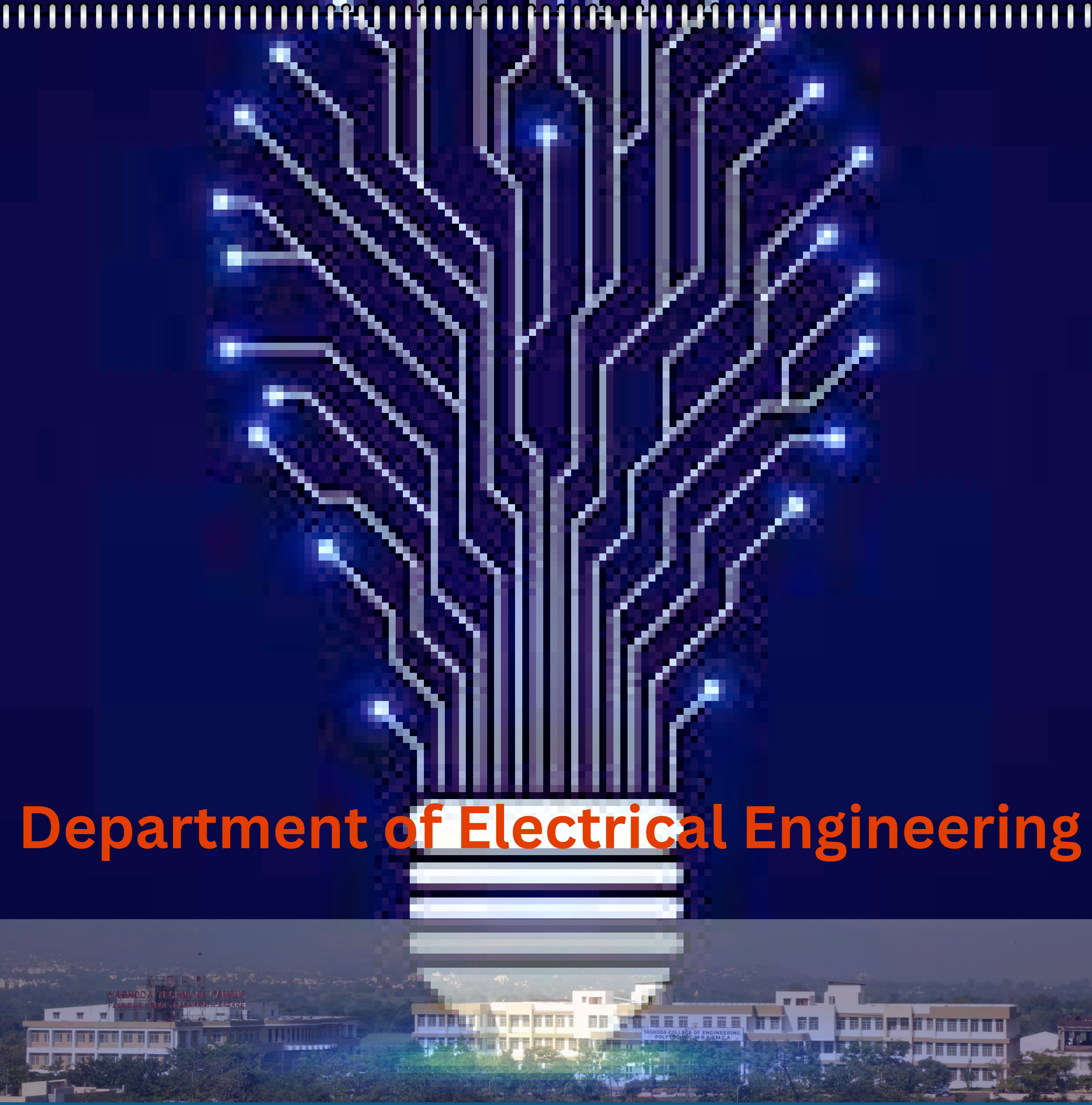
YASHODA SHIKSHAN PRASARAK MANDAL, SATARA
YASHODA TECHNICAL CAMPUS
DEPARTMENT OF ELECTRICAL ENGINEERING

ELECTRICAL MIRROR

December 2020

....AN TECHNICAL MAGAZINE



Department of Electrical Engineering

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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 2020-21 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.

Power Grid Modernization:

Power grid modernization refers to the comprehensive upgrade of the existing electrical grid infrastructure to meet the demands of the digital age. With the integration of renewable energy sources, electric vehicles, and smart technologies, the traditional grid system needs transformation. Modernization initiatives focus on enhancing grid reliability, flexibility, and efficiency through the integration of advanced sensors, communication networks, and real-time data analytics. Smart meters, equipped with two-way communication capabilities, allow utilities and consumers to monitor electricity usage in real time. This data is invaluable for load forecasting, grid optimization, and demand response programs. Advanced sensors placed on transformers, power lines, and substations detect anomalies and potential failures, enabling proactive maintenance and minimizing downtime. Grid modernization also involves the deployment of energy storage systems, such as large-scale batteries and pumped hydro storage, to store excess energy generated during periods of low demand and release it during peak times. This balances supply and demand, ensuring a stable electricity supply even when renewable sources are intermittent. Furthermore, grid modernization initiatives integrate cyber security measures to protect against cyber threats and ensure the grid's resilience. Encryption, firewalls, and intrusion detection systems are implemented to safeguard data and prevent unauthorized access. By embracing these advancements, power grid modernization lays the foundation for a sustainable, reliable, and technologically advanced energy future.

DANANE MADHURI VIJAY- Final Year

YASHODA INSTITUTES, SATARA
ENGINEERING (B.TECH)
- ARTIFICIAL INTELLIGENCE & DATA SCIENCE
- COMPUTER SCIENCE & ENGINEERING
- CIVIL ENGINEERING
- ELECTRICAL ENGINEERING
- ELECTRONICS & TELECOMMUNICATION ENGINEERING
- MECHANICAL ENGINEERING (B.Tech./M.Tech)
POLYTECHNIC
- COMPUTER ENGINEERING
- CIVIL ENGINEERING
- INFORMATION TECHNOLOGY
- ELECTRICAL ENGINEERING
- MECHANICAL ENGINEERING
- ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
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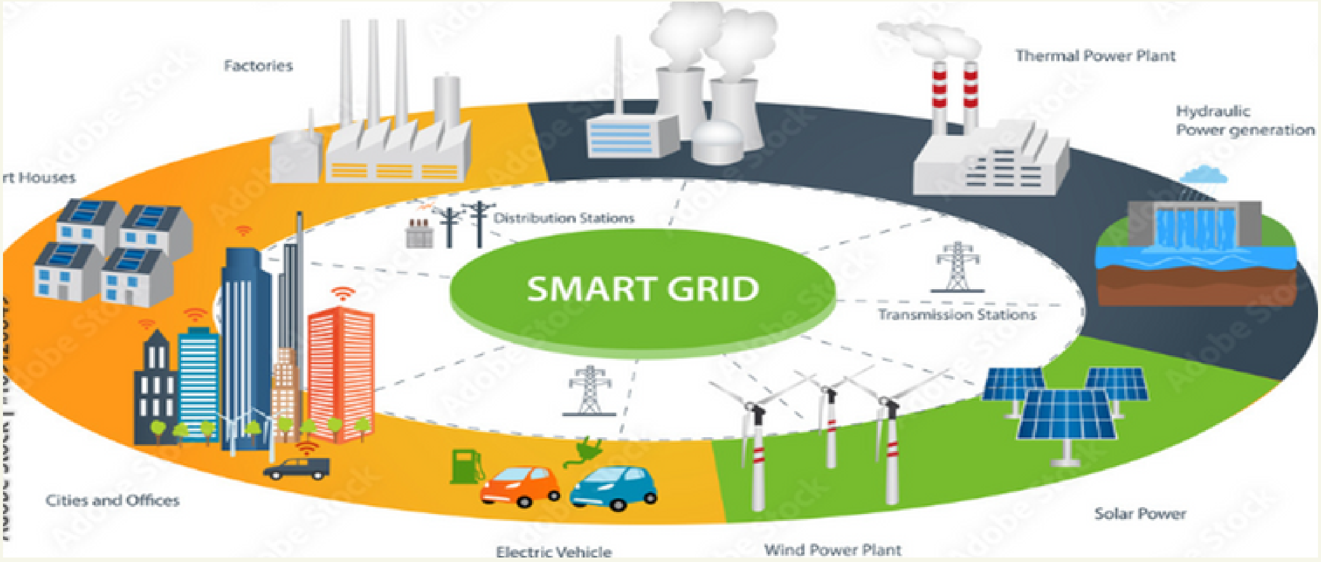
Renewable Energy Sources

Renewable energy sources are at the forefront of the global push towards sustainable energy solutions. Solar power, derived from harnessing the sun's energy through photovoltaic cells, has seen remarkable advancements, making it an increasingly viable and affordable option for both residential and industrial applications. Wind energy, generated through wind turbines, is a key player in the renewable energy landscape, with vast wind farms harnessing the power of the wind to produce electricity. Hydroelectric power, generated by flowing water, remains a reliable and mature source of renewable energy, with hydroelectric plants operating in various parts of the world. One of the significant challenges in renewable energy is energy storage. Innovative solutions, such as advanced battery technologies and grid-scale energy storage systems, are being developed to store excess energy generated during peak times for use when demand is high or supply is low. Additionally, research is ongoing in the field of geothermal energy, tapping into the Earth's natural heat for electricity generation, and wave energy, harnessing the power of ocean waves to produce clean electricity.

KAMANE KAJOL MAHESH
Final Year

Smart Grid Technology

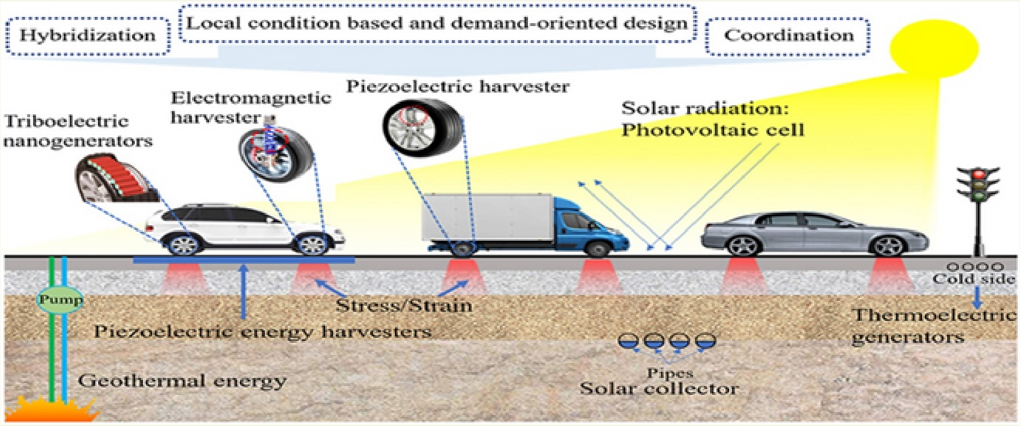
Smart grids are the backbone of the future energy landscape, integrating advanced communication, control, and computing technologies into the existing electricity grid. By deploying sensors, smart meters, and other intelligent devices, smart grids enable real-time monitoring of electricity usage. These data points are then analyzed to optimize energy distribution, reducing wastage and improving efficiency. Through IoT devices and robust data analytics, smart grids empower consumers to make informed decisions about their energy consumption patterns, promoting energy conservation. In addition to enhancing efficiency, smart grids enhance the grid's resilience and reliability. They enable self-healing capabilities, where the grid can automatically detect and respond to faults, minimizing downtime. Moreover, smart grids facilitate the integration of renewable energy sources by efficiently managing their intermittent nature. They enable bidirectional communication, allowing consumers with solar panels or wind turbines to feed excess energy back into the grid.



Prof. Pawashe Anup

Energy Harvesting Technologies

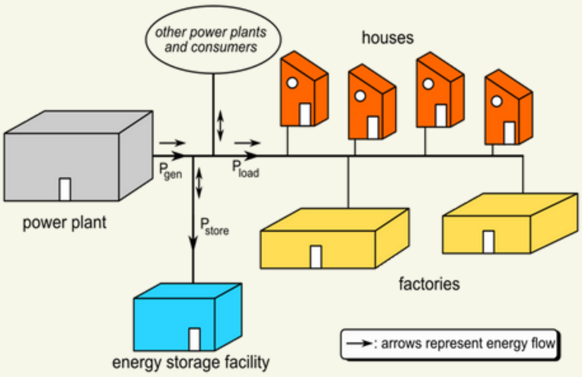
Energy harvesting technologies capture and convert ambient energy from the environment into usable electrical energy. These technologies play a vital role in powering low-power electronic devices, sensors, and IoT devices in remote or inaccessible locations where traditional power sources are impractical. Various forms of ambient energy, including solar, thermal, vibration, and RF (radiofrequency) energy, are harnessed using specialized devices and systems. Solar energy harvesting involves the use of photovoltaic cells to convert sunlight into electricity. These cells, often integrated into small panels, generate power during daylight hours, making them ideal for outdoor sensors and devices. Thermal energy harvesting utilizes temperature differences to generate electricity. Thermoelectric generators convert heat gradients into electrical power, allowing for energy extraction from sources like industrial machinery or body heat. Vibration energy harvesting employs piezoelectric materials or electromagnetic induction to convert mechanical vibrations into electrical energy. This technology is valuable in applications where machinery or natural vibrations are present, such as in industrial environments or wearable devices. RF energy harvesting captures energy from radiofrequency signals, often using antennas and rectifiers to convert RF waves into direct current (DC) electricity. This technology is used in RFID (radio-frequency identification) systems and wireless sensor networks. Energy harvesting technologies are particularly beneficial in remote monitoring systems, agricultural sensors, healthcare devices, and wearable electronics. By reducing the reliance on disposable batteries and enabling self-sufficient power sources, these technologies contribute to environmental sustainability and the advancement of IoT applications.



DHANE DHANANJAY SURESH
Third Year

Grid Energy Storage

Grid energy storage systems store excess electricity generated during periods of low demand and release it during peak demand times. These systems enhance grid stability, balance supply and demand, and support the integration of renewable energy sources. Various energy storage technologies, including batteries, pumped hydro storage, compressed air energy storage, and flywheels, are deployed at different scales to meet the specific requirements of the grid. Batteries are widely used in grid energy storage due to their flexibility and scalability. Lithium-ion batteries, in particular, are prevalent in grid-scale applications, providing high energy density and fast response times. These batteries store energy during periods of excess generation, such as sunny or windy days, and discharge it during high-demand periods or when renewable sources are unavailable. Pumped hydro storage is one of the oldest and most efficient forms of grid energy storage. It involves pumping water from a lower reservoir to an upper reservoir during periods of low demand and releasing it through turbines to generate electricity during peak demand times. Pumped hydro storage systems offer high energy efficiency and can respond quickly to fluctuations in demand. Compressed air energy storage (CAES) systems store energy by compressing air into underground caverns or tanks. During discharge, the compressed air is released and heated, driving turbines connected to generators to produce electricity. CAES systems offer large-scale energy storage capabilities and are particularly suited for grid stabilization and supporting renewable energy integration. Flywheel energy storage systems store energy in the form of kinetic energy by spinning a massive rotor at high speeds. During discharge, the rotor's rotational energy is converted back into electricity. Flywheels provide rapid response times and can serve as backup power sources during grid disturbances.



PATANE AARTI VIJAY
Final Year

Advanced Power System Protection

Advanced power system protection technologies are essential for ensuring the reliable and safe operation of electrical grids. These technologies detect and isolate faults, prevent equipment damage, and minimize downtime. Protective relays, which monitor electrical parameters such as voltage, current, and frequency, play a crucial role in power system protection. Numerical relays, equipped with microprocessors, offer advanced features such as adaptive protection settings and fault recording capabilities. They can analyze complex waveforms and provide accurate fault location information. Digital relays communicate with other devices in the grid, enabling coordinated protection schemes and rapid fault isolation. Synchrophasors, synchronized phasor measurement units, provide real-time data on voltage and current phasors across the grid. By analyzing synchrophasor data, grid operators can assess the grid's stability, detect oscillations, and identify potential issues before they escalate into major disturbances. Wide-area monitoring systems (WAMS) use synchrophasor data from multiple locations to assess the overall grid's stability and dynamics. These systems enable early detection of grid-wide disturbances, allowing operators to take corrective actions promptly. Fault location algorithms utilize data from sensors and protective relays to pinpoint the location of faults on power lines. These algorithms analyze fault signatures, such as current and voltage waveforms, and use algorithms to calculate the fault's distance from specific grid points. Rapid fault location reduces downtime and enables faster restoration of power

MULIK ABHIJEET BRAHMADEO
Third Year

Internet of Things (IoT) in Electrical Engineering

The Internet of Things (IoT) has ushered in an era of connectivity and intelligence, transforming electrical engineering in profound ways. IoT devices, equipped with sensors and communication capabilities, are integrated into various electrical systems, enabling remote monitoring and control. In smart homes, IoT devices automate lighting, heating, and security systems, enhancing comfort and energy efficiency. In industrial settings, IoT sensors collect real-time data from machines and equipment, enabling predictive maintenance and optimizing operational efficiency. The integration of IoT in energy systems has led to the concept of smart meters. These devices provide detailed insights into electricity usage patterns, allowing consumers to monitor and manage their energy consumption effectively. Smart grids, equipped with IoT sensors, monitor the health of the grid, detect faults instantaneously, and reroute electricity flow, ensuring a stable and reliable supply.

Dr. Vivek Vinayak Puranik

Energy Efficiency in Buildings

Energy efficiency in buildings is crucial for reducing energy consumption, lowering greenhouse gas emissions, and promoting sustainable urban development. Building design, insulation, lighting, HVAC (heating, ventilation, and air conditioning) systems, and appliances all contribute to a building's energy efficiency. Energy-efficient building design incorporates passive design strategies, such as optimal orientation, natural daylighting, and strategic placement of windows, to minimize the need for artificial lighting and reduce heating and cooling loads. High-performance insulation materials, such as spray foam and aerogels, provide effective thermal barriers, preventing heat transfer and reducing the building's reliance on heating and cooling systems. Energy-efficient lighting technologies, including LEDs and CFLs, are used to replace traditional incandescent bulbs, reducing lighting-related energy consumption. Smart lighting systems, equipped with sensors and automation, adjust lighting levels based on occupancy and natural light availability, further optimizing energy usage. HVAC systems, responsible for a significant portion of a building's energy consumption, are designed with energy efficiency in mind. Variable refrigerant flow (VRF) systems, geothermal heat pumps, and advanced control systems regulate indoor temperatures efficiently. Regular maintenance and timely replacement of air filters improve HVAC system performance, ensuring optimal energy efficiency. Energy Star-rated appliances and equipment, such as refrigerators, washing machines, and air conditioners, meet strict energy efficiency standards set by regulatory agencies. These appliances consume less energy during operation, saving both electricity and money for consumers. Building energy management systems (BEMS) integrate various building systems, including lighting, HVAC, and security, into a centralized control platform. BEMS analyze real-time data, enabling automated control and optimization of energy usage. By monitoring energy consumption patterns and identifying inefficiencies, BEMS facilitate proactive energy management and reduce overall building energy consumption.

Thakare Bhushan Kashinath
Second Year

Advanced Materials in Electrical Engineering

Advanced materials play a pivotal role in advancing electrical engineering technologies, enabling the development of high-performance electronic devices, sensors, and energy storage systems. Graphene, a single layer of carbon atoms arranged in a hexagonal lattice, exhibits remarkable electrical conductivity, mechanical strength, and thermal properties. Graphene-based materials are utilized in flexible electronics, high-speed transistors, and energy storage devices like super capacitors. Nanomaterials, including nanoparticles and nanocomposites, are engineered at the nanoscale level, offering unique properties due to their small size. Nanocomposites, combining nanoparticles with polymers or metals, enhance material strength, thermal conductivity, and electrical conductivity. These composites find applications in high-voltage insulation, printed electronics, and lightweight components for aerospace and automotive industries. Superconducting materials, which exhibit zero electrical resistance at low temperatures, enable the development of high-efficiency electrical transmission systems and powerful magnets for medical devices and scientific research. High-temperature superconductors, discovered in the late 20th century, operate at relatively higher temperatures, making them more practical for various applications. Quantum dots, semiconductor nanocrystals, emit specific wavelengths of light based on their size, making them valuable in LED displays, solar cells, and biological imaging. Quantum dot-based LEDs offer vibrant colors and energy-efficient lighting solutions.

Inamdar Afaroj Sikandar
Second Year

Artificial Intelligence in Power Systems

Artificial Intelligence (AI) is revolutionizing power systems by introducing predictive analytics, machine learning algorithms, and advanced data processing techniques. These technologies analyze vast amounts of data generated by power grids, enabling accurate forecasting of electricity demand. Predictive maintenance, a key application of AI, uses algorithms to identify potential issues in power generation and distribution equipment before they escalate into failures, minimizing downtime and repair costs.

Machine learning algorithms are employed in load forecasting, where historical consumption data is analyzed to predict future demand accurately. By understanding consumption patterns, utilities can optimize their energy production and distribution, reducing wastage and ensuring a stable supply. AI also plays a crucial role in grid management, detecting anomalies and adapting the grid's configuration in real time. This proactive approach enhances the grid's resilience and reliability, ensuring uninterrupted power supply to consumers.

Prof. Kolambkar Sudin Vinayak

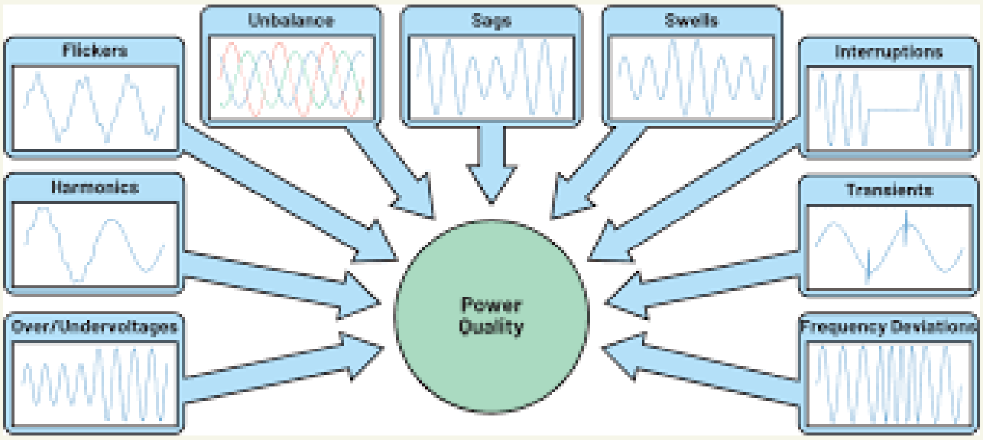
Energy Storage Solutions

Energy storage solutions are essential components of modern energy systems, addressing the intermittent nature of renewable energy sources and balancing supply and demand. Advanced battery technologies, including lithium-ion batteries, are widely used for energy storage due to their high energy density and efficiency. These batteries store excess energy generated during periods of high renewable energy production, releasing it during peak demand times or when renewable sources are unavailable. Super capacitors, another energy storage technology, offer rapid charging and discharging capabilities. They are ideal for applications requiring bursts of energy, such as regenerative braking systems in electric vehicles. Thermal storage systems, utilizing phase-change materials, store and release energy by changing their physical state, providing efficient heating and cooling solutions. Grid-scale energy storage solutions, such as pumped hydro storage and compressed air energy storage, store large quantities of energy for entire communities. Pumped hydro storage uses excess electricity to pump water to a higher elevation, releasing it later to generate electricity when demand is high. Compressed air energy storage compresses air into underground caverns, releasing it to drive turbines during peak demand periods.

NIKAM AISHWARYA CHANDRAKANT

Power Quality Monitoring and Improvement

Power quality monitoring and improvement involve measures to ensure the stability, reliability, and efficiency of electrical power supply. Poor power quality, characterized by voltage fluctuations, harmonics, and surges, can damage electronic devices, disrupt operations, and lead to financial losses. Power quality monitoring systems continuously analyze electrical parameters, identify anomalies, and implement corrective measures to maintain high-quality power supply. Voltage sag and swell events, characterized by temporary decreases or increases in voltage levels, can disrupt sensitive equipment. Voltage monitoring devices detect these events and activate compensators, such as voltage regulators, to stabilize the voltage supply. Voltage regulators adjust the voltage levels to within acceptable limits, preventing damage to connected devices. Harmonics, generated by nonlinear loads such as computers and variable frequency drives, can distort voltage and current waveforms. Harmonic filters, consisting of capacitors, inductors, and resistors, are installed to mitigate harmonic distortion. These filters absorb harmonic currents and maintain sinusoidal waveforms, ensuring the smooth operation of electrical equipment. Transient overvoltages, or voltage surges, can result from lightning strikes, switching operations, or faults in the grid. Surge protectors and lightning arresters are deployed to divert excess energy from surges away from connected devices. Surge protectors absorb the energy and dissipate it harmlessly, preventing voltage spikes from damaging sensitive electronics.



ZORE SUNIL SHAMRAV
Final Year