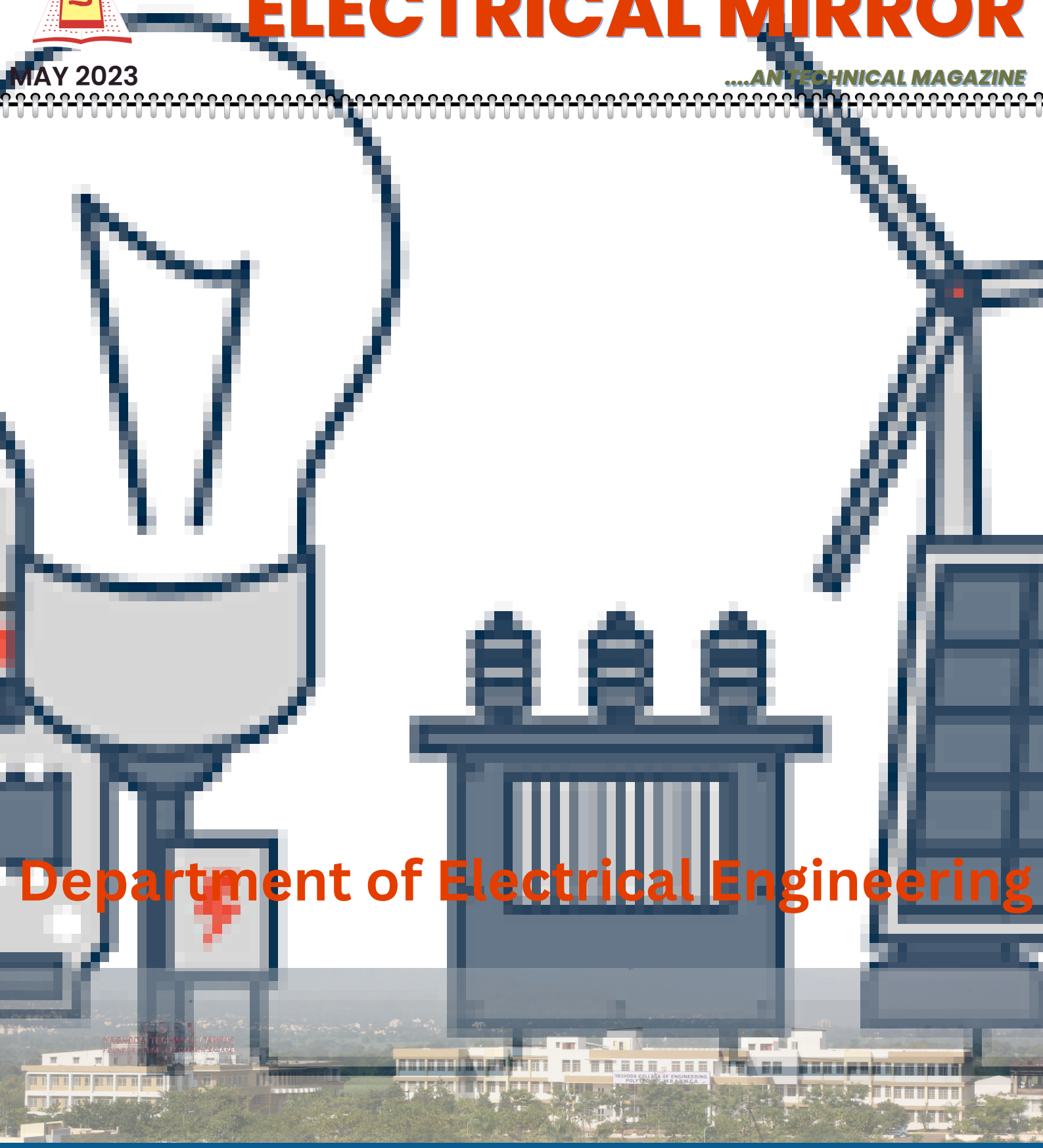
YASHODA SHIKSHAN PRASARAK MANDAL, SATARA
YASHODA TECHNICAL CAMPUS
DEPARTMENT OF ELECTRICAL ENGINEERING

ELECTRICAL MIRROR

MAY 2023

....AN TECHNICAL MAGAZINE



Department of Electrical Engineering

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

ELECTRICAL MIRROR

MAY 2023

....AN TECHNICAL MAGAZINE

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

PRESIDENT'S DESK

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

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

Prof. Dasharath Sagare
Founder President
YSPM - YSS, Satara

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

ELECTRICAL MIRROR

MAY 2023

....AN TECHNICAL MAGAZINE

PRINCIPAL'S MESSAGE

GREETINGS TO ALL!

I am really honored and feel very privileged to function as the Principal of Yashoda Technical Campus (YTC), Satara. Let me take this opportunity to thank the Management, Yashoda Shikshan Prasarak Mandal (YSPM), Satara for giving me an opportunity to serve the community here in YSPM family.

We believe that the existence, growth, survival and future of every Educational Institute will long lasting only if that Institute make and keep the students & parents and all the stakeholders of the Institute feel very happy and satisfied. The students & parents will be happy only if they get their expectations and dreams are fulfilled for which the student has taken an admission in the Institute. This can be achieved only if every entity in an Institute works with Academic Excellence, Research Excellence and Training & Placement Excellence, along with Overall Development of the Student to Serve the Society thereby exceling and ensuring EXCELLENCE IN TECHNICAL EDUCATION with OUTCOME BASED EDUCATION. Our Institute Growth lies in Institute Motto that is "PARENTS AND STUDENTS DREAMS ARE OUR INSTITUTE MISSIONS". Therefore I appeal everyone to join together in achieving the aim "A HAPPY STUDENT, A HAPPY PARENT, AND A HAPPY & MOST PREFERABLE INSTITUTE.

Dr. P. R. Badadapure
Principal, YSPM, Satara
PhD (ECE)
MIEEE LMISTE, IAENG, IFERP, ICSES

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

ELECTRICAL MIRROR

MAY 2023

....AN TECHNICAL MAGAZINE

HOD'S MESSAGE

Welcome to the Department of Electrical Engineering. The Department has been immensely active and professionally productive since its inception in 2011. Presently, the department has U.G. Program with more than 100 undergraduate students.

Since the commencement of the program, the department has made sincere efforts in the development of students through effective teaching – learning processes, training and industrial visits. Eight (8) batches of Electrical Engineering have been passed out from the institute. The students graduated from our department have been securing good placements in Private and Public sectors.

The Department is having mixture of well experienced and young, enthusiastic faculty members. The Laboratories are well equipped with Latest Experimental and Computational Facilities. Industry Interaction has been increased with industry-sponsored projects. Industries also offer the vocational training to our students. The department organizes Guest Lectures, Faculty Development Programs, Workshops and Seminars in various specialized field which offers an opportunity to meet eminent speakers and exchange ideas. The faculty frequently publishes and presents their research work in reputed national/ international Journals and Conferences. Apart from the curriculum, students from our department have won prizes by participating in Local, State and National level competitions.

I am pleased to release 2023-24 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.

Prof. Dr. N. N. Jamadar
HOD, Faculty of Electrical Engineering,Yashoda Technical Campus, Satara

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

ELECTRICAL MIRROR

MAY 2023

....AN TECHNICAL MAGAZINE

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.

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

ELECTRICAL MIRROR

MAY 2023

....AN TECHNICAL MAGAZINE

Electric Vehicle Software and Connectivity

Electric vehicles rely on sophisticated software systems for battery management, energy optimization, and connectivity. These software solutions are essential for ensuring efficient operation, seamless charging experiences, and integration into the evolving smart transportation ecosystem. Battery Management Software: Battery management software (BMS) monitors the health, state of charge, and temperature of individual battery cells. Engineers develop advanced algorithms that optimize charging and discharging cycles, ensuring even wear and preventing overcharging or deep discharges. BMS plays a crucial role in extending the battery's lifespan and maintaining consistent performance over time. Additionally, predictive algorithms estimate remaining driving range based on driving patterns and battery status, providing accurate range predictions to users. Energy Optimization Algorithms: Energy optimization algorithms analyze driving patterns, traffic conditions, and topography to optimize energy usage. These algorithms determine the most efficient use of the battery's energy, adjusting power delivery based on driving demands. For instance, during highway driving, the algorithm may prioritize steady-state energy consumption, whereas in urban areas with frequent stops, regenerative braking is emphasized to capture kinetic energy and extend the driving range. Engineers continuously refine these algorithms through real-world testing and simulations, ensuring optimal energy efficiency for electric vehicles. Connectivity Features: Connectivity is a key enabler for electric vehicles, allowing them to communicate with charging stations, smart grids, and other vehicles. Vehicle-to-Grid (V2G) communication enables bidirectional energy flow between the vehicle and the grid, supporting grid stability and renewable energy integration. Engineers develop secure communication protocols and robust encryption methods to protect data transmitted between the vehicle and external systems. Over-the-air (OTA) software updates enable manufacturers to remotely update vehicle software, introducing new features, improvements, and security patches. Connectivity also enables remote diagnostics, allowing manufacturers to monitor vehicle health, diagnose issues, and provide proactive maintenance recommendations to users.

ROKHADE SUYASH RAVINDRA
Second Year

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

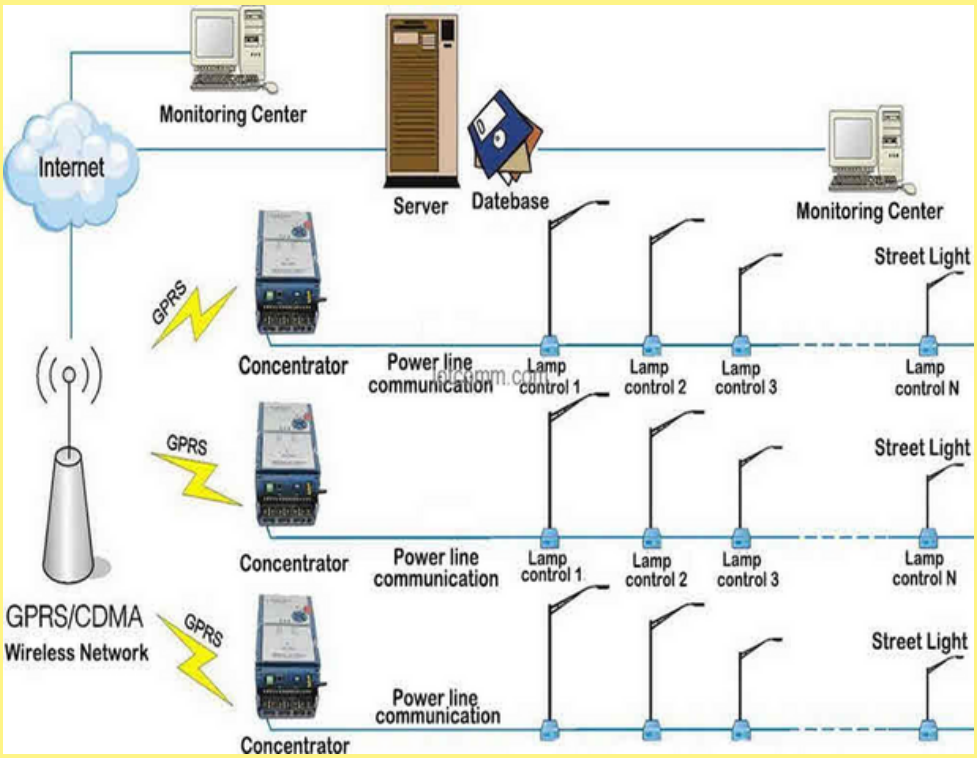
ELECTRICAL MIRROR

MAY 2023

....AN TECHNICAL MAGAZINE

Energy-Efficient Lighting Technologies

Energy-efficient lighting technologies, such as light-emitting diodes (LEDs) and organic light-emitting diodes (OLEDs), have revolutionized the lighting industry by offering high efficiency, long lifespan, and diverse applications. LEDs, semiconductor devices that emit light when an electric current passes through them, consume significantly less energy than traditional incandescent and fluorescent bulbs. They are widely used in various applications, including residential lighting, street lighting, and automotive lighting. OLEDs, thin organic layers emitting light when an electric current is applied, are employed in flexible displays, lighting panels, and wearable devices. These technologies not only reduce energy consumption but also offer design flexibility, enabling innovative lighting solutions in architecture, entertainment, and automotive industries. Ongoing research focuses on improving LED efficiency, developing cost-effective manufacturing processes, and expanding the application range of OLEDs, driving the transition to energy-efficient lighting solutions.



THAKARE PRIYANKA
Second Year

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

ELECTRICAL MIRROR

MAY 2023

....AN TECHNICAL MAGAZINE

Electric Vehicle Motorsport

Electric motorsport, exemplified by events like Formula E, serves as a proving ground for electric vehicle technology. Motorsport competitions push the boundaries of engineering innovation, driving advancements in electric motor efficiency, battery power, and aerodynamics. Engineers and racing teams collaborate to enhance motor performance, optimize energy usage, and improve overall vehicle dynamics. High-Performance Electric Motors: Motorsport demands high-performance electric motors capable of delivering exceptional power and torque. Engineers design custom motors with specialized winding patterns, advanced magnetic materials, and precise manufacturing techniques. These motors operate at high speeds, generating substantial power for rapid acceleration and high top speeds. Optimization of motor efficiency is a continuous focus, ensuring minimal energy loss during operation. Battery Technology Advancements: Motorsport applications drive advancements in battery technology, aiming for higher energy density and faster charging capabilities. Engineers develop custom battery packs that can deliver high bursts of power for quick acceleration. Thermal management systems ensure that batteries maintain optimal operating temperatures, preventing overheating during intense racing conditions. Motorsport competitions serve as a test bed for new battery chemistries and materials, pushing the limits of what electric vehicle batteries can achieve.

Mane Arti Balkrishna
Final Year

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

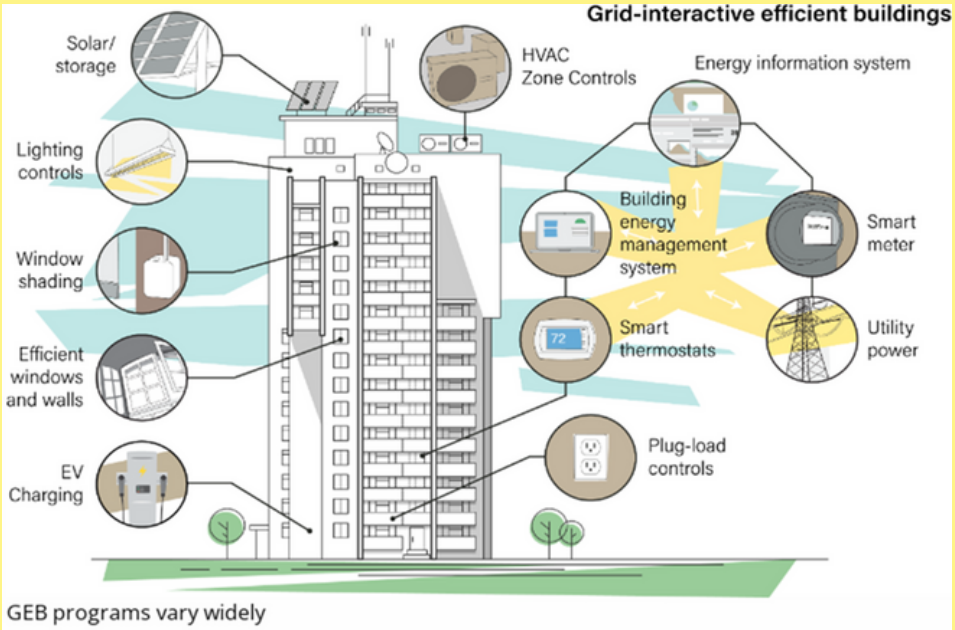
ELECTRICAL MIRROR

MAY 2023

....AN TECHNICAL MAGAZINE

Grid-Interactive and Energy-Aware Buildings

Grid-interactive and energy-aware buildings leverage smart technologies to optimize energy usage, reduce costs, and support grid stability. These buildings integrate sensors, actuators, and automation systems to monitor occupancy, energy consumption, and environmental conditions. Building energy management systems (BEMS) analyze real-time data to control lighting, HVAC systems, and other appliances, ensuring energy efficiency and occupant comfort. Demand response programs enable buildings to adjust their energy usage based on grid demand and electricity prices, reducing stress on the grid during peak periods. Energy-aware buildings incorporate renewable energy sources, energy storage systems, and energy-efficient technologies to minimize their environmental impact. Rooftop solar panels, wind turbines, and geothermal systems generate clean energy on-site, reducing reliance on the grid. Battery storage systems store excess energy for later use, improving energy resilience and supporting grid stability. Research in grid-interactive and energy-aware buildings explores innovative energy management algorithms, human-centric design approaches, and grid integration strategies, shaping the future of sustainable and intelligent buildings.



POONAM JADHAV
Third Year

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

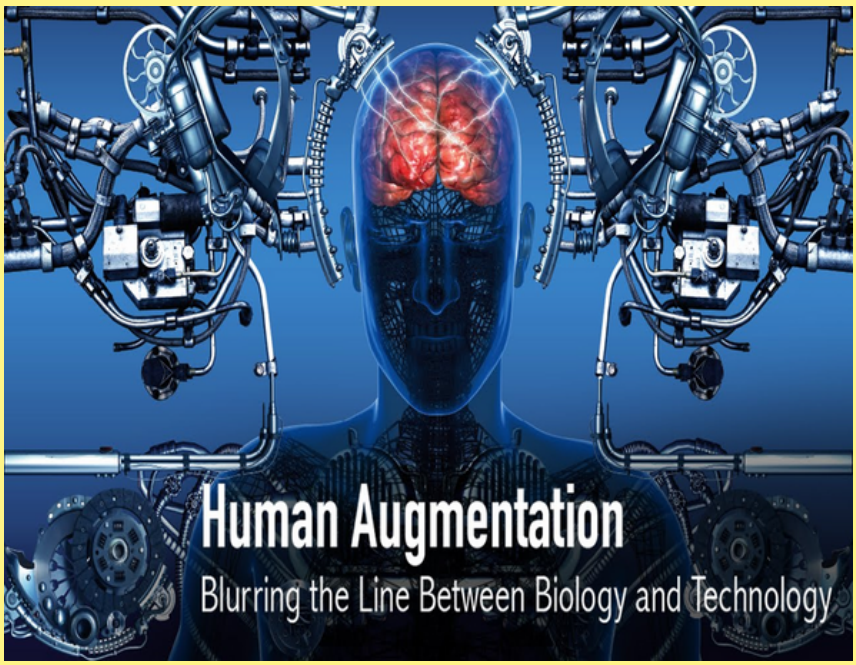
ELECTRICAL MIRROR

MAY 2023

....AN TECHNICAL MAGAZINE

Human Augmentation Technologies

Human augmentation technologies enhance human capabilities by integrating electronic and mechanical components with the human body. These technologies find applications in healthcare, assistive devices, and performance enhancement. Prosthetic limbs, equipped with sensors and microprocessors, enable natural movement and dexterity for individuals with limb loss. Brain-computer interfaces (BCIs) allow direct communication between the brain and external devices, enabling paralyzed individuals to control computers, robotic arms, or exoskeletons. Cochlear implants restore hearing by electrically stimulating the auditory nerve, providing a sense of sound to individuals with hearing loss. Wearable exoskeletons support physical rehabilitation and enhance strength and endurance for industrial and military applications. Human augmentation technologies also include smart glasses, smart contact lenses, and implantable devices, offering augmented reality experiences and health monitoring capabilities. Research in this field focuses on improving the interface between humans and machines, enhancing the reliability and safety of augmentation devices, and exploring ethical implications, ensuring responsible and beneficial integration of human augmentation technologies into society.



SHINDE SHUBHAM HARI
Third Year

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

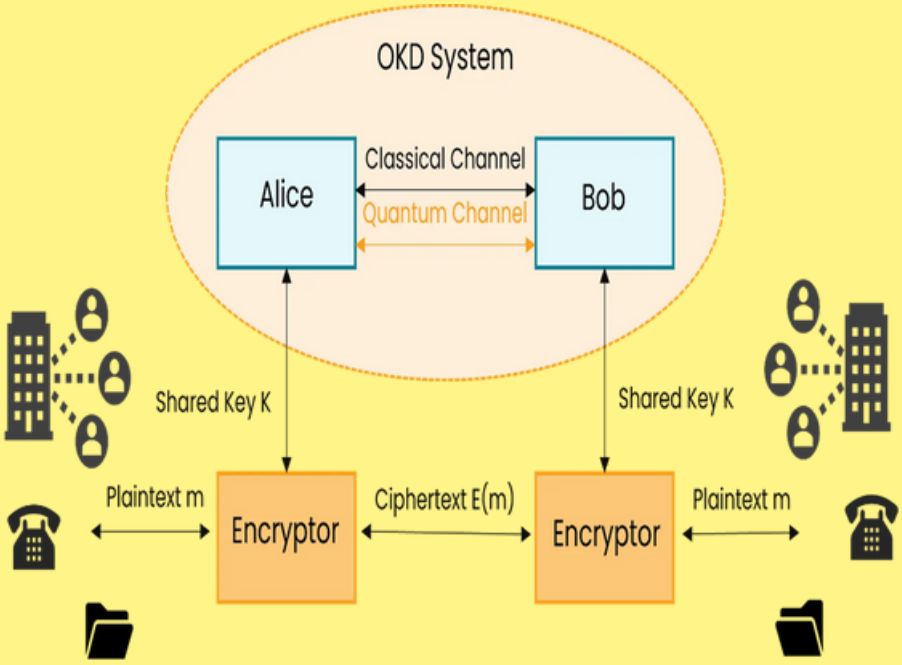
ELECTRICAL MIRROR

MAY 2023

....AN TECHNICAL MAGAZINE

Quantum Communication and Quantum Cryptography

Quantum communication leverages the principles of quantum mechanics to secure communication channels against eavesdropping and interception. Quantum cryptography, a subset of quantum communication, offers theoretically secure methods for encrypting and decrypting messages. Quantum key distribution (QKD) systems enable two parties to exchange cryptographic keys with unconditional security. The security of QKD relies on the principles of quantum superposition and entanglement, making it impossible for an eavesdropper to intercept the key without detection. Quantum communication also includes quantum teleportation, a process in which quantum states are transferred from one location to another using quantum entanglement. Quantum communication technologies have potential applications in secure communication networks, financial transactions, and government communications, offering unparalleled security compared to classical cryptographic methods. Ongoing research focuses on developing practical QKD systems, extending the range of quantum communication, and addressing challenges related to quantum repeaters and quantum memory, paving the way for quantum-secured communication infrastructures.



Patil Ulhas Ashok
Final Year

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

ELECTRICAL MIRROR

MAY 2023

....AN TECHNICAL MAGAZINE

Renewable Energy Sources: Powering a Sustainable Future

Renewable energy sources have emerged as the linchpin in the global pursuit of sustainable and clean energy solutions. As the world grapples with the challenges of climate change and environmental degradation, renewable energy offers a promising path forward. One of the most abundant and versatile sources of renewable energy is solar power, harnessed through various technologies. This section delves deep into solar energy, exploring its mechanisms, applications, benefits, and the pivotal role it plays in shaping a greener future. Solar Energy: Harnessing the Power of the Sun Solar energy, the radiant energy emitted by the sun, is harnessed using photovoltaic (PV) cells to create electricity or through concentrated solar power (CSP) systems for thermal energy. The key component driving this technology is the PV cell, a semiconductor device that directly converts sunlight into electricity through the photovoltaic effect. When photons, particles of light, strike the PV cell, they dislodge electrons from their atoms, creating an electric current. This process

MANE DIVYA LAXMAN
Second Year

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

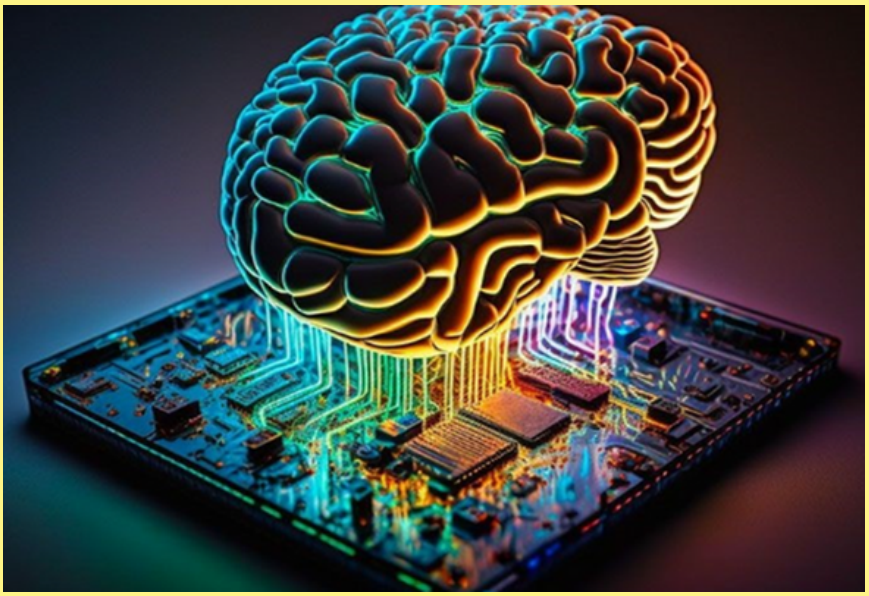
ELECTRICAL MIRROR

MAY 2023

....AN TECHNICAL MAGAZINE

Neuromorphic Engineering and Brain-Inspired Computing

Neuromorphic engineering mimics the architecture and functionality of the human brain in electronic circuits and systems. These brain-inspired technologies offer energy-efficient computing solutions for artificial intelligence and cognitive computing applications. Neuromorphic chips, designed to emulate neural networks, process information in a way similar to the human brain, enabling tasks such as pattern recognition and decision-making. Spiking neural networks (SNNs), a type of neuromorphic architecture, use spikes or pulses of activity to represent information, allowing efficient event-based processing. Neuromorphic systems excel in tasks requiring real-time processing and low power consumption, making them suitable for applications like robotics, sensor networks, and edge computing. Brain-inspired computing also includes memristor-based neural networks, which utilize memristive devices to store and process information, offering potential solutions for neuromorphic computing hardware. Research in neuromorphic engineering explores novel circuit designs, advanced materials, and neuromorphic algorithms, enhancing the capabilities of brain-inspired computing systems and enabling innovative applications in artificial intelligence.



PRIYANKA SUDHIR PAWAR
Third Year

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

ELECTRICAL MIRROR

MAY 2023

....AN TECHNICAL MAGAZINE

Quantum Sensing and Quantum Metrology

Quantum sensing utilizes quantum properties to measure physical quantities with exceptional precision, surpassing the limits of classical sensors. Quantum metrology, a branch of quantum sensing, explores the fundamental principles of quantum mechanics to develop ultra-sensitive measurement devices. Quantum sensors, such as atomic clocks and magnetometers, leverage quantum phenomena like superposition and entanglement to achieve high accuracy in measuring time, magnetic fields, and other physical parameters. Atomic clocks, based on the vibrations of atoms, provide the most accurate timekeeping standards, essential for global navigation systems and scientific research. Quantum magnetometers, using the magnetic properties of atoms, detect minute magnetic fields, enabling applications in geophysics, materials science, and medical imaging. Quantum sensors have revolutionized fields such as gravitational wave detection, enabling the observation of cosmic events with unprecedented sensitivity. Research in quantum sensing and metrology focuses on improving sensor stability, miniaturization, and exploring quantum-enhanced measurement techniques, opening new avenues for scientific discoveries and technological innovations. In conclusion, the diverse and dynamic field of electrical engineering continues to evolve, driven by innovation, research, and the pursuit of sustainable and transformative technologies. From quantum computing and plasma technologies to neuromorphic engineering and quantum sensing, these advancements not only shape the future of electrical engineering but also contribute to solving global challenges and improving the quality of life. With ongoing research, interdisciplinary collaborations, and a commitment to addressing societal needs, electrical engineers are at the forefront of creating a more connected, efficient, and sustainable world.

SHIRKE ROHIT AJIT
Second Year

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

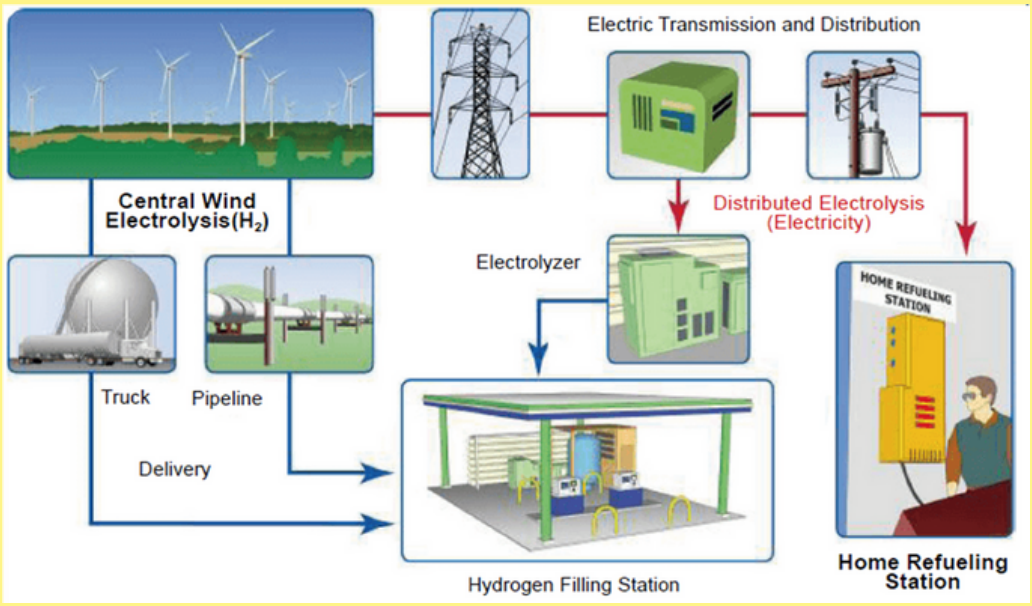
ELECTRICAL MIRROR

MAY 2023

....AN TECHNICAL MAGAZINE

Renewable Energy Sources: Powering a Sustainable Future (Wind Energy)

Wind energy, one of the oldest and most widely used forms of renewable energy, has become a cornerstone of the global push towards sustainability. Harnessing the power of the wind, wind energy provides a clean and renewable source of electricity. In this section, we explore the mechanisms of wind energy, its applications, benefits, and the transformative impact it has on the global energy landscape. The Mechanics of Harnessing the Wind energy is harnessed through the use of wind turbines. These turbines consist of large blades attached to a central hub. As the wind blows, it causes the turbine blades to rotate. This rotational motion is transferred to a generator, which converts the kinetic energy of the rotating blades into electricity. The amount of energy generated is directly proportional to the wind speed; higher wind speeds result in greater electricity production.Wind turbines are strategically placed in areas with consistent and strong winds, such as coastal regions and elevated landscapes. Modern wind turbines come in various sizes, from small turbines used for residential or agricultural applications to massive utility-scale turbines that form wind farms.



RATHI SAGAR RAJESH
Second Year

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

ELECTRICAL MIRROR

MAY 2023

....AN TECHNICAL MAGAZINE

Renewable Energy Sources: Powering a Sustainable Future (Hydropower)

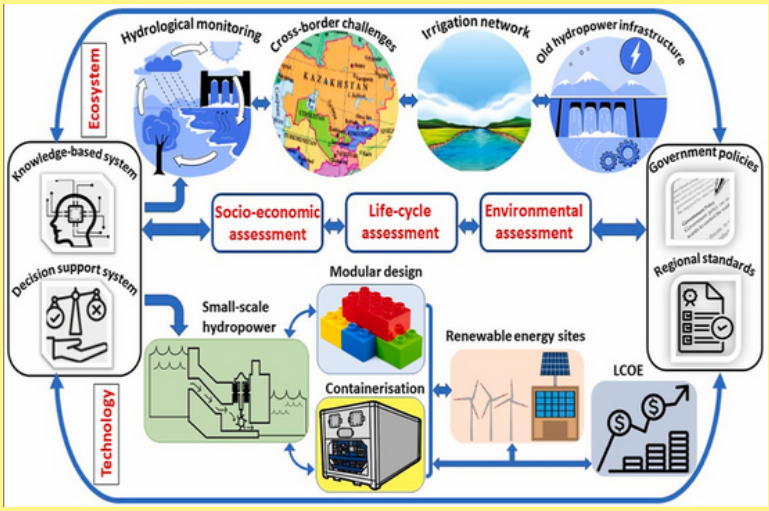
Hydropower, derived from the energy of flowing or falling water, has been a fundamental source of renewable energy for centuries. It is a versatile and reliable energy source that has powered communities, industries, and civilizations throughout history. In this section, we explore the mechanisms of hydropower, its applications, benefits, and the role it plays in shaping a sustainable energy landscape.

Hydropower: Tapping into the Flow of Water

Hydropower systems harness the kinetic energy of moving water to generate electricity. There are two primary methods of harnessing hydropower: through dams and turbines or utilizing run-of-the-river systems.

Dams and Turbines: In dam-based hydropower systems, large dams are constructed across rivers. The stored water is released through turbines, driving them to generate electricity. The potential energy of the water at a height is converted into mechanical energy, which is then transformed into electrical energy.

Run-of-the-River Hydropower: Run-of-the-river systems do not involve large dams. Instead, they use the natural flow of rivers to generate electricity. A portion of the river's water is diverted through turbines, which convert the kinetic energy of the flowing water into electricity. Run-of-the-river systems minimize environmental impact, allowing rivers to maintain their natural flow.



NIKAM PRANALI PRMOD
Second Year

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

ELECTRICAL MIRROR

MAY 2023

....AN TECHNICAL MAGAZINE

Renewable Energy Sources: Powering a Sustainable Future (Biomass Energy)

Biomass energy, derived from organic materials such as wood, agricultural residues, and waste, has been a part of human energy use for millennia. It is a versatile and renewable energy source that can be converted into electricity, heat, or biofuels. In this section, we explore the mechanisms of biomass energy, its applications, benefits, and the challenges associated with its sustainable utilization.

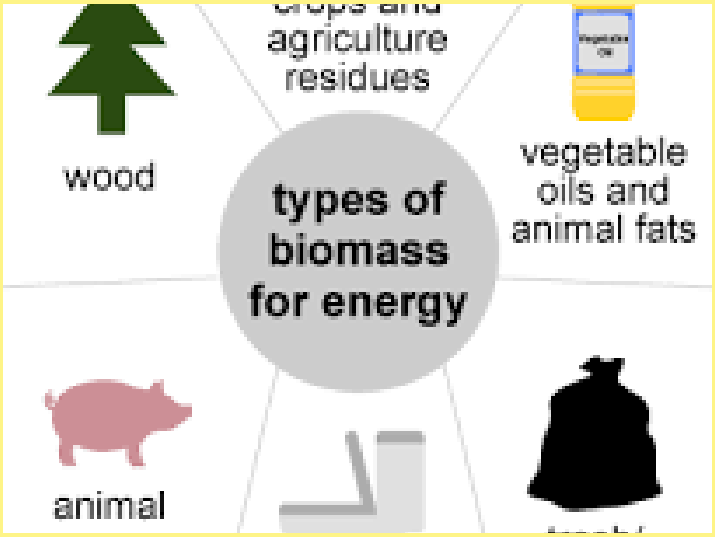
Biomass Energy: Harnessing the Power of Organic Matter

Biomass energy is derived from organic materials through various conversion processes:

Combustion: Biomass materials can be burned directly for heat or electricity generation. Biomass combustion releases the stored energy in the form of heat, which can be used for space heating, water heating, or to produce steam for electricity generation through steam turbines.

Biogas Production: Biomass, such as agricultural and organic waste, can undergo anaerobic digestion, a biological process where microorganisms break down the organic matter in the absence of oxygen. This process produces biogas, a methane-rich gas that can be used as a renewable fuel for electricity generation, heating, or transportation.

Biofuels: Biomass can be converted into biofuels, such as biodiesel and bioethanol, through processes like fermentation and transesterification. Biofuels serve as renewable alternatives to conventional fossil fuels, powering vehicles and machinery with lower greenhouse gas



KASHID AKSHAY ARJUN
Second Year

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

ELECTRICAL MIRROR

MAY 2023

....AN TECHNICAL MAGAZINE

Renewable Energy Sources: Powering a Sustainable Future (Geothermal Energy)

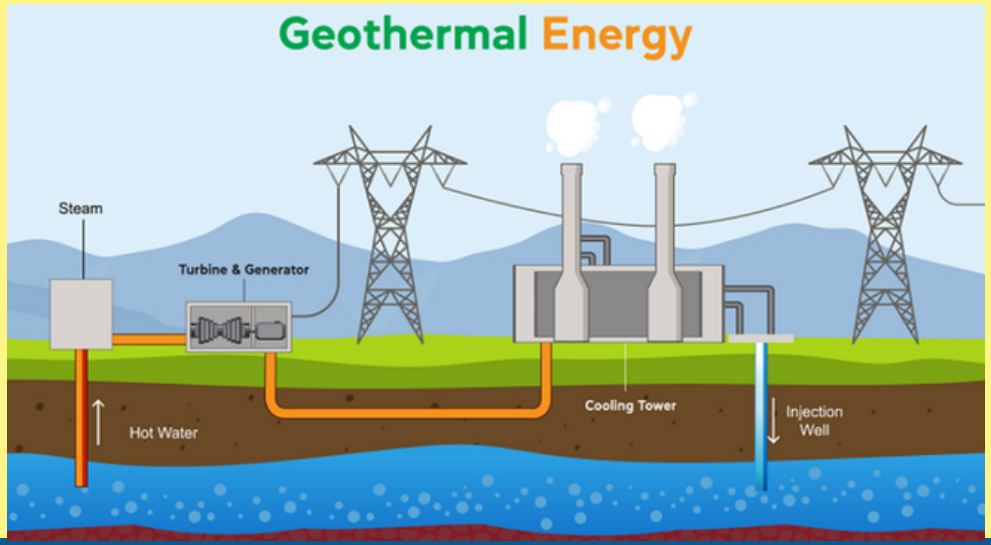
Geothermal energy, harnessed from the Earth's internal heat, is a reliable and renewable source of power and heat. It has been used for centuries for bathing, space heating, and cooking and is now a significant contributor to the global energy mix. In this section, we explore the mechanisms of geothermal energy, its applications, benefits, and the challenges associated with its sustainable utilization.

Geothermal Energy: Tapping into Earth's Heat

Geothermal energy originates from the Earth's internal heat, primarily from the decay of naturally occurring radioactive isotopes and the original heat from the Earth's formation. This heat is harnessed through various technologies:

Geothermal Heat Pumps: Geothermal heat pumps utilize the Earth's stable ground temperature to heat or cool buildings. Pipes containing a heat transfer fluid are buried underground, allowing the exchange of heat between the fluid and the ground. Geothermal heat pumps provide efficient heating, cooling, and hot water solutions for residential and commercial buildings.

Geothermal Power Plants: Geothermal power plants tap into geothermal reservoirs of steam or hot water located beneath the Earth's surface. Wells are drilled into these reservoirs, and the high-temperature fluids are brought to the surface. The steam or hot water drives turbines connected to generators, producing electricity.



MOMIN ARBAZ SALIM
Second Year