to-weight ratios, making them essential in achieving weight reduction goals without compromising structural integrity. High-strength steel alloys play a vital role in vehicle safety and light weighting. These steels are specifically designed to withstand high impact forces, ensuring passenger safety in the event of a collision. Engineers utilize advanced forming techniques, such as hot stamping and tailored blank solutions, to create intricate shapes from high-strength steel sheets. These components enhance the vehicle's safety features while contributing to weight reduction efforts. Incorporating lightweight materials in vehicle design not only extends the driving range but also improves handling, acceleration, and overall performance. As materials science continues to advance, engineers explore innovative combinations of materials, ensuring a perfect balance between weight reduction, safety, and durability in electric vehicles

PAWAR YASH RAJENDRA
Second Year