

**P.S.V COLLEGE OF ENGINEERING AND TECHNOLOGY-  
KRISHNAGIRI 635108**

# **THUNDERSTROM**

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**Dept of Electrical and Electronics Engineering**

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## ABOUT THE INSTITUTION

P.S.V College of Engineering and Technology is one of the leading Private Academic Institutions in Tamil Nadu state of India. Establishments and achievements are long way of 15 years with marked research and innovations that caters societal impact.

P.S.V College of Engineering and Technology, an affiliated Institution, was established in the year 2008 under the St. Joans Educational Trust by Dr. P. Selvam, a well-known Academician and philanthropist with a motive of providing quality education to the rural community at an affordable cost. P.S.V College of Engineering and Technology has humble beginning with 4 UG departments and at present it offers 8 UG departments and 4 PG departments in the areas of Engineering, Science, Technology and Management under Anna University and approved by AICTE. P.S.V College of Engineering and Technology is known for the stamp of quality, multi-disciplinary / diversified, quality faculty and excellent infrastructure to cater the needs of local and global needs.

The ethos of the Institution lies impregnated with the beliefs, values, responsibility, accountability and societal welfare by inculcating all these life-enriching standards to the students along with the dissemination of education and other accompaniments to build the future of the nation empathetic values. The institution insists the students that they should try to solve the social or scientific problems by using Science and Technology. P.S.V College of Engineering and Technology aids in imparting knowledge, teamwork, innovation, entrepreneurship, courage, sacrifice, and duty, which are the innards of a meaningful life.

The faculty members are well-experienced, seasoned, and prolific academicians. PSVCET is a coeducational, privately endowed college committed to extending knowledge through teaching and research.

## INSTITUTION VISION, MISSION AND QUALITY POLICY

### **VISION**

Our slogan is Innovation through excellence. We Encourage creativity, promote innovation, build leadership and nurture team work.

### **MISSION**

M1: To prepare the students with high professional skills.

M2: To become intellectually luminous and globally competitive.

M3: To undertake continuous assessment and remedial measures.

M4: To instill a spirit of innovation through excellence, ethical values and social stimulation.

M5: To enhance the competency in all spheres of academic activities.

### **QUALITY POLICY**

To pursue worldwide standards of excellence in all our endeavors encompassing coaching, research, consultancy and persevering with education and to stay focused in our core and help functions and in that course to hold ourselves responsible to our stakeholders, through embedded strategies of self-evaluation and improvement.

- Creating a culture of total quality as a way of life.
- Enhancing quality consciousness amongst staff and students.

### ABOUT THE DEPARTMENT

The Department of Electrical and Electronics Engineering was established in 2008 with a sanctioned intake of 60 in UG. Also offers PG degrees in Power Systems Engineering from 2012 and Power Electronics and Drives from 2014. Right from inception, the department has been offering well – built infrastructural facilities with different electrical platforms for grooming professional students to meet the incessant demands of the Core Industries. The Department strives to produce eminent professional tuned to the real time working environment. To fulfill this objective, the software and hardware facilities are updated regularly. The department is strengthened in all facets by the constant directions and leadership from Dr.P.Selvam, Chairman P.S.V Group of Institutions, Dr. P. Lawrence, Principal of P.S.V College of Engineering and Technology.

The department is headed by Dr.B.Gokulakrishnan ,M.E.,Ph.D., Professor and Member in ISTE,IEI and IAI having more than 25 years of teaching experience and 6 years of research experience. He has a strong focus on research and development and dedicated to promoting research and a culture of innovation, academic excellence.

The 4-year under graduate course offered by the department had adopted NEP curriculum and includes core electronics subjects, professional electives, laboratory courses, open electives, industrial training, and project work.

## DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

### **VISION**

To be a pre-eminent department feeding knowledge-based education dedicated to perfection in Electrical and Electronics Engineering careers.

### **MISSION**

- M1: To provide quality training with practical Engineering Skills.
- M2: To prepare students to succeed in globally competitive.
- M3: To provoke the faculty and students to do the research on societal aspirants.
- M4: To enhance the students to design Electrical and Electronic systems those are socially acceptable.
- M5: To motivate the students to express Ethics, communication skills and team work.

### **PSOs**

- PSO1:** Understand the fundamentals of mathematics, Science and apply knowledge to identify, formulate, design and investigate Complex engineering problems of electric circuits, Control systems, Electrical machines, power systems, auditing, Energy saving aspects.
- PSO2:** Apply the techniques and modern tools of both hardware and software in electrical Engineering to adapt in multidisciplinary fields.
- PSO3:** Design and develop the novel techniques in various domains to identify the research gaps to meet the industrial demands for professional development and personnel growth.

### **PEOs**

- PEO1:** Find employment in Core Electrical and Electronics Engineering and service sectors.
- PEO2:** Get elevated to technical lead position and lead the organization competitively.
- PEO3:** Enter into higher studies leading to post-graduate and research degrees.
- PEO4:** Become an entrepreneur and be part of electrical and electronics product and service industries.

## MESSAGE FROM CHAIRMAN



**"If you are planning for a year, sow rice; if you are planning for a decade, plant trees; if you are planning for a lifetime, educate people"** In the present socio-economic scenario of globalization, higher and technical education has come to occupy the center stage. Scientific community has been significantly converted into a round-the-world community sharing concepts, exchanging ideas and collaborating on projects with an international yardstick. Web based learning system, fast growing use of Internet, importance of video conferencing in learning and research are considered these days as a common practice in the myriad developing fields around the World. P.S.V. College of Engineering & Technology creates technologists enlightened with value-based conduct, honesty, integrity and love for the profession. When students pass out of P.S.V. College of Engineering & Technology, they become decently trained engineers and technicians having innovative approach, love for experiments and skill in achieving their goals. P.S.V. College of Engineering & Technology-ians should have the recognition as Technical Leaders and innovators and not merely technical managers. The watch words of the College stands for "Prosperity, Solidarity, Victory".

**Dr. P. Selvam ,M.A.,B.Ed., M.Phil.,Ph.D.,  
Chairman,  
PSVCET-Krishnagiri.**

### MESSAGE FROM SECRETARY



I am not approaching education as a business motive. According to me education means "service". I am taking this opportunity to explore my regards for the service of the people in the form of education. Our P.S.V. College of Engineering & Technology has been surrounded by rural area which we carry the motto of pouring the knowledge of literacy to the rural background students. If a person has been well educated, it stimulates him to think in technical way with positive approach, which indirectly implicates that "Education makes the man perfect." According to today's status, this world is dominated by technology. This world has been built by many creative Engineers. The fate of the future world is in the hands of today's Engineers. From the launching of rockets to manufacturing the rubber comes from the mystical minds of Engineers. Our P.S.V. College of Engineering & Technology carries the womb of tomorrow's Engineers who are going to play vital part to built extraordinary world.

Dr. S.Vivek,M.A.,MBA(UK),Ph.D.,  
Secretary,  
PSVCET-Krishnagiri.



## MESSAGE FROM PRINCIPAL



The world has undergone a vast change and more so in the last decade. The trend is to continue and expected to be even far more unpronounced. The need to be geared up for tomorrow is far greater than ever before. Opportunities before us are immense and the task is onerous. Thus P.S.V. College of Engineering & Technology selected an innovative and creative factor to create a hub of higher and quality education. We provide opportunities to the young generation for evolving their core competencies and building up their career as world class professionals with broad based foundation and in-depth knowledge and versatile personality to meet the challenges of the Global competition in tune with industry aspirations.

**Dr.P.Lawrence,M.E.,Ph.D.,  
Principal,  
PSVCET-Krishnagiri.**

### MESSAGE FROM HoD



**Welcome to the Department of Electrical and Electronics Engineering...!**

**We are having hard-working students and dynamic faculty, whose expertise spans the range of disciplines in various stream and a very healthy work-culture, are the basic elements that comprise the Department of Electrical and Electronics Engineering, the hub of the institute's academia.**

**Our students stand at the intersection of innovation and tradition, where our commitment to excellence serves as the guiding light illuminating our path forward. It is with great pride that we witness the dedication and passion exhibited by our students and faculty in pursuit of knowledge and academic distinction.**

**Our department is not merely a collection of individuals, but a cohesive community bound together by a shared vision of shaping the future through the power of electrical and electronic engineering. Whether we are exploring the realms of renewable energy, advancing cutting-edge technologies, or delving into the intricacies of power systems, our collective efforts propel us towards greater heights of success and achievement.**

**I am confident that the students of our department would justify the credibility of the department by showing a high level of professional competence in their respective field.**

**I wish Best of Luck to all of them....!!!**

**Dr.B.Gokulakrishnan,M.E.,Ph.D.,  
HoD /EEE,  
PSVCET-Krishnagiri.**

## EDITORIAL BOARD OF THUNDERSTORM

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Assistant Professor/EEE

### MESSAGE FROM EXECUTIVE EDITORS

**We are delighted to present the college magazine "Thuderstorm-2022." This magazine serves as a platform for students and staff to showcase their talents and hidden skills. We extend our heartfelt thanks to the Management, Principal, HODs, Faculty, and staff members of PSVCET. Special gratitude to the Editorial Board Members for their insightful suggestions and advice. We are also grateful to the student members of the Editorial Board for their dedicated efforts in producing the magazine in an engaging manner.**

**With Regards,**

**R.Prasath, III Year EEE**

**S.Karthick, III Year EEE**

## **EVENTS ORGANIZED**

The EEE Association's Spark Club organized a guest lecture on "Economic Dispatch and Optimum Control in Power Systems" by Dr. R. Valarmathi, M.E., Ph.D., Associate Professor of EEE at NSIT, Salem, on August 18, 2022.

A one-day workshop on "ETAP Application in Power Systems" was conducted by Mr. D. Purushothaman, Senior Manager at Numeric Power Systems, Chennai, on September 19, 2022.

In association with ISTE, a one-day seminar on the "Digital Version of Voltage and Current Meters" was organized on March 24, 2023, aiming to create awareness among students about these innovative digital instruments.

A two-day workshop titled "Electrical Vehicle Integration, Connectivity, and IoT" was held by Mr. M. Parthiban, M.E., Technical Product Manager at Caliber Embedded India Pvt. Ltd., Salem, on February 23-24, 2023.

An additional workshop on MATLAB/SIMULINK training was conducted by industry expert Mr. M. Parthiban, M.E., Technical Product Manager at Caliber Embedded India Pvt. Ltd., Salem, on February 10, 2023, from 10:00 AM to 4:00 PM.

## Placement

Career Guidance Training Program: Every student had an opportunity to undergo a rigorous training program of 200+ hours for enhancing their Technical & General Capabilities. Learning has been never a challenge, but an opportunity for our students to achieve their dream career offers with leading international organizations. Table shows the list of recruiters and No. of students got placed.

S.No.	Recruiter		No. of Students Placed
1.	PEGATRON Technology, Chennai.		18
2.	M-core Tech, Bengaluru		01
3.	JBM		03

**Total No. of offer letters received: 21**

## GLIMPSE



Guest Lecture on Economic Dispatch and Optimum Control in Power Systems



Workshop on ETAP Application in Power System



Guest Lecture on Modern Traction System & SCADA



Seminar on "Digital version of the voltage and current meters"



Workshop Training on MATLAB/ SIMULINK



Two Days Workshop on Electrical Vehicle Integration, Connectivity and IoT

## The Science of Thunderstorm Electricity

Thunderstorms are one of nature's most electrifying events, quite literally. The interplay of atmospheric dynamics, thermodynamics, and electrical processes creates spectacular displays of lightning and thunder. Understanding the electrical nature of thunderstorms involves delving into the processes that generate and discharge electrical energy within these formidable weather systems.

### Formation of Thunderstorms

Thunderstorms form when warm, moist air rises into the atmosphere and cools, condensing into clouds and releasing latent heat. This process fuels further ascent of the air, leading to the development of towering cumulonimbus clouds. Within these clouds, complex interactions occur that lead to the separation of electrical charges.

### Charge Separation

The exact mechanisms of charge separation in thunderstorms are still the subject of ongoing research, but several key processes are widely accepted:

1. **Collision of Ice Particles:** Within the cloud, ice particles collide with each other. These collisions can transfer charge between particles. Typically, smaller ice crystals acquire a positive charge and are carried upward by strong updrafts, while larger, heavier graupel (soft hail) particles gain a negative charge and fall toward the lower part of the cloud.
2. **Inductive Charging:** As particles of differing sizes and phases (ice, water, and super cooled water) interact, an electric field forms within the cloud. This electric field can induce charges on the particles, contributing to the overall charge separation.
3. **Non-Inductive Charging:** Some charging occurs due to the thermoelectric effect, where temperature differences between colliding particles result in the transfer of electrons, leading to charge separation without the influence of an external electric field.

### Structure of Electrical Charges in Thunderstorms

Typically, a mature thunderstorm cloud has a tripole charge structure:

- **Upper Positive Charge:** Located near the top of the cloud where the smallest ice crystals are concentrated.
- **Main Negative Charge:** Situated in the mid-levels of the cloud where graupel particles are abundant.
- **Lower Positive Charge:** Sometimes found at the base of the cloud, possibly due to the presence of melting hail and raindrops.



## Lightning: The Discharge Process

When the electrical potential difference between the charged regions within the cloud, or between the cloud and the ground, becomes sufficiently large, a lightning discharge occurs.

Lightning can take several forms:

1. **Intra-Cloud (IC) Lightning:** The most common type, occurring within the cloud, transferring charge between regions of opposite polarity.
2. **Cloud-to-Ground (CG) Lightning:** Less common but more impactful, this type of lightning involves the discharge of negative or positive charge from the cloud to the ground. Negative CG lightning is more frequent than positive CG lightning.
3. **Cloud-to-Cloud and Cloud-to-Air Lightning:** These less common forms involve the transfer of charge between separate clouds or between the cloud and the surrounding air.

## The Lightning Process

A typical lightning flash involves several stages:

1. **Step Leader Formation:** A negatively charged channel, called a stepped leader, descends from the cloud in a series of rapid steps, ionizing the air and creating a path for the lightning discharge.
2. **Connection with Ground:** When the stepped leader approaches the ground, positive streamers rise from the ground to meet it. Upon connection, a highly conductive channel is formed.
3. **Return Stroke:** A powerful surge of positive charge travels up the established channel from the ground to the cloud, producing the visible flash of lightning and the accompanying thunder.
4. **Subsequent Strokes:** Additional discharges can occur along the same channel, creating multiple strokes within a single lightning flash.

## Thunder: The Acoustic Result

Thunder is the acoustic shock wave resulting from the rapid heating and expansion of air caused by the lightning discharge. The air surrounding the lightning channel is heated to temperatures around 30,000 Kelvin (54,000 degrees Fahrenheit) in a fraction of a second. This sudden expansion creates a shock wave that propagates outward as sound.

## Types of Thunder Sounds

- **Claps and Booms:** Sharp, loud sounds indicating a nearby lightning strike.
- **Rumbles:** Prolonged, rolling sounds produced by distant lightning strikes, where the sound waves from different parts of the lightning channel arrive at the listener at slightly different times.

## **The Role of Thunderstorms in Earth's Electrical Circuit**

Thunderstorms are a crucial component of the global electric circuit, maintaining the balance of electrical charge between the Earth's surface and the ionosphere. Through the continuous generation of lightning, thunderstorms transfer negative charge from the atmosphere to the ground, playing a key role in the Earth's electrical dynamics.

## **Safety and Precautions**

Given the immense power of thunderstorms, understanding and respecting their potential hazards is essential. Key safety tips include:

- **Seek Shelter:** Stay indoors or in a vehicle during a thunderstorm.
- **Avoid Conductive Objects:** Stay away from metal objects, tall structures, and open fields.
- **Listen to Weather Alerts:** Pay attention to weather warnings and forecasts to stay informed about potential thunderstorm activity.

## **Conclusion**

The electrical phenomena of thunderstorms are a testament to the dynamic and powerful processes at play in our atmosphere. From the microscopic interactions of ice particles to the awe-inspiring display of lightning, thunderstorms showcase the intricate balance of forces that drive weather systems. Understanding these processes not only deepens our appreciation for nature's wonders but also enhances our ability to predict and respond to severe weather events.

**Program Outcomes:**

Program Outcomes		Graduates of Electrical and Electronics Engineering
PO1	Engineering knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage	Create, select and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

<b>PO8</b>	<b>Ethics</b>	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO9</b>	<b>Individual and team work</b>	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO10</b>	<b>Communication</b>	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
<b>PO11</b>	<b>Project management and finance</b>	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO12</b>	<b>Life-long learning</b>	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.