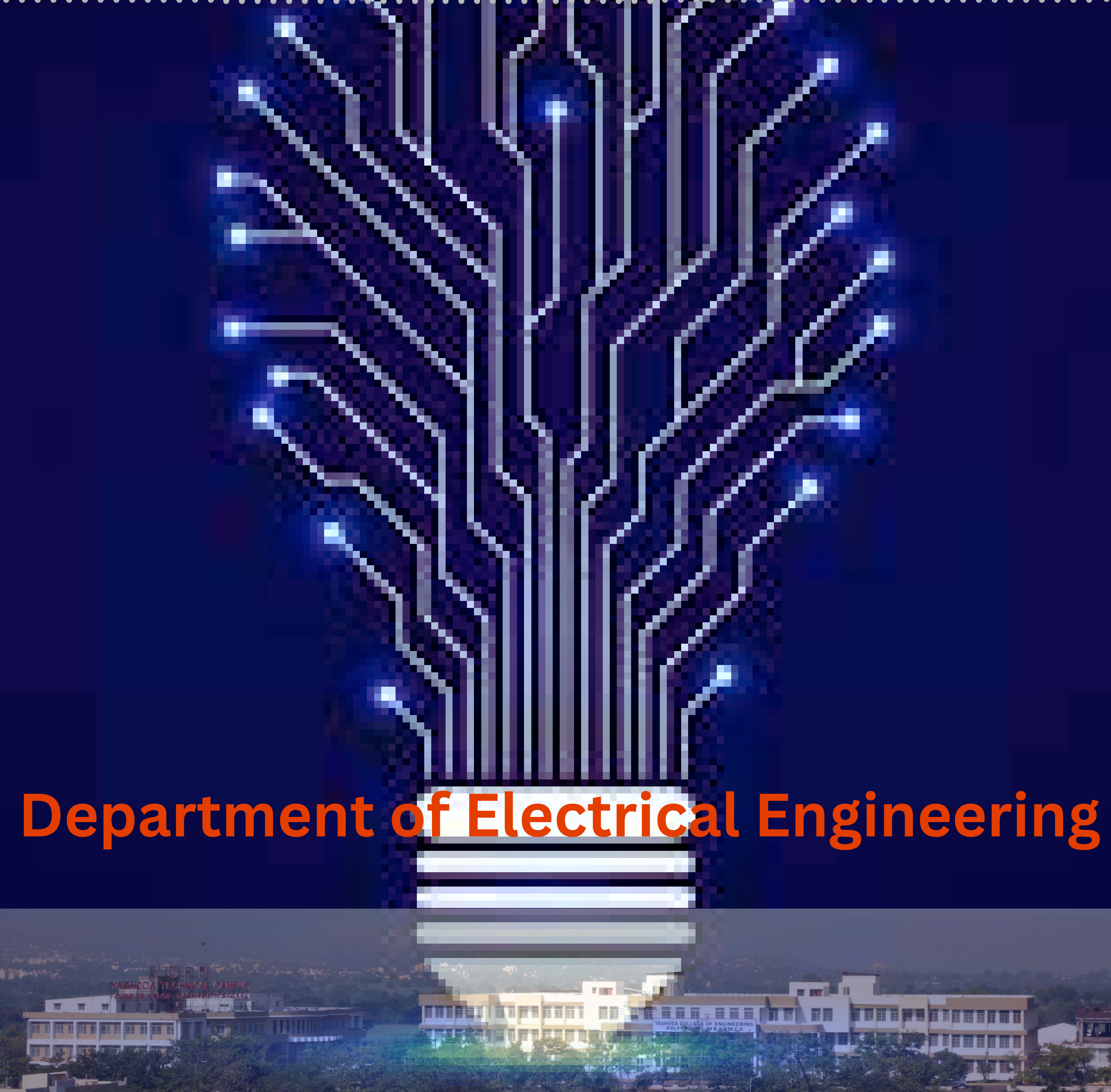
YASHODA SHIKSHAN PRASARAK MANDAL, SATARA
YASHODA TECHNICAL CAMPUS
DEPARTMENT OF ELECTRICAL ENGINEERING

ELECTRICAL MIRROR

MAY 2021

....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 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

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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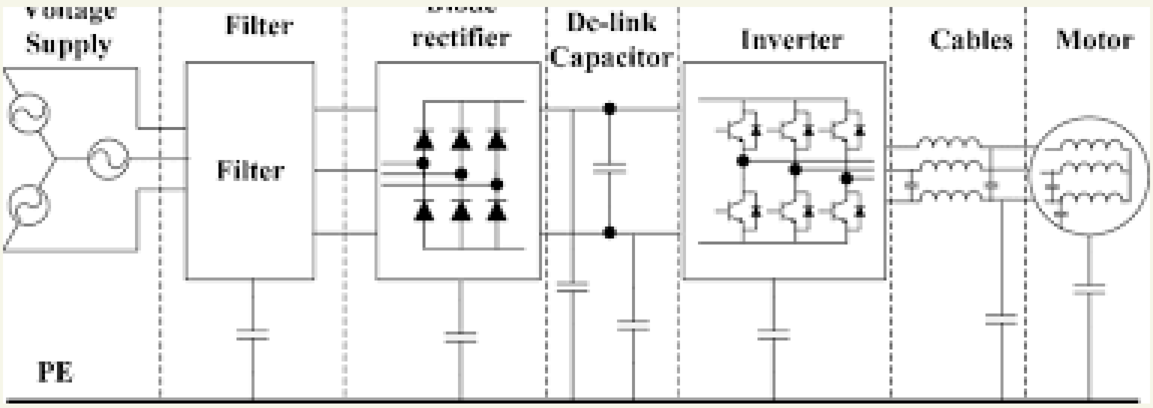
Power Electronics and Drives

Power electronics and motor drives are fundamental components in various electrical systems, controlling the conversion and distribution of electrical energy. Power electronic devices, such as diodes and transistors, regulate the voltage and current flow in electronic circuits, ensuring efficient energy usage. Converters, including rectifiers and inverters, transform direct current (DC) into alternating current (AC) and vice versa, enabling the integration of renewable energy sources into the grid. Motor drives, powered by power electronics, regulate the speed and torque of electric motors. Variable frequency drives (VFDs) are widely used in industrial applications, allowing precise control of motor speed and optimizing energy usage. In renewable energy systems, motor drives adjust the rotor speed of wind turbines and control the flow of water in hydroelectric plants, maximizing energy extraction from these sources. Power electronics and motor drives also play a vital role in electric vehicles (EVs). In EV propulsion systems, power electronics manage the power flow from the battery to the motor, ensuring efficient and smooth acceleration. Regenerative braking systems, enabled by power electronics, capture and store energy during braking, extending the vehicle's range and improving overall efficiency.



ADITYA BHIMRAO KANASE
Final Year

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Electrical Safety Standards and Practices

Electrical safety is paramount in all electrical engineering endeavors. Adhering to established electrical safety standards and practices is essential to prevent accidents, fires, and electrical hazards. National and international standards, such as the National Electrical Code (NEC) in the United States and the International Electrotechnical Commission (IEC) standards globally, outline safety guidelines for electrical installations and equipment. Proper grounding of electrical systems is a fundamental safety practice, preventing electric shocks and ensuring the safe dissipation of excess electrical energy. Ground fault circuit interrupters (GFCIs) and arc fault circuit interrupters (AFCIs) are safety devices designed to detect and interrupt abnormal electrical currents, mitigating the risk of electrical fires. Regular inspections, maintenance, and testing of electrical equipment and systems are crucial to identifying potential issues before they escalate, ensuring the safety of both individuals and property.

KADAM SUSHANT PRAKASH
Third Year

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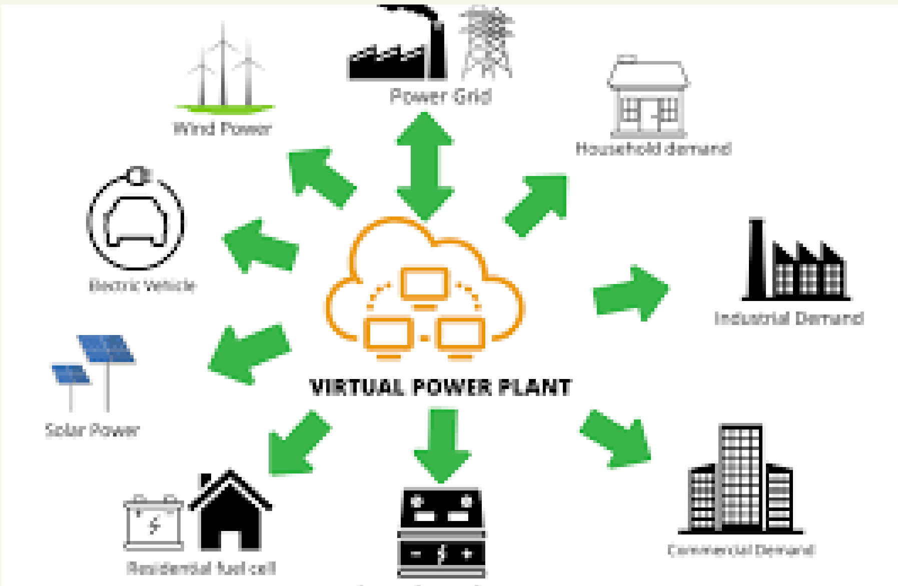
Emerging Trends in Power Generation

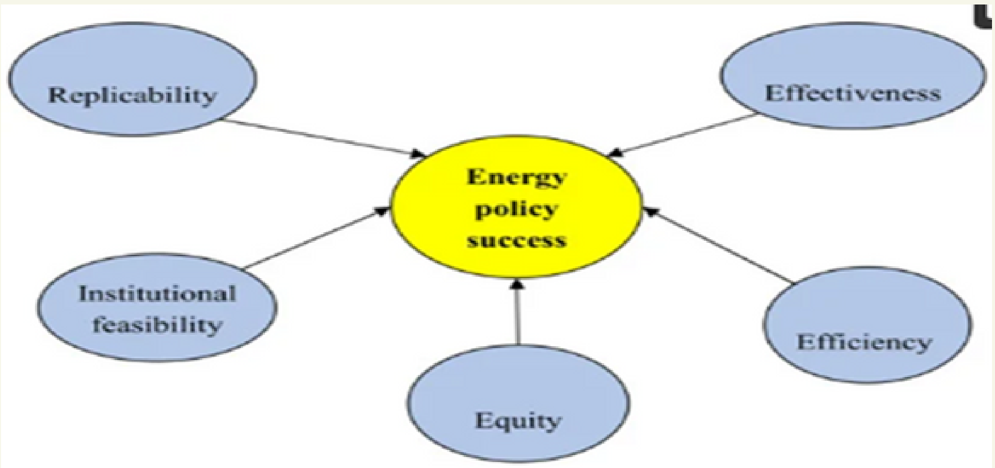
Emerging trends in power generation focus on harnessing energy from unconventional sources and developing innovative technologies to improve efficiency and sustainability. Geothermal power, derived from the Earth's natural heat, is a renewable energy source with vast potential, especially in regions with geothermal activity. Enhanced geothermal systems (EGS) involve drilling deep into the Earth's crust, creating artificial geothermal reservoirs and harnessing the heat for electricity generation. Wave energy, generated by the movement of ocean waves, is another promising source of renewable energy. Wave energy converters (WECs) capture the kinetic and potential energy of waves, converting it into electricity. Ocean thermal energy conversion (OTEC) utilizes the temperature difference between warm surface waters and cold deep waters to produce electricity. OTEC systems employ a cycle of evaporation and condensation to drive turbines, generating clean and sustainable energy. Microgrids are an emerging trend in power generation and distribution. Microgrids are small-scale, localized energy systems that can operate independently or in conjunction with the main grid. They integrate renewable energy sources, energy storage solutions, and advanced control systems, ensuring a reliable and resilient power supply to communities, especially in remote or off-grid areas.



Nade Akshay Vijay
Second Year

Sustainable Energy Policies and Regulations

Sustainable energy policies and regulations are essential frameworks established by governments and regulatory bodies to promote the adoption of renewable energy sources, energy efficiency, and environmental sustainability. These policies are instrumental in mitigating climate change, reducing greenhouse gas emissions, and transitioning to a low-carbon economy. Sustainable energy policies encompass a wide range of initiatives, including renewable energy targets, carbon pricing mechanisms, and energy efficiency standards. Renewable energy targets set specific goals for the share of renewable energy in the overall energy mix. These targets incentivize investments in solar, wind, hydroelectric, and other renewable energy projects. Governments offer subsidies, tax incentives, and feed-in tariffs to encourage the development and deployment of renewable energy technologies. Feed-in tariffs guarantee renewable energy producers a fixed payment for the electricity they generate, making renewable energy projects financially viable. Carbon pricing mechanisms, such as carbon taxes and cap-and-trade systems, put a price on carbon emissions, encouraging industries to reduce their greenhouse gas emissions. Carbon taxes impose a tax on each ton of emitted carbon dioxide, providing a financial incentive to industries to adopt cleaner technologies and reduce emissions. Cap-and-trade systems establish a cap on total emissions and allocate emission allowances to industries.



Prof. Pawashe Anup

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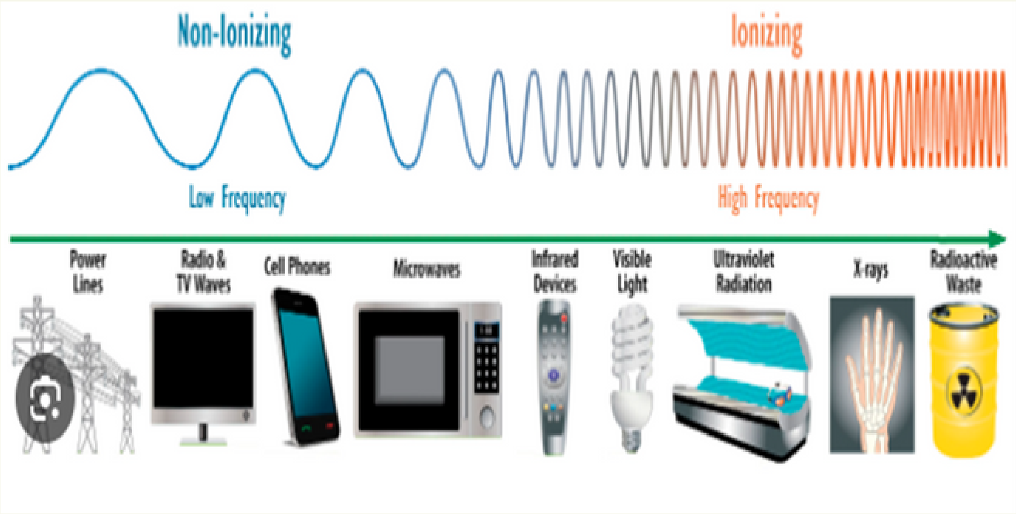
Electromagnetic Field (EMF) Exposure and Health

Electromagnetic fields (EMFs) are generated by various sources, including power lines, electrical appliances, wireless communication devices, and natural phenomena. EMFs consist of electric and magnetic fields that are present wherever electricity is used. Concerns have been raised about the potential health effects of prolonged exposure to EMFs, leading to extensive research and regulatory guidelines to mitigate potential risks. Low-frequency EMFs, generated by power lines and electrical appliances, are a focus of health studies due to their omnipresence in daily life. While there is ongoing research, the scientific consensus to date, as indicated by organizations like the World Health Organization (WHO), suggests that low-frequency EMFs at typical environmental levels do not pose significant health risks. However, research continues to explore potential links between long-term EMF exposure and specific health conditions. Radiofrequency EMFs, produced by wireless communication devices like cell phones and Wi-Fi routers, have been extensively studied. The consensus among health organizations, including the WHO, is that the current evidence does not establish a clear link between radiofrequency EMF exposure from these devices and adverse health effects when used within established safety guidelines. Nevertheless, ongoing research monitors potential long-term effects, especially in vulnerable populations. Precautionary measures are implemented in the form of safety guidelines and exposure limits established by regulatory bodies.



Dr. Vivek Vinayak Puranik

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Energy-Efficient Lighting Technologies

Energy-efficient lighting technologies have transformed the lighting industry, offering environmentally friendly alternatives to traditional incandescent bulbs. Light-emitting diodes (LEDs) are the frontrunners in energy-efficient lighting, consuming significantly less energy and lasting longer than incandescent and fluorescent bulbs. LEDs emit light by electroluminescence, where electrons pass through a semiconductor, producing light without generating excess heat. Compact fluorescent lamps (CFLs) are another energy-efficient lighting option, utilizing gas discharge to produce ultraviolet light, which is then converted into visible light by a phosphorescent coating inside the bulb. Organic light-emitting diodes (OLEDs) are a cutting-edge lighting technology, emitting light through organic compounds' electroluminescence. OLEDs are flexible, lightweight, and offer uniform illumination, making them ideal for various applications, including displays and architectural lighting. The emergence of smart lighting systems has further enhanced energy-efficient lighting solutions. Smart lighting integrates LED technology with IoT connectivity, allowing users to control lighting remotely, customize color temperatures, and adjust brightness levels according to preferences and needs. Motion sensors and occupancy sensors are incorporated into smart lighting systems, enabling automated control based on detected movement and occupancy, conserving energy when lighting is unnecessary.

PALEKAR MAYURI MURALIDHAR
Third Year

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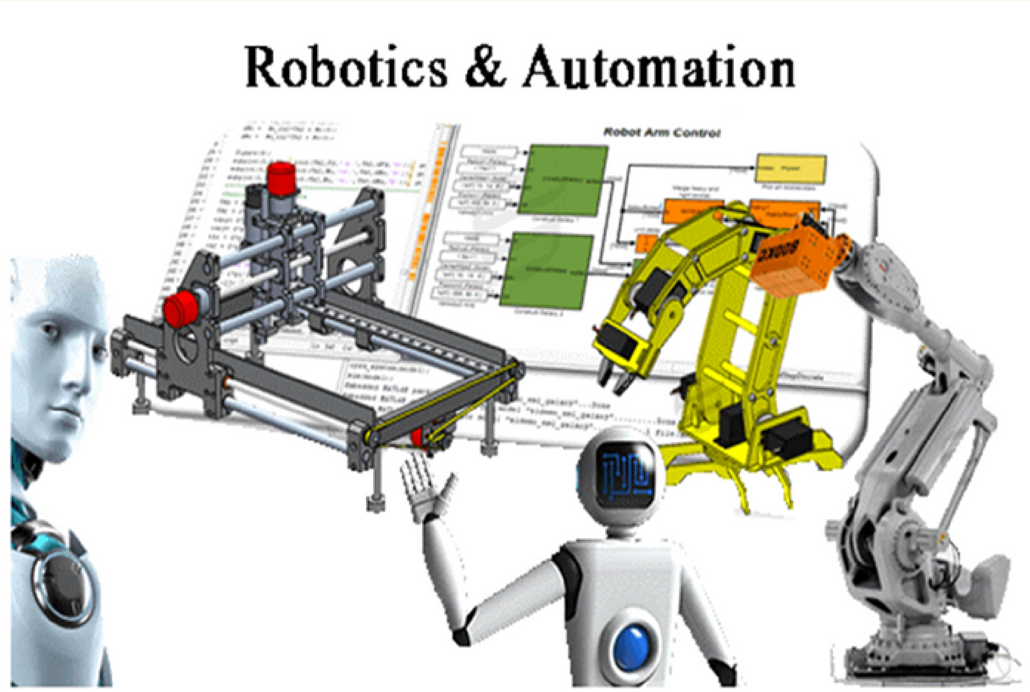
Robotics and Automation in Electrical Engineering

Robotics and automation have revolutionized various industries, enhancing efficiency, precision, and safety in complex tasks. In electrical engineering, robots are employed in diverse applications, from manufacturing and assembly to maintenance and inspection. Robotic arms, equipped with sensors and advanced control systems, perform intricate tasks with high accuracy, making them invaluable in the production of electronic components and devices. Automated assembly lines utilize robots to assemble circuit boards, solder components, and conduct quality inspections, significantly increasing production speed and consistency. Collaborative robots, or cobots, work alongside human operators, assisting in tasks that require human dexterity and decision-making skills. These cobots are equipped with sensors that allow them to detect and respond to human presence, ensuring a safe working environment. In maintenance tasks, drones equipped with cameras and sensors inspect electrical infrastructure, such as power lines and substations, identifying issues such as wear, damage, or vegetation encroachment. These inspections are crucial for preventive maintenance, enabling timely repairs and reducing the risk of electrical failures.



SALUNKHE ADITYA RAJESH
Final Year

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Blockchain Technology in Energy Sector

Blockchain technology, a decentralized and secure digital ledger system, is transforming the energy sector by enhancing transparency, efficiency, and reliability in energy transactions. Blockchain enables the creation of secure, tamper-proof records of energy generation, consumption, and transactions. Its decentralized nature eliminates the need for intermediaries, reducing costs and increasing the speed of transactions. In the energy sector, blockchain facilitates the implementation of peer-to-peer (P2P) energy trading platforms. P2P platforms allow consumers with renewable energy sources, such as solar panels, to sell excess energy directly to nearby consumers. Smart contracts, self-executing contracts with predefined rules, automate energy transactions on these platforms. When a solar panel owner generates excess energy, the surplus is automatically sold to neighboring consumers, and payments are settled through blockchain-enabled smart contracts. Blockchain-based microgrids enhance energy resilience and reliability in communities. Microgrids are localized energy systems that can operate independently or in conjunction with the main grid. Blockchain technology ensures secure energy transactions within microgrids, enabling seamless energy sharing and distribution. In the event of a grid outage, microgrids supported by blockchain continue to provide electricity to connected consumers, enhancing energy resilience. Energy traceability and certification are improved through blockchain, ensuring the authenticity of renewable energy certificates (RECs) and guarantees of origin (GOs). These certificates certify the renewable origin of energy and are crucial for promoting renewable energy adoption. Blockchain records the entire energy production and distribution process, creating a transparent and immutable chain of information. This transparency instills confidence in consumers and businesses, encouraging them to invest in renewable energy sources. Grid management and maintenance benefit from blockchain technology's ability to securely store and share data. Maintenance records, grid performance data, and equipment status can be recorded on a blockchain, providing real-time access to authorized personnel. Decentralized energy markets, facilitated by blockchain, allow consumers to participate in energy trading, promoting energy democratization and empowering individuals to actively engage in the energy market.

CHAVAN POURNIMA SURESH- Final Year

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Artificial Intelligence (AI) in Energy Forecasting

Artificial intelligence (AI) is revolutionizing energy forecasting by enhancing the accuracy and reliability of predictions related to energy demand, supply, and consumption patterns. AI algorithms, particularly machine learning models, analyze vast amounts of historical and real-time data to identify patterns, correlations, and trends. These insights enable energy operators and planners to optimize energy production, distribution, and consumption, leading to more efficient and sustainable energy systems. Load forecasting, a critical aspect of energy management, predicts electricity demand based on historical data, weather patterns, and socio-economic factors. AI-driven load forecasting models leverage machine learning algorithms to analyze historical load data, weather conditions, and even social events that may influence energy demand. These models can accurately predict future load patterns, allowing utilities to optimize their generation and distribution strategies. By anticipating peak demand periods, utilities can ensure a stable power supply, reduce energy wastage, and minimize costs. Renewable energy forecasting involves predicting the output of renewable energy sources like solar and wind. AI algorithms analyze weather data, solar radiation, wind speed, and other relevant factors to forecast renewable energy generation. Accurate renewable energy forecasts enable grid operators to balance supply and demand effectively. When integrated into grid management systems, these forecasts optimize the utilization of renewable energy sources, reduce reliance on fossil fuels, and lower greenhouse gas emissions. Energy price forecasting predicts market prices for electricity, natural gas, and other energy commodities. AI models analyze historical price data, market trends, geopolitical events, and supply-demand dynamics to make accurate price predictions. Energy traders and market participants use these forecasts to make informed decisions regarding energy trading, investment, and risk management. Accurate price forecasts enhance market efficiency and enable stakeholders to respond swiftly to market fluctuations. Grid maintenance and outage prediction utilize AI-driven predictive analytics to identify potential equipment failures and grid vulnerabilities. Outage prediction models analyze various factors, such as weather conditions and historical outage data, to predict potential outages. Utilities can take preventive measures, such as reinforcing power lines or trimming trees near power lines, to mitigate outage risks.

PAUL VARSHA RANOJ- Final Year

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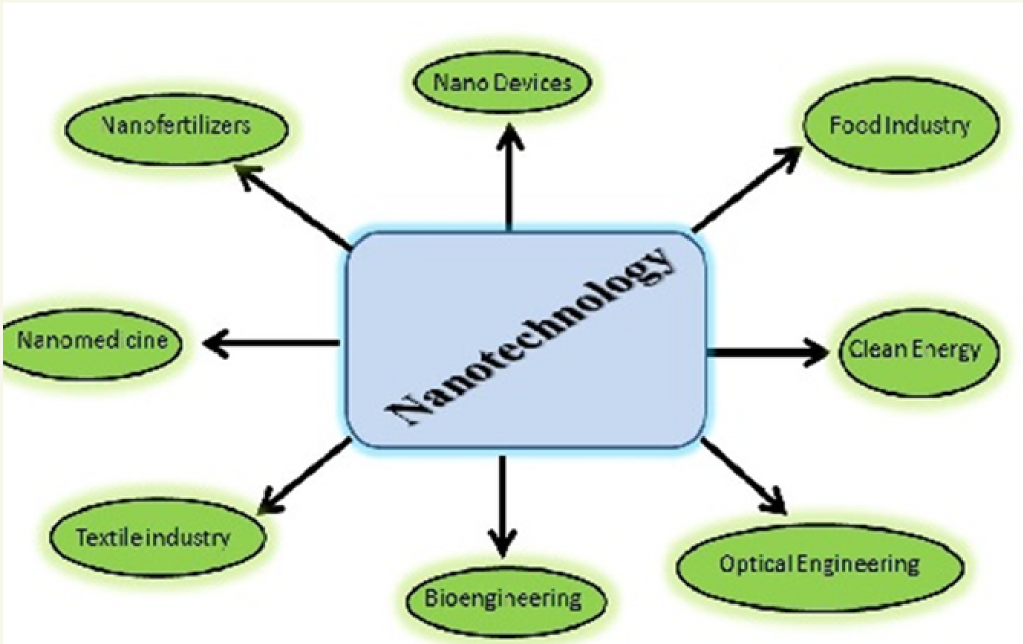
Nanotechnology in Electrical Engineering

Nanotechnology, the manipulation of materials at the nanoscale level, has revolutionized electrical engineering by enabling the development of smaller, more efficient components and devices. Nanomaterials exhibit unique properties due to their small size, offering advantages such as enhanced conductivity, mechanical strength, and thermal stability. Carbon nanotubes, for example, possess excellent electrical conductivity and mechanical strength, making them ideal candidates for applications in nanoelectronics. Nanoelectronics involves the use of nanoscale materials and devices in electronic components. Transistors, the building blocks of electronic circuits, have seen significant miniaturization through nanotechnology. Nanoscale transistors, such as FinFETs and nanowire transistors, offer reduced power consumption and improved performance, enabling faster and more energy-efficient electronic devices. In addition to nanoelectronics, nanotechnology has led to the development of nanosensors, capable of detecting and measuring various physical and chemical properties. Nanosensors are employed in diverse applications, including environmental monitoring, healthcare diagnostics, and industrial process control. These sensors offer high sensitivity and specificity, enabling precise measurements at the molecular level.



KARCHE SURAJ DADASAHEB
Third Year

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Smart Cities and IoT Integration

Smart cities leverage the Internet of Things (IoT) and interconnected technologies to enhance urban living, improve infrastructure, and promote sustainability. IoT devices, sensors, and data analytics enable cities to collect real-time information about various aspects of urban life, ranging from traffic flow and waste management to energy consumption and air quality. Smart city initiatives focus on creating efficient, sustainable, and livable urban environments through technology integration. Smart transportation systems utilize IoT devices and sensors to monitor traffic patterns, congestion levels, and public transportation usage. Data from these sensors enable real-time traffic management, optimized traffic signal timings, and efficient public transportation routes. Smart parking solutions use sensors to detect available parking spaces and guide drivers to vacant spots, reducing congestion and enhancing parking efficiency. Waste management in smart cities is optimized through IoT-enabled smart bins. These bins are equipped with sensors that detect waste levels. When the bins are full, they send signals to waste collection services, indicating the need for emptying. Smart waste management reduces unnecessary trips, saves fuel, and minimizes environmental impact. Energy efficiency in smart cities is achieved through IoT-enabled smart grids and smart meters. Smart grids optimize energy distribution by analyzing real-time data on energy demand and supply. Smart meters allow consumers to monitor their energy usage in real time and adjust their consumption patterns accordingly. These technologies enable demand response programs, where consumers can voluntarily reduce their energy usage during peak demand periods, reducing strain on the grid and lowering energy costs. Environmental monitoring systems in smart cities use sensors to measure air quality, water quality, and noise levels. Real-time data on pollutants and environmental factors enable timely interventions, such as adjusting traffic flow to reduce air pollution or addressing noise pollution in residential areas. Citizens can access this data through mobile apps, raising awareness and promoting environmentally conscious behavior.

INDALKAR SHWETA GAJANAN
Third Year

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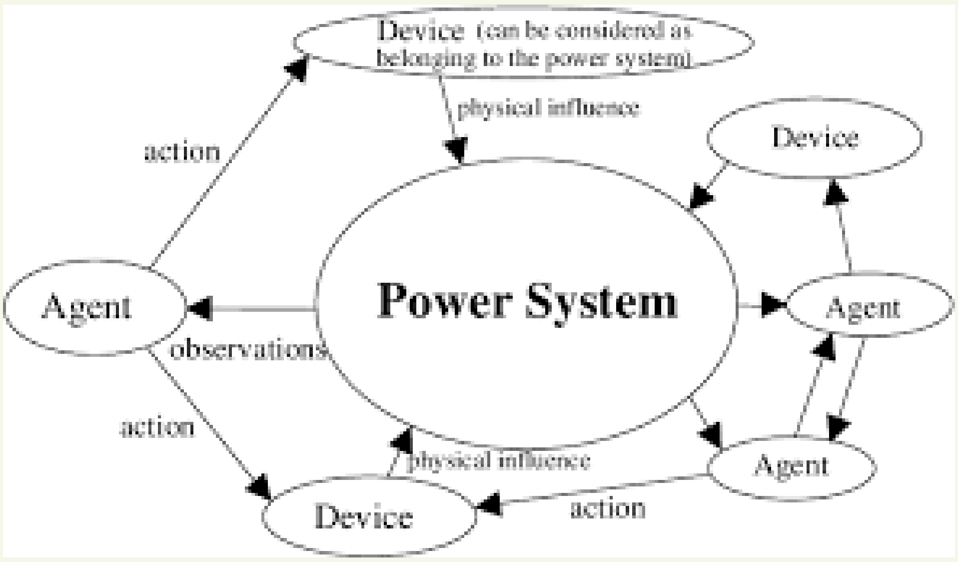
Power System Stability and Control

Power system stability and control are essential for ensuring the reliable operation of electricity grids, preventing blackouts and voltage fluctuations. Power system stability refers to the grid's ability to return to a stable operating state after experiencing a disturbance, such as a fault or sudden changes in demand. Stability is maintained through various control mechanisms, including automatic generation control (AGC) and voltage regulation. AGC is a vital component of power system stability, adjusting the output of generators in real time to match the electricity demand. Generators are equipped with control systems that receive signals from grid sensors, enabling them to increase or decrease their output as needed. By balancing generation and demand, AGC ensures the grid's stability and prevents frequency deviations. Voltage regulation is another critical aspect of power system control, maintaining voltage levels within acceptable limits. Voltage regulators, installed in substations and on power lines, adjust voltage levels as needed, ensuring that consumers receive electricity at the appropriate voltage. Overvoltage and undervoltage can damage electrical equipment and disrupt the operation of sensitive devices, making voltage regulation crucial for the grid's reliability.



TORASKAR RUPALI RAJARAM
Final Year

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Green Building Technologies

Green building technologies focus on creating environmentally sustainable and energy-efficient buildings. These technologies integrate innovative design, construction practices, and materials to minimize a building's environmental impact and reduce energy consumption. Green buildings incorporate energy-efficient HVAC systems, renewable energy sources, sustainable materials, and intelligent building management systems. Energy-efficient HVAC (heating, ventilation, and air conditioning) systems are a cornerstone of green building technologies. These systems are designed to optimize indoor climate while minimizing energy consumption. Variable refrigerant flow (VRF) systems use advanced control mechanisms to adjust refrigerant flow based on the specific heating or cooling requirements of different building zones. Energy recovery ventilation systems capture and reuse heat energy from outgoing air, reducing the energy needed to heat incoming fresh air. Renewable energy sources, such as solar panels and wind turbines, are integrated into green buildings to generate clean electricity on-site. Solar photovoltaic (PV) panels capture sunlight and convert it into electricity, powering lighting, appliances, and HVAC systems. Wind turbines harness wind energy to generate electricity, particularly in locations with consistent wind patterns. Combined with energy storage systems, these renewable sources ensure a reliable energy supply, even during grid outages. Sustainable materials play a crucial role in green building construction. Recycled and reclaimed materials, such as recycled steel, reclaimed wood, and recycled glass, reduce the demand for virgin resources and minimize waste. Low-VOC (volatile organic compounds) paints, adhesives, and sealants improve indoor air quality by emitting fewer harmful chemicals. High-efficiency insulation materials, such as spray foam and cellulose, minimize heat transfer, reducing the need for heating and cooling. Intelligent building management systems (BMS) optimize energy usage by integrating various building systems, including lighting, HVAC, and security, into a centralized control platform. BMS analyze real-time data from sensors and meters, enabling automated control and optimization of energy usage. Occupancy sensors adjust lighting and HVAC settings based on room occupancy, ensuring energy is not wasted in unoccupied spaces.

Shelke Prajakta Sadashiv
Second Year

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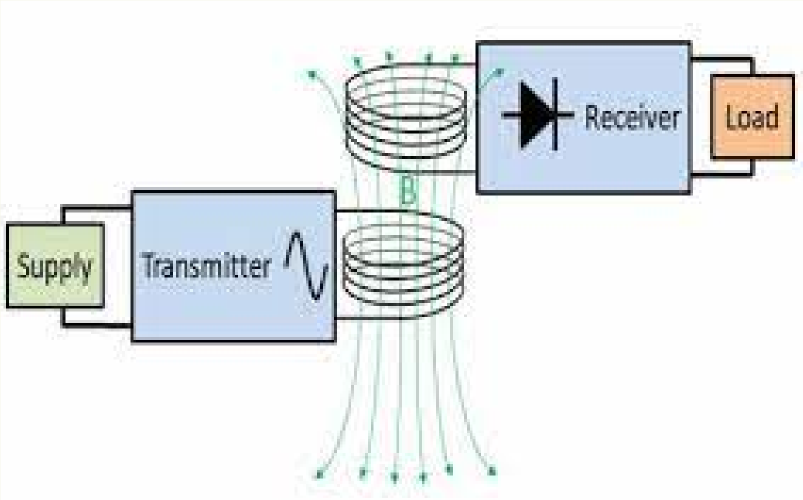
Wireless Power Transmission

Wireless power transmission technologies have made significant strides in recent years, offering convenient and efficient methods of charging electronic devices and electric vehicles. Inductive charging, widely used in wireless charging pads and smartphone charging stations, transfers energy through electromagnetic fields. The charging station generates an alternating magnetic field, inducing a current in the receiving device's coil, which is then converted back into electricity. Resonant inductive coupling is an advanced wireless charging technique, enhancing the efficiency and range of wireless power transmission. By tuning the sender and receiver coils to resonate at the same frequency, resonant inductive coupling minimizes energy losses, allowing for efficient energy transfer over greater distances. This technology is employed in wireless charging systems for electric vehicles, enabling hands-free charging without physical connections. Radiofrequency (RF) wireless power transmission utilizes radio waves to transmit energy across short to medium distances. RF energy is converted into direct current (DC) power by rectifying circuits in the receiving device. RF wireless power transmission is employed in applications such as implantable medical devices, where physical connections are impractical or pose health risks. RF energy can penetrate biological tissues, allowing for wireless charging of pacemakers and neurostimulators inside the body.



Prof. Shinde Madhav Ramrao