Vel Tech
Rangarajan Dr. Sagunthala
R&D Institute of Science and Technology
(Deemed to be University Estd. u/s 3 of UGC Act, 1956)

Recognised as CATEGORY-1 DEEMED TO BE UNIVERSITY by the UGC University Grants Commission

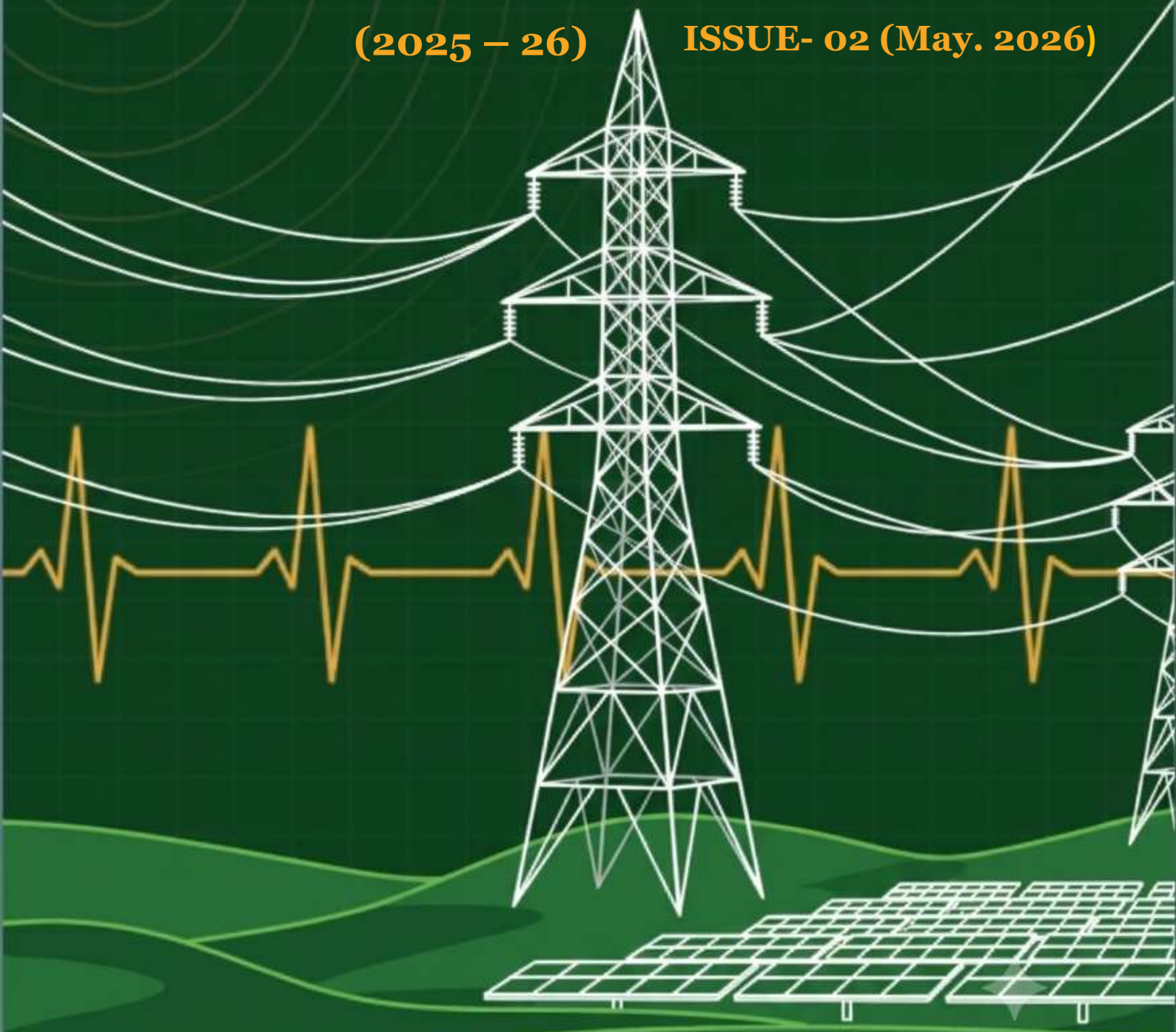
SCHOOL OF ELECTRICAL AND COMMUNICATION

DEPARTMENT OF

ELECTRICAL AND ELECTRONICS ENGINEERING

Spark Magazine

(2025 – 26) ISSUE- 02 (May. 2026)



Foreword



Col. Prof. Vel. Dr. R. Rangarajan
Founder President & Chancellor



Dr. Mrs. Sagunthala Rangarajan
Foundress President

We remain committed to building an educational environment that nurtures knowledge, character, innovation, and excellence. Our institution continues to encourage students and faculty to pursue meaningful academic, research, and technological endeavors, supported by modern infrastructure, well-equipped laboratories, and a dedicated faculty. The Department of Electrical and Electronics Engineering reflects this vision through its academic achievements, research initiatives, funded projects, industry collaborations, and the accomplishments of its students and faculty.



DEPARTMENT OF EEE

Foreword



Mrs. Rangarajan Mahalakshmi Kishore
Chairperson & Managing Trustee

Delighted to witness the achievements of faculty and students across academic and research activities, the Chairperson congratulates the entire team on the effort behind this report and commends the department for producing talent-driven, innovative engineers to meet society's new and challenging issues.



Foreword



Prof. Dr. Rajat Gupta
Vice Chancellor

I am delighted to present the latest edition of Spark, the flagship magazine of the EEE Department. This magazine reflects our continuous pursuit of research excellence, creativity, co-curricular activity and technical learning of our students. Kudos to the editorial team, faculty, and brilliant students whose hard work and contributions made this edition possible.



Prof. Dr. E. Kannan
Registrar

I warmly congratulate the EEE Department on launching this vibrant edition of Spark. This platform beautifully captures the dynamic activities, student achievements, and academic excellence of the department. I wish the EEE team continued success in inspiring our community through such creative and meaningful initiatives.



Message from Dean and Head of the Department

Dr. R. S. Valarmathi
Professor & Dean
School Of Electrical and Communication



The School continues to make remarkable progress, driven by the achievements of our faculty, students and staff in cutting-edge research, academic excellence, and industry collaboration. Spark, the magazine of EEE department serves as a wonderful window into this journey—reflecting our focus on innovation, hands-on learning, and community impact. I commend the entire team for shaping our students into future-ready professionals and bringing these milestones to light.

Dr. K.Karunanithi
Professor & Head
Department of Electrical and Electronics Engineering



It is with great pleasure and immense pride that I present Spark, the official magazine of the Department of Electrical and Electronics Engineering. I invite you to explore these pages to discover the remarkable achievements and creative brilliance within our department. Together, as we continue to push boundaries, we look forward to a vibrant future driven by transformative education, innovative research, and impactful contributions to the world of EEE.

VISION OF THE DEPARTMENT

To offer quality education in Electrical and Electronics Engineering that builds strong principles, enhances employability skills, promotes interdisciplinary research and develops leaders capable of delivering technological solutions to societal and industrial challenges.

MISSION OF THE DEPARTMENT

M1: To provide strong fundamentals and globally relevant education through outcome-based teaching and learning.

M2: To enhance academic, industry and international collaborations for experiential learning, leadership development, teamwork and employability.

M3: To foster a research-oriented academic environment that promotes innovation, interdisciplinary learning, and solutions to industrial challenges and societal needs.

M4: To instil ethical values, sustainability, social responsibility, respect for diversity and lifelong learning in engineering practices.

PROGRAMME EDUCATIONAL OBJECTIVE

PEO1: Design and analyse electrical and electronic systems by applying the knowledge of mathematics and engineering.

PEO2: Provide practical solution to multidisciplinary societal problems through innovative ideas.

PEO3: Secure positions and continue as valued, creative and proficient employees in a wide variety of fields and industries for a rewarding career.

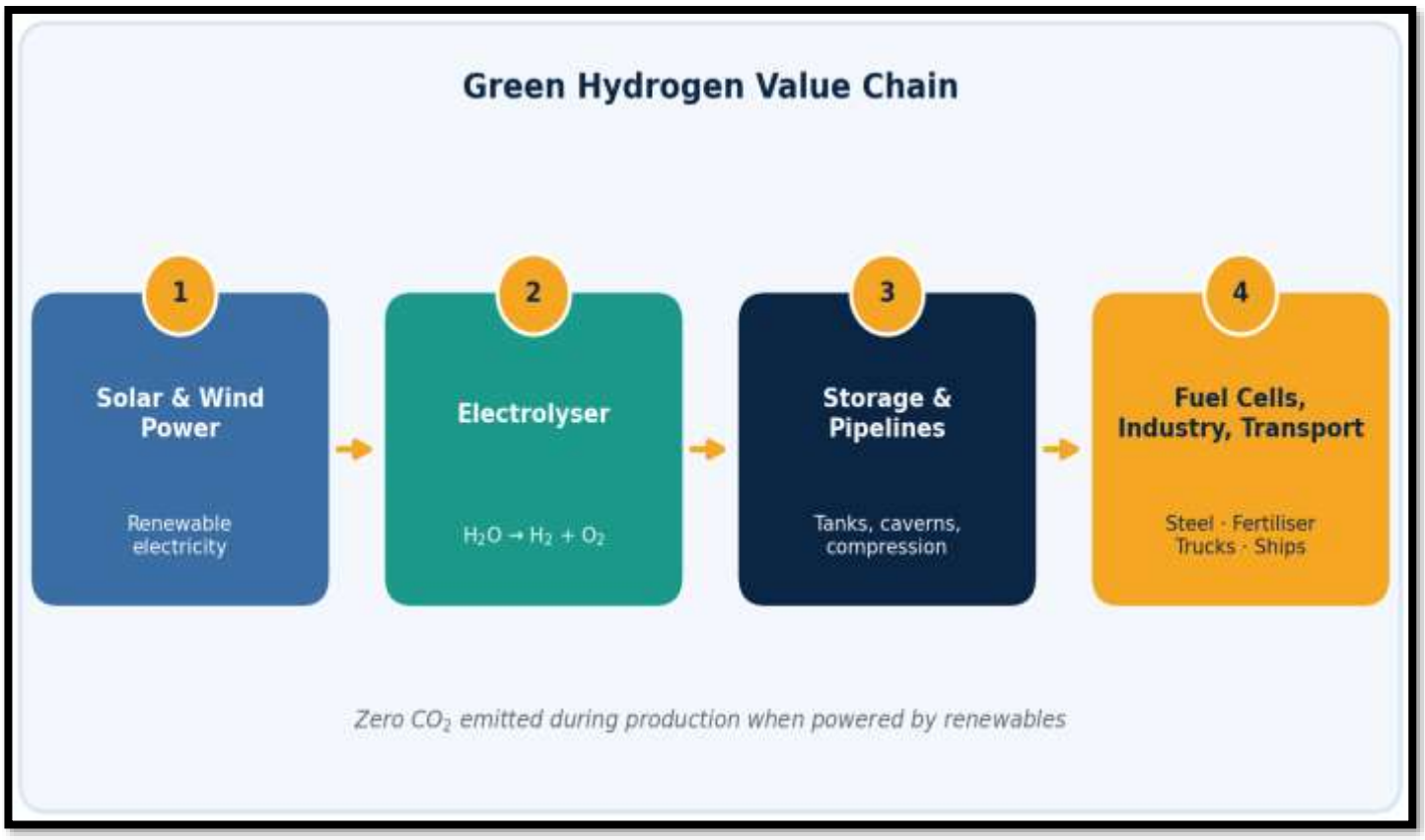


Energizing Next

Green Hydrogen: The Fuel of the Future

Green hydrogen is made by splitting water into hydrogen and oxygen in an electrolyser powered by renewable electricity such as solar and wind. Unlike hydrogen made from natural gas, it releases no carbon dioxide during production. India's National Green Hydrogen Mission aims for 5 million tonnes of annual production capacity by 2030.

In the future, green hydrogen can store surplus renewable energy for days or months, clean up steel, fertiliser and refining industries, and fuel heavy trucks, ships and trains through fuel cells. The main challenges are the cost of electrolysers, energy lost in conversion, and safe storage and transport. For electrical engineers, power electronics, grid integration and control of electrolyser plants will be key skill areas.



5 MMT
Mission target for green hydrogen per year by 2030

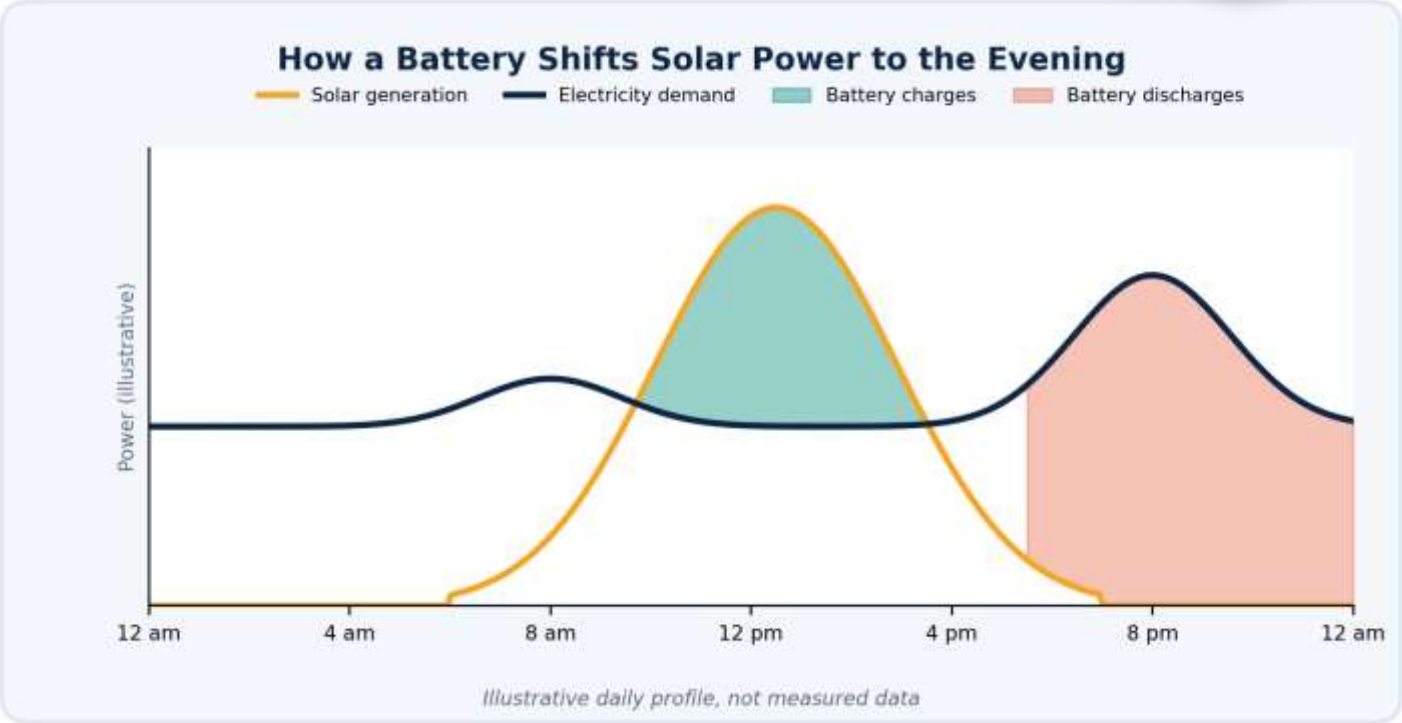
Zero CO_2
emitted while producing green hydrogen

2070
India's net-zero emissions target year

VTU26940, PRETHVI ADRIAN.S

Captured Daylight Hours

Battery Storage: Sunshine After Sunset



Solar and wind produce power only when the sun shines and the wind blows, but demand often peaks in the evening. Battery energy storage systems (BESS) solve this mismatch by charging when generation is high and discharging when demand is high. Lithium-ion batteries dominate today, while sodium-ion, flow and solid-state batteries are being developed for lower cost, longer life and better safety.

A utility-scale battery plant has battery racks, a power conversion system (inverter), a battery management system and an energy management system. In future, AI will forecast generation and demand and decide when to charge or discharge. Used EV batteries can get a second life in stationary storage. Batteries can also respond to grid frequency changes within a fraction of a second, which makes the whole

Li-ion
today's dominant storage chemistry

Na-ion
emerging low-cost alternative

24×7
round-the-clock solar power with storage

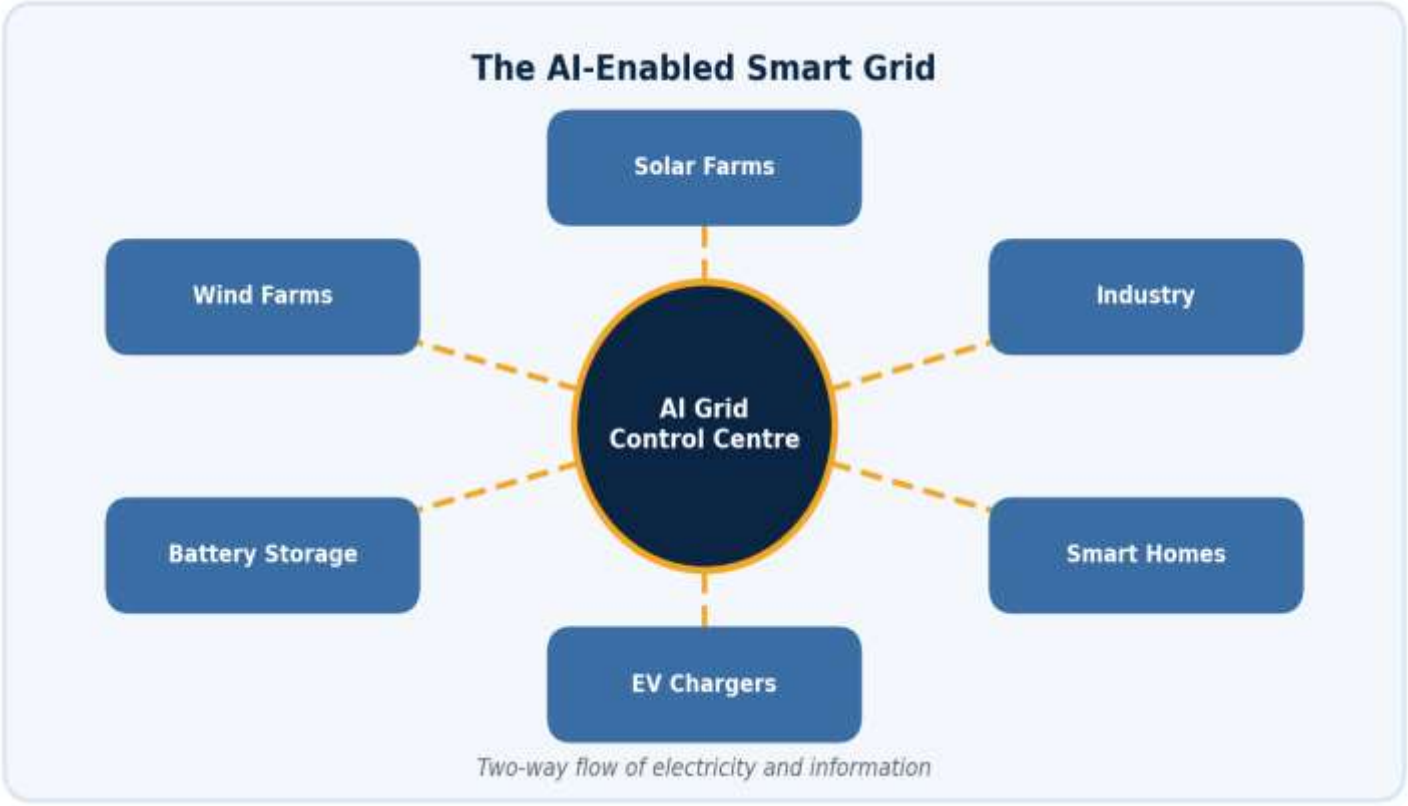
VTU30394, BELLAM KAVYA SRI

Tomorrow Grid

Smart Grids: The Intelligent Network

A smart grid adds sensors, communication networks and software to the traditional power system so that electricity and information flow in both directions. Smart meters, phasor measurement units (PMUs) and SCADA systems give operators real-time visibility, and automated switches can isolate a fault and restore supply to healthy sections within seconds.

Artificial intelligence will make the grid predictive. Machine-learning models can forecast solar output and demand, detect theft or equipment faults early, and balance millions of rooftop solar panels, batteries and EV chargers. Cyber-security becomes critical because a connected grid has more entry points. The future grid will be self-healing, consumer-friendly and ready to carry a large share of



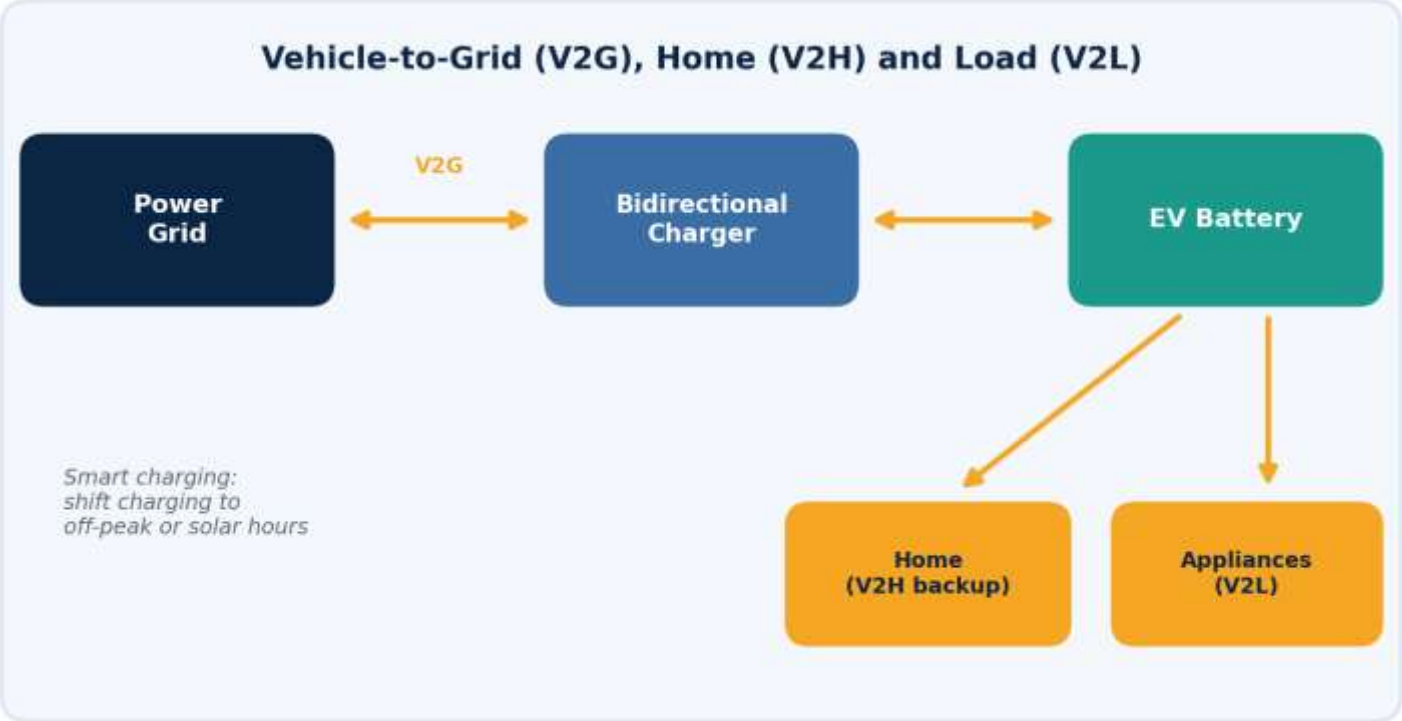
2-way
flow of electricity and data

PMU
real-time monitoring of grid health

Self-healing
automatic fault isolation and restoration

Wheels to Grid

Electric Vehicles and Vehicle-to-Grid



Electric vehicles are changing transport, but they are also becoming part of the electrical system. A typical EV carries a battery of tens of kilowatt-hours, enough to supply an average Indian household for several days. Smart charging shifts charging to hours of low demand or high solar output and avoids overloading distribution transformers.

With vehicle-to-grid (V2G), vehicle-to-home (V2H) and vehicle-to-load (V2L) technology, a parked EV can send power back to the grid, run a house during an outage or supply appliances. Millions of EVs could act as one giant distributed battery. Fast chargers, bidirectional converters and communication standards such as OCPP and ISO 15118 are the engineering areas that will make this possible.

V2G
vehicle sends power back to the grid

V2H
backup power for the home

V2L
run appliances from the EV battery

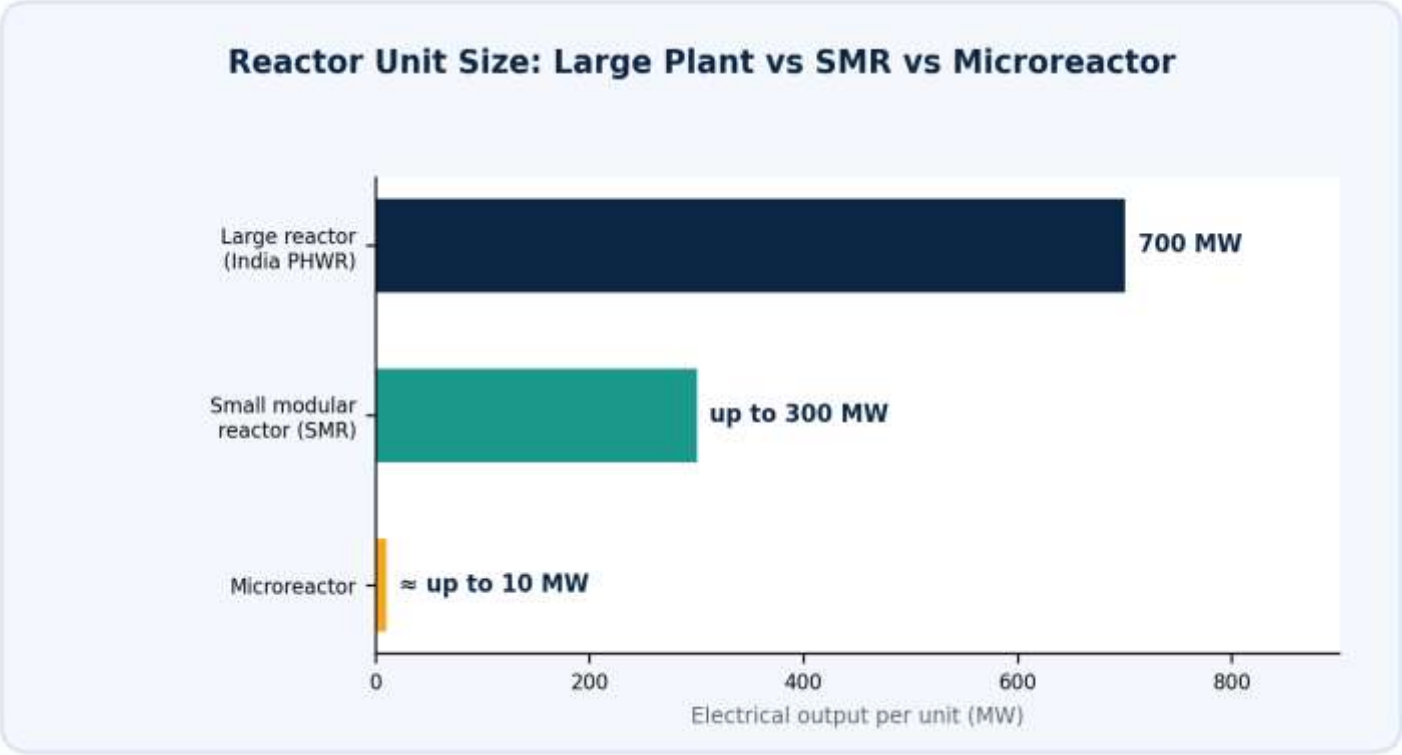
VTU30268, ANGOTHU SATHISH

Small Modular Reactors (SMRs)

Next-Gen Micro Reactors

Small modular reactors (SMRs) are nuclear reactors with an output of up to about 300 MW per unit, roughly one-third of a conventional large reactor. Parts can be built in a factory and transported to site, which can shorten construction time and improve quality control. Many designs use passive safety systems that rely on gravity and natural circulation instead of pumps.

India's Nuclear Energy Mission targets 100 GW of nuclear capacity by 2047, with a ₹20,000 crore allocation for research on small reactors and at least five to be operational by 2033. SMRs can supply steady low-carbon power to industries, remote areas and old coal-plant sites, and can provide high-temperature heat for hydrogen production. Cost, waste management and public acceptance remain challenges.



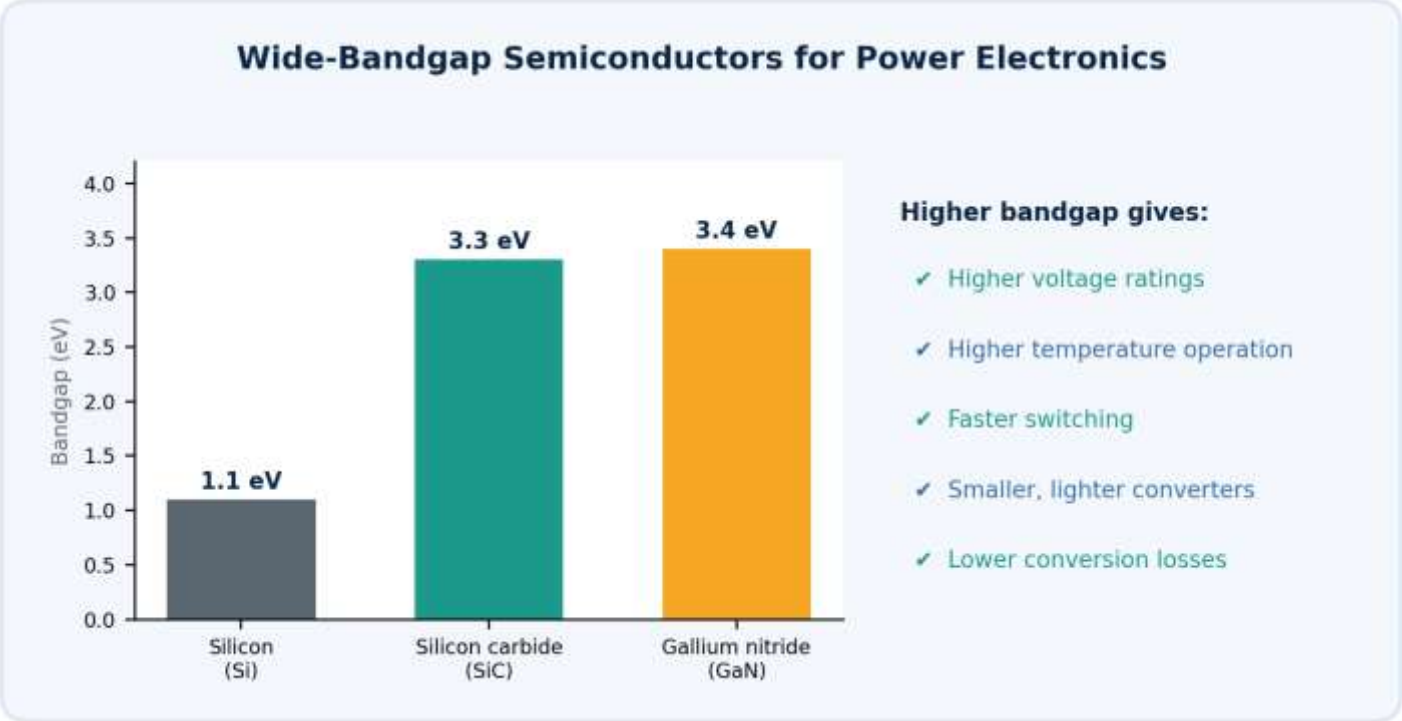
≤ 300 MW
typical size limit of one SMR unit

100 GW
India's nuclear capacity goal by 2047

5 by 2033
small reactors planned under the Mission

Power Chip

SiC and GaN: Power Electronics



Power electronics converts electricity from one form to another in solar inverters, EV chargers, motor drives and data centres. For decades silicon devices have done this job, but they are reaching their limits. Silicon carbide (SiC) and gallium nitride (GaN) are wide-bandgap materials that work at higher voltages, higher temperatures and much higher switching frequencies.

Faster switching means smaller inductors, capacitors and heat sinks, so converters become lighter, easier to cool and more efficient. SiC is already used in EV traction inverters and fast chargers, while GaN is popular in compact phone chargers and is moving into servers and solar microinverters. With India building its semiconductor ecosystem, power devices will be an exciting area for future EEE graduates.

1.1 eV
bandgap of silicon

3.3 eV
bandgap of silicon carbide

3.4 eV
bandgap of gallium nitride

VTU28550, GUDEPU NISHITHA

Poem

Last Wish

A quiet whisper in the fading light,

To leave a legacy serene and bright.

Let no lingering tears or shadows fall,

When time answers its final call.

Scatter my dreams like seeds upon the earth,

To give a future generation birth.

Keep passion burning in the hearts I leave,

And find continuous strength, no need to grieve.

Remember only warmth, the joy, the grace,

And let true peace forever hold this place.

VTU28550, GUDEPU NISHITHA

Poem

A genius mind

A spark of brilliance, quiet and profound,

Unlocking secrets where no paths were found.

A restless spirit seeking truth untold,

In subtle patterns waiting to unfold.

With vision reaching past the known horizon,

Above the common noise, a star is risin’.

In elegant equations, clear and light,

A genius mind illuminates the night.

VTU26889, K.DHANUSH

TRIBUTE

Mathematical Genius.: Srinivasa Ramanujan Iyengar



Srinivasa Ramanujan Iyengar was an extraordinary Indian mathematical genius whose intuitive brilliance reshaped modern mathematics. Born in Erode, Tamil Nadu, Ramanujan possessed an innate, almost mystical passion for numbers.

Despite having little formal training in advanced mathematics, he independently derived thousands of complex theorems, identity formulas, and infinite series in isolation.

In 1913, his extraordinary talent caught the attention of Cambridge mathematician G. H. Hardy, leading Ramanujan to Trinity College, England. There, despite frail health and cultural hardship, he published groundbreaking work on number theory, partition functions, modular forms, and mock theta functions. Hardy famously remarked that Ramanujan's mathematical insight was on par with legends like Euler and Gauss.

Ramanujan often attributed his mathematical discoveries to his family deity, Goddess Namagiri, stating, "An equation for me has no meaning unless it expresses a thought of God."

Though his life was tragically cut short at the age of 32, his notebooks containing over 3,900 results continue to inspire researchers, finding applications in modern string theory, crystallography, and computer science. In India, his birth anniversary, December 22, is celebrated as National Mathematics Day, honoring a timeless legacy of raw, unyielding genius.

VTU30280, SANJAY K

Essay

Mediation: The Stress Relaxer



In a fast-paced world filled with endless demands, tight deadlines, and constant digital noise, stress has become an almost unavoidable part of daily life. Left unmanaged, chronic stress takes a heavy toll on both physical health and mental well-being. Meditation offers a time-tested, accessible antidote—serving as a natural and powerful stress relaxer that restores inner balance.

At its core, meditation is the practice of training the mind to focus and redirect thoughts. When stress triggers the body's primitive "fight-or-flight" response—elevating heart rate, raising blood pressure, and flooding the system with cortisol—meditation activates the relaxation response. Through simple techniques such as deep belly breathing, body scans, or focused awareness, the heart rate slows, muscle tension eases, and stress hormone levels decrease. Beyond immediate physical calm, regular meditation transforms how we react to life's challenges. By cultivating mindfulness, it allows us to observe thoughts and emotions without judgment, creating a mental buffer between a stressor and our reaction. Instead of feeling overwhelmed, we develop the clarity and resilience needed to navigate difficult situations with calm composure.

Incorporating just a few minutes of meditation into a daily routine—whether in the quiet morning hours or during a midday break—can profoundly enhance quality of life. It quiets a restless mind, improves focus, and promotes restful sleep. Ultimately, meditation is not about escaping reality; it is about building a peaceful sanctuary within, empowering us to meet life with tranquility and quiet confidence.

VTU30268, ANGOTHU SATHISH

ARTS’

Art: Shading Some Real Truth!





VTU30268, ANGOTHU SATHISH

RANGOLIS’

Rangoli: Colors of Joy





VTU 28550,GUDEPU NISHITHA

Sudoku

Sudoku: Learn and Fun.

Fill in the grid with numbers 1 to 9 making sure no number is repeated in every row, every column and within each mini grid.

	1			5				4
	4		8		6		7	
		5		3			8	
		7	9				5	
1					8	6	2	
3			4					
	2	8	6	1				
		9	2			3		1
7								

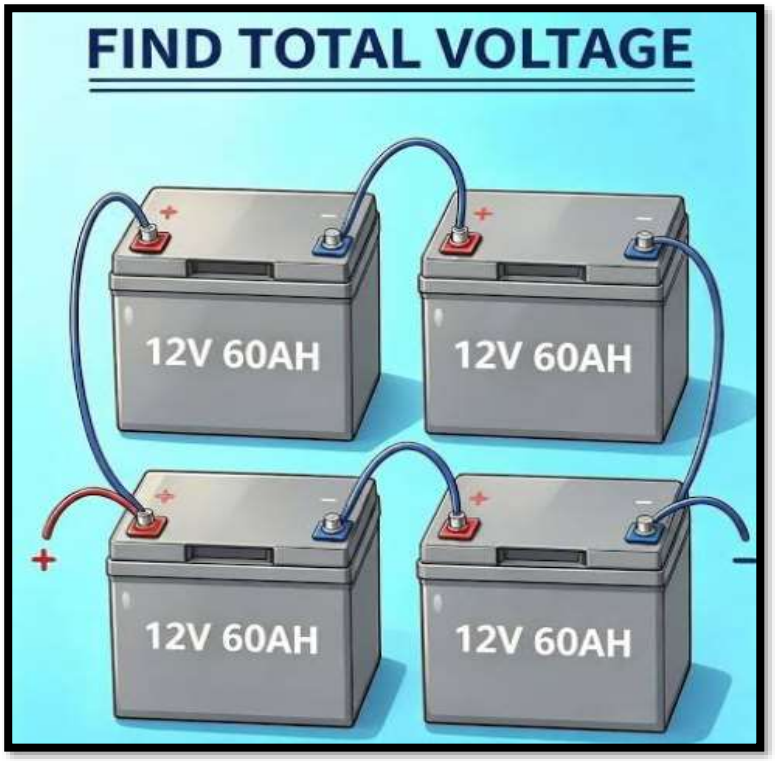
Answer

8	1	6	7	5	2	9	3	4
2	4	3	8	9	6	1	7	5
9	7	5	1	3	4	2	8	6
6	8	7	9	2	1	4	5	3
1	5	4	3	7	8	6	2	9
3	9	2	4	6	5	7	1	8
4	2	8	6	1	3	5	9	7
5	6	9	2	8	7	3	4	1
7	3	1	5	4	9	8	6	2

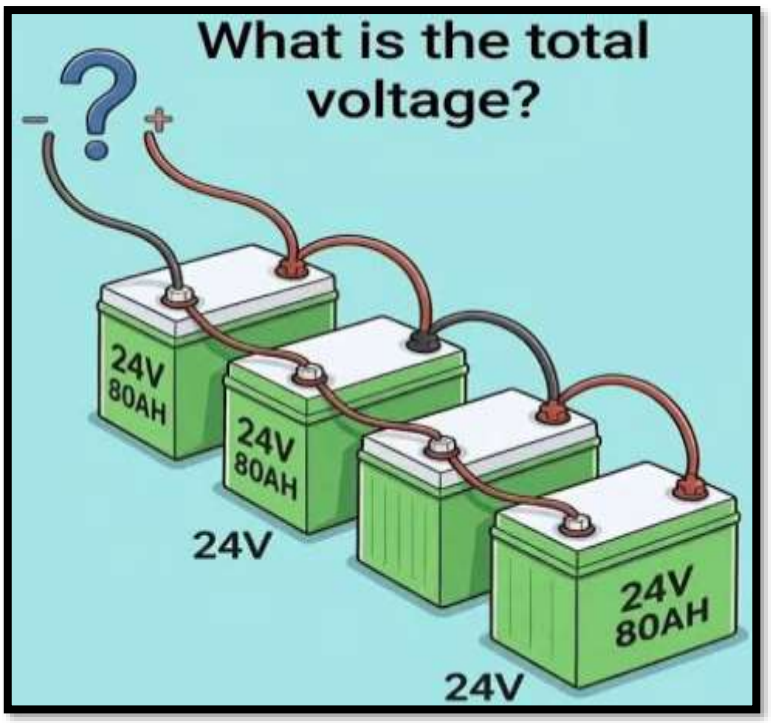
VTU 28550,GUDEPU NISHITHA

Puzzle

Puzzle: Battery Connection



Answer: 48 V



Answer: 96 V

TTS 351, Dr. P.K. Dhal

Brain Teaser: Try once!

Brain Teaser

•I am the central processing unit on a single integrated circuit, handling data processing, but I require external memory and peripherals to function as a complete system. What am I?

Answer: Microprocessor

•I integrate a processor core, memory (RAM/ROM), and input/output peripherals onto a single silicon chip to control embedded systems. What am I?

Answer: Microcontroller

•I am a dedicated register that holds the memory address of the next instruction to be fetched and executed. What am I?

Answer: Program Counter (PC)

•I perform mathematical calculations and boolean logic operations within the central processing unit. What am I?

Answer: Arithmetic Logic Unit (ALU)

•I am a specialized storage location inside the processor used to temporarily hold data, instructions, or memory addresses for ultra-fast access. What am I?

Answer: Processor Register

•I am a hardware or software signal that temporarily halts the processor's current execution flow to service a high-priority event. What am I?

Answer: Interrupt

•I convert physical real-world analog signals into digital values that a microcontroller can process. What am I?

Answer: Analog-to-Digital Converter (ADC)

•I am a hardware subsystem used within a microcontroller to generate precise time delays, track events, or produce pulse-width modulation signals. What am I?

Answer: Timer / Counter

Quiz Challenge



1. What is the primary function of a Level 3 DC Fast Charger?
A) Slow charging B) Rapid DC charging C) Grid discharging
Answer: B) Rapid DC charging

2. Which standard connector type is most common for DC Fast Charging (DCFC)?
A) Type 1 B) CHAdeMO C) CCS connector
Answer: C) CCS connector

3. What is the main purpose of the Thermal Management System?
A) Temperature control B) Voltage step-up C) Motor cooling
Answer: A) Temperature control

4. What technology allows an EV to push surplus electricity back into the grid?
A) Wireless charging B) Vehicle-to-Grid (V2G) C) Regenerative braking
Answer: B) Vehicle-to-Grid (V2G)

5. What electrical metric determines how quickly an EV battery can absorb energy?
A) Charging power B) Battery weight C) Motor speed
Answer: A) Charging power

6. What is the function of the On-Board Charger (OBC)?
A) AC to DC B) DC to AC C) Step-down voltage
Answer: A) AC to DC

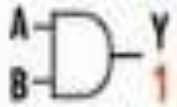
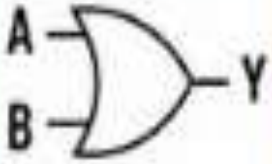
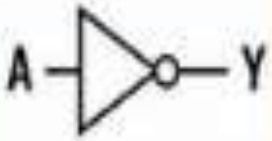
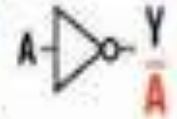
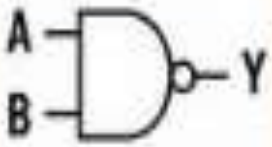
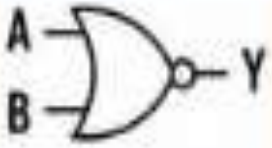
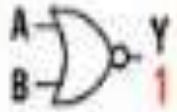
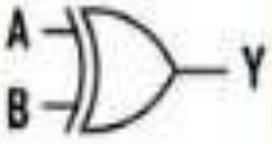
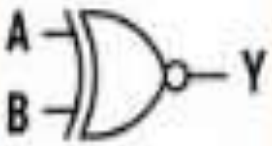
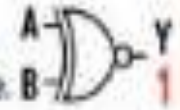
7. Why does fast charging typically slow down significantly after reaching 80% capacity?
A) To save power B) Prevent overheating C) Discharge cells
Answer: B) Prevent overheating

8. What does the acronym "EVSE" stand for in charging infrastructure?
A) Supply equipment B) Storage engine C) Speed energy
Answer: A) Supply equipment

TTS 351, Dr. P.K. Dhal

Meet the Component: Logic Gates

Building Blocks

GATE	SYMBOL	BOOLEAN EXPRESSION	TRUTH TABLE	FUNCTION
AND GATE (Multiplication)		$Y = A \cdot B$	A B | Y 0 0 | 0 0 1 | 0 1 0 | 0 1 1 | 1	Output is 1 only when all inputs are 1. 
OR GATE (Addition)		$Y = A + B$	A B | Y 0 0 | 0 0 1 | 1 1 0 | 1 1 1 | 1	Output is 1 when any one or all inputs are 1. 
NOT GATE (Inverter)		$Y = \bar{A}$	A | Y 0 | 1 1 | 0	Output is the complement (opposite) of the input. 
NAND GATE (NOT AND)		$Y = \overline{A \cdot B}$	A B | Y 0 0 | 1 0 1 | 1 1 0 | 1 1 1 | 0	Output is 0 only when all inputs are 1. 
NOR GATE (NOT OR)		$Y = \overline{A + B}$	A B | Y 0 0 | 1 0 1 | 0 1 0 | 0 1 1 | 0	Output is 1 only when all inputs are 0. 
XOR GATE (Exclusive OR)		$Y = A \oplus B$ $= \bar{A}B + A\bar{B}$	A B | Y 0 0 | 0 0 1 | 1 1 0 | 1 1 1 | 0	Output is 1 when inputs are different. 
XNOR GATE (Exclusive NOR)		$Y = \overline{A \oplus B}$ $= AB + \bar{A}\bar{B}$	A B | Y 0 0 | 1 0 1 | 0 1 0 | 0 1 1 | 1	Output is 1 when inputs are the same. 

CREDITS

Editorial Team & Acknowledgements

ACKNOWLEDGEMENTS

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