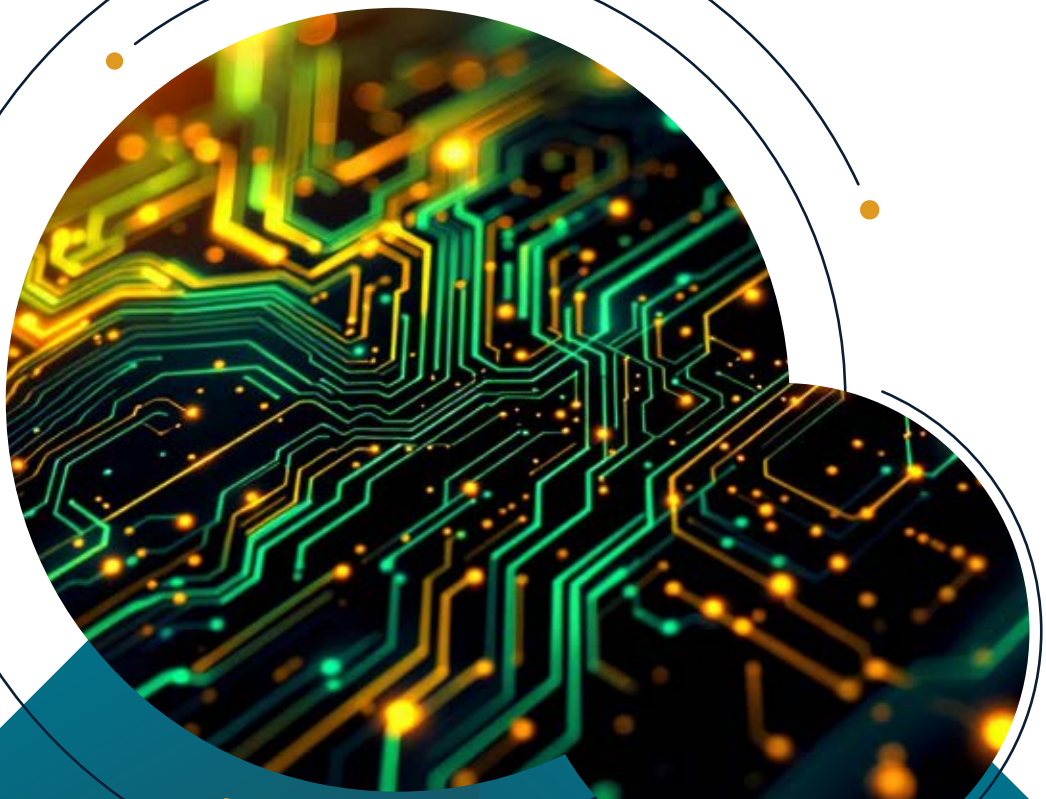
NEW HORIZON
COLLEGE OF ENGINEERING

SILVER HORIZONS 25 YEARS OF GLOBAL LEARNING

DEPARTMENT OF
ELECTRICAL AND ELECTRONICS ENGINEERING

SPRING TRONICALS



JANUARY – JUNE 2026

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Message from Chairman

Dr. Mohan Manghnani,
Chairman of New Horizon Educational Institutions

It gives me immense pleasure to extend my greetings through this edition of SPRING TRONICALS, the biannual magazine of the Department of Electrical and Electronics Engineering. The EEE Department has consistently established itself as a center of academic excellence, innovation, and professional growth, contributing significantly to the reputation and progress of our institution.In today's rapidly advancing technological environment, continuous learning, adaptability, and innovation are essential. Our department remains committed to providing a dynamic academic ecosystem that nurtures technical competence, critical thinking, creativity, and leadership among students. Through regular curriculum enhancements, industry interactions, research initiatives, and experiential learning opportunities, we strive to prepare our students to meet the evolving demands of the engineering profession.

It is highly encouraging to witness the enthusiasm and accomplishments of our students and faculty members across diverse academic, technical, research, and extracurricular domains. Their dedication, creativity, and pursuit of excellence continue to strengthen the department's vibrant academic culture. SPRING TRONICALS serves as an excellent platform to showcase these achievements, innovative projects, technical articles, research contributions, and various departmental activities undertaken during the period of January to June 2026.I sincerely appreciate the efforts of the editorial team, faculty members, and students whose commitment and hard work have made this publication possible. I am confident that this edition of SPRING TRONICALS will serve as a valuable source of knowledge, inspiration, and motivation for all readers.

I extend my best wishes to all our students, faculty members, alumni, and stakeholders for continued success and excellence in their future endeavors.

Message from President

Mr. Dhermesh Manghnani
President of New Horizon Educational Institution

The future belongs to those who possess the courage to innovate, the curiosity to learn, and the determination to transform challenges into opportunities. As we navigate an era characterized by rapid technological evolution and global interconnectedness, institutions of higher education carry the profound responsibility of nurturing not just engineers, but visionaries who will shape the world of tomorrow.

It gives me great pleasure to present the January–June 2026 edition of SPRING TRONICALS, the biannual magazine of the Department of Electrical and Electronics Engineering at New Horizon College of Engineering.

At New Horizon Educational Institution, we firmly believe that excellence in education is achieved when knowledge, innovation, research, and societal responsibility converge. Our mission is to cultivate an ecosystem where students are encouraged to explore, experiment, innovate, and excel beyond the boundaries of conventional learning. We strive to empower our students with not only technical competence but also with the confidence, adaptability, and leadership skills required to thrive in an increasingly dynamic world.The Department of Electrical and Electronics Engineering continues to exemplify these values through its commitment to academic excellence, industry engagement, research innovation, and holistic student development. The achievements documented in this edition of SPRING TRONICALS reflect the department's dedication to fostering a culture of creativity, collaboration, and continuous improvement.

This magazine serves as a celebration of ideas, accomplishments, and aspirations. It captures the collective efforts of our students, faculty members, researchers, alumni, and industry partners, all of whom contribute to building a vibrant academic community committed to excellence and innovation.I commend the editorial team and all contributors for their dedication and sincere efforts in bringing out this remarkable publication.

May this edition inspire every reader to embrace lifelong learning, pursue innovation with passion, and contribute meaningfully towards creating a sustainable and technologically advanced future.

I extend my heartfelt wishes to the Department of Electrical and Electronics Engineering for continued growth, success, and many more milestones in the years ahead.

Message from Principal

Dr. Manjunatha
Principal, NHCE

In today's rapidly evolving technological era, the true measure of engineering education lies not only in academic excellence but also in the ability to nurture innovation, critical thinking, and professional competence. At New Horizon College of Engineering, we are committed to creating a learning environment that empowers students with the knowledge, practical exposure, and industry-relevant skills essential for achieving success in their professional journeys.As industries continue to undergo significant transformation driven by emerging technologies and global challenges, the demand for adaptable, skilled, and innovative engineers has never been greater. Recognizing this evolving landscape, our institution consistently strives to bridge the gap between classroom learning and real-world applications through experiential learning, industry collaborations, research initiatives, and skill development programs.

It gives me immense pleasure to present this edition of SPRING TRONICALS, the in-house magazine of the Department of Electrical and Electronics Engineering. This publication serves as a reflection of the department's vibrant academic culture, showcasing the numerous technical activities, research endeavors, innovative projects, achievements, and collaborative initiatives undertaken during the period of January to June 2026.The magazine stands as a testament to the creativity, dedication, and perseverance of our students, faculty members, alumni, and the editorial team. Their collective efforts have resulted in a publication that not only documents accomplishments but also inspires future innovation and excellence.

I extend my heartfelt appreciation to everyone who contributed to this edition and congratulate the editorial committee for their exceptional efforts in bringing out such an informative and engaging publication. I am confident that this issue of SPRING TRONICALS will provide valuable insights, inspire new ideas, and offer an enriching experience to all its readers.

I convey my best wishes to the Department of Electrical and Electronics Engineering for continued success and many more achievements in the years to come.

Message from HoD-EEE

Dr. S. Sujitha
Prof. & HOD EEE, NHCE

It gives me immense pleasure to present the January–June 2026 edition of SPRING TRONICALS, the biannual magazine of the Department of Electrical and Electronics Engineering. This publication serves as a reflection of the vibrant academic environment, innovative spirit, and collective achievements of our department during the past six months.The Department of Electrical and Electronics Engineering continues to strive towards academic excellence by fostering a culture of innovation, research, industry engagement, and holistic student development. In an era of rapid technological advancements and evolving industry expectations, our focus remains on equipping students with strong technical foundations, practical skills, problem-solving abilities, and professional competencies that prepare them to become successful engineers and responsible global citizens. The period from January to June 2026 has been marked by numerous achievements and activities, including seminars, workshops, expert lectures, industrial visits, Green Energy Club initiatives, student projects, research contributions, and placement accomplishments. These initiatives have provided valuable opportunities for our students to explore emerging technologies, enhance their technical expertise, and develop leadership and teamwork skills.

One of the greatest strengths of our department is the enthusiasm, creativity, and dedication demonstrated by our students and faculty members. Their accomplishments in academics, research, innovation, and extracurricular activities continue to inspire us and contribute significantly to the growth and reputation of the department.SPRING TRONICALS is more than just a magazine; it is a platform that celebrates achievements, encourages knowledge sharing, and documents the continuous journey of learning and innovation within our department. This edition showcases the collective efforts of our students, faculty members, alumni, and stakeholders who have contributed towards creating a dynamic and progressive academic ecosystem.I sincerely appreciate the efforts of the editorial team, faculty members, and students whose dedication and hard work have made this publication possible. I hope that this edition of SPRING TRONICALS will serve as a source of inspiration, knowledge, and motivation for all its readers.

I extend my best wishes to everyone associated with the Department of Electrical and Electronics Engineering and look forward to many more accomplishments in the years ahead.

New Horizon College of Engineering

VISION

To emerge as an institute of eminence in the fields of engineering, technology and management in serving the industry and the nation by empowering students with a high degree of technical, managerial and practical competence.

MISSION

- To strengthen the theoretical, practical and ethical dimensions of the learning process by fostering a culture of research and innovation among faculty members and students.
- To encourage long-term interaction between the academia and industry through their involvement in the design of curriculum and its hands-on implementation.
- To strengthen and mould students in professional, ethical, social and environmental dimensions by encouraging participation in co-curricular and extracurricular activities.

QUALITY POLICY

To provide educational services of the highest quality both curricular and co-curricular to enable students integrate skills and serve the industry and society equally well at global level.

VALUES

- Academic Freedom
- Integrity
- Inclusiveness
- Innovation
- Professionalism
- Social Responsibility

ABOUT DEPARTMENT

Welcome to the Department of Electrical & Electronics Engineering (EEE) at New Horizon College of Engineering (NHCE), Bangalore. EEE is one of the prestigious branches of Engineering and one among the oldest departments of NHCE-Bangalore started in 2001. The EEE Department has been playing a vital role in producing engineers and technologists of high caliber ever since it was established in the year 2001. The Department is accredited by NAAC with 'A' Grade and accredited by NBA. The vision of EEE Department is to create contemporary Engineers, innovators and entrepreneurs to make a better nation and in turn, a better world. A critical investigation and innovation into the modern state-of-art and cutting edge technology lead to the fact that an electrical graduate fits better in today's competitive world.

The strength of the department is highly qualified faculty members with expertise in various fields of electrical engineering, state of art laboratory facilities. The department is inclined towards bridging the gap between Industry and academia by collaborating with Multinational Companies in the field of Electrical Engineering.

Indo-French Center of Excellence in Electricity, Automation and Energy (IFCEEAE) is one such initiative evolved through "MoU" with French Ministry of National Education and Schneider Electric India Pvt. Ltd., The main objectives of IFCEEAE are

- To train the students of all streams of engineering in automation field
- To facilitate interdisciplinary and applied research with a focus on innovative product development
- To provide excellent career opportunities to students through exchange programs with French Universities, industrial training, innovative learning and R & D activities especially in the areas like Smart Grid, Internet of things (IoT), Energy Management Systems, Embedded systems, Supervisory Control and Data Acquisition (SCADA) and industrial automation.

The Department nurtures the young minds beyond the curriculum by facilitating technical clubs in promoting technical events, community development/society impact and universal value/ethics programs. In supporting to this, Department of Electrical and Electronics Engineering has established Institute of Electrical and Electronics Engineers (IEEE) – Power Electronics Society (PELS) Student Branch Chapter (Geo-Code: SBC66131). Industrial Electronics Society (IES) Student Branch Chapter (Geo-Code: SBC66131B). Power and Energy Society (PES) Student Branch Chapter (Geo-Code: SBC66131D). Which is the non- profitable, world largest technical professional organization for the advancement of technology. The students have a greater exposure and flexibility in campus placements in core industries, IT sectors and Public Sector Units (PSU).

VISION

To evolve into a centre of excellence in Electrical and Electronics Engineering for bringing out contemporary engineers, innovators, researchers and entrepreneurs for serving nation and society.

MISSION

- To provide suitable forums to enhance the teaching-learning, research and development activities.
- Framing and continuously updating the curriculum to bridge the gap between industry and academia in the contemporary world and serve society.
- To inculcate awareness and responsibility towards the environment and ethical values.

PROGRAM OUTCOMES (POS)

PO1 Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization, as specified in WK1 to WK4 respectively, to develop solutions to complex engineering problems.

PO2 Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems, reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3 Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems, components or processes to meet identified needs with consideration for public health and safety, whole-life cost, net zero carbon, culture, society and the environment as required. (WK5)

PO4 Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge, including the design of experiments, modelling, analysis and interpretation of data to provide valid conclusions.(WK8)

PO5 Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling, recognising their limitations in solving complex engineering problems. (WK2 and WK6)

PO6 The Engineer and the World: Analyse and evaluate societal and environmental aspects while solving complex engineering problems, considering their impact on sustainability with reference to the economy, health, safety, legal framework, culture and environment. (WK1, WK5 and WK7)

PO7 Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national and international laws. (WK9)

PO8 Individual and Collaborative Teamwork: Function effectively as an individual and as a member or leader in diverse or multidisciplinary teams.

PO9 Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, and make effective presentations considering cultural, language and learning differences.

PO10 Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making, and apply these to one's own work as a member and leader in a team, and to manage projects in multidisciplinary environments.

PO11 Life-Long Learning: Recognise the need for and have the preparation and ability for:

i) independent and life-long learning
ii) adaptability to new and emerging technologies
iii) critical thinking in the broadest context of technological change. (WK8)

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1 To provide good learning environment to develop entrepreneurship capabilities in various areas of Electrical and Electronics Engineering with enhanced efficiency, productivity, cost effectiveness and technological empowerment of human resource.

PEO2 To inculcate research capabilities in the areas of Electrical and Electronics Engineering to identify, comprehend and solve problems and adopt themselves to rapidly evolving technology.

PEO3 To create high standards of moral and ethical values among the graduates to transform them as responsible citizens of the nation.

KNOWLEDGE AND ATTITUDE PROFILE (WK)

WK1 A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2 Conceptually based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3 A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4 Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much of it is at the forefront of the discipline.

WK5 Knowledge including efficient resource use, environmental impacts, whole-life cost, reuse of resources, net zero carbon and similar concepts that supports engineering design and operations in a practice area.

WK6 Knowledge of engineering practice (technology) in the practice areas within the engineering discipline.

WK7 Knowledge of the role of engineering in society and identified issues in engineering practice such as professional responsibility towards public safety and sustainable development.

WK8 Engagement with selected knowledge in the current research literature of the discipline and awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9 Ethics, inclusive behaviour and conduct. Knowledge of professional ethics, responsibilities and norms of engineering practice. Awareness of diversity in terms of ethnicity, gender, age, physical ability with mutual respect and inclusive attitudes.

PROGRAM SPECIFIC OUTCOME (PSOs)

PSO1 Apply knowledge of electrical machines, circuit analysis, electronics, power systems, control, instrumentation, power electronics, signal processing, and embedded systems to analyse, design, and implement solutions for real-world applications using modern hardware and software tools.

PSO2 Design and develop innovative solutions in renewable energy, electric vehicles, smart grids, and automation with focus on environmental sustainability and societal needs.

EDITORIAL TEAM

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Senior Assistant Professor
EEE Department, NHCE

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MoUs SIGNED

NHCE MoU with Fortis Energy Intelligence

30.01.2026

New Horizon College of Engineering signed a Memorandum of Understanding (MoU) with Fortis Energy Intelligence on 30th January 2026 to foster collaboration in the areas of energy analytics, sustainability, and intelligent energy management solutions. This partnership aims to enhance skilling, research, and consultancy opportunities for NHCE students and faculty, while supporting Fortis Energy Intelligence in developing data-driven, efficient, and sustainable energy solutions. The MoU represents a significant step in strengthening academia–industry collaboration in the energy intelligence and sustainability domain.

Key takeaways: –

- Collaboration between NHCE and Fortis Energy Intelligence to drive innovation in energy analytics, sustainability practices, and intelligent energy management systems.
- Training, certification, and skill development programs for NHCE students and faculty in energy intelligence, data-driven decision-making, and emerging energy technologies.
- Joint research, consultancy, and knowledge exchange initiatives to support sustainable energy solutions and industry-ready workforce development.

HACKATHONS

Hardware Hackathon of QuantumX’26

26.03.2026 to 28.03.2026

The Hardware Hackathon of QuantumX'26 was held from 26th to 28th March 2026 and provided an engaging, hands-on platform for participants to innovate and develop practical solutions. The event focused on hardware-based problem-solving, encouraging creativity, technical proficiency, and teamwork. In the first round, teams presented their project ideas through concise PowerPoint presentations to demonstrate clarity of thought and technical planning. The second round required participants to work with the provided hardware kits and develop a functional prototype within a limited timeframe. This stage challenged teams to apply their skills in real time while managing constraints effectively. The final round featured a demonstration presentation in a hospital-themed arena that simulated real-world conditions. Shortlisted teams showcased their working prototypes, highlighting usability, innovation, and implementation effectiveness. The event infrastructure included well-organised tool support and guidance zones to assist participants throughout the competition. The arena setup added realism and excitement, enhancing the competitive spirit of the hackathon. Participants expressed highly positive feedback, appreciating the event's structure, resources, and overall learning experience.

FACULTY ACHIEVEMENTS

Sl. No.	Faculty Name	Achievement	Date	Awarding Organization
1	Dr. S. Sujitha	Director, AADLIS EI Private Limited – AI-driven technology startup (Entrepreneurship & Innovation)	28 Jan 2026	Ministry of Corporate Affairs, Government of India
2	Dr. Vinoth Kumar K	Best Innovation Ambassador	02 Dec 2025	Ministry of Education's Innovation Cell (MIC), AICTE
3	Dr. Vinoth Kumar K	Certificate of Appreciation	02 Jan 2026	IEEE PELS & IEEE IES Bangalore Chapter
4	Dr. Agalya V	Post Graduate Diploma in Intellectual Property Rights Law	03 Nov 2025	Supreme Court of India, Bangalore
5	Dr. Agalya V	WEI Outstanding IP Mentor Award	23 Nov 2025	Women Entrepreneur India
6	Dr. Agalya V	Patent Granted (Inventor)	06 Nov 2025	Indian Patent Office
7	Dr. Agalya V	Guest Speaker – Valuable Knowledge Sharing	02 Dec 2025	Ministry of Education / AICTE
8	Dr. Agalya V	Patent Granted	18 Feb 2026	Indian Patent Office
9	Dr. Gunapriya B	AICTE-QIP-PG 2025 Certificate Programme – *AI and Data Science for Smart Healthcare*	Jun–Dec 2025	IIT (ISM) Dhanbad & AICTE
10	Dr. R. Mohan Das	AICTE-ATAL FDP Funding Received (AY 2025–26)	18–23 Aug 2025	AICTE-ATAL
11	Anitha A	Long Service Award (10 Years)	05 Sep 2025	NHCE
12	Ch. Kavitha	Long Service Award (10 Years)	05 Sep 2025	NHCE
13	Vinod Kumar S	KSCST Project Funding Approved (₹5,000)	02 Mar 2026	Karnataka State Council for Science and Technology (KSCST)
14	Sangeetha C. N.	KSCST Project Funding Approved (₹5,000)	02 Mar 2026	Karnataka State Council for Science and Technology (KSCST)
15	Satishkumar D	AICTE-QIP-PG 2025 Certificate Programme – *Intelligent Transport Systems for Electric Vehicles*	Jun–Dec 2025	NITK Surathkal& AICTE
16	Satishkumar D	Long Service Award (10 Years)	05 Sep 2025	NHCE

ACADEMIC TOPPERS

The Department of Electrical and Electronics Engineering proudly recognizes the outstanding academic performance of its students. The following students have secured top positions through their dedication, perseverance, and commitment to excellence, serving as an inspiration to their peers.

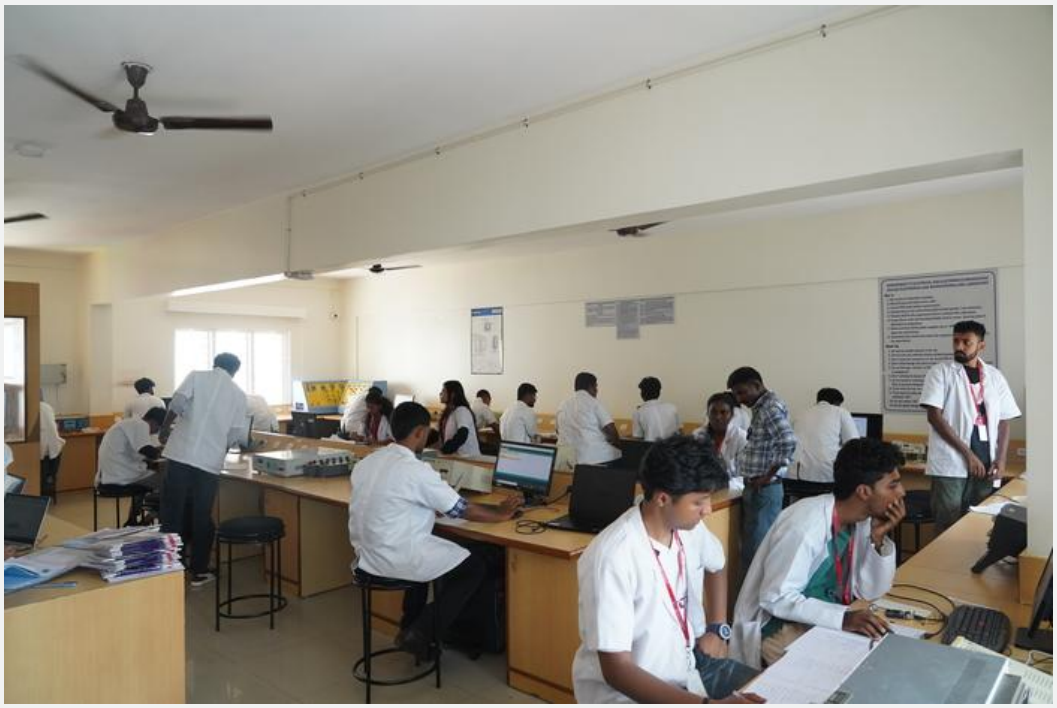
RANK	USN	NAME
1	1NH22EE046	G R YASHWANTH
2	1NH22EE085	R GAGANA
3	1NH22EE048	GOWRI MANOJKUMAR
4	1NH22EE090	RANI GUPTA R
5	1NH22EE063	LALITH NARAYAN
6	1NH23EE408	R KIRAN KUMAR
7	1NH22EE099	SHATAKSHI PATTANAIK
8	1NH23EE407	PUNITH KUMAR D
9	1NH22EE088	RAJ SINGH
10	1NH22EE053	IQRA BASHIR

LABORATORY INFRASTRUCTURE

Control and Measurements Laboratory

The Control and Measurements Laboratory equips students with practical skills in control systems and electrical measurement via hands-on experiments and simulations. It allows for analysis and design using MATLAB, with hardware implementation to validate results. Experiments include servo motors, PID controllers, and various electrical transducers, enhancing students' understanding of system performance, measurement principles, and control strategies while developing their analytical and problem-solving skills.

Analog and Microcontroller Laboratory



The Analog and Microcontroller Laboratory teaches students to design, analyze, and implement analogue electronic circuits and embedded systems. It focuses on semiconductor devices, analogue signal processing, and circuit design, while also covering microcontroller programming and interfacing with Keil-51 software, enhancing skills in embedded system development and automation technologies.

Electric Circuit and Research Laboratory

The Electric Circuit and Research Laboratory equips students with foundational skills in electrical circuit analysis through hands-on experiments and simulations. It facilitates the construction and verification of circuits with various elements, enhancing understanding of electrical engineering principles. The lab supports circuit modeling and research using modern software tools, allowing students to test theoretical concepts and analyze circuit behavior. This environment fosters the development of experimental, analytical, and research skills, preparing students for advanced studies and practical engineering applications.

Electrical Machines Laboratory

The DC Machines and Transformers Laboratory and the Synchronous and Induction Machines Laboratory offer a variety of electrical machines and instruments for student hands-on experience. Students learn about the construction, operation, testing, and performance of DC, induction, and synchronous machines, as well as transformers. Key experiments include efficiency evaluation, speed control, voltage regulation, and testing, helping students gain a strong understanding of electrical machine operation and relevant industry skills in testing and performance evaluation.

Power System Simulation Laboratory

The Power System Simulation Laboratory offers students hands-on experience in modeling, analyzing, and simulating modern electrical power systems using software like MATLAB, ETAP, and Mi-Power. It covers system operation, planning, protection, stability, control, and power quality through simulation-based experiments, fostering analytical and problem-solving skills applicable in the power generation, transmission, and distribution sectors.

Digital and Power Electronics Laboratory

The Digital and Power Electronics Laboratory offers students practical experience in digital electronics and power electronic systems. It focuses on digital logic circuits, advanced power semiconductor devices, and power converters through hands-on experimentation. Equipped with modern trainer kits and measuring instruments, the lab supports a range of projects, enhancing students' practical skills and analytical abilities in the field.

Power System Protection and High Voltage Laboratory

The Power System Protection and High Voltage Laboratory is a key facility within the Department of Electrical and Electronics Engineering, offering students practical experience in power system protection and high-voltage engineering. The lab is equipped for experiments on protective relays, high-voltage testing, and fault analysis. Students can explore various protection schemes, including overcurrent and distance protection, as well as conduct high-voltage generation tests. It also facilitates the study of dielectric properties and insulation performance, enhancing students' skills in power system protection and research applications.

Schneider Industrial Automation Laboratory

The Schneider Industrial Automation Laboratory is a Centre of Excellence aimed at enhancing expertise in automation technologies for digital transformation in industries. In partnership with Schneider Electric, it offers advanced facilities for students and scholars to engage in hands-on experience with industrial automation systems, PLC programming, and SCADA. The lab provides specialized courses for engineering students, fostering skills in automation system design and implementation, while also promoting research and industry partnerships, and preparing students for careers in automated sectors.

JOURNAL PUBLICATION DETAILS

Sl No	Faculty Name	Paper Title	Month Year	Journal / Conference Title	Volume	Issue	Page start	Page end	Source (Scopus / WoS)	Publication Type (Journal / Conference)	DOI
1	Arangarajan Vinayagam	A hyperband optimized Bi-LSTM model for electric demand forecasting in diversified power systems	March, 2026	Results in Engineering	29		1	20	Scopus	Journal	https://doi.org/10.1016/j.rineng.2026.109891
2	Meenakshi Sundaram Padamanabhan	Optimized Hybrid Approach for Assessing Pollution Severity in Polymer Insulators Using Random Forest and Fuzzy Logic	May, 2026	Automation and Remote Control							10.1134/S0005117925600971
3	Arangarajan Vinayagam	An extensive analysis of machine learning algorithms for the identification and differentiation of high impedance faults in various power network topologies	June, 2026	Results in Engineering	30		1	17	Scopus	Journal	https://doi.org/10.1016/j.rineng.2026.110421
4	Arangarajan Vinayagam	High impedance fault discrimination in microgrid power system using stacking ensemble approach	March, 2026	International Journal of Applied Power Engineering (IJAPE)	15	1	98	109	Scopus		10.11591/ijape.v15.i1
5	Dr. Sujoy Das	Adaptive load sifting strategy for short-term hydrothermal energy scheduling using crayfish optimization algorithm	January, 2026	Electrical Engineering	108	2	1	24	Scopus	Journal	https://doi.org/10.1007/s00202-026-03518-z
6	Mrs. Soumya K.V	High sensitivity terahertz metasurface biosensor integrating plasmonic coupling and machine learning for wearable diabetes monitoring	January, 2026	Sensing and Bio-Sensing Research	51	NA	1	15	Scopus	Journal	https://doi.org/10.1016/j.sbsr.2026.100968
7	Dr. Vinoth Kumar K	Advanced modeling techniques for solar radiation estimation: enhancing renewable energy integration in power grids	January, 2026	Electrical Engineering	108	1	1	10	Scopus	Journal	https://doi.org/10.1007/s00202-025-03508-7

CONFERENCE PUBLICATION DETAILS

Sl No	Faculty Name	Paper Title	Month Year	Journal / Conference Title	Volume	Page start	Page end	Source (Scopus / WoS)	DOI
1	Surat Pyari Atti	ZeroEdge: Ambient Energy Harvesting Framework for Powerless IoT in Sustainable Smart Ecosystems	March, 2026	Proceedings of 5th International Conference on Communication, Computing and Electronics Systems, ICCCES 2026	5	529	535	Scopus	10.1109/ICCCES62661.2026.11436498
2	Dr. Sujitha S	Real-Time Router for Intelligent Electric Vehicle Communication	March, 2026	Proceedings of 5th International Conference on Communication, Computing and Electronics Systems, ICCCES 2026	5	462	466	Scopus	10.1109/ICCCES62661.2026.11437148
3	Vinod Kumar S	Smart Solar Wind EV Charging with V2H Integration and Energy Management	March, 2026	Proceedings of 5th International Conference on Communication, Computing and Electronics Systems, ICCCES 2026	5	268	275	Scopus	10.1109/ICCCES62661.2026.11437114
4	Dr. Gunapriya B	ZeroRush: Iot-Based Motorbike Monitoring with Helmet Detection and Eco-Safe Driving Score Using Adaptive Penalty Scoring Method	March, 2026	2nd Asian Conference on Intelligent Technologies (ACOIT)	2			Scopus	10.1109/ACOIT66109.2025.11436427
5	Kavitha Chenna Reddy	Hand Gesture-Based Control System for Home Automation Using Arduino and APDS-9960 Sensor	2026	6th International Conference on Data Science, Machine Learning and Applications	6	348	354		https://doi.org/10.1007/978-981-95-5835-3_55
6	Kavitha Chenna Reddy	Smart Home Automation using APK for real-time Control and AI-Enabled Expansion Possibilities	2026	6th International Conference on Data Science, Machine Learning and Applications	6	744	751		https://doi.org/10.1007/978-981-95-5835-3_109
7	Dr. Sujoy Das	Optimizing Short-Term Hydrothermal Dispatch: A Robust Solution via Artificial Protozoa Optimizer	Febuary, 2026	2nd International Conference on Green Industrial Electronics and Sustainable Technologies (GIEST)	2	1	5	Scopus	10.1109/GIEST66547.2025.11387152
8	Sangeetha CN	IoT-Embedded Intelligent Waste Monitoring System	Febuary, 2026	International Conference on Data Science, Machine Learning and Applications	1	165	171	Scopus	https://doi.org/10.1007/978-981-95-5831-5_18
9	Sangeetha CN	Green Power Integration: Solar Inverter Hardware for Residential EV Charging	Febuary, 2026	10th International Conference on Communication and Electronics Systems (ICCES-2025)	10	387	389	Scopus	10.1109/ICCES67310.2025.11336908
10	Soumya KV	Advanced Telemetry-Controlled Quadcopter System for Wireless Surveillance and Control in High-Risk Environments	Febuary, 2026	2025 International Conference on Communication and Smart Devices (ICCoSD)	NA	1	4	Scopus	10.1109/ICCoSD66074.2025.11348178
11	Sunil SK	AI based EV Charging Station Scheduling for Smart Energy Systems	January, 2026	6th International Conference on IoT Based Control Networks and Intelligent Systems (ICICNIS)	6			Scopus	10.1109/ICICNIS66685.2025.11315683
12	Dr. Sujitha S	Smart Handleber with Integrated Auto Finger Sensor for Biometric Authentication and Rider Safety	January, 2026	International Conference on Intelligent Computing, Information and Control Systems (ICOIICS-2025)	NA	104	109	Scopus	NA

PATENT DETAILS (January to June - 2026)

Sl. No.	Name of the Inventor	Application No.	Date of Application Submitted	Title of Patent	Published/ Granted	Publication Volume No	Publication Date
1	Dr. Sujitha S	202541130761 A	23/12/2025	AI-ASSISTED REAL-TIME ROUTING DEVICE FOR EV APPLICATION	Published	01/2026	01-02-2026
2	Vinod kumar M H	202641052162 A	24/04/2026	FULL-FACE BIKE HELMET WITH MODULAR DUAL-FILTRATION RESPIRATORY PROTECTION	Published	5/2026	05-08-2026
3	Soumya KV	202541130799	23/12/2025	Smart Sloped Vertical Hydrophonic Indoor Farming Chamber For Height -Adaptable Plant Growth	Published	01/2026	01-02-2026
4	Sunil S K	202641021161 A	23/2/2026	AI-DRIVEN SELF-SUSTAINED PLANT POT	Published	10/2026	03-06-2026
5	Dr. Mohan Das R	202641020993 A	23/2/2026	A Solar-Powered Smart Bag with Rain Sensing and Automated Flap Control	Published	10/2026	03-06-2026
6	Dr. Gunapriya B	Design No: 446999-001	02-05-2025	CAMERA -INTEGRATED MUDGUARD	Granted	NA	02-05-2026
7	Satish Kumar D	202541036697 A	15/04/2025	AMBULANCE PRIORITY TRAFFIC MANAGEMENT SYSTEM FOR EMERGENCY RESPONSE OPTIMIZATION	Published	06/2026	02-06-2026
8	Sangeetha C N	202541130765 A	23/12/2025	SMART ASSISTIVE HEALTH MONITORING FRAMEWORK FOR NEURO-MUSCULAR PATIENTS	Published	01/2026	01-02-2026
9	Pooja Jose	202541130790 A	23/12/2025	VISION-ASSISTED ROBOTIC ARM CONTROL SYSTEM FOR AUTONOMOUS OBJECT DETECTION AND PICK AND PLACE OPERATIONS	Published	01/2026	01-02-2026
10	Vinod Kumar S	202541131063 A	24/12/2025	DYNAMIC ENERGY MANAGEMENT SYSTEM FOR SOLAR–WIND EV CHARGING WITH INTEGRATED VEHICLE-TO-HOME FUNCTIONALITY USING AHEMA INTELLIGENCE	Published	01/2026	01-02-2026
11	Dr. Sujitha S	202541122431 A	12-05-2025	DESIGN OF A SMART HANDLEBAR WITH INTEGRATED AUTO FINGER BIOMETRIC AUTHENTICATION AND RIDER SAFETY SYSTEM	Published	01/2026	01-02-2026
12	Dr. Agalya V	202541122419 A	12-05-2025	SYSTEM AND METHOD FOR OFFLINE WATER VENDING MACHINE WITH AUTO SECURE PREPAID CONTROL AND SMART DISPENSING MECHANISM	Published	01/2026	01-02-2026

DETAILS OF FACULTY DEVELOPMENT PROGRAMME (FDP) ATTENDED BY FACULTY

Sl No	Name of the Faculty	Title of the FDP	No. of days/ weeks	Dates	Organization
1	katheek Vankadara	Power quality Challenges and MitigationTechniques in EV Charging and Renewable-Rich Distribution System	5 days	16/02/2026 to 20/02/2026	Annant Gyan Knowledge and Skills Private Limited
2	Dr. Sujitha S	Advanced Modelling for Sustainable Power and Mobility System	3 days	05/01/2026 to 7/01/2026	Sir M. Visvesvaraya Institute of Technology, Bengaluru,
3	Vinod Kumar S	Advanced Modelling for Sustainable Power and Mobility System	3 days	05/01/2026 to 7/01/2026	Sir M. Visvesvaraya Institute of Technology, Bengaluru,
4	Satish Kumar D	Integrating AI & ML for sustainable Electric Vehicle Development and Smart Mobility	6 days	05/01/2026 to 10/01/2026	D.K.T.E. Society's Textile & Engineering Institute
5	Anitha A	Outcome based Padagogic for effective learning	4 week	Feb to March 2026	NPTEL Online Certification Course

Details of NPTEL courses attended by Faculty

Sl.No	Name of the Faculty	Title of the Course	No. of Weeks	Period
1	Anitha A	Outcome based Padagogic for effective learning	4	Feb to March 2026
2	Sujoy Das	Recent Advances in Transmission Insulators	4	Jan to Feb 2026
3	Surat Pyari Atti	Python for Data Science	4	Jan to Feb 2026
4	Veena M H	Effective Engineering Teaching In Practice	4	Jan to Feb 2026
5	Pooja Jose	Effective Engineering Teaching In Practice	4	Jan to Feb 2026
6	Agalya	Trademark Law	4	Feb to March 2026

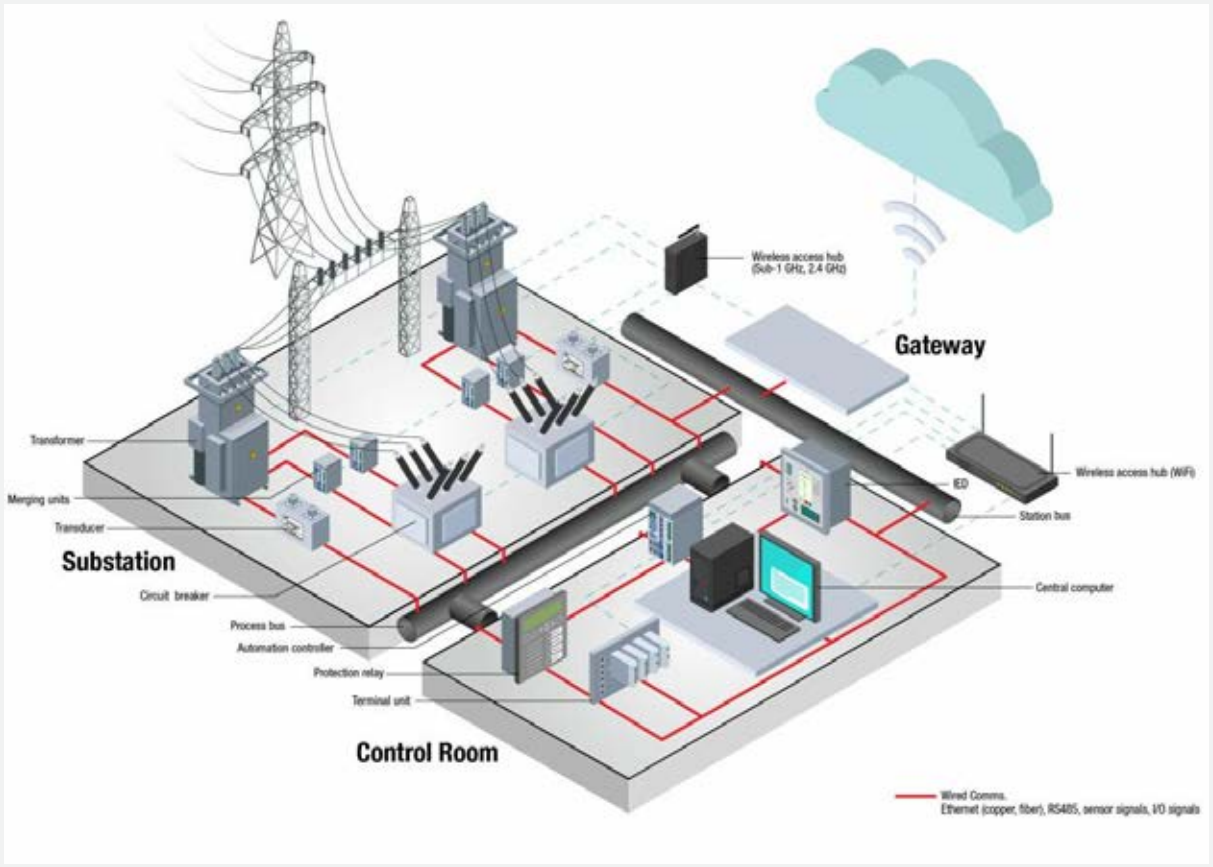
Details of Student Projects Funded by KSCST

Sl.No	PI	Co-PI	Project Title	Name of the Funding agency	Sanctioned Date	Duration of the project	Amount
1	Dr. Sujitha S		PORTABLE, HUMAN-ENERGY CHARGER FOR RURAL AND EMERGENCY USE	Karnataka State Council for Science and Technology (KSCST), Indian Institute of Science, Bangalore-560012	02.03.2026	1 Year	5,000.00
2	Dr. Sujitha S		AI-ASSISTED REAL-TIME ROUTER FOR NTELLIGENT ELECTRIC VEHICLE COMMUNICATION SYSTEMS	Karnataka State Council for Science and Technology (KSCST), Indian Institute of Science, Bangalore-560012	02.03.2026	1 Year	5,000.00
3	Mr. Vinod Kumar S	Dr. Sujitha S	GENERATION OF ELECTRICITY USING SOLAR-WIND HYBRID SYSTEM TO CHARGE ELECTRIC VEHICLES WITH V2H CAPABILITY	Karnataka State Council for Science and Technology (KSCST), Indian Institute of Science, Bangalore-560012	02.03.2026	1 Year	5,000.00
4	Ms. Sangeetha C N		DEVELOPMENT OF AN INTELLIGENT REAL- TIME ROUTE OPTIMISATION AND NAVIGATION SYSTEM FOR TRAFFIC MANAGEMENT	Karnataka State Council for Science and Technology (KSCST), Indian Institute of Science, Bangalore-560012	02.03.2026	1 Year	5,000
5	Mr. Sunil S K		REAL-TIME MONITORING AND PRIORITY LOAD BALANCING SYSTEM FOR ELECTRIC VEHICLE CHARGING IN THREE-PHASE DISTRIBUTION NETWORKS	Karnataka State Council for Science and Technology (KSCST), Indian Institute of Science, Bangalore-560012	02.03.2026	1 Year	5,000
6	Dr.Agalya V		DESIGN OF NEXT GENERATION WATER ATM FOR DROUGHT AREAS	Karnataka State Council for Science and Technology (KSCST), Indian Institute of Science, Bangalore-560012	02.03.2026	1 Year	5,000

DIGITAL TWIN TECHNOLOGY FOR MODERN POWER GRIDS

1. Introduction

Digital Twin Technology is one of the most transformative innovations in the field of smart energy systems and power engineering. A digital twin is a virtual representation of a physical object, process, or system that continuously receives real-time data from the physical asset through sensors, communication networks, and Internet of Things (IoT) devices. Unlike traditional simulation models, a digital twin dynamically updates itself based on live operational data, allowing engineers and operators to monitor system performance, predict failures, optimize operations, and make informed decisions. In modern power systems, digital twin technology has emerged as a critical tool for enhancing grid reliability, efficiency, resilience, and sustainability. As power grids become increasingly complex due to the integration of renewable energy sources, electric vehicles, distributed energy resources, and smart meters, maintaining stable grid operation becomes more challenging. Digital twins address these challenges by providing a real-time digital environment where utilities can analyze system behavior, simulate various operating conditions, and predict potential failures before they occur. This proactive approach significantly reduces maintenance costs, improves power quality, minimizes outages, and supports better planning and operational decisions.


Wireless access hub
(Sub-1 GHz, 2.4 GHz)
Gateway
Transformer
Merging units
Transducer
Substation
Circuit breaker
Process bus
Automation controller
Protection relay
Terminal unit
Control Room
IED
Wireless access hub (WiFi)
Station bus
Central computer
Wired Comms.
Ethernet (copper, fiber), RS485, sensor signals, I/O signals

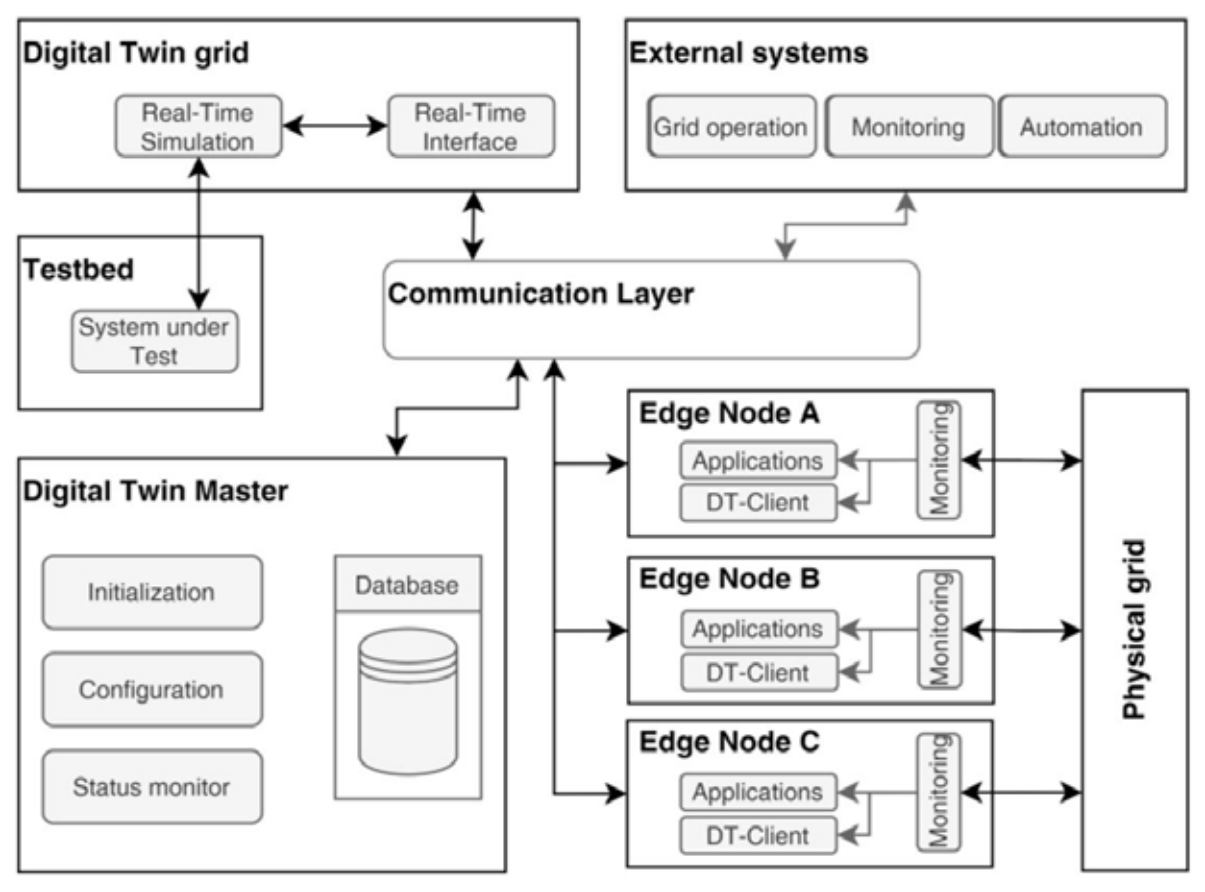
The evolution of digital twin technology is closely linked with advancements in Industry 4.0, artificial intelligence (AI), cloud computing, edge computing, and big data analytics. Originally developed for aerospace applications, digital twins are now widely adopted across manufacturing, healthcare, transportation, and energy sectors. In electrical power systems, digital twins integrate data from Supervisory Control and Data Acquisition (SCADA) systems, Phasor Measurement Units (PMUs), smart meters, Intelligent Electronic Devices (IEDs), and IoT sensors to create a highly accurate virtual model of the grid. This virtual model mirrors the real-world behavior of substations, transformers, transmission lines, distribution feeders, and power generation units. Operators can observe equipment conditions, monitor voltage stability, detect overload conditions, identify fault locations, and optimize power flow in real time. Consequently, utilities can shift from reactive maintenance to predictive maintenance, thereby increasing asset lifespan and reducing unexpected equipment failures.

2. What is a Digital Twin?

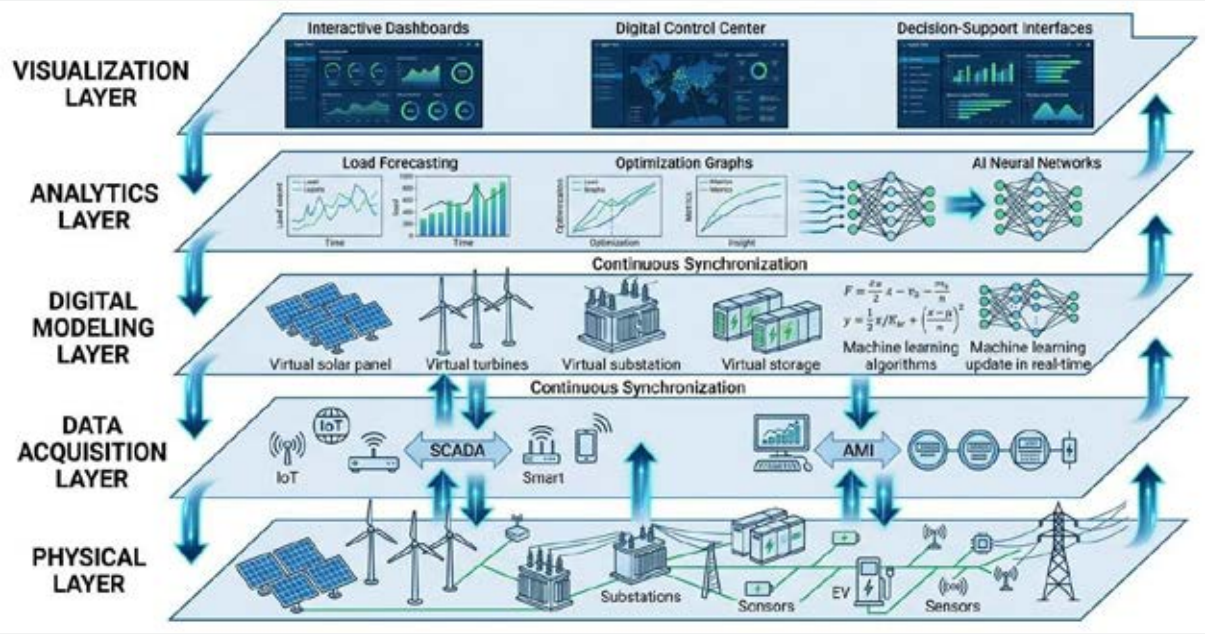
A digital twin is a continuously updated digital replica of a physical system that reflects its current operating condition using live sensor data and computational models. It consists of three primary components: the physical asset, the digital model, and the communication infrastructure that enables continuous data exchange between them. In power grids, the physical assets include power plants, transformers, transmission lines, substations, circuit breakers, distribution feeders, and consumer loads. Sensors installed on these assets collect parameters such as voltage, current, frequency, temperature, vibration, humidity, insulation condition, and equipment health. This information is transmitted through communication networks to cloud or edge computing platforms where advanced analytics, machine learning algorithms, and simulation software process the data to create an accurate digital representation of the physical grid.

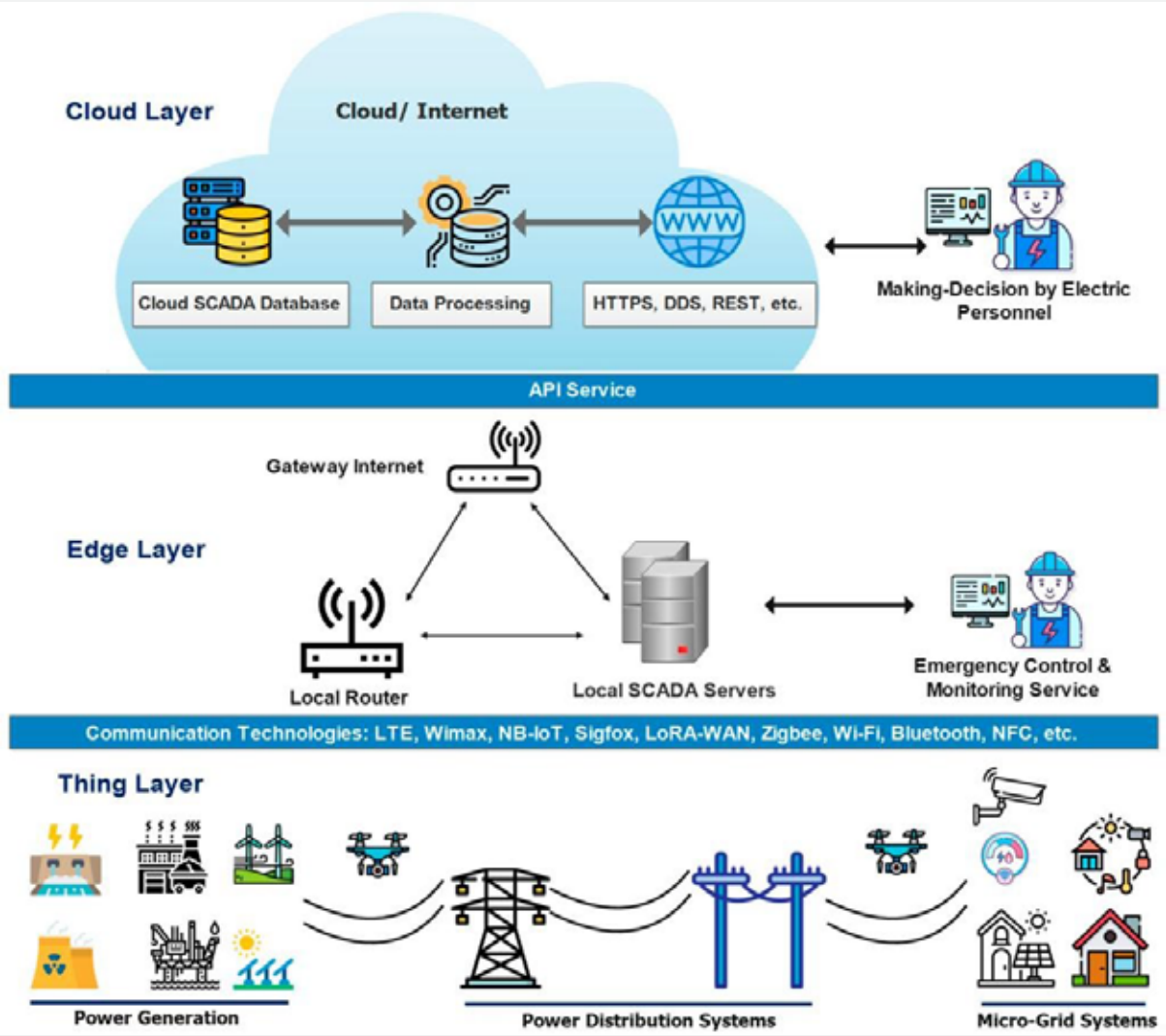
Unlike conventional monitoring systems, digital twins are capable of continuously learning from operational data. As environmental conditions, load demands, or equipment characteristics change, the digital twin updates itself automatically to reflect these changes. This capability allows utilities to perform "what-if" analyses, evaluate contingency scenarios, optimize maintenance schedules, and improve emergency response planning. Digital twins also support operator training by providing realistic simulation environments without risking damage to actual equipment. Furthermore, they enable utilities to test new control strategies, renewable integration techniques, and demand response programs before implementing them in the real grid.

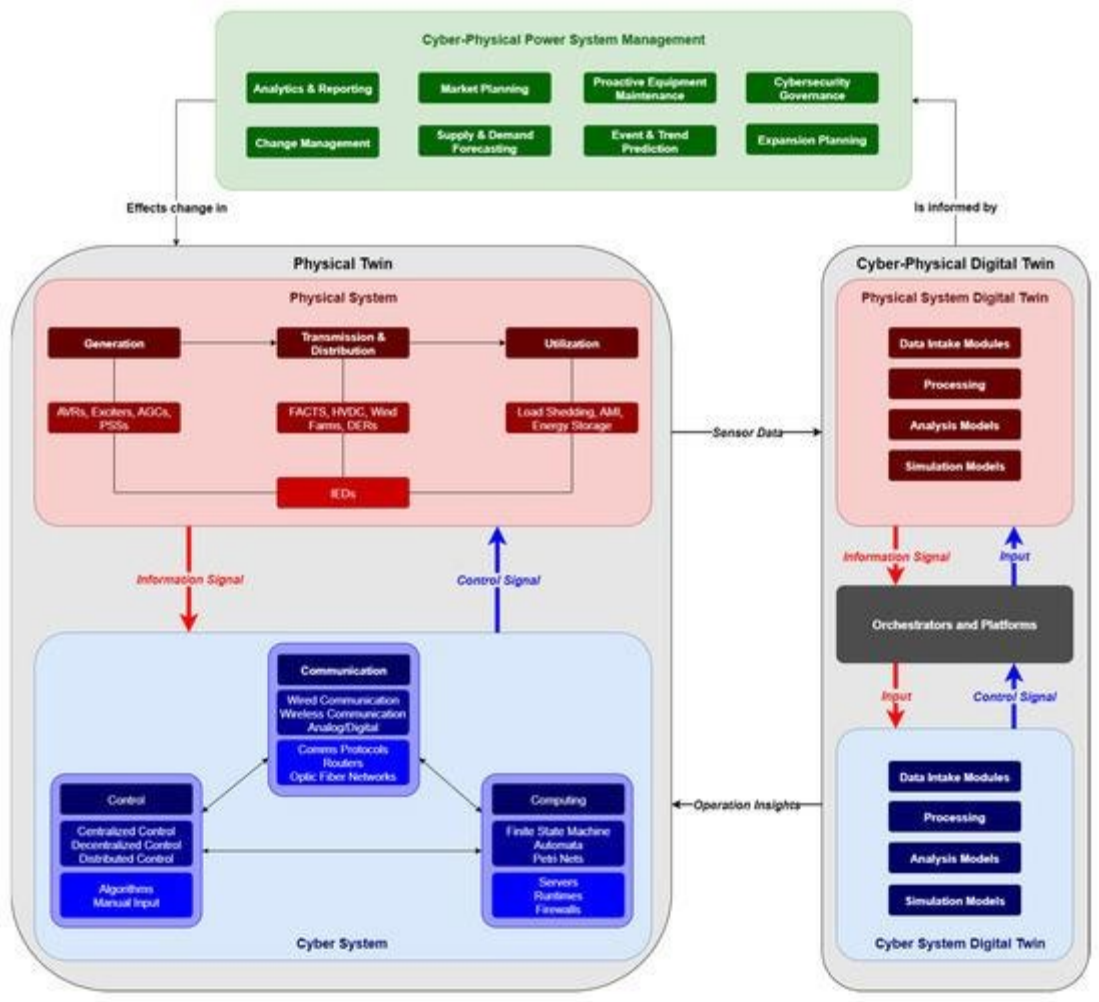
Figure 1: Basic Digital Twin Concept



Architecture and Working Principle




Cloud Layer
Cloud/ Internet
Cloud SCADA Database
Data Processing
HTTPS, DDS, REST, etc.
Making-Decision by Electric Personnel
API Service
Gateway Internet
Edge Layer
Local Router
Local SCADA Servers
Emergency Control & Monitoring Service
Communication Technologies: LTE, Wimax, NB-IoT, Sigfox, LoRA-WAN, Zigbee, Wi-Fi, Bluetooth, NFC, etc.
Thing Layer
Power Generation
Power Distribution Systems
Micro-Grid Systems



3. Architecture of Digital Twin for Power Grids

The architecture of a digital twin for power grids consists of several interconnected layers that facilitate seamless communication between physical assets and the digital environment. The first layer is the physical infrastructure, which includes generators, transformers, substations, transmission lines, distribution networks, renewable energy plants, and consumer loads. Sensors installed throughout the grid continuously monitor operational parameters such as voltage, current, power factor, temperature, vibration, and equipment health.

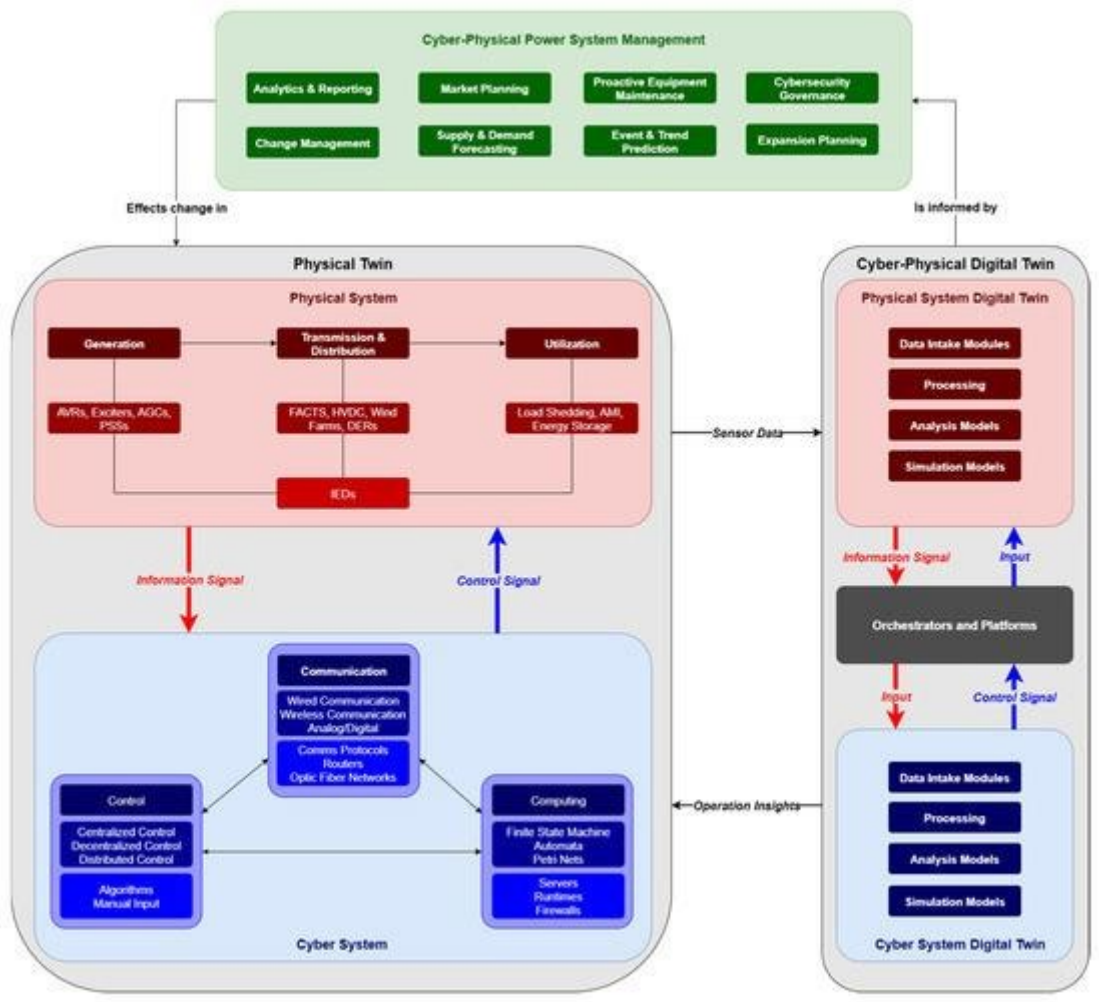
The second layer comprises communication technologies that transfer sensor data to centralized computing platforms. Communication protocols such as IEC 61850, DNP3, MQTT, 5G networks, fiber-optic communication, and wireless sensor networks enable reliable and low-latency data transmission.

The third layer is the data processing platform, where cloud computing and edge computing technologies store, analyze, and process large volumes of operational data. Artificial intelligence, machine learning, digital signal processing, and big data analytics identify trends, detect anomalies, and predict future equipment behavior.

The fourth layer contains the digital twin model itself. This virtual representation continuously synchronizes with the physical power grid, enabling real-time visualization, system simulations, fault analysis, contingency planning, and optimization studies.

The final layer consists of visualization dashboards and decision-support systems used by grid operators. These interfaces display real-time equipment conditions, alarms, predicted failures, maintenance schedules, and operational recommendations.

Figure 2: Digital Twin Architecture

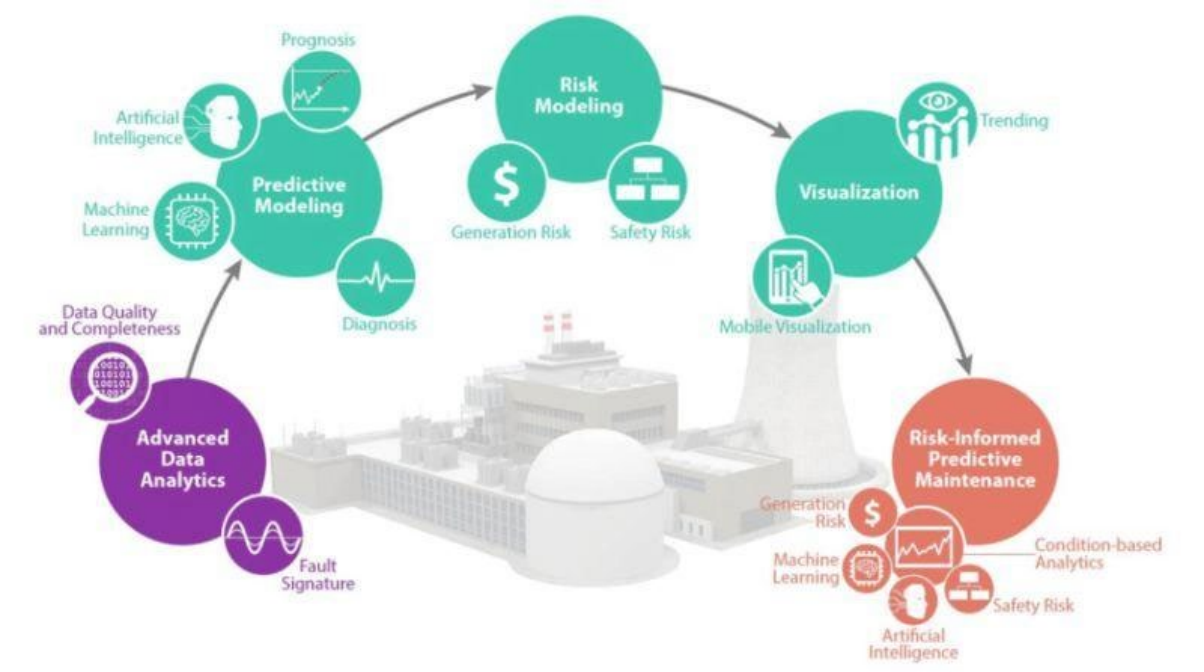


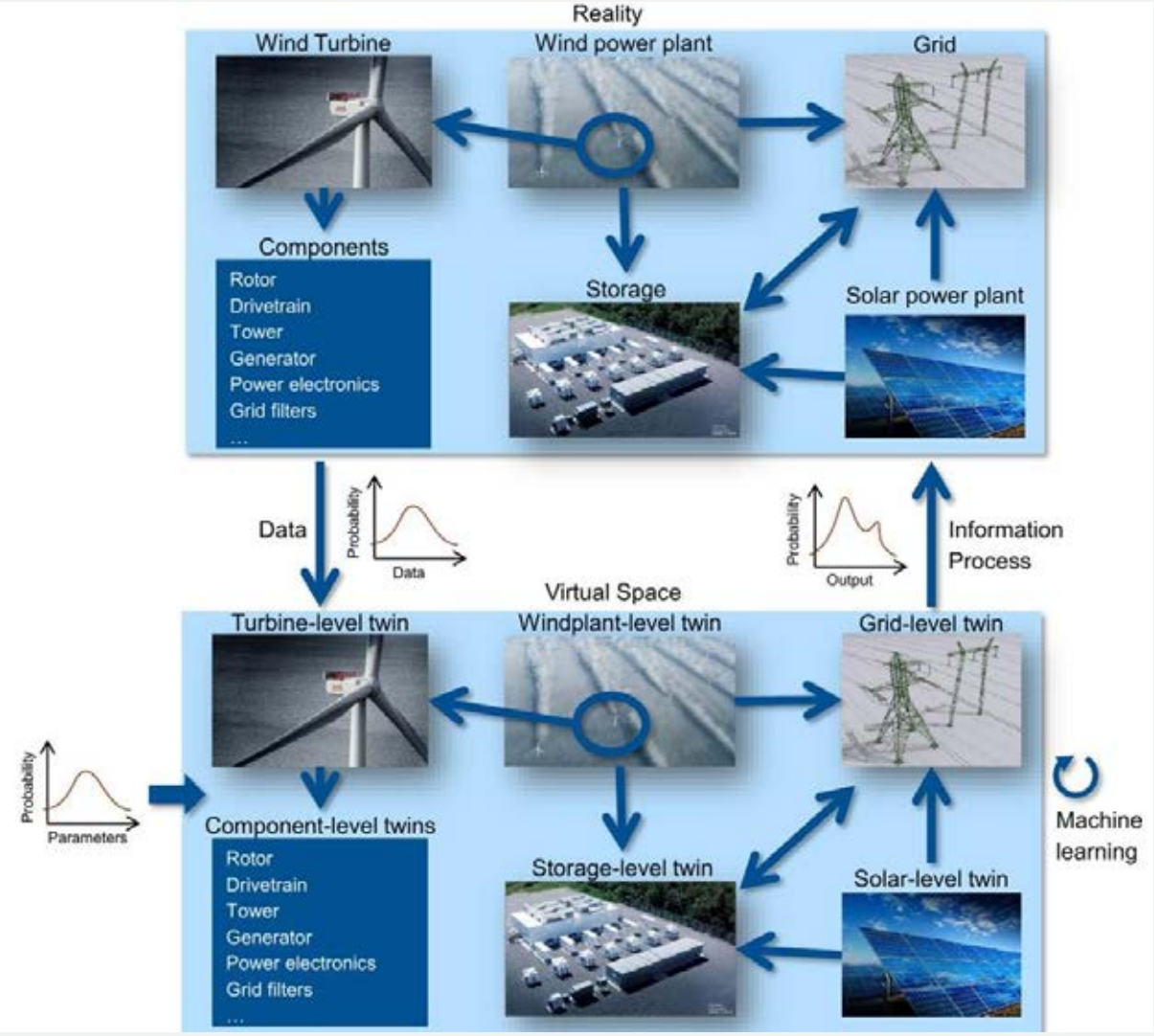
4. Working Principle

The working principle of a digital twin begins with real-time data acquisition from sensors installed throughout the power grid. These sensors measure electrical and environmental parameters and send the collected data through secure communication networks to cloud servers. The cloud platform processes this information using advanced analytics and updates the digital twin accordingly. Machine learning algorithms compare current operating conditions with historical data to identify abnormal behavior and estimate future equipment conditions. Engineers can perform virtual simulations of fault conditions, renewable integration, equipment failures, and load variations without affecting the actual grid. Based

on simulation results, optimized control commands are sent back to the physical system to improve operational performance.

Applications and Real-World Examples





5. Applications of Digital Twin in Power Grids

Digital twin technology supports numerous applications throughout the power system lifecycle. One of the most important applications is predictive maintenance. By continuously monitoring transformer temperatures, insulation degradation, vibration levels, and oil quality, digital twins can predict equipment failures weeks or months before they occur. This enables utilities to schedule maintenance during planned outages rather than responding to unexpected breakdowns.

Digital twins are also extensively used for grid planning and expansion. Utilities simulate future load growth, renewable energy penetration, and network upgrades to determine optimal investment strategies. Another critical application is fault detection and diagnosis, where digital twins identify fault locations, estimate equipment damage, and recommend restoration procedures. In renewable energy integration, digital twins help balance fluctuating solar and wind generation while maintaining voltage stability and frequency regulation. They are also used for operator training, allowing engineers to practice emergency response scenarios safely.

Real-World Examples

- Siemens uses digital twin technology to monitor substations and optimize asset management, improving operational efficiency.
- GE Vernova applies digital twins for predictive maintenance of turbines, transformers, and transmission equipment.
- National Grid employs digital twin concepts to improve transmission planning and enhance grid resilience.
- SP Group integrates digital twin technologies with smart-grid initiatives to improve energy distribution and outage management.

Advantages, Challenges, and Future Trends

6. Advantages

Digital twin technology provides numerous benefits to modern power systems. It enhances reliability by enabling continuous monitoring and early fault detection. Predictive maintenance reduces maintenance costs and extends equipment lifespan. Real-time visualization improves operator awareness and supports faster decision-making. Utilities can optimize power flow, reduce energy losses, improve voltage regulation, and increase renewable energy integration. Digital twins also improve cybersecurity preparedness by allowing operators to simulate cyberattack scenarios and evaluate mitigation strategies without affecting the real system. Additionally, they contribute to environmental sustainability by minimizing energy wastage and supporting efficient resource utilization.

7. Challenges

Despite its advantages, digital twin implementation faces several challenges. High initial investment costs for sensors, communication infrastructure, cloud computing, and software platforms can be a barrier for many utilities. Maintaining data accuracy and synchronization between physical assets and digital models requires robust communication networks and reliable sensors. Cybersecurity remains a significant concern because interconnected systems are vulnerable to cyber threats and unauthorized access. Integrating digital twins with legacy power infrastructure is technically complex, and utilities often require skilled personnel with expertise in AI, IoT, data analytics, and power systems.

8. Future Trends

The future of digital twins in power grids will involve deeper integration with AI, edge computing, 5G communication, blockchain, and autonomous grid control. Self-healing grids capable of detecting faults and automatically restoring service will become increasingly common. Digital twins will support microgrids, distributed energy resources, electric vehicle charging infrastructure, and smart cities. Advanced AI algorithms will improve demand forecasting, optimize renewable energy utilization, and enable fully autonomous grid management.

9. Case Study: Digital Twin for Transformer Monitoring

A utility company deploys temperature, vibration, dissolved gas analysis, and oil quality sensors on a high-voltage transformer. These sensors continuously transmit operational data to a cloud-based digital twin platform. The digital twin detects an abnormal increase in winding temperature and insulation degradation. AI algorithms predict a high probability of transformer failure within two months if no maintenance is performed. Engineers schedule preventive maintenance during a planned outage, replacing deteriorated insulation before catastrophic failure occurs. As a result, the utility avoids an unexpected outage, reduces repair costs, extends transformer lifespan, and improves customer reliability.

10. Conclusion

Digital twin technology represents a major advancement in the modernization of electrical power systems. By creating a continuously updated virtual representation of the physical grid, digital twins enable utilities to monitor equipment health, optimize system performance, predict failures, and support informed operational decisions. The technology significantly improves reliability, efficiency, sustainability, and resilience while reducing operational costs and enhancing renewable energy integration. Although challenges related to implementation costs, cybersecurity, and data management remain, rapid advances in artificial intelligence, cloud computing, IoT, and communication technologies are making digital twins increasingly practical for utilities worldwide. As smart grids continue to evolve, digital twin technology is expected to become an essential component of future intelligent energy systems.

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