Department of

Electrical and Electronics Engineering

Thunder Trends

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ENGINEERING COLLEGE :: NELLORE

(APROVED BY AICTE, NEW DELHI & PERMANENTLY AFFILIATED TO JNTU, ANANTHAPURAMU)

Vision of the Institute

To be one of the nation's premier Institutions for Technical and Management Education and a key contributor for Technological and Socio-economic Development of the Nation.

Mission of the Institute

- To produce technically competent Engineers and Managers by maintaining high academic standards, world class infrastructure and core instructions.
- To enhance innovative skills and multi disciplinary approach of students through well experienced faculty and industry interactions.
- To inculcate global perspective and attitude of students to face real world challenges by developing leadership qualities, lifelong learning abilities and ethical values.

Vision of the Department

To impart knowledge in the field of Electrical and Electronics Engineering to meet the technical challenges of industry and society with strong innovative skills, leadership qualities and ethics.

Mission of the Department

- To provide standard training and effective teaching learning process to the students by using the state-of-the-art laboratories, core instruction and efficient faculty.
- To enhance competent, innovative and technical skills amongst the students through training programs by industry and external participation.
- To inculcate leadership qualities, ethical values and lifelong learning skills in learners to serve the society and nation for overall development through value based education.

Program Educational Objectives (PEOs)

Programme Educational Objectives (PEOs) of B.Tech (Electrical and Electronics Engineering) program are: Within few years of graduation, the graduates will

PEO-1: To solve composite problems using mathematics, basic sciences and engineering principles in the domains of testing, design and manufacturing.

PEO-2: To achieve higher positions in their profession by demonstrating leadership qualities, research and innovative abilities.

PEO-3: To contribute in the field of Electrical and Electronics Engineering to finding solutions for societal problems through their lifelong learning skills and ethical values.

Program Outcomes (POs)

PO-1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO-2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO-3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO-4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO-5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO-6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO-7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO-8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO-9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO-10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO-11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO-12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

On completion of the B.Tech. (Electrical and Electronics Engineering) degree, the graduates will be able to

PSO-1: Provide alternate solutions to address the problems with specific requirements in the field of Electrical and Electronics Engineering.

PSO-2: be ready to work professionally in relevant industries like power systems, control systems and software industries.

PROFESSOR DESK

Solar and wind continued to dominate renewable capacity expansion, jointly accounting for 90 per cent of all net renewable additions in 2019. Solar, with 586 GW, increased by 20 per cent, while wind, with 623 GW, increased by 10 per cent. China and the United States continued to dominate the increase in wind power, while China, India, Japan, the Republic of Korea and Viet Nam had the highest new solar capacity in 2019.

Hydropower accounted for the largest share of the global total, with a capacity of 1,190 GW. It increased minimally by 12 GW (up 1 per cent on 2018), possibly because some large projects missed their expected completion dates. China and Brazil accounted for most of the expansion.

Other renewables included 124 GW of bioenergy, 14 GW of geothermal, and 0.5 GW of marine energy. Turkey, followed by Indonesia and Kenya, led in expanding their geothermal energy use.

Off-grid capacity grew by 160 MW (up 2 per cent) to reach 8.6 GW in 2019. Bioenergy accounts for 40 per cent of off-grid capacity. China accounted for half of all new capacity in biofuel use.

Renewable generation capacity by region:- Asia accounted for 54 per cent of new capacity in 2019 (44 per cent of the global total).

Capacity in Europe and North America expanded by 6.6 and 6 per cent respectively.

Oceania and the Middle East were the fastest growing regions (up 18.4 and 12.6 per cent respectively), although their share of global capacity is small.

Africa only increased by 2.0 GW (up 4.3 per cent) to reach 48 GW.

Dr. G. Venkateswarlu,
HOD, Dept of EEE, NECN

Smart Home

Smart homes and buildings are a rapidly growing trend in the field of Electrical Electronics Engineering (EEE). The concept of smart homes and buildings involves the integration of various electronic devices, sensors, and systems to create a more efficient and convenient living and working environment. In this article, we will explore the various technologies and systems that are involved in creating a smart home or building, as well as the benefits and challenges of implementing these systems.

What is a smart home or building? A smart home or building is a living or working space that is equipped with various electronic devices and systems that are designed to make the space more efficient, comfortable, and convenient. These devices and systems include lighting systems, heating and cooling systems, security systems, entertainment systems, and home automation systems.

The devices and systems in a smart home or building are connected to each other and to the internet, creating what is known as the Internet of Things (IoT). This connectivity allows users to control and monitor their devices and systems from anywhere in the world using a smartphone or tablet.

Technologies used in smart homes and buildings Smart homes and buildings rely on various technologies and systems to function. Some of the most important technologies and systems used in smart homes and buildings are:

1. Sensors : Sensors are a key component of smart homes and buildings. They are used to monitor various environmental conditions, such as temperature, humidity, light, and air quality. Sensors can also be used to detect motion, sound, and other events.

2. Home automation systems : Home automation systems are used to control various devices and systems in a smart home or building. These systems can be programmed to turn lights on and off, adjust the thermostat, lock and unlock doors, and perform other tasks automatically.

3. Lighting systems : Lighting systems are an important part of smart homes and buildings. They can be programmed to turn on and off automatically based on occupancy, time of day, or other factors. Lighting systems can also be controlled remotely using a smart phone or tablet.

4. Heating and cooling systems: Heating and cooling systems are essential for creating a comfortable living or working environment. In a smart home or building, these systems can be programmed to adjust the temperature based on occupancy, time of day, or other factors. They can also be controlled remotely using a smartphone or tablet.

5. Security systems: Security systems are an important part of smart homes and buildings. These systems can include video cameras, motion sensors, and door and window sensors. They can be programmed to alert users of any unusual activity, such as a break-in or fire.

6. Entertainment systems : Entertainment systems, such as televisions, speakers, and media players, can also be integrated into a smart home or building. These systems can be controlled remotely using a smart phone or tablet, allowing users to stream music or video from anywhere in the world.

Benefits of smart homes and buildings There are many benefits to living or working in a smart home or building. Some of the key benefits include:

1. Energy efficiency: Smart homes and buildings are designed to be more energy-efficient than traditional homes and buildings. By using sensors, automation systems, and other technologies, smart homes and buildings can reduce energy consumption and lower utility bills.

2. Convenience: Smart homes and buildings are designed to be more convenient for users. By automating various tasks, such as turning lights on and off or adjusting the thermostat, smart homes and buildings can make life easier for their occupants.

3. Security: Smart homes and buildings are more secure than traditional homes and buildings. By using video cameras, motion sensors, and other security systems, smart homes and buildings can deter burglars and protect their occupants.

4. Comfort: Smart homes and buildings offer several benefits, including increased energy efficiency, improved safety and security, and enhanced convenience and comfort for residents. The following are some of the technologies and trends that contributed to the development of smart homes and buildings in recent years:**1. Internet of Things (IoT) Devices:** The IoT has revolutionized the way we interact with our surroundings, and smart homes and buildings are no exception. The IoT is a network of connected devices that can communicate with each other to perform various tasks.

In the context of smart homes and buildings, IoT devices can include smart thermostats, lighting systems, security cameras, and door locks. These devices can be controlled remotely through a mobile app, allowing residents to adjust the temperature, turn on lights, or lock doors from anywhere.

2. Energy Management Systems (EMS): Smart homes and buildings can leverage EMS to optimize energy consumption and reduce costs. These systems can monitor energy usage and adjust heating and cooling systems to maintain a comfortable temperature while minimizing waste. They can also identify areas of the building that are using too much energy and recommend changes to improve efficiency.

3. Artificial Intelligence (AI): AI technology can be integrated into smart homes and buildings to automate tasks and improve energy efficiency. For example, an AI-powered HVAC system can learn the habits and preferences of residents and adjust the temperature accordingly. AI-powered lighting systems can also adjust the brightness and color of lights based on the time of day and the amount of natural light in the room.

4. Voice Recognition Technology: Voice recognition technology has become increasingly popular in recent years, and smart homes and buildings can leverage this technology to provide a hands-free, convenient experience for residents. Voice assistants like Amazon's Alexa or Google Assistant can be used to control various aspects of the home, from adjusting the temperature to playing music.

5. Integration with Renewable Energy Sources: Smart homes and buildings can be designed to integrate with renewable energy sources like solar panels or wind turbines. These systems can help reduce energy costs and decrease reliance on non-renewable energy sources.

6. Enhanced Security and Surveillance: Smart homes and buildings can leverage advanced security systems like facial recognition technology, smart locks, and motion sensors to enhance safety and security. These systems can send notifications to homeowners' phones when there is a security breach, or when someone arrives at the door.

7. Smart Appliances: Smart appliances like refrigerators, washing machines, and ovens can be connected to the internet and controlled remotely through a mobile app. This can provide residents with greater convenience and control over their appliances, as well as help improve energy efficiency.

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Overall, smart homes and buildings are becoming increasingly popular due to the many benefits they offer. With the continued development of new technologies and the growing awareness of the need for energy efficiency, we can expect to see even more innovations in this field in the coming years.

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HVDC Development in 2019 Second Half

In the second half of 2019, there were several noteworthy developments in the field of High Voltage Direct Current (HVDC) technology. Here are some of the advancements that took place:

1. Grid-Scale HVDC Systems: The use of HVDC technology in grid-scale applications continued to grow in the second half of 2019. This includes projects like the North Sea Link, a 720 km underwater cable that will connect the power grids of Norway and the UK. HVDC technology allows for the efficient transmission of large amounts of electricity over long distances, making it ideal for these types of applications.

2. Advances in Converter Technology: HVDC converters are an essential component of any HVDC system, and advances in converter technology continued in the second half of 2019. One notable development was the introduction of modular multilevel converter (MMC) technology. This technology allows for more efficient and reliable conversion of AC power to DC power, making it ideal for use in HVDC systems.

3.Expansion of Offshore Wind Farms: HVDC technology is also playing a key role in the expansion of offshore wind farms. In the second half of 2019, several large-scale offshore wind projects were announced, including the 2.4 GW Dogger Bank project in the UK. HVDC technology is used to connect these offshore wind farms to the onshore power grid, enabling the efficient transmission of electricity over long distances.

4. Improved Control and Monitoring Systems: As HVDC systems become more complex, the need for advanced control and monitoring systems becomes more apparent. In the second half of 2019, several companies announced new control and monitoring systems for HVDC systems, including ABB's Ability PowerStore and Siemens' PowerLink Asset Management System. These systems provide real-time monitoring and control of HVDC systems, allowing for more efficient operation and maintenance.

5. Use of HVDC for Energy Storage: HVDC technology is also being used in energy storage applications. In the second half of 2019, several companies announced new energy storage projects that use HVDC technology, including the 400 MW Greenlink Interconnector project between Ireland and Wales. HVDC technology allows for efficient transmission of energy between different storage facilities, enabling the creation of a more flexible and responsive energy grid.

6. Increased Use of HVDC in Asia: While HVDC technology has been used extensively in Europe, it is still relatively new in other parts of the world. In the second half of 2019, there was a significant increase in the use of HVDC technology in Asia, particularly in China. This includes projects like the 640 km long Ximeng-Changji DC transmission project, which will connect wind and solar power facilities in China's Xinjiang region to the national grid.

7. Research and Development: Finally, there were several research and development projects underway in the second half of 2019 aimed at improving HVDC technology. This includes projects like the European Union's PROMOTioN project, which is focused on developing new HVDC technologies and improving the efficiency and reliability of existing systems.

Overall, the second half of 2019 was an exciting time for HVDC technology, with significant advancements in converter technology, control and monitoring systems, and the use of HVDC in grid-scale applications and energy storage. As the demand for clean, renewable energy continues to grow, we can expect to see even more exciting developments in this field in the years to come.

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Electrical Vehicle Development in 2019

In the second half of 2019, there were several significant developments in the field of electric vehicles (EVs), including advancements in battery technology, charging infrastructure, and the introduction of new models by major automakers. Here are some of the key highlights:

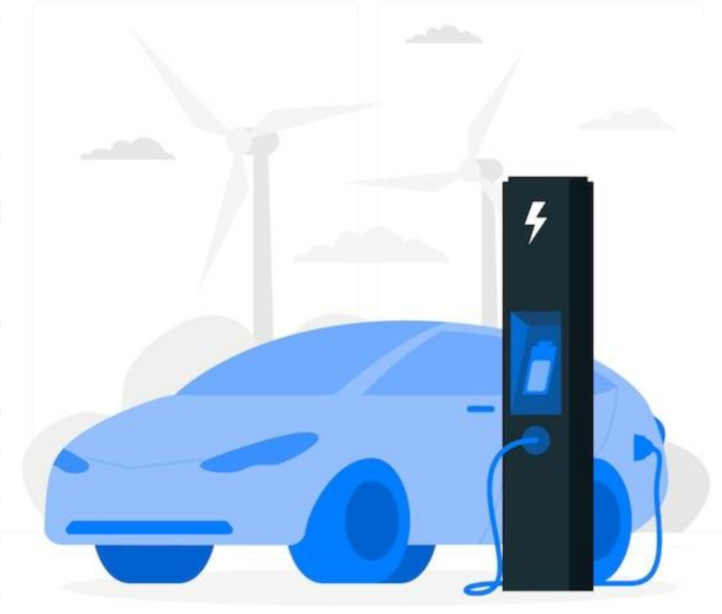
1. Battery Technology Advancements: In the second half of 2019, several companies announced advancements in battery technology that could help make electric vehicles more practical and affordable. For example, Tesla announced plans to introduce a new "million-mile" battery that could last for more than a million miles of driving before needing to be replaced. This could significantly reduce the total cost of ownership for electric vehicles, making them more competitive with traditional gas-powered cars. Other companies, such as Solid Power and Quantum Scape, announced progress in developing solid-state batteries that offer higher energy density and faster charging times than conventional lithium-ion batteries.

2. Charging Infrastructure: As the popularity of electric vehicles continues to grow, the need for charging infrastructure has become increasingly important. In the second half of 2019, several companies and governments announced plans to invest in charging infrastructure to support the transition to electric vehicles. For example, Electrify America announced plans to install over 2,000 high-speed charging stations across the United States by the end of 2025. Similarly, the European Union announced plans to invest €800 million in charging infrastructure as part of its goal to become carbon neutral by 2050.

3. New Electric Vehicle Models: In the second half of 2019, several major automakers announced new electric vehicle models or updates to existing models. For example, Audi introduced its first all-electric SUV, the e-tron, which offers a range of over 200 miles on a single charge. Similarly, Porsche introduced the Taycan, a high-performance electric sports car that offers a range of up to 280 miles.

Other companies, such as Ford and Volkswagen, announced plans to introduce new electric models in the coming years.

4. Government Incentives: In many countries, governments offer incentives to encourage consumers to switch to electric vehicles. In the second half of 2019, several governments announced new or expanded incentives for electric vehicle buyers. For example, the United Kingdom announced plans to increase its electric vehicle grant from £3,500 to £4,500, while the Canadian government announced a new incentive program that offers up to $5,000 off the purchase of a new electric vehicle.



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5. Autonomous Driving: While still in the development stage, autonomous driving technology could have a significant impact on the electric vehicle market in the coming years. In the second half of 2019, several companies made progress in developing autonomous driving technology for electric vehicles. For example, Tesla announced plans to launch its fully autonomous driving system in 2020, while Waymo (a subsidiary of Alphabet) announced plans to launch a commercial autonomous ride-hailing service in Arizona using electric vehicles.

Overall, the second half of 2019 was an exciting time for the electric vehicle industry, with significant advancements in battery technology, charging infrastructure, and the introduction of new models by major automakers. As the industry continues to grow and evolve, it is likely that we will see even more significant developments in the years to come.

About BMS in Second Half

In the second half of 2019, there were significant developments in battery management systems (BMS) for electric vehicles, energy storage systems, and other applications that rely on lithium-ion batteries. BMS is a critical component that monitors and controls the charging and discharging of batteries to ensure optimal performance, safety, and longevity. Here are some of the developments in BMS technology during this period:

1. Enhanced safety features: One of the primary focuses of BMS development has been on improving safety features. This includes developing algorithms that can detect and prevent thermal runaway, a dangerous condition where batteries can overheat and cause fires or explosions. Additionally, BMS developers have been working on new ways to monitor battery health in real-time and prevent overcharging, which can also lead to safety issues.

2. Integration with the cloud: Another area of BMS development has been in integrating BMS with cloud-based monitoring and control systems. This allows for real-time data collection and analysis, which can help operators optimize battery performance and identify potential issues before they become major problems. Cloud-based BMS systems can also enable remote monitoring and control of batteries, which is especially useful for large-scale energy storage systems.

3. Increased accuracy and precision: BMS developers have been working on improving the accuracy and precision of battery monitoring and control.

This includes developing new algorithms for state-of-charge (SOC) and state-of-health (SOH) estimation, which can help improve battery performance and extend its lifespan. BMS developers have also been working on improving cell balancing algorithms, which help ensure that individual cells within a battery pack are charged and discharged evenly.

4. Artificial intelligence and machine learning: In recent years, there has been a growing trend towards using artificial intelligence (AI) and machine learning (ML) algorithms to improve BMS performance. In the second half of 2019, BMS developers continued to explore the potential of AI and ML for battery monitoring and control. For example, some developers are using AI and ML algorithms to predict battery performance and identify potential issues before they occur.

5. Improved battery pack design: Finally, BMS developers have been working closely with battery pack designers to improve the overall performance and safety of lithium-ion batteries. This includes developing new materials and architectures for battery packs that can improve energy density, reduce weight, and enhance safety. BMS developers are also working to optimize the control and management of battery packs to ensure that they operate efficiently and safely.

In conclusion, BMS technology is a critical component in the development of safe and reliable lithium-ion batteries for electric vehicles, energy storage systems, and other applications. The developments in BMS technology during the second half of 2019 demonstrate the ongoing efforts to improve the performance, safety, and longevity of lithium-ion batteries, and to enable the widespread adoption of clean energy technologies.

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Development of Soid state battery in 2019 second half

In the second half of 2019, there were significant developments in solid-state battery technology. Solid-state batteries are a type of battery that uses a solid electrolyte instead of a liquid or gel electrolyte, which can provide higher energy density, faster charging, and increased safety compared to traditional lithium-ion batteries. Here are some of the key developments in solid-state battery technology during this period:

1. Advances in solid electrolyte materials: One of the primary focuses of solid-state battery development has been on finding suitable solid electrolyte materials that can provide high ionic conductivity, good stability, and low cost. In the second half of 2019, researchers made progress in developing new solid electrolyte materials, such as lithium phosphorus oxynitride (LiPON) and sodium ion conducting ceramics, which could improve the performance and reduce the cost of solid-state batteries.

2. Improved electrode materials: In addition to solid electrolytes, researchers have also been working on improving the electrode materials used in solid-state batteries. This includes developing new cathode materials, such as sulfur and metal oxides, that can provide high energy density and good stability. Researchers have also been working on improving the anode materials, such as lithium metal and lithium alloy, which can increase the energy density and reduce the charging time of solid-state batteries.

3. Enhanced manufacturing techniques: Another area of development in solid-state battery technology has been in improving the manufacturing techniques for solid-state batteries. Researchers have been exploring new methods for producing solid electrolytes and electrodes, such as chemical vapor deposition and printing techniques, that could improve the scalability and reduce the cost of solid-state battery production.

4. Improved performance and safety: The development of solid-state batteries has focused on improving their performance and safety compared to traditional lithium-ion batteries. Solid-state batteries can provide higher energy density, faster charging, and increased safety, but there are still challenges to be addressed, such as the formation of dendrites and thermal stability. In the second half of 2019, researchers made progress in addressing these issues and improving the overall performance and safety of solid-state batteries.

5. Commercialization efforts: Finally, there were also significant efforts in commercializing solid-state battery technology during the second half of 2019. Several companies announced plans to develop and manufacture solid-state batteries, such as Toyota and Samsung, which could lead to increased adoption of this technology in electric vehicles and other applications.

In conclusion, the developments in solid-state battery technology during the second half of 2019 demonstrate the ongoing efforts to improve the performance, safety, and cost-effectiveness of this technology. While there are still challenges to be addressed, such as the scalability and manufacturing cost, the progress made in solid electrolyte and electrode materials, manufacturing techniques, and performance and safety, shows that solid-state batteries have the potential to revolutionize the energy storage industry and enable the widespread adoption of clean energy technologies.

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