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THE SPARK

Igniting Innovations

DEPARTMENT OF
ELECTRICAL AND ELECTRONICS
ENGINEERING

SEP
2026



UNIVERSITY COLLEGE OF ENGINEERING KAKINADA (A)
JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

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EVENTS

- Dr. Ravindra Kollu, Professor, EEE, UCEK & Director of IQAC and capacity building JNTUK, successfully completed a 40 Hour Faculty Development Program on “NextGeneration EV Propulsion Control: Energy-Efficient Vector Control, Model Predictive & Fault-Tolerant Designs” Sponsored by Ministry of Electronics and Information Technology (MeitY), Government of India, organized by E & ICT Academy, NIT Warangal, in association with National Institute of Technology Raipur from 21st September – 02nd October, 2026.
- Dr. Ravindra Kollu, Professor, EEE, UCEK, received Best Teacher Award for academic year 2025-2026 honoring Excellence in Teaching. This event was held on the occasion of Teacher's Day and Engineer's day celebrations held on 15th September 2026. The event was graced by Prof. C. S. R. K. Prasad, Hon'ble Vice-chancellor, JNTUK, Prof. K. Padma Raju, Principal, UCEK, Prof. G. V. S. R. Deekshitulu, Vice Principal (Academics), UCEK, and Prof. M Swaroopa Rani Vice Principal (Administration), UCEK.
- The students of EEE and ECE departments organized Ganesh Pooja celebration on the third day of Vinayaka Chavithi. Held at the Old auditorium, JNTUK, on Wednesday, 16 September 2026, the joint event brought together students, faculty members, and staff in a spirit of devotion, harmony, and festivity. The day commenced early with elaborate Ganesh Pooja rituals at 7:30 AM, where students and faculty gathered to invoke the blessings of Lord Ganesha for wisdom, academic excellence, and overall success. In the afternoon at 2:30 PM, the festivities shifted to energetic recreational games, fostering unity and friendly competition among attendees, with winners being rewarded with special gifts. The grand celebration concluded at 5:15 PM with an evening Pooja followed by a lively cultural program featuring music, dance, and drama performances that filled the venue with enthusiasm. This collaborative initiative between the EEE and ECE departments beautifully reflected their shared values of knowledge, innovation, and togetherness, making the third day of the festival a memorable occasion for the entire university community.



ACHIVEMENTS

- IIIrd B.Tech students from the Electrical and Electronics Engineering department, UCEK, JNTUK, have successfully completed the 8-week course titled Design, Technology and Innovation, offered by the Indian Institute of Technology Bombay (IIT Bombay) via SWAYAM during the JUL-SEP 2026 session. The students cleared this multidisciplinary certification, reflecting their dedication to continuous learning and problem-solving beyond the classroom. Congratulations to all the students for this achievement.
- Soaring High with Pride: A Journey of Discipline, Dedication and Patriotism Representing the spirit of the National Cadet Corps (NCC) Air Wing, our cadet K.T.S.SAATHVIKA (25021A0241) embarked on a remarkable journey of discipline, leadership, unity and patriotism at the All India Vayu Sainik Camp 2026. The experience provided a valuable platform to develop leadership qualities, strengthen camaraderie and uphold the ideals of service and national pride. From the proud moments at NCC Directorate (AP & T), to the bonds formed with fellow cadets and the honour of being part of a prestigious national-level camp, every moment became a cherished memory. These experiences reflect the true essence of NCC - Unity and Discipline - inspiring us to aim higher, serve the nation and soar towards excellence.
- Badi Ramana, 24021D3406, M.Tech – AEPS have successfully completed the project research on “Mitigation of Voltage Drop, Harmonic Distortion and Peak Load Issues In Renewable Energy Integrated Electric Vehicle Microgrid” under the guidance of Dr. M. Ramalinga Raju, Senior Professor of EEE, UCEK, JNTUK.
- Sariki Mohan Santhosh, 24021D5206, M.Tech – PED have successfully completed the project research on “Investigation of Different Carrier Waveforms For THD Performance of A Reduced-Switch Multilevel Inverter” under the guidance of Dr. Ch. Sai Babu, Senior Professor of EEE, UCEK, JNTUK.
- Kadiri Vijayakumar Reddy, 24021D3405, M.Tech – AEPS have successfully completed the project research on “Comparative Analysis of Loss Minimization and Voltage Improvement Strategies in Radial Distribution Feeders” under the guidance of Dr. T. Murali Mohan, Professor of EEE, UCEK, JNTUK.
- Bylapudi Narayanarao, 24021D0807, M.Tech – HVE have successfully completed the project research on “Experimental Investigation of Breakdown Strength Enhancement in Transformer Oil Using Filtration and NANO Particles” under the guidance of Dr. N. Sumathi, Professor of EEE, UCEK, JNTUK.



CLOUD

How the Cloud Actually Works

Behind the soft-sounding name is a very physical, very engineered system of buildings, machines, and clever software.

The Cloud Is Someone Else's Computer

The word "cloud" suggests something weightless and floating. In reality, the cloud is a global network of enormous buildings called data center, packed with thousands of servers, storage drives, cables, and cooling systems. When you stream a movie, save a photo, or ask an AI a question, your request travels over the internet to one of these buildings, gets processed by a real machine, and the result comes back to you in a fraction of a second. What makes it "the cloud" is not the hardware itself, but the *model*: instead of buying and maintaining your own servers, you rent computing power over the internet, paying only for what you use. Think of it like electricity. You don't build a power plant to run your lights; you plug into the grid and get a bill.

What Is Inside a Data Center

A modern cloud data center is a warehouse-sized facility built around a few core ingredients:

- **Servers:** Racks upon racks of computers that do the actual processing. They are stripped down, with no screens or keyboards, and are built to be swapped out quickly.
- **Storage systems:** Arrays of drives that hold data, with copies spread across multiple machines so that no single failure loses anything.
- **Networking gear:** Switches and fiber-optic cables that connect servers to each other and to the wider internet at extreme speeds.
- **Power and cooling:** Backup generators, batteries, and industrial cooling systems, because thousands of running machines produce enormous heat.



Fig 1.1: Data center

Companies like Amazon, Microsoft, and Google operate hundreds of these facilities, grouped into regions (such as "US East" or "Europe West") and subdivided into availability zones, which are separate data centers within a region. Spreading things out means that a power failure or flood in one building doesn't take down your whole application.

The Real Magic: Virtualization

If every customer needed their own physical server, the cloud would be wildly wasteful. The key innovation is "virtualization", software that lets one physical machine act like many independent computers.

A program called a hypervisor sits on top of the hardware and carves it into virtual machines (VMs). Each VM believes it has its own processor, memory, and disk, and each is isolated from the others. One customer might be running a small website on a slice of a server while another runs a database on the slice next to it, with neither able to see the other.

A lighter-weight cousin is the container (popularized by Docker). Containers package an application and its dependencies together and share the host's operating system, so they start in seconds and use fewer resources. Tools like Kubernetes then orchestrate thousands of containers automatically, starting, stopping, and moving them as demand changes.

CLOUD

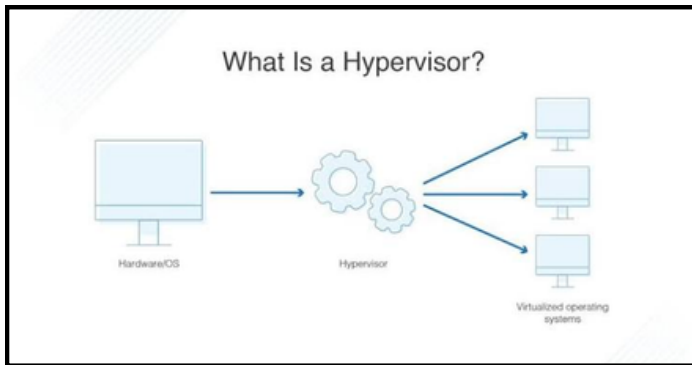


Fig 1.2:hypervisor type virtualization

How a Request Travels Through the Cloud:
Here is what happens, simplified, when you open a cloud-hosted app:

- **DNS lookup:** Your device translates the app's name into a numeric address.
- **Load balancer:** The request arrives at a traffic director that sends it to a healthy, lightly loaded server.
- **Application servers:** Code running in VMs or containers handles the logic: checking who you are, fetching your data.
- **Databases and storage:** The app pulls what it needs from managed databases or object storage.
- **Response:** The result travels back to your screen, often in well under a second.

Elasticity: Why the Cloud Scales

The cloud's biggest practical advantage is elasticity. Imagine an online store on Black Friday. Traffic might jump tenfold in an hour. In the old world, the company would have to own enough servers to survive the peak, leaving most of them idle the rest of the year.

In the cloud, auto-scaling watches demand and adds servers when traffic climbs, then removes them when it falls. You pay for the capacity you actually used. This is why a two-person start up can serve millions of users without owning a single machine.

Reliability and Security

Cloud providers design for the assumption that hardware will fail. Data is replicated across multiple drives and zones, health checks constantly monitor servers, and failed components are replaced automatically. This is how major services reach "five nines" of availability, about 99.999% uptime.

Security works as a shared responsibility. The provider secures the physical buildings, hardware, and core infrastructure. You are responsible for how you configure your own resources: who has access, whether data is encrypted, and whether storage is accidentally left open to the public. Most cloud breaches stem from misconfiguration, not from the provider's walls being breached.

The Trade-Offs

The cloud is not magic, and it isn't always cheaper. Costs can creep up if resources are left running unnoticed. Relying heavily on one provider can create vendor lock-in, making it hard to move elsewhere. Data centers also consume significant electricity and water, which is why major providers invest in renewable energy and more efficient cooling. And when a large provider has an outage, a surprising share of the internet can go down with it.

conclusion:

The cloud is a combination of three ideas: massive shared hardware, software that slices it into isolated pieces, and automation that adds or removes capacity on demand.** Behind every tap on your phone is a chain of data center, virtual machines, load balancers, and databases working together in milliseconds.

It may be called the cloud, but it's really the world's largest shared machine room, and understanding that makes the whole thing a lot less mysterious.

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HVDC Systems and Insulation Aging

INTRODUCTION:

High Voltage Direct Current (HVDC) transmission systems play an important role in modern power transmission due to their ability to transmit large amounts of electrical power over long distances with lower transmission losses compared to conventional HVAC systems in suitable applications. HVDC technology is particularly useful for long-distance bulk power transmission, submarine and underground cables, and the integration of renewable energy sources such as solar and wind power. The reliability and efficiency of HVDC systems largely depend on the performance of their insulation materials, which are used in cables, converter stations, transformers, and other high-voltage equipment.

Insulation aging is a gradual deterioration of the electrical, thermal, and mechanical properties of insulating materials over time. In HVDC systems, insulation materials are continuously exposed to high electric fields, temperature variations, moisture, space-charge accumulation, and environmental stresses.

Keywords:

HVDC transmission, insulation aging, dielectric strength, space charge, electrical breakdown, polymeric cables, condition monitoring.

HVDC Transmission Systems:

HVDC transmission systems convert alternating current into direct current at the sending end and convert it back into alternating current at the receiving end. The main components include converter stations, converter transformers, smoothing reactors, filters, DC transmission lines or cables, and control and protection systems.

HVDC transmission is particularly suitable for long-distance bulk power transfer, submarine cable connections, and the integration of renewable energy sources. However, the converter stations and DC cables require insulation systems capable of withstanding continuous electrical stress and transient over voltages. The performance of these insulation systems directly affects the safety, reliability, and availability of the transmission network.

Insulation Aging Mechanisms:

The Insulation aging occurs when insulating materials gradually lose their original electrical, thermal, or mechanical properties. The major aging mechanisms in HVDC systems are described below.

Electrical Aging:

Electrical aging occurs due to prolonged exposure to high electric fields. Excessive electrical stress may initiate electrical treeing, local discharges, and microscopic damage within the insulating material. Over time, these defects can develop into insulation breakdown.

Thermal Aging:

Thermal aging results from elevated operating temperatures and repeated temperature variations. Excessive heat can accelerate chemical reactions, oxidation, and changes in the molecular structure of insulating materials. In polymeric insulation, these changes may reduce mechanical strength and dielectric performance.

Space-Charge Accumulation:

Space-charge accumulation is a major concern in HVDC insulation. Electric charges may become trapped within the insulating material or accumulate near interfaces. These charges can distort the electric field and create localized regions of increased stress, potentially accelerating degradation and increasing breakdown risk.

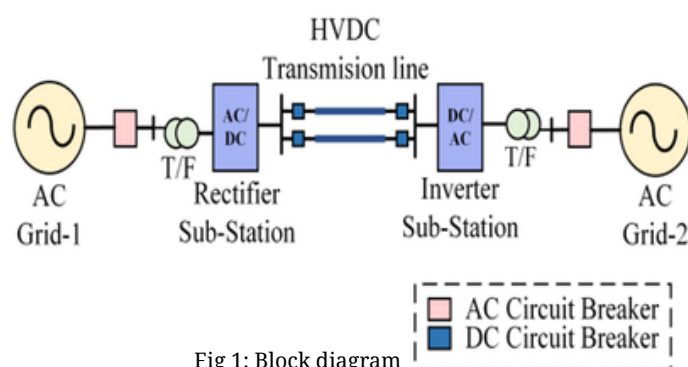


Fig 1: Block diagram

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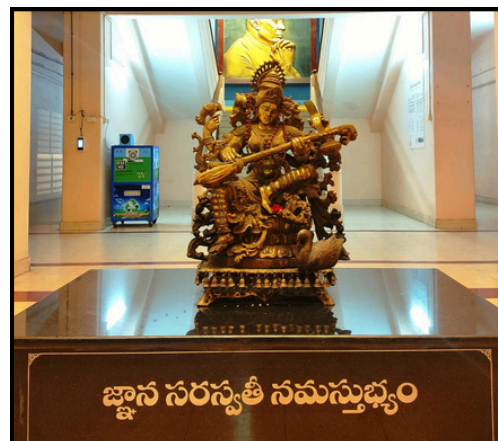
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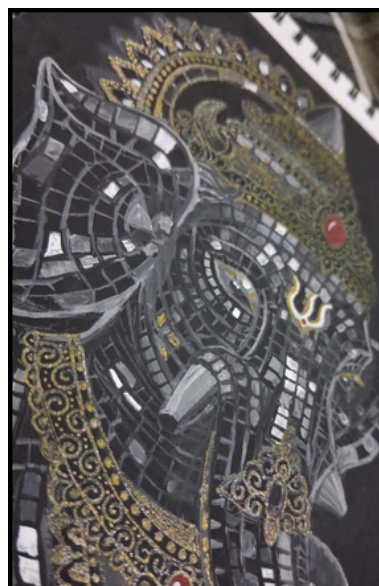


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