AY-2025-2026

ELECTROSPHERE

Annual Technical Magazine from

DEPARTMENT OF

ELECTRICAL & ELECTRONICS ENGINEERING



GATES

INSTITUTE OF TECHNOLOGY

Autonomous

Approved by A.I.C.T.E. & Affiliated to JNTUA, Ananthapuramu, Gootyanantapur(v), Gooty, Ananthapuramu(Dist.)-515401

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Powering Ideas · Energising Futures

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EDITORIAL TEAM

ElectroSphere · Annual Technical Magazine

CHIEF PATRON	Management, GATES Institute of Technology
PATRON	Principal, GATES Institute of Technology, Gooty
CHIEF EDITOR	**Dr. G. Madhu Mohan, Professor & Head, Department of EEE**
EDITORIAL BOARD	Faculty and students of the Department of EEE
PUBLISHED BY	Department of Electrical & Electronics Engineering, GATES Institute of Technology (Autonomous), Gooty, Anantapur (Dist.) – 515401

ABOUT THIS ISSUE

ElectroSphere brings together the activities, achievements and ideas of the Department of EEE. This 2025–26 edition records fifteen programmes — from MATLAB/Simulink and EV certification to a six-day FDP on smart grids and a visit to the Power Grid substation at Gooty — and adds a special section on the technologies that defined the year: record clean energy, grid batteries, electric vehicles, made-in-India chips, nuclear reform and the power needs of AI.

MESSAGE

From the HoD's Desk

Dear Students, Faculty Members and Well-wishers,

It is my privilege to present the 2025–26 edition of ElectroSphere, the annual technical magazine of the Department of Electrical & Electronics Engineering.

This year the department organised fifteen programmes. Three certification programmes — on MATLAB/Simulink, on Electric Vehicles and Battery Management Systems, and on circuit simulation with PSPICE and Multisim — gave students practical skills that industry values. Five guest lectures by experts from leading institutions covered smart grids and e-mobility, power-system protection, control of modern power networks, sustainable engineering and advances in electrical machines, and an industrial visit to the Power Grid substation at Gooty connected the classroom with the real transmission network.

We also invested in our teachers through a six-day Faculty Development Programme on smart-grid technologies, and in the all-round growth of our students through sessions on interaction skills, research methods, project management, intellectual property and NPTEL certification. Our students brought laurels through symposium prizes, NSS service, innovation-ambassador training and a national innovation challenge.

Electrical engineering is changing faster than ever. In 2025–26 India crossed 50% clean power capacity, added record solar and wind, expanded grid batteries and electric vehicles, and began making its own chips. The special section in this issue explains these developments and the skills they demand. I urge every student to use these opportunities — learn continuously, earn certifications, and build projects that matter.

I thank our management and Principal for their constant support, and the faculty coordinators, resource persons and students who made every programme a success.

With best wishes,

Dr. G. Madhu Mohan

Professor & Head, Department of EEE · GATES Institute of Technology, Gooty





GATES Institute of Technology, Gooty — campus and department

WHO WE ARE

About GATES and the Department of EEE

GATES Institute of Technology, Gooty, is an autonomous institution approved by AICTE and affiliated to JNTUA, Ananthapuramu. Accredited by NBA and with an 'A' grade from NAAC, the Institute serves the drought-prone rural region of Anantapur district by offering professional education with discipline, values and a strong practical orientation. Its green campus, powered in part by solar energy, reflects the Institute's commitment to sustainability.

The Department of Electrical & Electronics Engineering offers the B.Tech programme in EEE with laboratories in electrical machines, power electronics, power systems, control systems, measurements and simulation. Certification programmes, guest lectures, industrial visits and faculty development keep teaching and learning in step with the technologies used in industry today.

The Institute

VISION

To impart the best technical and management education instilled with discipline, values and leadership qualities that will produce professional technocrats.

MISSION

M1 To contribute to the social and economic development of this drought prone rural region through professional education.

M2 To prepare graduates who will engage effectively and responsibly in practicing of engineering and management profession in ever changing global economy.

M3 To contribute and to be a role model for a green and eco-friendly campus through solar energy.

Department of EEE

VISION

To impart the best technical education instilled with discipline, values and leadership qualities that will produce professional technocrats in Electrical and Electronics Engineering.

MISSION

M1 To impart fundamental Electrical and Electronics Engineering concepts and a broad set of technical skills.

M2 To prepare Electrical and Electronics Engineering graduates who will engage effectively and responsibly in practicing engineering.

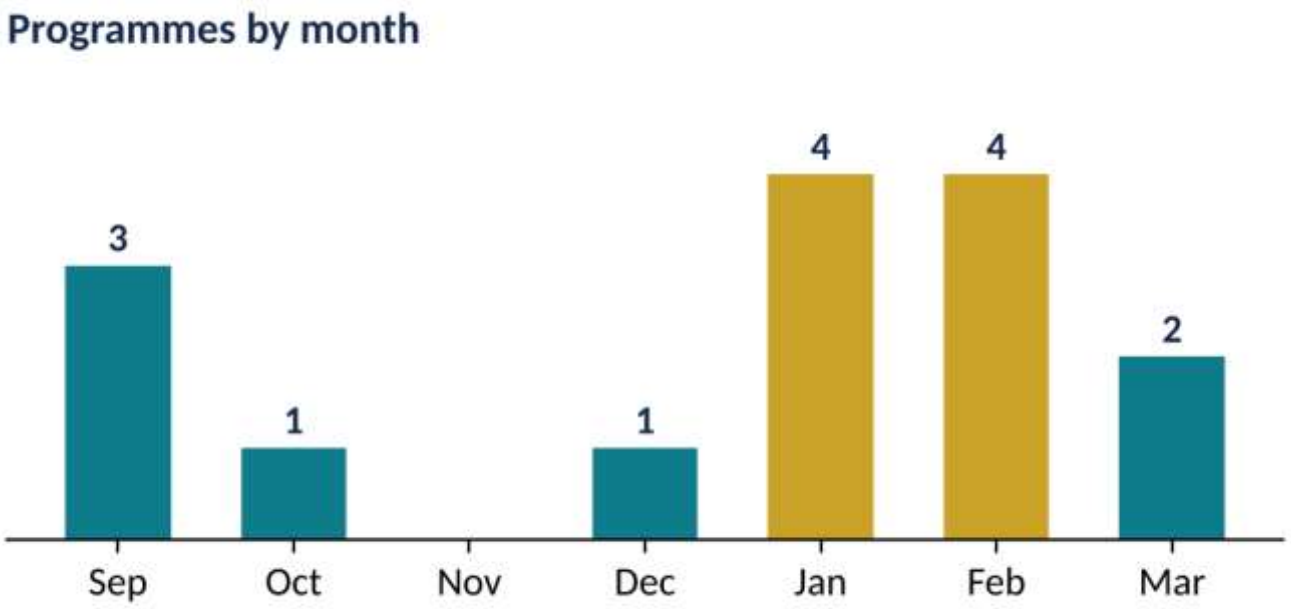
M3 To impart practical exposure on latest technological developments in Electrical and Electronics Engineering.

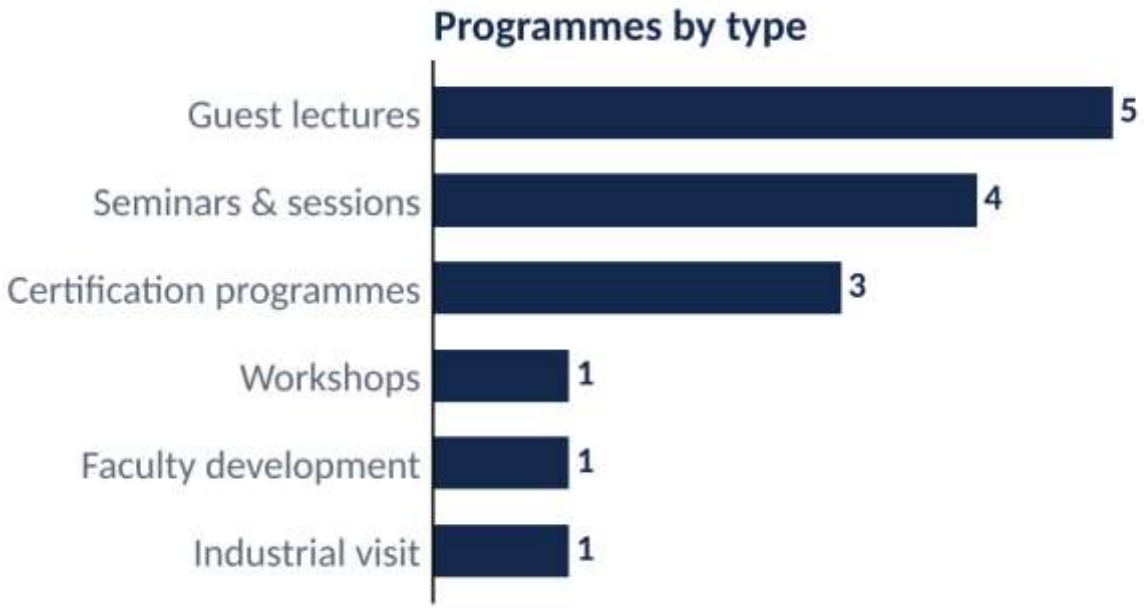
2025–26 AT A GLANCE

The Year in Numbers

15	5	3	6
PROGRAMMES ORGANISED	EXPERT GUEST LECTURES	CERTIFICATION PROGRAMMES	DAYS OF FACULTY DEVELOPMENT

The year opened in September 2025 with a seminar on interaction skills, a research-methods workshop and the six-day MATLAB/Simulink certification program, and continued with the EV & BMS certification course in October and PSPICE/Multisim training in December. January and February 2026 were the busiest months — with NPTEL awareness, the smart-grid FDP, three guest lectures, a project-management seminar, a patent seminar and the industrial visit to the Power Grid substation, Gooty. Two guest lectures in March closed the academic calendar.





ACTIVITY REGISTER

Programmes Organised in 2025–26

All programmes of the Department of EEE during AY 2025–26, in chronological order, with resource persons.

No.	Date	Programme	Resource person(s)
1	03 Sep 2025	**Seminar on Interaction Skills**	Dr. Nasreen Noor, G. Pulla Reddy Engineering College, Kurnool
2	19 Sep 2025	**Workshop on Engineering Research Methods and Data Analysis**	Dr. R. Hussain Vali, RGM College of Engineering & Technology, Nandyal
3	22 – 27 Sep 2025	**Six-Day Certification Program on MATLAB/Simulink for Electrical Engineers**	Dr. S. Khadarvali, KSRM College of Engineering, Kadapa; Mr. B. Madhu Sudhan Naidu, Executive Engineer, APTRANSCO, Kurnool; Mr. Sai Sampath Kumar, RGM College of Engineering & Technology, Nandyal
4	05 Oct 2025	**Certification Course on Electric Vehicle & BMS**	Mr. P. Pedda Reddy, Mr. P. Sampath Kumar and Mr. M. S. Shiva Kumar
5	01 Dec 2025	**Certificate Program on PSPICE/Multisim**	Ms. E. Jyothimai
6	05 Jan 2026	**Awareness Session on NPTEL Certification**	Dr. G. Madhu Mohan, Professor & Head, Department of EEE
7	12 Jan 2026	**Guest Lecture on Smart Grid & Electric Mobility**	Dr. K. Nagesh, Assistant Professor, BVC College of Engineering, Rajahmundry
8	19 – 24 Jan 2026	**Six-Day FDP on Smart Grid Technologies and Future Power Systems**	Dr. R. Sravana Kumar, Professor, MITS, Madanapalle; Prof. G. Panduranga Reddy, GPCET, Kurnool; Dr. G. Siva Prasad, KSRM College of Engineering, Kadapa
9	27 Jan 2026	**Guest Lecture on Power System Protection**	Dr. S. Chaitanya, GITAM, Bengaluru
10	08 Feb 2026	**Seminar on Engineering Project Management & Cost Analysis**	Dr. D. Lenin, RGM College of Engineering & Technology, Nandyal
11	16 Feb 2026	**Guest Lecture on Control Systems in Modern Power Networks**	Dr. S. Hareesh, Sree Vidyanikethan Engineering College, Tirupati
12	19 Feb 2026	**Industrial Visit – Power Grid, Gooty**	Mr. D. Gopinath (industry coordinator)
13	28 Feb 2026	**Seminar on Traditional Knowledge & Patent Issues**	Dr. G. Jaya Krishna, Holy Mary Institute of Technology & Science (HITS), Hyderabad
14	11 Mar 2026	**Guest Lecture on Sustainable Engineering & Future Trends**	Dr. Subba Rao, Vignan's University, Vadlamudi
15	24 Mar 2026	**Guest Lecture on Advancements in Electrical Machines**	Dr. G. Venkateswarlu Reddy, Annamacharya Institute of Technology & Sciences (AITS), Rajampet

LEARNING FROM THE BEST

Experts from across the region

Resource persons came from RGM College of Engineering & Technology (Nandyal), KSRM College of Engineering (Kadapa), APTRANSCO (Kurnool), G. Pulla Reddy Engineering College (Kurnool), MITS (Madanapalle), GPCET (Kurnool), BVC College of Engineering (Rajahmundry), GITAM (Bengaluru), Sree Vidyanikethan (Tirupati), HITS (Hyderabad), Vignan's University and AITS (Rajampet) — bringing academic depth and industry practice to our students.

FLAGSHIP PROGRAMME · CERTIFICATION PROGRAM

Six-Day Certification Program on MATLAB/Simulink for Electrical Engineers

22 – 27 Sep 2025 • Certification Program

The first flagship programme of the year gave students six days of hands-on training in MATLAB and Simulink — the most widely used simulation platform in electrical engineering. Beginning with MATLAB programming, matrices and plotting, participants moved on to Simulink modelling of electrical circuits, DC and AC machines, power electronic converters and control systems. Sessions by an APTRANSCO engineer connected simulation with real power-system practice, including load-flow and fault studies. Each day ended with a lab exercise, and participants completed an assessment to earn their certificate.

MATLAB and Simulink are used by industry, research laboratories and universities worldwide to design and test electrical systems before hardware is built. By the end of the week participants could model a three-phase supply feeding a converter-driven motor, tune a PI controller and read the results from scopes and plots — skills they can use immediately in their own laboratory courses and projects.

Resource persons: *Dr. S. Khadarvali, KSRM College of Engineering, Kadapa; Mr. B. Madhu Sudhan Naidu, Executive Engineer, APTRANSCO, Kurnool; Mr. Sai Sampath Kumar, RGM College of Engineering & Technology, Nandyal*

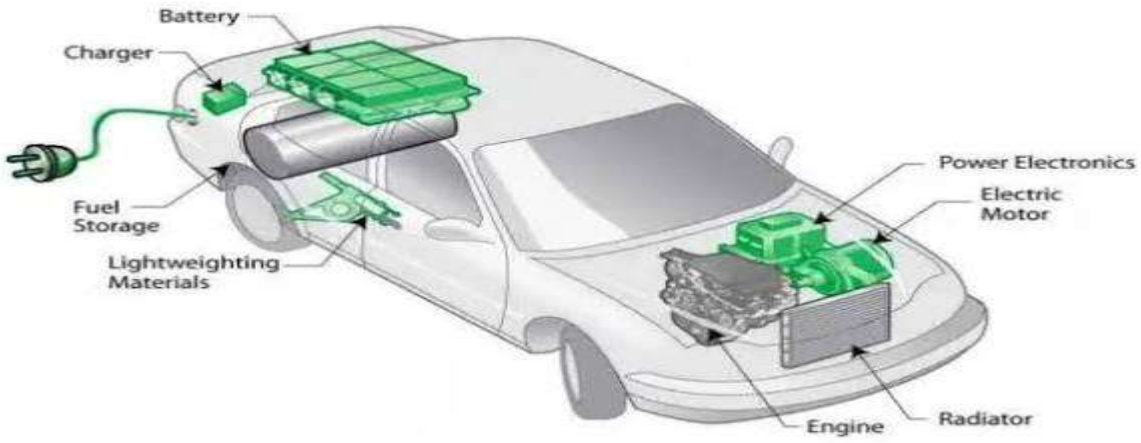
WHAT PARTICIPANTS GAINED

Students can now build and test simulation models for their laboratory work, mini projects and major projects.

FLAGSHIP PROGRAMME · CERTIFICATION COURSE

Certification Course on Electric Vehicle & BMS

05 Oct 2025 • Certification Course



This certification course focused on the electric vehicle and its most critical subsystem — the battery management system (BMS). Students studied EV architecture, lithium-ion cell chemistries, battery packs and their ratings, and the functions of a BMS: cell-voltage and temperature monitoring, state-of-charge and state-of-health estimation, cell balancing and protection. The course also covered traction motors and inverters, on-board chargers, charging standards and safety. Demonstrations and problem-solving sessions linked the material to the Power Electronics and Electrical Machines courses of the B.Tech EEE programme.

The battery is the costliest part of an electric vehicle and the BMS is its brain. Understanding how cells are monitored, balanced and protected — and why temperature matters so much — prepares students both for the EV industry and for grid-scale battery storage, one of the fastest-growing areas of power engineering.

Resource persons: *Mr. P. Pedda Reddy, Mr. P. Sampath Kumar and Mr. M. S. Shiva Kumar*

WHAT PARTICIPANTS GAINED

Participants earned a certificate and industry-relevant knowledge for careers in e-mobility and battery technology.

FLAGSHIP PROGRAMME · FACULTY DEVELOPMENT PROGRAMME

Six-Day FDP on Smart Grid Technologies and Future Power Systems

19 – 24 Jan 2026 • Faculty Development Programme

The department organised a six-day Faculty Development Programme on smart-grid technologies and future power systems. Expert speakers covered smart-grid architecture, advanced metering infrastructure, integration of solar and wind energy, battery energy storage, microgrids, wide-area monitoring with phasor measurement units, demand response, and cyber security of power networks. Simulation sessions and case studies showed how these ideas can be brought into the classroom and into student projects.

Faculty from the department and other institutions took part in lectures, discussions and simulation sessions. The programme directly supports the department's mission of giving students practical exposure to the latest technological developments, as faculty carry these topics into their courses, laboratories and project guidance.

Resource persons: *Dr. R. Sravana Kumar, Professor, MITS, Madanapalle; Prof. G. Panduranga Reddy, GPCET, Kurnool; Dr. G. Siva Prasad, KSRM College of Engineering, Kadapa*

WHAT PARTICIPANTS GAINED

Faculty updated their knowledge of modern power systems, strengthening teaching and research in the department.

ACTIVITY CHRONICLE · SEPTEMBER 2025

Month by Month

01 Seminar on Interaction Skills

03 Sep 2025 • Seminar

The academic year opened with a seminar on the interaction skills that every engineer needs in the classroom, in project teams and at the workplace. The resource person explained how to listen actively, ask good questions, speak with clarity and confidence, and respond politely in discussions and interviews. Students took part in short pair activities and impromptu speaking rounds, and received practical tips on body language, tone and professional etiquette when talking to faculty, recruiters and colleagues.

Resource person: *Dr. Nasreen Noor, G. Pulla Reddy Engineering College, Kurnool*

Outcome: Students gained confidence in everyday professional communication, group discussions and interviews.

02 Workshop on Engineering Research Methods and Data Analysis

19 Sep 2025 • Workshop

This workshop introduced students to the methods engineers use to plan and carry out research. Topics included choosing a research problem, carrying out a literature survey, designing experiments and simulations, and collecting reliable data. The second session focused on data analysis — basic statistics, graphs, curve fitting and drawing sound conclusions from results — along with the use of spreadsheet and MATLAB tools and good practice in writing technical reports and papers.

Resource person: *Dr. R. Hussain Vali, RGM College of Engineering & Technology, Nandyal*

03 Certificate Program on PSPICE/Multisim

01 Dec 2025 • Certificate Program

This certificate program trained students to design and test electronic circuits on the computer before building them on the bench. Participants learned schematic entry, component libraries and the main analyses — DC operating point, DC sweep, AC frequency response and transient analysis. They simulated rectifiers, amplifiers, op-amp circuits, filters and simple power-electronic converters, and compared simulated waveforms with theory. Multisim's virtual instruments — oscilloscope, function generator and multimeter — made the experience close to working in a real laboratory.

Resource person: *Ms. E. Jyothimai*

Outcome: Students can verify circuit designs by simulation, saving time and components in lab and project work.

04 Awareness Session on NPTEL Certification

05 Jan 2026 • Awareness Session

In this session the Head of the Department introduced students to NPTEL — the national online-learning programme of the IITs and IISc. He explained how to choose courses that match the EEE curriculum and career goals, how enrolment and the proctored certification exam work, and how NPTEL credits can be transferred under the autonomous regulations. Students were shown popular courses in power electronics, electrical machines, power systems, control and programming, and were encouraged to form study groups and enrol in the coming semester.



Resource person: *Dr. G. Madhu Mohan, Professor & Head, Department of EEE*

Outcome: Students were motivated to earn NPTEL certificates that add value to their academic record and placement profile.



Clearing student doubts at the NPTEL awareness session

05 Guest Lecture on Smart Grid & Electric Mobility

12 Jan 2026 • Guest Lecture

This guest lecture explained how two of the biggest changes in electrical engineering — smart grids and electric vehicles — are connected. The speaker described the smart-grid layers of sensing, communication and control, smart meters and distribution automation, and then the impact of EV charging on distribution feeders and transformers. Smart charging, time-of-day tariffs and vehicle-to-grid (V2G) operation were presented as ways of turning EVs from a burden into a resource that helps balance a grid rich in solar power.

Resource person: *Dr. K. Nagesh, Assistant Professor, BVC College of Engineering, Rajahmundry*

Outcome: Students understood how e-mobility and grid modernisation must be planned together.

06 Guest Lecture on Power System Protection

27 Jan 2026 • Guest Lecture

This lecture dealt with the systems that keep the power grid safe when faults occur. The speaker explained the types of faults, the role of current and voltage transformers, and the principles of overcurrent, distance and differential protection. The move from electromechanical to numerical relays, protection coordination, and the IEC 61850 standard for digital substations were discussed, together with examples of how fast fault clearing prevents equipment damage and wide-spread blackouts.

Resource person: *Dr. S. Chaitanya, GITAM, Bengaluru*

Outcome: Students related the Switchgear & Protection syllabus to the practice followed in modern substations.



Student spirit on the GATES campus

07 Seminar on Engineering Project Management & Cost Analysis

08 Feb 2026 • Seminar

This seminar introduced the management skills that every engineer needs when leading real projects. Topics included the project life cycle, work-breakdown structure, scheduling with Gantt charts, CPM and PERT, and resource planning. The cost-analysis part covered estimation, budgeting, cash flow, payback period and simple life-cycle costing, with examples from electrical installations such as a rooftop solar plant and a substation upgrade.

Resource person: *Dr. D. Lenin, RGM College of Engineering & Technology, Nandyal*

Outcome: Students learned to plan, schedule and cost their projects in a professional way.

08 Guest Lecture on Control Systems in Modern Power Networks

16 Feb 2026 • Guest Lecture

The speaker showed how control theory keeps a large power network stable. Topics included load-frequency control and automatic generation control, excitation and voltage control, and the control of inverter-based resources such as solar and battery plants, which now supply a growing share of power. Grid-forming and grid-following inverters, and the role of SCADA and energy-management systems in control centres, were explained with block diagrams and simulation results.

Resource person: *Dr. S. Hareesh, Sree Vidyanikethan Engineering College, Tirupati*

Outcome: Students saw how the Control Systems course is applied to real power-grid operation.

ACTIVITY CHRONICLE · FEBRUARY 2026

09 Industrial Visit – Power Grid, Gooty

19 Feb 2026 • Industrial Visit

Students visited the Power Grid substation at Gooty, an important node of the inter-state transmission network. Engineers explained the layout of the switchyard and the function of each item of equipment — power transformers and reactors, circuit breakers, isolators, current and voltage transformers, lightning arresters and wave traps. In the control room, students saw how protection relays, SCADA screens and communication links are used to monitor and operate the substation round the clock, and learned about the strict safety rules followed near extra-high-voltage equipment.



Resource person: *Mr. D. Gopinath (industry coordinator)*

Outcome: Students related transmission and protection theory to real equipment and operating practice.





At the POWERGRID control room, Gooty, and a site engineer explaining the switchyard equipment

10 Seminar on Traditional Knowledge & Patent Issues

28 Feb 2026 • Seminar

This seminar on intellectual property explained what can and cannot be patented, the criteria of novelty, inventive step and industrial application, and the steps involved in filing an Indian patent application. A special focus was the protection of India's traditional knowledge — the role of the Traditional Knowledge Digital Library and well-known cases where patents based on traditional knowledge were challenged. Students were encouraged to search patent databases before starting their projects.

Resource person: *Dr. G. Jaya Krishna, Holy Mary Institute of Technology & Science (HITS), Hyderabad*

Outcome: Students understood how to protect innovations and respect existing knowledge and intellectual property.



Students and faculty at an institute gathering on the GATES campus

11 Guest Lecture on Sustainable Engineering & Future Trends

11 Mar 2026 • Guest Lecture

This lecture looked at how engineers can design for a sustainable future. The speaker discussed life-cycle thinking, energy efficiency, renewable energy and storage, electric mobility, recycling of batteries and solar panels, and green buildings. Future trends such as artificial intelligence in energy management, green hydrogen and smart cities were introduced, with a call to students to make sustainability part of every design decision.

Resource person: *Dr. Subba Rao, Vignan's University, Vadlamudi*

Outcome: Students appreciated the responsibility of engineers towards the environment and society.

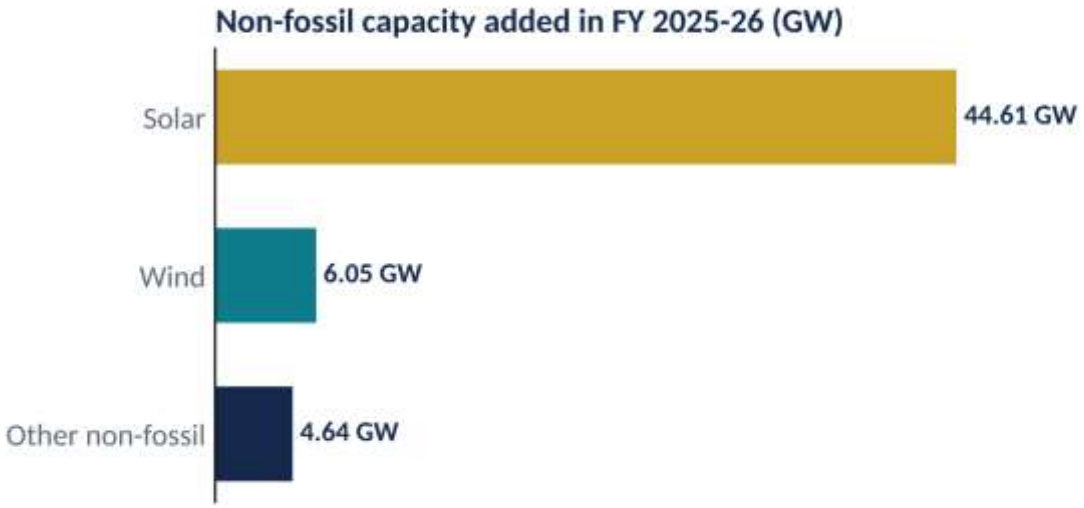
12 Guest Lecture on Advancements in Electrical Machines

24 Mar 2026 • Guest Lecture

The final guest lecture of the year covered new developments in electrical machines. The speaker explained permanent-magnet synchronous and brushless DC motors, switched- and synchronous-reluctance motors, and axial-flux machines used in electric vehicles and drones. High-efficiency IE3/IE4 induction motors, new magnetic and insulation materials, finite-element design tools and condition monitoring of machines were also discussed.

Resource person: *Dr. G. Venkateswarlu Reddy, Annamacharya Institute of Technology & Sciences (AITS), Rajampet*

Outcome: Students extended their Electrical Machines knowledge to the motors used in modern industry and e-mobility.



FACULTY ACHIEVEMENTS 2025–26

Research and Professional Growth

1 PH.D. AWARDED	**1** SCI / SCOPUS JOURNAL PAPER	**10** CONFERENCE PAPERS
7 FDPS ATTENDED	**1** NET QUALIFIED	**3** AWARDS RECEIVED

Faculty members continued to grow as teachers and researchers — publishing in indexed journals and conferences, completing a doctorate, qualifying in the national eligibility test and attending faculty development programmes, while

STUDENT ACHIEVEMENTS

Our Students Shine

TECHNICAL EXCELLENCE

Prize in Paper Presentation

Mr. B. Yugandhar Reddy and Ms. N. Radhika won the First Prize in Paper Presentation at a national-level technical symposium held on 12 February 2026, competing with students from many engineering colleges.



Prize presentation at EE SAMSLESHANA 2K26

NSS EXCELLENCE

Best NSS Volunteer Award

Mr. B. Yugandhar Reddy was honoured with the Best NSS Volunteer Award at GATES Institute of Technology in recognition of his outstanding contribution to community service and NSS activities.



Receiving the award at the Institute's 25th annual celebrations

INNOVATION AMBASSADORS

Innovation Ambassador Training

Mr. S. Rafi and Ms. N. Radhika of IV B.Tech EEE successfully completed the Innovation Ambassador (IA) training programme of the Ministry of Education's Innovation Cell and AICTE — Mr. Rafi at the Advanced Level — strengthening the institution's innovation and start-up ecosystem.



Innovation Ambassador certificate

STUDENT ACHIEVEMENTS

Innovation and Learning

NATIONAL INNOVATION

YUKTI 2025 — Shortlisted for the Final Round

The innovation "Optimized Wireless Charging of EVs Using Regenerative Braking and Battery–Supercapacitor Systems" was shortlisted for the final round of the AICTE Productization Fellowship under YUKTI – National Innovation Repository. The student team and their faculty mentor represented GATES at the Institution's Innovation Council (IIC) Regional Meet 2025 at Ramaiah University of Applied Sciences, Bengaluru, on 2 December 2025.



At the IIC Regional Meet 2025, Bengaluru





The YUKTI team with their faculty mentor at the IIC Regional Meet 2025, RMC Auditorium, Ramaiah University of Applied Sciences, Bengaluru (2 December 2025)

PHOTO GALLERY

Campus Life 2025–26

Learning in the classroom, in the field and on the playground.





Interactive classroom sessions in the department



Students in the switchyard during the industrial visit to the Power Grid substation, Gooty





Students on the cricket ground at the GATES campus

PHOTO GALLERY

Beyond the Classroom





Left: Blood Donation Camp with the Indian Red Cross Society, Anantapuramu. Right: candle rally on World Cancer Day (4 February)





Left: EEE students and faculty setting out for the industrial visit to POWERGRID, Gooty. Right: at the Swami Vivekananda statue on the GATES campus

CASE STUDY · SOLAR CAMPUS

The GATES Solar Campus: 200 kW of Clean Power

A living laboratory for renewable energy — and a source of real-data case studies for EEE students.



Illustration: rooftop and ground-mounted solar arrays feeding the campus and the APSPDCL grid through a bidirectional net meter

200 kW	3	15 yrs	Net metering
Total solar capacity on campus	Phases, 2011 – 2025	Of solar operation since March 2011	With APSPDCL since Sept 2025

GATES Institute of Technology was an early adopter of solar power in Andhra Pradesh. Its first 100 kW off-grid plant was commissioned in March 2011 — well before rooftop solar became common in the region — followed by a 50 kW off-grid extension in 2013. In September 2025 a 50 kW grid-tied plant (Phase III) was added under APSPDCL's net-metering framework, so that surplus solar energy is exported to the grid and credited against the electricity bill. The campus has a connected load of about 200 kW with an average demand of about 100 kW, and its daytime working hours match the solar generation curve closely.

The Department of EEE has turned this plant into a teaching resource. Using fifteen consecutive months of APSPDCL net-metering bills (January 2025 – May 2026), faculty and students prepared a set of case studies on the plant's technical performance, economics and environmental impact, together with simplified student-assignment versions used in the classroom. The following pages summarise their key findings.

Phase I — March 2011	100 kW off-grid solar plant; one of the early institutional solar installations in the region
Phase II — 2013	50 kW off-grid extension
Phase III — September 2025	50 kW grid-tied plant with bidirectional net metering (APSPDCL, LT2 Commercial)
Campus load	About 200 kW connected load; about 100 kW average demand

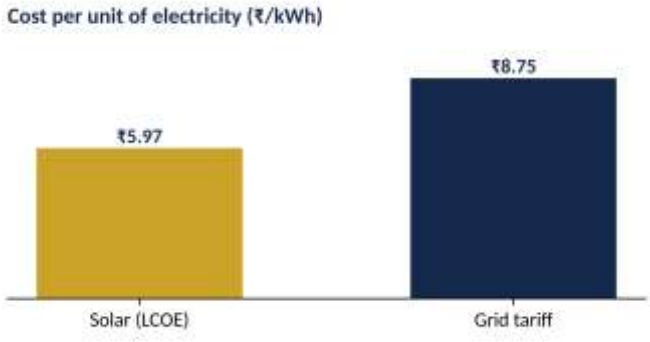
What Fifteen Months of Bills Reveal

42,188 kWh	₹3.10 lakh	₹5.97/kWh	14.2%
Solar generation recorded on the net meter, Jan 2025 – May 2026	Estimated savings from solar in 15 months	Levelised cost of solar vs ₹8.75 grid tariff	Internal rate of return (student feasibility study)

Case Study 1 analysed technical performance. Meter readings from each bill — grid import, solar generation and units exported — were tabulated month by month to calculate the solar share of campus energy, the units exported to the APSPDCL grid and the average daily consumption. February was consistently the best month for solar output in both years, thanks to clear skies and moderate temperatures, while a dip in May 2025 was flagged for investigation as a possible cloud-cover or panel-cleaning issue.

Case Study 2 looked at the money. Over the fifteen months the institution paid ₹11,77,471 in electricity bills, and the solar plant saved an estimated ₹3,09,967. The levelised cost of solar electricity works out to about ₹5.97 per unit, against a grid tariff of about ₹8.75. The best bill of the period came in February 2026 — just ₹24,957, with 5,245 kWh of solar generation and a power factor of 1.0.





LESSONS FROM THE BILL ANALYSIS

Pay on time	Interest on electricity duty and late-payment surcharge are avoidable costs — prompt payment removes them without any investment.
Claim every credit	Time-of-day (TOD) credits and the ISD deduction reduce the bill; the ISD deduction was claimed in only two months and should be claimed regularly.
Keep power factor at unity	A power factor of 1.0 since early 2026 shows good load and capacitor management.
Clean and monitor the panels	Month-by-month tracking makes dips such as May 2025 easy to spot, so cleaning or repairs can be scheduled quickly.

₹11.77 lakh	₹24,957	5,245 kWh	1.0
Total electricity bills, 15 months	Lowest bill — February 2026	Solar generation in February 2026	Power factor maintained since early 2026

CASE STUDY 3 · ENVIRONMENT AND LEARNING

Carbon Savings and a Living Laboratory

≈ 34.6 t	0.82	6
CO_2 emissions avoided by the metered solar output in 15 months	kg CO_2 per kWh — CEA emission factor used	UN Sustainable Development Goals supported

Case Study 3 estimated the environmental benefit. Every unit of solar electricity generated on campus replaces a unit that would otherwise come mostly from coal-fired power stations. Using the Central Electricity Authority's emission factor of 0.82 kg of CO_2 per kWh, the 42,188 kWh recorded on the net meter over fifteen months avoided about 34.6 tonnes of CO_2 — before counting the output of the older off-grid phases, which is used directly on campus and is not recorded on the APSPDCL meter.

The plant supports the UN Sustainable Development Goals on affordable and clean energy (SDG 7), quality education (SDG 4), industry and innovation (SDG 9), sustainable communities (SDG 11), responsible consumption (SDG 12) and climate action (SDG 13), and it is a practical expression of the Institute's mission to be a role model for a green and eco-friendly campus through solar energy.

SDG 4	SDG 7	SDG 9	SDG 11	SDG 12	SDG 13
Quality education	Affordable & clean energy	Industry & innovation	Sustainable communities	Responsible consumption	Climate action

FROM THE PLANT TO THE CLASSROOM

Subject	How the solar campus is used
Renewable Energy Sources	Sizing, specific yield and seasonal variation of a real 200 kW plant.
Power Electronics	Grid-tied and off-grid inverters, MPPT and power quality at the point of connection.
Utilization of Electrical Energy	Energy audit of campus loads and demand-side management.
Power Systems	Net metering, reverse power flow and the impact of rooftop solar on LT feeders.
Employability Skills	Reading a commercial electricity bill and presenting an economic case to management.

STUDENT ASSIGNMENTS

Simplified versions of the economic and carbon case studies are used as student assignments: students work through the real bill data step by step — calculating savings, payback and CO_2 avoided — and answer discussion questions on how the plant could perform even better.

Data: APSPDCL net-metering bills, USC 7211216000278, January 2025 – May 2026; department case studies on the 200 kW solar PV system.

SPECIAL SECTION

Latest Technologies & Developments in Electrical Engineering

Academic Year 2025 – 26

The academic year 2025–26 was a turning point for electrical engineering in India. Half of the country's installed power capacity came from clean sources five years ahead of target, a record 55 GW of non-fossil capacity was added, grid batteries and electric vehicles grew rapidly, the first made-in-India microprocessor was unveiled, and a new law opened nuclear power to private investment — while the rise of artificial intelligence created a new kind of electrical load.

This section explains ten of these developments in simple language. Each article gives the key numbers, explains the technology from an electrical engineer's point of view, links it to subjects in the B.Tech EEE curriculum and ends with a takeaway for students. Facts and figures are taken from official government releases and reputed news sources, named at the foot of each page.

01 Half of India's power capacity is now clean
CLEAN POWER

02 Rooftops and farms become power stations
DISTRIBUTED SOLAR

03 Batteries scale up for the grid
ENERGY STORAGE

04 A record year for electric vehicles
ELECTRIC MOBILITY

05 Made-in-India chips arrive
SEMICONDUCTORS

06 SiC and GaN power the new converters
POWER ELECTRONICS

07 Nuclear power opens up
NUCLEAR ENERGY

08 AI needs a lot of electricity
AI & DATA CENTRES

09 The grid meets record demand
GRID RELIABILITY

10 The grid goes digital
SMART GRIDS



TREND 01 · CLEAN POWER

Half of India's power capacity is now clean

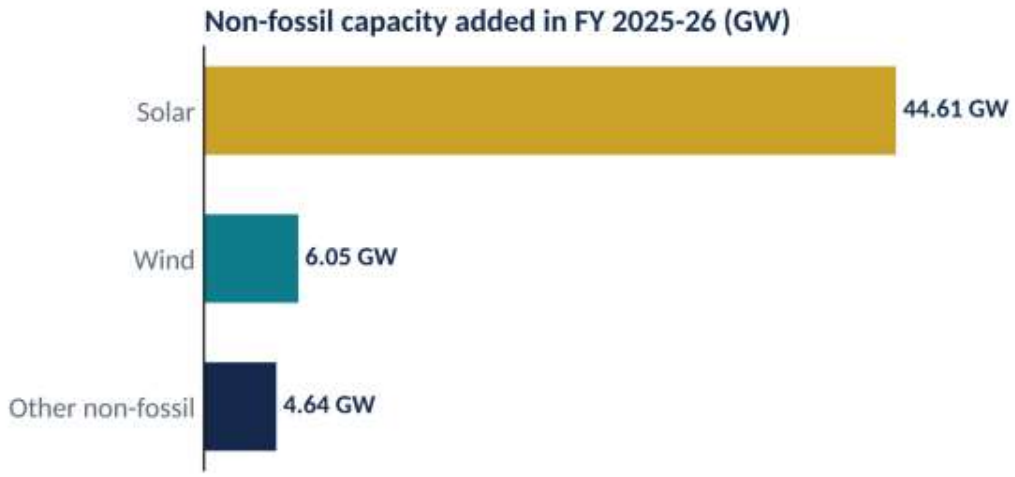
In 2025-26 India crossed the 50% non-fossil milestone five years early — and then added a record 55 GW of clean capacity.

55.3 GW	44.61 GW	50%
Non-fossil capacity added in FY 2025-26 — the highest ever	Solar added in one year, almost double the previous record	Share of non-fossil capacity reached on 30 June 2025

India set itself the goal of getting half of its installed power capacity from non-fossil sources by 2030. That target was reached on 30 June 2025, when 242.78 GW of the country's 484.82 GW capacity came from renewables, large hydro and nuclear. By 30 September 2025 total installed capacity had crossed 500 GW.

The financial year 2025-26 then broke every record. The Ministry of New and Renewable Energy reported 55.3 GW of new non-fossil capacity — including 44.61 GW of solar and 6.05 GW of wind, both the highest ever in a single year. Solar capacity crossed 150 GW by March 2026.

For electrical engineers, every gigawatt means new inverters, pooling substations, transmission lines, protection schemes and forecasting systems. Integrating so much variable power while keeping voltage and frequency stable is now the central task of power-system engineering.



Solar dominated the record additions of FY 2025-26.

FOR EEE STUDENTS **PV plant design, grid integration and power-system stability are the skills this growth demands.**

LINKED SUBJECTS

Power Systems · Power Electronics · Renewable Energy Sources

DID YOU KNOW?

On 29 July 2025 renewables met 51.5% of India's electricity demand for the first time.

Sources: MNRE, FY 2025-26 achievements (PIB, Apr 2026); Govt. of India statement on 50% non-fossil capacity (14 Jul 2025); Ministry of Power (PIB, 29 Oct 2025).

TREND 02 · DISTRIBUTED SOLAR

Rooftops and farms become power stations

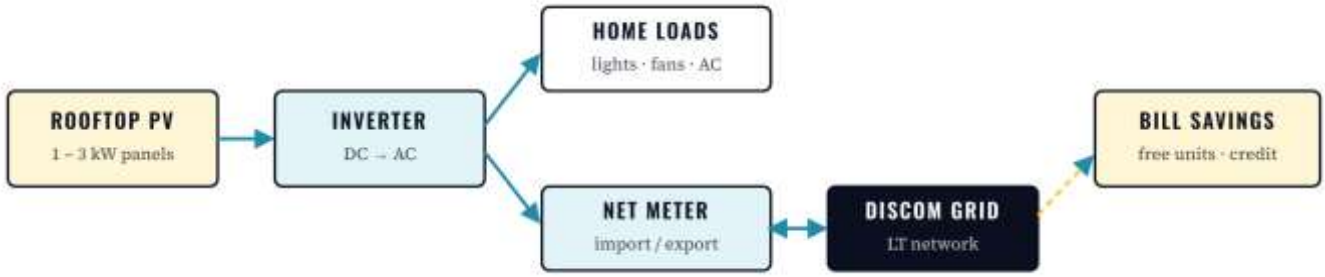
Distributed solar — on homes and on farms — grew faster than ever in 2025-26.

16.31 GW	30 lakh	7.67 GW
Distributed solar added in FY 2025-26	Homes with rooftop solar under PM Surya Ghar (Feb 2026)	Added under PM-KUSUM for farmers

Two national schemes are turning consumers into producers. PM Surya Ghar: Muft Bijli Yojana gives households financial help to install rooftop solar, while PM-KUSUM supports solar pumps and small solar plants for farmers. In 2025-26 distributed solar added 16.31 GW — about 8.71 GW on rooftops and 7.67 GW under KUSUM.

In February 2026 the Prime Minister marked the milestone of 30 lakh households powered by rooftop solar. Each rooftop system is a small grid-connected power plant with panels, an inverter, protection and a net meter, and lakhs of them change how distribution networks behave — power now flows back to the grid at noon.

This creates practical work close to home in Anantapur district: system sizing, installation, earthing, net-meter commissioning and maintenance. Distribution engineers must also plan for voltage rise, reverse power flow and transformer loading on rural feeders.



A grid-connected rooftop system — surplus solar is exported through the net meter.

FOR EEE STUDENTS **Rooftop design, net metering and LT distribution practice are directly employable skills.**

LINKED SUBJECTS

Electrical Distribution · Utilization of Electrical Energy

DID YOU KNOW?

The scheme supports rooftop solar in one crore households, with up to 300 free units a month.

Sources: MNRE FY 2025-26 achievements (PIB, Apr 2026); PM India, 30-lakh households milestone (23 Feb 2026).

TREND 03 · ENERGY STORAGE

Batteries scale up for the grid

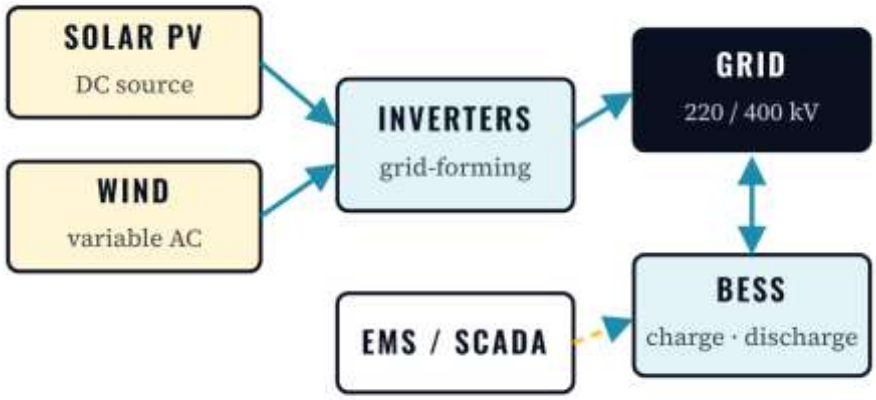
A second funding scheme in June 2025 supports 30 GWh of grid batteries — more than double the first.

30 GWh	₹5,400 cr	15 states
Battery storage supported by the 2025 VGF scheme	Viability gap funding from the Power System Development Fund	Share 25 GWh; NTPC gets 5 GWh

Solar output peaks at noon but demand peaks in the evening. Battery energy storage systems (BESS) shift that energy across the day. On 10 June 2025 the Ministry of Power approved a second Viability Gap Funding scheme of ₹5,400 crore for 30 GWh of battery storage, on top of the earlier scheme that grew from 4 GWh to about 13.2 GWh as battery prices fell.

A grid battery is an electrical engineer's system: thousands of lithium-ion cells managed by a battery-management system, bidirectional power-conversion systems, transformers, protection and SCADA. Batteries can respond within a fraction of a second, making them ideal for frequency control as well as evening peaks.

The battery-management concepts our students met in the EV & BMS certification course apply directly to grid-scale storage — the same cells, the same monitoring and balancing, at a far larger scale.



Renewables, inverters and battery storage working together under an energy-management system.

FOR EEE STUDENTS **Battery sizing, power-conversion systems and BMS design are fast-growing specialisations.**

LINKED SUBJECTS

Power Electronics · Power Systems · Electrical Measurements

DID YOU KNOW?

Storage projects under the 2025 scheme must be commissioned within 18 months of signing the agreement.

Source: Ministry of Power, VGF scheme for 30 GWh BESS (10 Jun 2025), as reported by Energetica India, JMK Research and Mint.

TREND 04 · ELECTRIC MOBILITY

A record year for electric vehicles

India sold about 24.5 lakh EVs in 2025-26, and every vehicle segment set a new record.

24.5 lakh	8.27%	14 lakh
EVs sold in FY 2025-26 (Vahan)	EV share of all new vehicles	Electric two-wheelers — 57% of EV sales

Electric vehicles continued their rapid rise. According to Vahan registration data, about 2.45 million EVs were sold in FY 2025-26, up 25% on the previous year. Electric two-wheelers led with 14 lakh units, electric three-wheelers crossed 8 lakh for the first time, and electric car sales nearly doubled to about 2 lakh.

Government support continued through the PM E-DRIVE scheme, which was extended until March 2028 within its ₹10,900 crore outlay, with funds for charging stations, e-buses, e-trucks and e-ambulances.

Every EV is a power-electronics system on wheels — battery pack and BMS, traction inverter, PMSM or BLDC motor, on-board charger and DC-DC converter. Mass adoption also means new loads on the grid, which is why smart charging and vehicle-to-grid technology were the theme of our January guest lecture.



Two- and three-wheelers made up about nine in ten EVs sold in FY 2025-26.

FOR EEE STUDENTS **Motor drives, converter design, battery management and charging infrastructure are core EV skills.**

LINKED SUBJECTS

Electrical Machines · Power Electronics · Control Systems

DID YOU KNOW?

EV sales crossed 2 lakh a month for the first time in October 2025.

Sources: Vahan data as analysed by Autocar Professional (Apr 2026); Ministry of Heavy Industries, PM E-DRIVE extension (PIB, Aug 2025).

TREND 05 · SEMICONDUCTORS

Made-in-India chips arrive

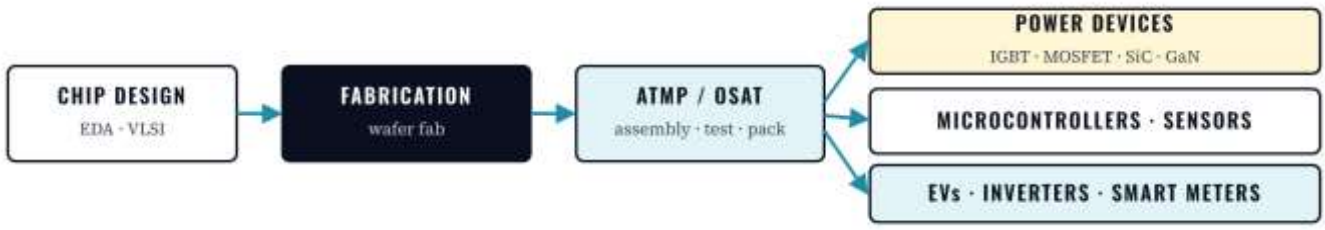
India presented its first fully indigenous 32-bit microprocessor and approved its first commercial silicon-carbide fab.

Vikram 3201	10	₹1.60 lakh cr
Indigenous 32-bit processor shown at Semicon India, 2 Sep 2025	Semiconductor projects approved under ISM by Aug 2025	Investment across six states

At Semicon India 2025 in New Delhi, the first made-in-India 32-bit microprocessor, Vikram 3201, was presented to the Prime Minister. Designed by ISRO and built at the Semiconductor Laboratory, it is a space-grade processor for launch-vehicle electronics — a milestone in self-reliance.

On 12 August 2025 the Union Cabinet approved four more projects under the India Semiconductor Mission, taking the total to ten with about ₹1.60 lakh crore of investment in six states. They include India's first commercial compound-semiconductor fab for silicon carbide (SiC) devices in Odisha, and a unit in our own state of Andhra Pradesh.

Power devices made of SiC are central to EV inverters, fast chargers, solar inverters and railways, so this industry links directly to the B.Tech EEE curriculum. Testing, packaging and fab facility engineering all need electrical engineers.



The semiconductor value chain — and where power devices fit.

FOR EEE STUDENTS **Device physics, VLSI basics and power-device testing open doors in a new Indian industry.**

LINKED SUBJECTS

Electronic Devices & Circuits · Digital Electronics · VLSI Design

DID YOU KNOW?

Vikram 3201 succeeds the 16-bit Vikram 1601, used in ISRO launch vehicles since 2009.

Sources: Semicon India 2025 reports (IANS, The Hindu, 2 Sep 2025); Cabinet approval of four semiconductor units (PIB / Business Today, 12 Aug 2025).

TREND 06 · POWER ELECTRONICS

SiC and GaN power the new converters

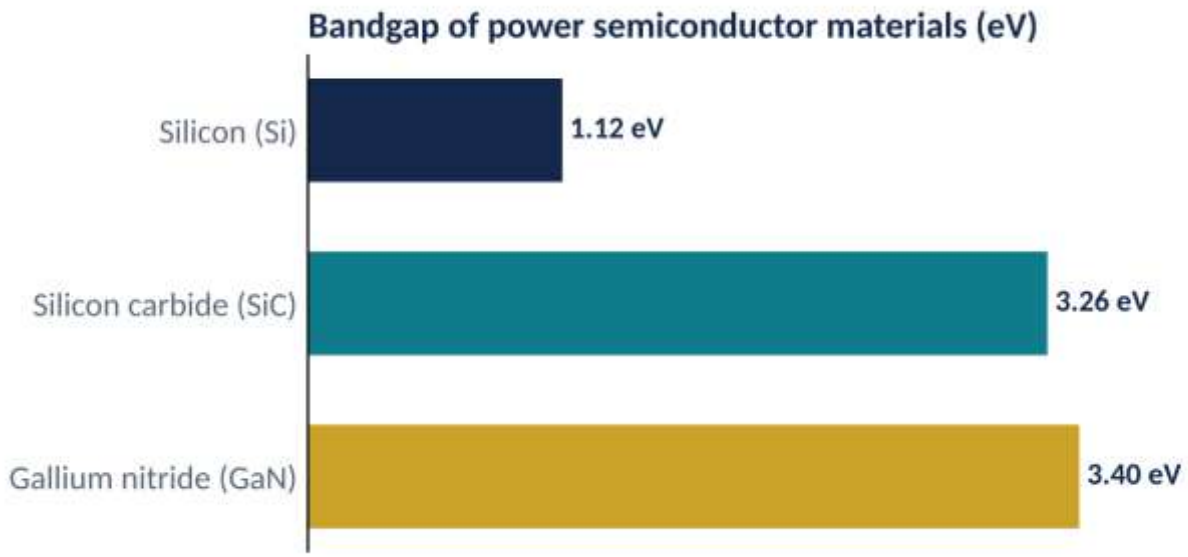
Wide-bandgap devices are moving from laboratories into Indian fabs, EVs and solar plants.

~3×	800 V	Smaller
Wider bandgap of SiC and GaN compared with silicon	EV battery systems enabled by SiC MOSFETs	Magnetics and heat sinks at higher switching frequency

For decades power electronics ran on silicon IGBTs and MOSFETs. Silicon carbide (SiC) and gallium nitride (GaN) have a much wider bandgap, so they block higher voltages, switch much faster and run hotter with lower losses. With India's first commercial SiC fab approved in 2025, these devices are also becoming a domestic industry.

The benefits show up everywhere: EV traction inverters with higher efficiency and range, fast chargers that fit in small cabinets, laptop and phone chargers half the size of older designs, and solar inverters that need less cooling.

Designing with wide-bandgap devices needs new skills — fast gate drivers, careful PCB layout to cut stray inductance, EMI filtering and thermal design. Circuit simulation with PSPICE and Multisim, taught in our December certificate program, is the first step towards these designs.



A wider bandgap allows higher voltage, temperature and switching speed.

FOR EEE STUDENTS **Converter design with SiC/GaN, gate drivers and thermal management are high-value design skills.**

LINKED SUBJECTS

Power Electronics · Electronic Devices & Circuits

DID YOU KNOW?

Small GaN chargers are possible because faster switching allows much smaller transformers and capacitors.

Bandgap values: standard material data (Si 1.12 eV, 4H-SiC 3.26 eV, GaN 3.4 eV). SiC fab: Cabinet approval (12 Aug 2025).

TREND 07 · NUCLEAR ENERGY

Nuclear power opens up

A new law and a ₹20,000 crore mission aim for 100 GW of nuclear power by 2047.

SHANTI Act	₹20,000 cr	100 GW
New nuclear law passed by Parliament, Dec 2025	Nuclear Energy Mission for small modular reactors	Nuclear capacity target for 2047

Nuclear power supplies steady, carbon-free base-load electricity, but India's capacity has stayed around 8–9 GW. The Union Budget 2025-26 launched a Nuclear Energy Mission with ₹20,000 crore for research on Small Modular Reactors (SMRs), aiming for at least five indigenous SMRs in operation by 2033 and 100 GW of nuclear capacity by 2047.

In December 2025 Parliament passed the Sustainable Harnessing and Advancement of Nuclear Energy for Transforming India (SHANTI) Act. It replaces the Atomic Energy Act of 1962 and the nuclear liability law of 2010, allows regulated private participation, and gives the Atomic Energy Regulatory Board statutory status.

Whatever the reactor, the electrical side is familiar: large synchronous generators, excitation and governor control, generator transformers, switchyards and highly reliable auxiliary and emergency power systems.



From reactor heat to grid power — the electrical chain of a nuclear plant.

FOR EEE STUDENTS **Synchronous machines, protection and power-plant electrical systems remain vital skills.**

LINKED SUBJECTS

Electrical Machines · Power System Operation & Control

DID YOU KNOW?

An SMR is built in modules in a factory, which can shorten construction time and cost.

Sources: Union Budget 2025-26 (PIB, Feb 2025); SHANTI Act — World Nuclear News and All India Radio (Dec 2025).

TREND 08 · AI & DATA CENTRES

AI needs a lot of electricity

India's data centres quadrupled in five years — and their power demand could grow almost tenfold by 2032.

~1,500 MW	13.56 GW	38,000+
Data-centre capacity in 2025 (375 MW in 2020)	Projected data-centre demand by 2031-32	GPUs made available under IndiaAI

Artificial intelligence runs on large data centres filled with GPUs, and every GPU needs reliable power and cooling. The Ministry of Electronics and IT told Parliament that India's data-centre capacity grew from about 375 MW in 2020 to around 1,500 MW in 2025, while the Ministry of Power expects data-centre demand to reach 13.56 GW by 2031-32.

Under the IndiaAI Mission more than 38,000 GPUs have been made available to start-ups, researchers and academic institutions at subsidised rates, so Indian AI models can be trained at home.

For electrical engineers, a data centre is a demanding customer: dedicated high-voltage substations, redundant feeders, large UPS and battery systems, diesel or gas back-up, power-quality control and very efficient cooling. AI is also used inside the power sector — for load and solar forecasting, fault detection and predictive maintenance.



Data-centre power demand: 2020, 2025 and the 2031-32 projection.

FOR EEE STUDENTS **Python, data analysis and power-quality engineering are becoming everyday tools for power engineers.**

LINKED SUBJECTS

Power Systems · Power Electronics · Computer Programming

DID YOU KNOW?

Cooling can use a large share of a data centre's electricity — efficient design saves both energy and money.

Sources: MeitY reply in Parliament as reported by IBEF and w.media (Mar 2026); Ministry of Power projection.

TREND 09 · GRID RELIABILITY

The grid meets record demand

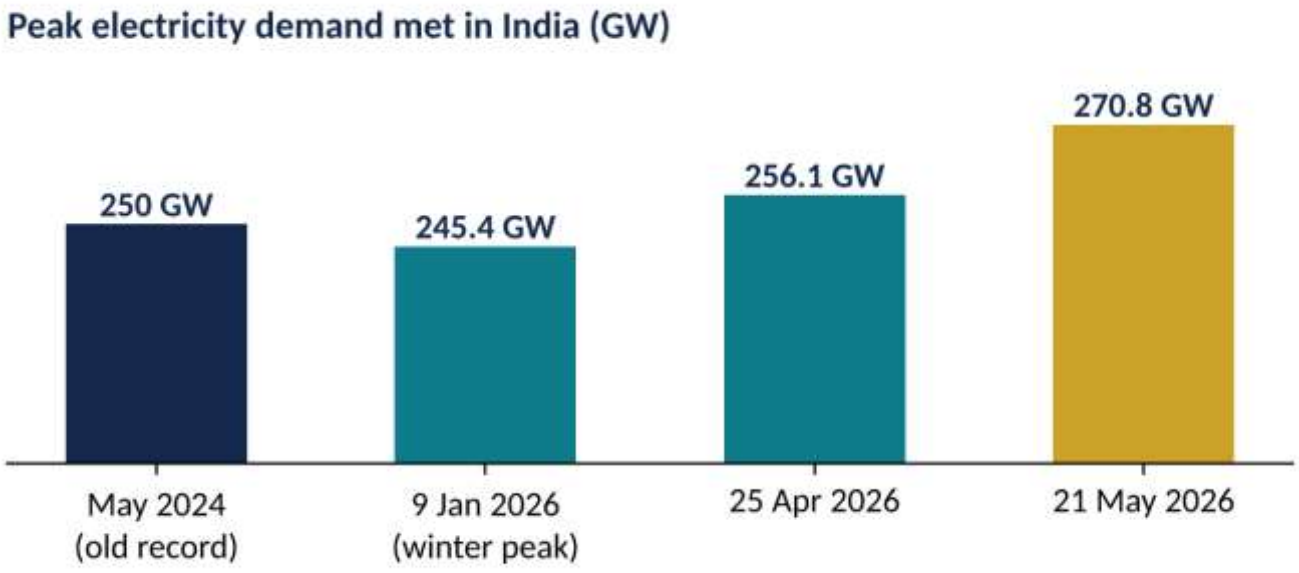
India's peak electricity demand broke records three times in 2025-26 — and was met without shortage.

245.4 GW	256.1 GW	270.8 GW
Winter peak met on 9 January 2026	All-time peak on 25 April 2026	New record on 21 May 2026

Heatwaves, more air-conditioners and a growing economy pushed India's electricity demand to new highs. After a winter peak of 245.4 GW in January 2026, demand passed the 2024 record of 250 GW and reached 256.1 GW on 25 April 2026 — met without any shortfall. In May 2026 it climbed further, to a record 270.8 GW on 21 May.

Solar power made a visible difference: on the record April day, solar supplied nearly a third of generation around midday. The hardest hours are now the evenings, when solar output disappears but cooling demand remains — which is why storage and flexible generation matter so much.

Meeting such peaks needs accurate forecasting, careful scheduling of every power station, strong inter-regional transmission and fast protection. Our industrial visit to the Power Grid substation at Gooty showed students one link in this national chain.



Peak demand met: a new record almost every few weeks in summer 2026.

FOR EEE STUDENTS **Load forecasting, power-system operation and protection skills are always in demand.**

LINKED SUBJECTS

Power System Operation & Control · Power System Analysis

DID YOU KNOW?

India runs one of the largest synchronous grids in the world — all regions operate at the same 50 Hz.

Sources: Ministry of Power data reported by Renewable Watch and AIR (Apr 2026); Business Today (23 May 2026).

TREND 10 · SMART GRIDS

The grid goes digital

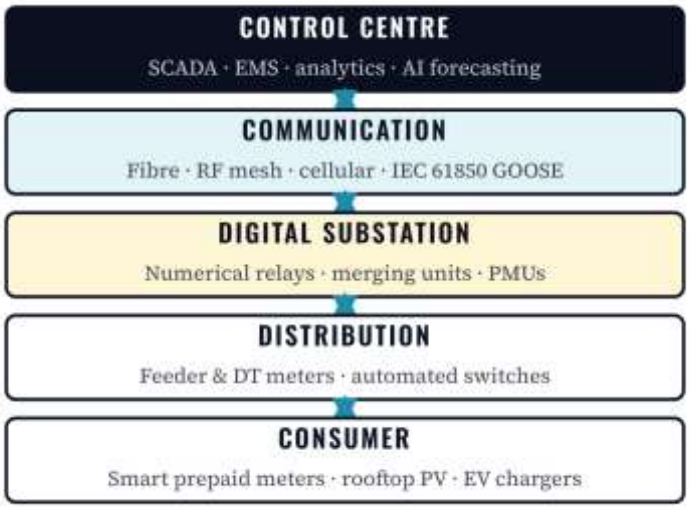
Smart meters, digital substations and wide-area monitoring are turning a one-way network into an intelligent two-way system.

Two-way	IEC 61850	PMUs
Power and data now flow in both directions	Standard for digital substation communication	Watch the grid many times a second

The traditional grid sent power one way — from large generators to passive consumers — with meters read once a month. The smart grid adds sensors, communication and control at every level: smart prepaid meters, automated distribution feeders that isolate faults in seconds, and phasor measurement units that let operators see the grid's dynamics in real time.

Inside substations, copper wiring between instrument transformers and relays is giving way to optical fibre and the IEC 61850 standard, with numerical relays exchanging protection messages in milliseconds. With so much solar, storage and EV charging on the network, demand response and cyber security have become essential.

These were exactly the topics of the department's six-day Faculty Development Programme on smart-grid technologies in January 2026, and of the guest lectures on power-system protection and control in modern power networks.



Layers of a smart grid — from the consumer's meter to the control centre.

FOR EEE STUDENTS **Protection, SCADA, communication protocols and cyber security are the new core of grid engineering.**

LINKED SUBJECTS

Switchgear & Protection · Power Systems · Communication

DID YOU KNOW?

A phasor measurement unit time-stamps each reading using GPS, so distant substations can be compared exactly.

SKILLS FOR THE FUTURE

The EEE Toolkit for 2026 and Beyond

The developments in this magazine point to a clear set of skills. The table links each technology to the subjects that build its foundation, the tools worth learning and the jobs it creates. Many of these tools were part of this year's certification programmes.

Technology	Core subjects	Tools to learn	Career roles
Solar & wind	Power Systems, Power Electronics, Renewable Energy	PVsyst, MATLAB/Simulink, ETAP	Solar design engineer, O&M engineer, grid-integration engineer
Rooftop & KUSUM solar	Electrical Distribution, Utilization of Energy	PVsyst, AutoCAD Electrical	Rooftop installer, energy auditor, DISCOM engineer
Battery storage	Power Electronics, Electrical Measurements	MATLAB/Simulink, PLECS, Python	BESS engineer, BMS developer
Electric vehicles	Electrical Machines, Power Electronics, Control	MATLAB/Simulink, PSPICE, Arduino	EV powertrain engineer, charging engineer
SiC / GaN converters	Power Electronics, EDC	PSPICE/Multisim, LTspice, KiCad	Power-electronics designer, test engineer
Semiconductors	Electronic Devices, Digital Electronics, VLSI	Verilog, Cadence/Synopsys tools	Device test engineer, fab facility engineer
Nuclear & thermal plants	Electrical Machines, Power Plant Engineering	ETAP, MATLAB	Plant electrical engineer, protection engineer
AI & data centres	Power Systems, Power Electronics, Programming	Python, MATLAB, data tools	Data-centre power engineer, energy data analyst
Grid operation	Power System Operation & Control	PowerWorld, ETAP, SCADA	Load-dispatch engineer, planning engineer
Smart grids	Switchgear & Protection, Communication	PSCAD, ETAP, IEC 61850 tools	Protection engineer, SCADA engineer

FREE LEARNING RESOURCES

NPTEL and SWAYAM courses on power electronics, smart grids, electric vehicles and renewable energy; MATLAB Onramp courses; IEEE Xplore and NDLI through the college library; and the Skill India Digital portal for short certifications. As explained in the NPTEL awareness session, NPTEL credits can also count towards the B.Tech programme.

From the editorial desk

We thank the management, the principal, faculty members, resource persons and students whose work fills these pages. Readers are welcome to send articles, project write-ups and photographs for the next issue of Electro Sphere to the Department of EEE.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT VISION

To impart the best technical education instilled with discipline, values and leadership qualities that will produce professional technocrats in Electrical and Electronics Engineering.

DEPARTMENT MISSION

M1: To impart fundamental Electrical and Electronics Engineering concepts and a broad set of technical skills.

M2: To prepare Electrical and Electronics Engineering graduates who will engage effectively and responsibly in practicing engineering.

M3: To impart practical exposure on latest technological developments in Electrical and Electronics Engineering.

Program Educational Objectives (PEO's)

On successful completion of UG in Electrical and Electronics Engineering, the Graduates will:

PEO1: Have a successful professional career with a strong foundation in basic sciences, along with in-depth knowledge of electrical engineering.

PEO2: Pursue higher studies to contribute for the betterment of the society.

PEO3: Continue in their chosen profession by practicing lifelong learning.

Program Specific Outcomes (PSO's)

PSO1: Using Power Electronics knowledge in conjunction with Electrical Machines understanding to create an engineering solution in the domains of Electrical Drives.

PSO2: Develop innovative cutting-edge technologies in power systems related to efficient electrical power conversion and control.