

**YASHODA SHIKSHAN PRASARAK MANDAL, SATARA**

**YASHODA TECHNICAL CAMPUS**

**DEPARTMENT OF ELECTRICAL ENGINEERING**

# **ELECTRICAL MIRROR**

**DECEMBER 2021**

**....AN TECHNICAL MAGAZINE**



## **Department of Electrical Engineering**



**YASHODA INSTITUTES, SATARA**

**ENGINEERING (B.TECH)**      **POLYTECHNIC**      ■ INSTITUTE CODE: 6757  
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■ CIVIL ENGINEERING	■ MECHANICAL ENGINEERING ( B.Tech./M.Tech)	■ INFORMATION TECHNOLOGY	■ ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

**ARCHITECTURE (B.Arch)6880**  
**MBA / MCA / PHARMACY (D/B/M)**

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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 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**

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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.

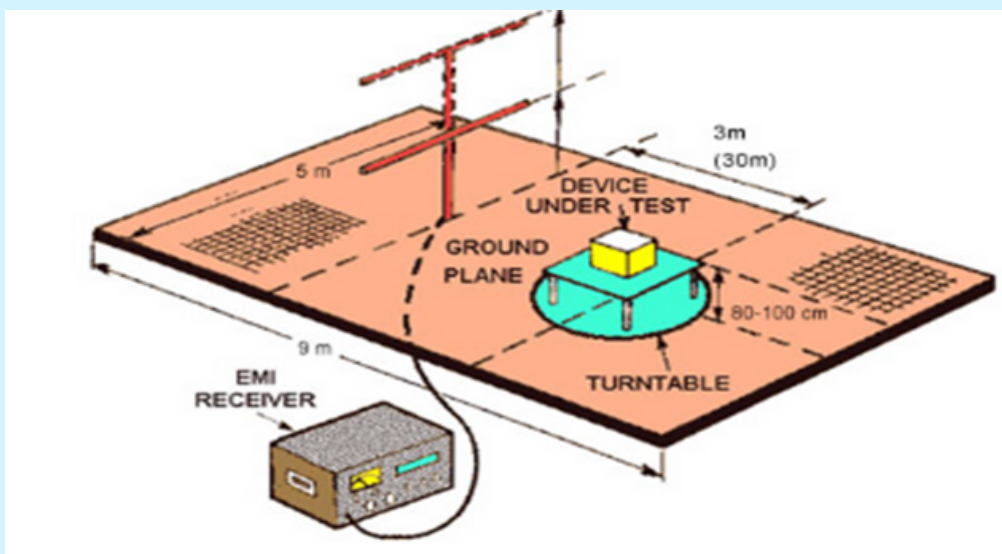
M2: Developing professional skills and right attitude among students that will help them to succeed and progress in their personal and professional career.

M3: Inculcating moral and ethical values in students with concern to society and environment.



## Electromagnetic Compatibility (EMC)

Electromagnetic Compatibility (EMC) is essential for ensuring the proper functioning of electronic devices and systems in the presence of electromagnetic interference (EMI). EMI can disrupt the operation of electronic circuits, leading to malfunctions and data corruption. EMC techniques mitigate the effects of EMI, ensuring that electronic devices operate reliably in various environments. One of the fundamental EMC practices is proper grounding, which provides a reference voltage level and prevents the buildup of static electricity. Grounding shields sensitive electronic circuits from external interference and equalizes voltage potential across interconnected devices. Electrical enclosures and devices are often grounded to prevent electrostatic discharge (ESD) events, which can damage electronic components. Shielding is another effective EMC technique, involving the use of conductive materials to create a barrier between sensitive circuits and external electromagnetic fields. Shields can be made from materials such as metal or conductive polymers, effectively blocking EMI and preventing its entry into sensitive areas of electronic devices. Shielding is especially crucial in high-frequency applications, where even small amounts of interference can disrupt signals.



MANE NIKITA TATYASO  
Final Year



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## Green Data Centers

Green data centers are energy-efficient and environmentally sustainable facilities designed to store, manage, and process digital data. Traditional data centers consume significant amounts of energy for cooling, lighting, and powering servers and networking equipment. Green data centers implement innovative technologies and practices to reduce energy consumption, minimize carbon emissions, and optimize resource utilization. Energy-efficient cooling systems are a key feature of green data centers. Traditional cooling methods, such as constant air conditioning, are replaced by advanced cooling techniques like hot aisle/cold aisle containment and economization. Hot aisle/cold aisle containment separates hot and cold air streams, preventing them from mixing and improving cooling efficiency. Economization systems use outside air to cool the data center when ambient temperatures are low, reducing the need for mechanical cooling. Virtualization technologies enable multiple virtual servers to run on a single physical server, reducing the number of physical servers required. Server consolidation through virtualization optimizes resource usage, leading to lower energy consumption and reduced hardware footprint. Green data centers also employ server management tools to dynamically adjust server workloads based on demand, ensuring that servers operate at optimal efficiency levels. Renewable energy sources, such as solar and wind power, are integrated into green data centers to generate clean electricity on-site. Solar panels installed on rooftops or nearby solar farms capture sunlight and convert it into electricity. Wind turbines harness wind energy to generate power. Combined with energy storage systems, these renewable sources provide a reliable and sustainable energy supply, reducing reliance on the grid. Energy-efficient lighting systems, such as LED lights and motion sensors, minimize electricity usage for lighting. LED lights consume significantly less energy than traditional fluorescent lights and have a longer lifespan. Motion sensors detect occupancy and adjust lighting levels accordingly, ensuring that lights are only used when needed. Energy-efficient data storage solutions, such as solid-state drives (SSDs) and data deduplication techniques, reduce the amount of physical storage space required and minimize energy consumption. SSDs consume less power and generate less heat than traditional hard disk drives (HDDs). Data deduplication eliminates redundant data, reducing the storage capacity needed and optimizing storage resources.

MANGORE ADITI ANANDA- Final year

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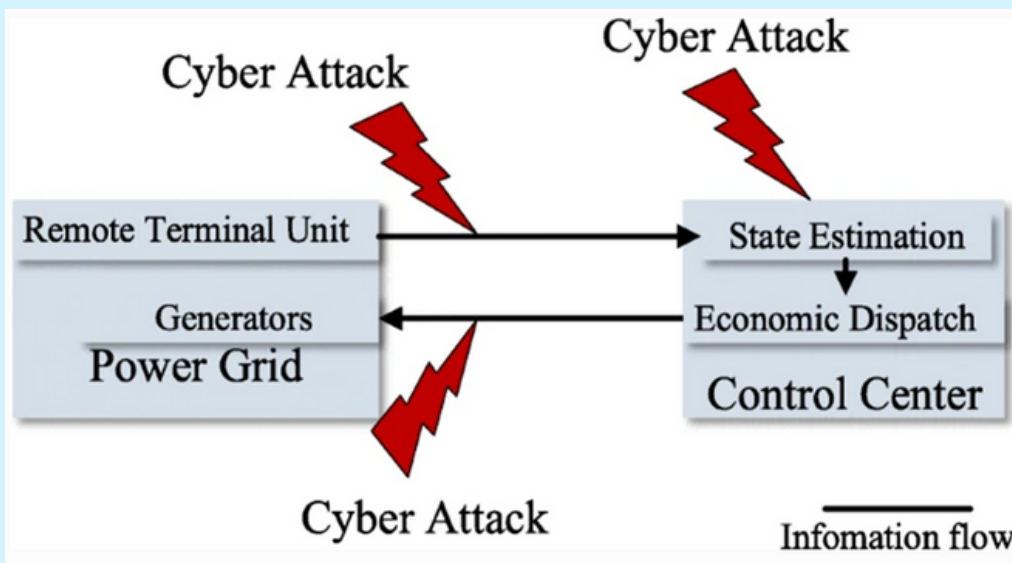
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### Cybersecurity in Electrical Systems

Cybersecurity is paramount in protecting electrical systems from cyber threats, ensuring the confidentiality, integrity, and availability of critical infrastructure. Electrical systems are vulnerable to cyber attacks, which can disrupt power generation, transmission, and distribution, leading to widespread outages and economic losses. Cybersecurity measures are implemented to prevent unauthorized access, data breaches, and malicious activities.

Encryption is a fundamental cybersecurity technique, securing data transmission and storage by converting information into unreadable formats, which can only be deciphered by authorized parties possessing the encryption keys. Advanced encryption algorithms, such as AES (Advanced Encryption Standard) and RSA (Rivest-Shamir-Adleman), are employed to protect sensitive data from eavesdropping and tampering. Network segmentation is a proactive cybersecurity measure, dividing the network into isolated segments, each with restricted access rights. By segmenting the network, the impact of a potential breach is limited to a specific segment, preventing the lateral movement of attackers. Access controls, such as firewalls and intrusion detection systems, monitor network traffic, detect anomalies, and block unauthorized access attempts, safeguarding the network from external threats.



Prof. Mali Pravin Appasaheb

## Humanitarian Projects in Electrical Engineering

Humanitarian projects in electrical engineering leverage technology to address societal challenges, providing innovative solutions to improve living conditions and empower communities. One such initiative is the implementation of microgrids in remote or underserved areas, ensuring a stable and reliable electricity supply. Microgrids integrate renewable energy sources, energy storage solutions, and advanced control systems, enabling communities to access electricity for lighting, communication, and essential appliances. Solar-powered electrification projects bring electricity to off-grid regions, utilizing solar panels to capture sunlight and generate electricity. These projects provide lighting for homes, schools, and healthcare facilities, enhancing safety and enabling educational and healthcare services. Portable solar lanterns and solar home systems offer versatile solutions, allowing individuals to charge mobile devices and access light, even in the absence of a centralized grid. Humanitarian projects also focus on water purification and sanitation, employing electrical engineering solutions to provide clean and safe drinking water. Electrodialysis and ultraviolet (UV) water disinfection systems remove impurities and pathogens from water sources, ensuring access to potable water. These technologies are particularly valuable in disaster-stricken areas, where access to clean water is limited.



Prof.Dr. Vivek Vinayak Puranik

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## Advanced Robotics in Electrical Engineering

Advanced robotics in electrical engineering involve the integration of robotic technologies in various aspects of electrical systems design, construction, maintenance, and operations. Robots equipped with sensors, AI algorithms, and automation capabilities enhance efficiency, safety, and precision in electrical engineering tasks. These robots find applications in industries ranging from power generation and distribution to maintenance and repair. Inspection robots equipped with cameras, sensors, and AI algorithms can autonomously inspect electrical infrastructure such as power lines, transformers, and substations. These robots navigate challenging terrains, climb poles, and access confined spaces to capture visual data and detect potential issues. AI algorithms analyze the data, identifying faults, wear and tear, and other anomalies, enabling preventive maintenance and reducing downtime. Maintenance robots perform routine maintenance tasks on electrical equipment, reducing the need for human workers to enter hazardous environments. These robots can replace faulty components, tighten connections, and perform cleaning tasks. By automating maintenance activities, these robots improve safety and minimize the risk of accidents for human workers. Cable-laying robots are utilized in the installation of underground power cables. These robots can dig trenches, lay cables, and cover them with soil or concrete. Automated cable-laying reduces manual labor, speeds up the installation process, and ensures precision in cable placement. These robots are equipped with sensors to detect obstacles and adjust their path accordingly. Robotic drones equipped with cameras and sensors are used for aerial inspections of electrical infrastructure. Drones can fly over power lines, substations, and solar installations, capturing high-resolution images and videos. AI algorithms process the drone data, detecting defects, vegetation encroachments, and hotspots in power lines. Drones provide a cost-effective and efficient solution for large-scale inspections of electrical systems

KOKATE AMAN SANJAY  
Third Year



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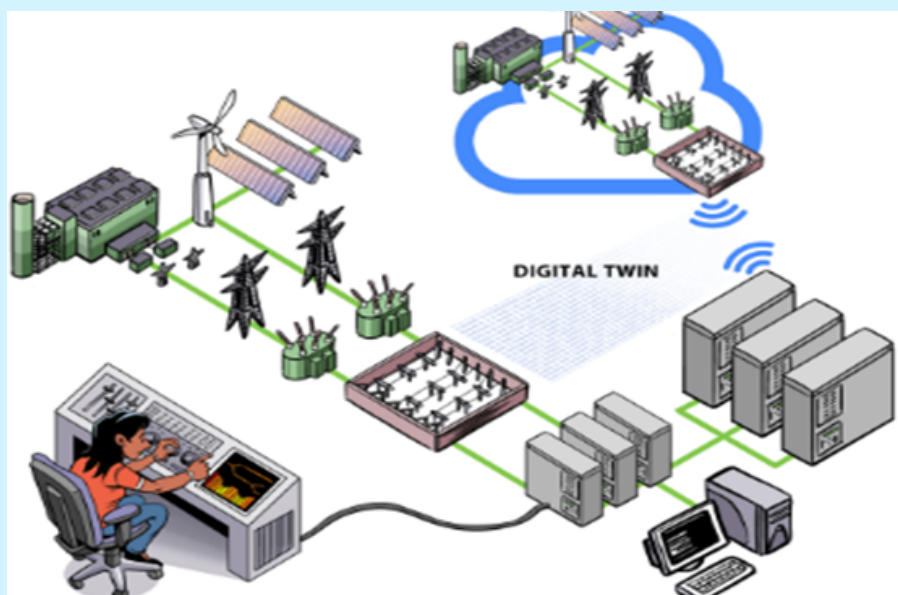
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## Digital Twin Technology in Electrical Engineering

Digital twin technology creates virtual replicas of physical systems, enabling real-time monitoring, simulation, and analysis. In electrical engineering, digital twins are utilized to model power grids, electrical components, and energy systems, providing valuable insights for optimization and decision-making. Digital twins integrate data from sensors, IoT devices, and other sources, creating a comprehensive representation of the physical system. Digital twins of power grids allow utilities to monitor electricity flow, detect faults, and optimize grid configuration. Real-time data from sensors and smart meters are fed into the digital twin, enabling predictive analysis and scenario planning. Utilities can simulate various scenarios, such as peak demand or renewable energy integration, to assess the grid's response and identify potential issues before they occur. In asset management, digital twins are employed to monitor the health and performance of electrical components, such as transformers and circuit breakers. By analyzing data from sensors embedded in these devices, engineers can assess their condition, predict maintenance needs, and optimize their lifespan. Predictive maintenance reduces downtime and repair costs, ensuring the reliable operation of electrical infrastructure.



**PATIL SUMIT SANJAY**  
Third Year



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## Human-Computer Interaction in Electrical Engineering:

Human-computer interaction (HCI) in electrical engineering focuses on designing intuitive and user-friendly interfaces for interacting with electrical systems, control panels, and software applications. HCI principles are applied to ensure that operators and users can interact with complex electrical systems efficiently, reducing the risk of errors and improving overall system performance. HCI plays a critical role in the design of control systems, monitoring interfaces, and software applications used in electrical engineering. User-centered design principles are essential in HCI, emphasizing the importance of understanding users' needs, preferences, and behaviors. Designers conduct user research, interviews, and usability testing to gather insights into how operators interact with electrical systems. This research informs the design process, ensuring that interfaces are tailored to users' mental models and workflows. Intuitive graphical user interfaces (GUIs) are designed to present complex information in a clear and understandable manner. GUI elements, such as buttons, sliders, and icons, are arranged logically to guide users through tasks. Interactive elements provide feedback, indicating the system's status, user actions, and potential errors. Consistent design patterns and visual cues enhance learnability and usability. Efficient navigation and task flow are key considerations in HCI. Menu structures, navigation paths, and interactive elements are organized to facilitate easy access to relevant information and functions. Task analysis is conducted to understand the sequence of actions users perform to complete tasks. Designers optimize task flows, minimizing the number of steps required to accomplish tasks and reducing cognitive load on users. Accessibility features ensure that electrical systems are usable by individuals with disabilities. HCI design incorporates features such as screen readers, voice commands, and keyboard shortcuts to accommodate users with visual or motor impairments. Color contrast and text size adjustments enhance readability for users with low vision. Captions and transcripts are provided for multimedia content to support users with hearing impairments. Feedback mechanisms, such as notifications, alerts, and alarms, are carefully designed to convey critical information effectively. Visual, auditory, and haptic feedback cues alert users to system status changes, warnings, and error conditions.

BARGE VITTHAL NIVRUTI

Final Year

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## Augmented Reality (AR) in Electrical Engineering

Augmented Reality (AR) technology overlays digital information onto the real world, offering immersive and interactive experiences. In electrical engineering, AR applications enhance training, maintenance, and visualization tasks. AR training simulations allow technicians to learn and practice complex procedures in a virtual environment, minimizing the risk of errors during real-world tasks. Interactive 3D models and animations provide detailed insights into electrical components and systems, improving technicians' understanding and skills. Maintenance procedures benefit from AR applications, providing technicians with real-time information and guidance. AR glasses or headsets display relevant data, schematics, and step-by-step instructions directly in the technician's field of view. This hands-free approach improves efficiency and accuracy, allowing technicians to diagnose issues, perform repairs, and conduct preventive maintenance tasks effectively. AR visualization tools enhance the design and planning phases of electrical engineering projects. Engineers and architects can visualize electrical systems in the context of the physical environment, identifying optimal locations for components and ensuring compliance with safety regulations. AR allows stakeholders to interact with virtual prototypes, making informed decisions about system configurations and layouts.



SHINGATE YASH DEEPAK  
Second Year



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## Electrification of Transportation

The electrification of transportation involves transitioning from traditional fossil fuel-powered vehicles to electric vehicles (EVs) and hybrid electric vehicles (HEVs). Electrified transportation reduces greenhouse gas emissions, air pollution, and dependence on fossil fuels. This shift toward sustainable transportation includes advancements in battery technology, charging infrastructure, and smart grid integration. Electric vehicles (EVs) are powered by electric motors and use rechargeable batteries as their energy source. EVs produce zero tailpipe emissions, contributing to cleaner air and reduced carbon emissions. Lithium-ion batteries, the most common type of batteries used in EVs, store and provide energy to drive the vehicle. Battery technology advancements focus on increasing energy density, reducing charging times, and extending battery lifespan. Charging infrastructure for EVs includes various charging levels, ranging from standard household outlets (Level 1) to high-power DC fast charging stations (Level 3). Level 1 chargers are suitable for overnight charging at home and are compatible with most EVs. Level 2 chargers offer faster charging and are commonly found in public charging stations and commercial areas. Level 3 chargers, also known as fast chargers, provide rapid charging for long-distance travel and can charge an EV to 80% capacity in a relatively short time. Smart grid integration plays a vital role in supporting the electrification of transportation. Smart charging solutions enable communication between EVs and the grid, allowing for dynamic charging management based on grid demand and electricity prices. Vehicle-to-grid (V2G) technology enables bidirectional energy flow, allowing EVs to discharge stored energy back to the grid during peak demand periods. V2G technology supports grid stability and provides additional revenue streams for EV owners. Public incentives and subsidies encourage the adoption of electric vehicles. Governments offer tax credits, rebates, and reduced registration fees for EV buyers. Incentives support the development of EV technology, reduce the overall cost of ownership, and promote the growth of charging infrastructure. Additionally, cities and municipalities invest in public transportation electrification, deploying electric buses and trains to reduce emissions and improve urban air quality.

SNEHA SANTOSH CHAVAN

Second Year

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## Ethical Considerations in Electrical Engineering

Ethical considerations are integral to the practice of electrical engineering, guiding professionals and researchers in their decision-making processes. Privacy concerns arise in the development and implementation of IoT devices and smart technologies. Ethical engineers prioritize user privacy, ensuring that data collected by these devices is protected and used responsibly. Transparency and informed consent are essential, allowing users to understand the data collection practices and giving them control over their personal information. Environmental impact assessment is crucial in the design and deployment of electrical systems. Engineers must evaluate the environmental consequences of their projects, considering factors such as energy consumption, resource depletion, and emissions. Sustainable practices, such as energy efficiency measures and the use of renewable energy sources, are essential to minimize the ecological footprint of electrical engineering projects. Social responsibility in electrical engineering involves addressing societal needs and promoting inclusivity. Engineers should consider accessibility in their designs, ensuring that electrical devices and systems are usable by individuals with disabilities. Humanitarian projects, such as electrification initiatives in underserved regions, exemplify the social impact of electrical engineering. Engineers engaged in these projects focus on improving living conditions, providing education, and fostering community development.

In conclusion, ethical considerations in electrical engineering encompass privacy protection, environmental stewardship, and social responsibility. By upholding ethical standards and integrating these principles into their work, electrical engineers contribute to a sustainable, inclusive, and responsible future



Prof. Pawashe Anup



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## Quantum Computing in Electrical Engineering

Quantum computing is a cutting-edge field in electrical engineering that leverages the principles of quantum mechanics to perform complex computations at an unprecedented scale. Quantum computers use quantum bits, or qubits, which can exist in multiple states simultaneously, enabling parallel processing of vast amounts of information. Quantum computing has the potential to revolutionize various applications, including cryptography, optimization problems, and materials science. Quantum key distribution (QKD) systems enable the exchange of cryptographic keys between parties in a way that is theoretically secure against eavesdropping. Quantum key distribution relies on the principles of quantum superposition and entanglement to detect any attempt to intercept the quantum keys, ensuring the confidentiality of communication. Quantum machine learning combines quantum computing with machine learning algorithms, enabling the processing and analysis of large datasets. Quantum machine learning algorithms leverage the parallel processing capabilities of quantum computers to solve complex optimization problems and improve pattern recognition tasks. Quantum machine learning has the potential to revolutionize fields such as data analysis, artificial intelligence, and drug discovery. In conclusion, the field of electrical engineering encompasses a wide array of topics and technologies, ranging from renewable energy systems and smart grids to quantum computing and advanced robotics. These advancements continue to shape the future of technology, enabling sustainable energy solutions, efficient communication networks, and innovative applications in various industries. As research and innovation in electrical engineering progress, the potential for transformative technologies and their positive impact on society remains limitless.

THORAT OMKAR MILIND  
Final Year



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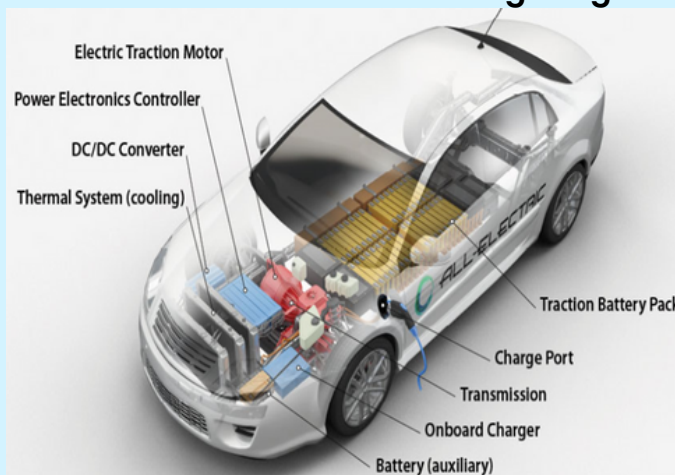
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## Electric Vehicle Technology

Electric Vehicle (EV) technology represents a transformative leap in the automotive industry, ushering in an era of sustainable transportation. At its core, EV technology revolves around the implementation of electric motors powered by rechargeable batteries. These batteries, primarily lithium-ion-based, store and provide energy for the vehicle's electric propulsion system. Unlike traditional internal combustion engine vehicles, EVs produce zero tailpipe emissions, making them a vital component in the global effort to mitigate climate change and reduce air pollution. The heart of an EV is its battery pack. Lithium-ion batteries are favored due to their high energy density, enabling vehicles to travel longer distances on a single charge. Engineers continuously work on improving the efficiency, energy density, and lifespan of these batteries. Research in battery technology explores materials like solid-state electrolytes, which promise higher energy density, faster charging, and improved safety compared to conventional liquid electrolytes. In addition to batteries, power electronics play a significant role in EVs. Power electronics convert the direct current (DC) stored in the battery into alternating current (AC) to drive the electric motor. These components, such as inverters and converters, ensure seamless power flow, optimizing the vehicle's performance and efficiency. Moreover, regenerative braking systems are integrated into EVs, capturing kinetic energy during braking and converting it back into electrical energy to recharge the battery. This innovation enhances energy efficiency, prolongs brake life, and maximizes the overall driving range of the vehicle.



**CHOUGULE UMA ASHOK**  
Third year



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 ARTIFICIAL INTELLIGENCE & DATA SCIENCE  
 COMPUTER SCIENCE & ENGINEERING  
 CIVIL ENGINEERING

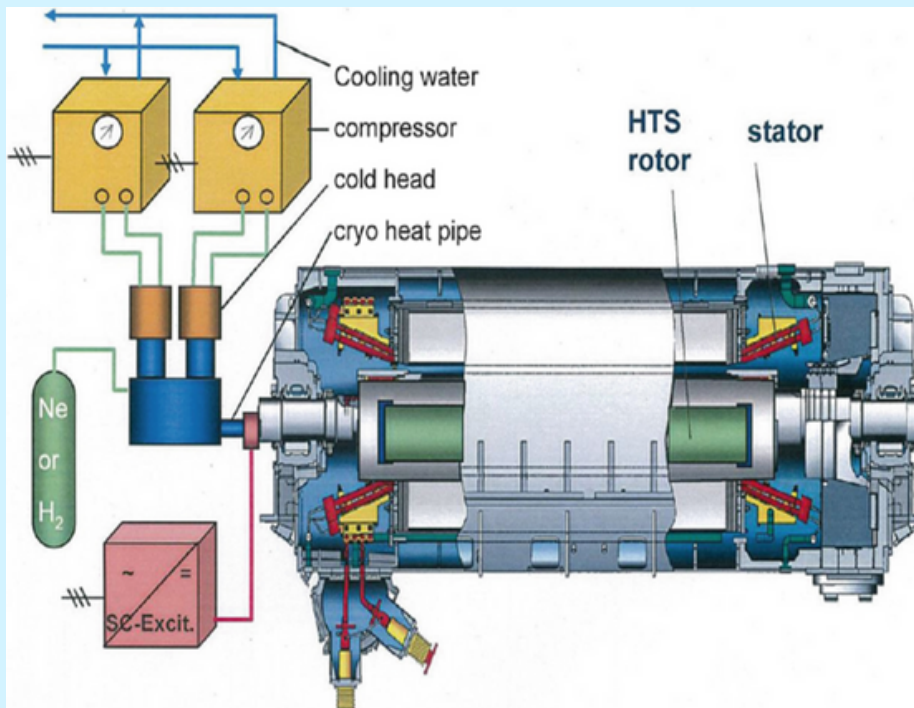
 ELECTRICAL ENGINEERING  
 ELECTRONICS & TELECOMMUNICATION ENGINEERING  
 MECHANICAL ENGINEERING ( B.Tech./M.Tech)

 COMPUTER ENGINEERING  
 CIVIL ENGINEERING  
 INFORMATION TECHNOLOGY

 ELECTRICAL ENGINEERING  
 MECHANICAL ENGINEERING  
 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

## Superconductivity in Electrical Engineering

Superconductivity, a phenomenon observed in certain materials, enables the flow of electric current without resistance. This unique property has transformative implications for electrical engineering. Superconductors find applications in various fields, including power transmission, medical imaging, and particle accelerators. In power transmission, superconducting cables minimize energy losses during electricity distribution, making the grid more efficient. Magnetic resonance imaging (MRI) machines utilize superconducting magnets for high-resolution medical imaging. Superconducting quantum interference devices (SQUIDs) are employed in extremely sensitive measurements, including brain activity and geological exploration. Ongoing research focuses on developing high-temperature superconductors for practical applications, potentially revolutionizing the energy and healthcare sectors.



TONSHAL RUPESH RAJKUMAR  
Second Year



**YASHODA INSTITUTES, SATARA**

**ENGINEERING (B.TECH)**

**POLYTECHNIC**

INSTITUTE CODE: 6757

NAAC B+

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