

# EDITORS



**Dr. Jaya. T** *B.E., M.Tech., Ph.D*

*Professor, Dept. of ECE, VISTAS*

Dr. T. Jaya has more than 13 years of teaching experience and research experience. She published more than 55 research papers/articles in Web of Science and Scopus indexed Journals. She has produced 6 Research scholars and produced Ph. D in 10 Research scholars under her supervision. She has won the best paper award for her research work in the International Conference,



**Dr. Jothilakshmi. G.R** *B.E., M.E., Ph.D*

*Professor, Dept. of ECE, VISTAS*

Dr. G. R.Jothilakshmi has more than 25 years of teaching experience including 10 years research experience. She published more than 55 research papers/articles in Web of Science and Scopus indexed Journals. She has successfully guided five research scholars to completion and is currently supervising six research scholars. She has also received the Best Paper Award for her research work at an international conference.



**Dr. Vijayragavan S.P** *B.Tech., M.E., Ph.D*

*Professor, Dept. of EEE, BIHER*

Dr. S. P. Vijayragavan is a PhD guide in ECE at Bharath Institute of Higher Education and Research with 17+ years of teaching and 5 years of industry experience. He holds a B.E. and M.Tech in Electronics-related fields and has published widely in reputed journals with notable citation indices. He is a reviewer for Springer and Elsevier, holds 15+ patents, and has authored multiple e-books. He has received recognitions including Stanford University subject expert acknowledgment and AD Scientific Index rankings. He has also guided funded TNSCST student projects.



**Dr. Vijayalakshmi. P** *B.E., M.E., MBA., Ph. D*

*Assoc. Professor, Dept. of ECE, VISTAS*

Dr. Vijayalakshmi P is currently serving as an Associate Professor at VISTAS, Chennai, with over 20 years of experience in both academia and industry. She obtained her B.Tech in Instrumentation Technology from MIT Campus, Anna University and specialization in Underwater Communications and networks. She is currently involved in a research project funded by MoES-DOM (₹29 lakhs). She has published more than 40 research articles, authored six books, published 10 utility patents and 8 granted industrial designs. She is also a Life Member of the Institution of Electronics and Telecommunication Engineers (IETE), India.



**Dr. Kumudham.R** *B.E., M.E., MBA., Ph. D*

*Assoc. Professor, Dept. of ECE, VISTAS*

Dr. Kumudham.R has 16+ years of experience (Teaching, Research and Industrial). She is acting as Doctoral Committee member for Ph.D research scholars in reputed universities. She has published her research work IEEE/Wos/SCIE/Scopus indexed journals. She has won the best paper award for her research work in the International Conference, VICFCNT 2021, SISTSHE 2022. She has published 2 patents and has received grants for 3 design patents. She served as a member of the Editorial Board in IJETT and potential reviewer for reputed international journals. She has produced 3 Ph.D Awardee and supervising PhD and UG scholars.



**Ms. G. Suvetha** *B.E., M.E., (Ph. D)*

*Asst. Professor, Dept. of ECE, VISTAS*

Ms. G. Suvetha is presently working as an Assistant Professor in the Department of Electronics and Communication Engineering at Vels Institute of Science, Technology & Advanced Studies (VISTAS), Chennai, India. She has over 10 years of experience in industry and teaching and is currently pursuing her Ph.D. in Electronics and Communication Engineering at VISTAS. She has published four research papers/articles in Scopus-indexed journals and conference proceedings. Her research interests include Cyber Security, Machine Learning, and Artificial Intelligence.

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VOLUME I

NEXTGEN ECI 2026

Rishab Developer



INTERNAL QUALITY  
ASSURANCE CELL



**VELS**

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(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)  
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Department of  
Electronics and Communication Engineering  
School of Engineering

Proceedings of  
NATIONAL CONFERENCE ON  
"EMERGING TRENDS IN ELECTRONICS,  
COMMUNICATION NETWORKS AND  
EMBEDDED IOT"

**NextGen ECI 2026**

Industry, Innovation and Infrastructure (SDG 9)

APRIL 8<sup>TH</sup> 2026

VOLUME-I





**Department of Electronics and Communication Engineering  
School of Engineering**

**Proceedings of the National Conference on  
“Emerging Trends in Electronics, Communication  
Networks and Embedded IoT” (NEXTGEN ECI 2026)**

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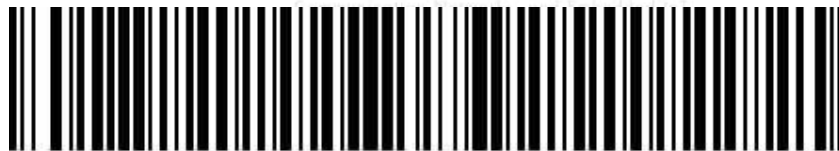
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## ABOUT THE CONFERENCE

The National Conference on ***“Emerging Trends in Electronics, Communication Networks, and Embedded IoT (NEXTGEN ECI 2026)”*** is organized by the Department of Electronics and Communication Engineering, School of Engineering, Vels Institute of Science, Technology & Advanced Studies (VISTAS).

The conference aims to bring together researchers, academicians, industry experts, and students on a common platform to explore and discuss the latest innovations, trends, and challenges in the fields of electronics, communication networks, and embedded Internet of Things (IoT). With the rapid advancement of technology, these domains are playing a crucial role in shaping smart systems, intelligent communication, and connected environments.

**NEXTGEN ECI 2026** provides an excellent opportunity for participants to present their research findings, exchange ideas, and foster collaborations across interdisciplinary domains. The conference features technical paper presentations, keynote sessions by eminent experts, and interactive discussions that encourage knowledge sharing and innovation.

The selected papers included in the proceedings have undergone a rigorous peer-review process to ensure originality, quality, and relevance. The conference is conducted in a hybrid mode, enabling both offline and online participation, thereby ensuring wider accessibility and inclusivity.

This conference is expected to serve as a catalyst for future research, promoting advancements in emerging technologies and contributing to the development of innovative solutions for real-world challenges.



## ABOUT THE INSTITUTION

**Vels Institute of Science, Technology & Advanced Studies-VISTAS (Deemed-to-be-University) has been backed by 20+ years of academic excellence, offering a learning experience designed to shape industry-ready professionals for global careers. The university follows a semester-based system across all UG and PG programs, giving students greater flexibility and the freedom to personalise their learning journey. All programs are UGC recognized and AICTE approved, ensuring national credibility.**

## ABOUT THE DEPARTMENT

**Established in 2008, the Department of Electronics and Communication Engineering offers programs approved by NBA, UGC, and AICTE. The department focuses on experienced faculty, state-of-the-art laboratories, and strong collaborations with government agencies and industries such as NIOT, IGCAR, and Faurecia. It also actively undertakes sponsored research projects funded by organizations like MOES (Deep Ocean Mission) and TNSCST, fostering advanced laboratories and innovative research initiatives.**



## **VISION OF THE DEPARTMENT**

**To be a centre of excellence in the field of Electronics and Communication Engineering (ECE) equipped with the state of art technologies to produce highly competent, resourceful, and ethical young professionals who create innovative solutions to the needs of the society and excel in the varied professional trends globally.**

## **MISSION OF THE DEPARTMENT**

**M1: To impart strong theoretical and experimental fundamentals in electronics and communication engineering that enable students to be competent in the growing technical demands and challenges.**

**M2: To facilitate appropriate technical exposure on the latest and cutting-edge technological trends through academic and collaborative interactions with industry, academia and research organizations.**

**M3: To foster an environment of excellence in theoretical and applied research evident through product development, patents, projects, publications in SCI and WOS journals, books and conferences.**

**M4: To participate in the development of the nation through social and ethical commitments by promising innovation, research and entrepreneurship.**

## MESSAGE FROM THE CHANCELLOR'S DESK



**Dr. ISHARI K. GANESH**  
**Founder- Chancellor**

In today's technological era, the role of Electronics and Communication Engineering has become increasingly significant in driving digital transformation and enabling advanced communication systems and embedded technologies that enhance efficiency, sustainability, and quality of life.

The National Conference on ***Emerging Trends in Electronics, Communication Networks, and Embedded IoT (Next-Gen ECI 2026)***, organized by the Department of Electronics and Communication Engineering at VISTAS, serves as a vibrant platform to showcase recent advancements in these domains. The conference will bring together academicians, researchers, industry professionals, and students from across the country to share innovative ideas, exchange knowledge, and explore emerging trends in electronics, communication networks, and embedded IoT.

I firmly believe that the intellectual discussions and collaborative spirit fostered during this conference will lead to meaningful innovations and inspire future research directions and also contribute to the nation's technological growth and global competitiveness.

I extend my heartfelt congratulations to the faculty members, organizing committee, and students of the Department of Electronics and Communication Engineering for their dedicated efforts in organizing this prestigious event. My best wishes for the grand success of Next-Gen ECI 2026. With Best Wishes

**With Best Wishes**  
**Dr. Ishari K. Ganesh**  
**Founder & Chancellor, VISTAS**

## MESSAGE FROM THE PRO-CHANCELLOR'S DESK



**Dr. A. Jothi Murugan**  
**Pro-Chancellor (P&D), VISTAS**

I am pleased to note that the Department of Electronics and Communication Engineering, VISTAS, is organizing the National Conference on ***“Emerging Trends in Electronics, Communication Networks, and Embedded IoT (NEXTGEN ECI 2026)”***. This conference reflects the institution’s continued commitment to fostering innovation, research, and academic collaboration in the fields of engineering and technology.

Electronics and Communication Engineering plays a pivotal role in driving technological advancements and societal development. With the rapid growth of communication networks, embedded systems, and Internet of Things (IoT), these domains are transforming industries and enabling smarter, more connected environments. NEXTGEN ECI 2026 provides an excellent platform for researchers, industry professionals, and students to present their work, exchange ideas, and build meaningful collaborations.

I believe that the deliberations of this conference will lead to new insights, encourage interdisciplinary research, and contribute to technological advancements with real-world impact. I commend the Department of Electronics and Communication Engineering for its dedicated efforts in organizing this significant event.

I extend my best wishes to all participants, speakers, sponsors, and organizers for the grand success of the conference.

**With Best Wishes,**  
**Dr. A. Jothi Murugan**  
**Pro-Chancellor (P&D), VISTAS**

## MESSAGE FROM THE VICE PRESIDENT'S DESK



**Dr. Preethaa Ganesh**  
**Vice President, Vels Group of Institutions**

I am pleased to note that the Department of Electronics and Communication Engineering, VISTAS, is organizing the National Conference on ***“Emerging Trends in Electronics, Communication Networks, and Embedded IoT (NEXTGEN ECI 2026)”*** at our campus. This conference will provide an excellent platform for bringing together academicians, researchers, industry professionals, and students to share their knowledge, innovations, and experiences.

Electronics and Communication Engineering continue to be a cornerstone of technological advancement. With the rapid evolution of communication networks, embedded systems, and the Internet of Things (IoT), these domains are playing a vital role in driving digital transformation and building smart, connected systems. Conferences such as **NEXTGEN ECI 2026** are instrumental in fostering collaboration and shaping future research directions.

I am confident that the technical sessions, keynote addresses, and discussions will inspire new ideas, promote innovation, and strengthen industry-academia partnerships. I extend my sincere appreciation to the organizing committee, faculty members, and students for their dedicated efforts in making this conference a success.

My best wishes to all participants for a rewarding and enriching conference experience.

**Best Regards,**  
**Dr. Preethaa Ganesh**  
**Vice President**  
**Vels Group of Institutions**

## MESSAGE FROM THE PRO-CHANCELLOR (SOE)



**Dr. M. Bhaskaran**  
**Pro-Chancellor (SOE), VISTAS**

It gives me immense pleasure to note that the Department of Electronics and Communication Engineering, School of Engineering, Vels Institute of Science, Technology & Advanced Studies (VISTAS) is organizing the National Conference on ***“Emerging Trends in Electronics, Communication Networks, and Embedded IoT (NEXTGEN ECI 2026)”***. The themes and sessions planned for this conference are timely and highly relevant, highlighting the latest innovations and research directions in Electronics and Communication Engineering and its allied domains. With the increasing focus on communication technologies, embedded systems, IoT, smart devices, and digital transformation, this conference provides a vibrant platform for academicians, researchers, industry professionals, and students to share their expertise and insights.

I am pleased to note that eminent experts will deliver keynote addresses and that participants from various institutions will present technical papers. Such interactions will enrich knowledge, promote collaboration, and help address the challenges of modern technology and innovation. I encourage all participants to actively engage in the sessions, keynote lectures, and discussions to gain maximum academic and professional benefit. I am confident that **NEXTGEN ECI 2026** will be a grand success. I congratulate the organizing committee, faculty members, and students for their dedicated efforts in organizing this prestigious event. I extend my best wishes for the success of the conference and for it to set a benchmark for future academic and research initiatives.

**With Best Wishes,**  
**Dr. M. Bhaskaran**  
**Pro-Chancellor (SOE), VISTAS**

## FOREWORD



**Dr. T. Sasipraba**  
**Vice-Chancellor, VISTAS**

It gives me great pleasure to note that the Department of Electronics and Communication Engineering, School of Engineering, Vels Institute of Science, Technology & Advanced Studies (VISTAS), is organizing the National Conference on ***Emerging Trends in Electronics, Communication Networks, and Embedded IoT (NEXTGEN ECI 2026)***.

The conference focuses on contemporary and emerging areas that are shaping the future of engineering and technology. With the increasing importance of communication networks, embedded systems, and IoT-driven applications, such initiatives play a vital role in bridging the gap between academia and industry.

I am delighted that distinguished experts will share their insights through keynote sessions and that participants will present their research contributions. These interactions will undoubtedly inspire innovative thinking, collaborative research, and practical solutions to technological challenges.

I appreciate the efforts of the organizing team in bringing together such a meaningful academic platform. I am confident that this conference will achieve its objectives and set a benchmark for future events.

**Best Regards**  
**Dr. T. Sasipraba**  
**Vice-Chancellor, VISTAS**

## MESSAGE



**Dr. M. Chandrasekaran**  
**Registrar, VISTAS**

It is a matter of great pride to note that the Department of Electronics and Communication Engineering, School of Engineering, Vels Institute of Science, Technology & Advanced Studies (VISTAS), is organizing the National Conference on ***Emerging Trends in Electronics, Communication Networks, and Embedded IoT (NEXTGEN ECI 2026)***.

The conference provides an excellent opportunity for participants to exchange ideas, present research findings, and explore advancements in the fields of electronics, communication, and embedded technologies. The chosen themes reflect the current trends and future directions of engineering innovation.

I am glad that the conference is being hosted with keynote speakers and technical sessions involving participants from diverse backgrounds. Such academic engagements play a crucial role in enhancing knowledge, encouraging innovation, and promoting collaborative research.

I extend my sincere appreciation to the organizing committee, faculty members, and students for their commitment and efforts towards this conference. I wish the conference a grand success and hope it paves the way for future academic excellence.

**Best Regards,**  
**Dr. M. Chandrasekaran**  
**Registrar, VISTAS**

## MESSAGE



**Dr. C. Arun**  
**Dean – School of Engineering**  
**VISTAS**

It gives me immense pleasure to note that the Department of Electronics and Communication Engineering, School of Engineering, Vels Institute of Science, Technology & Advanced Studies (VISTAS), is organizing the National Conference on ***Emerging Trends in Electronics, Communication Networks, and Embedded IoT (NEXTGEN ECI 2026)***.

The themes and sessions planned for this conference are timely and highly relevant, highlighting the latest innovations and research directions in Electronics, Communication Engineering, and Embedded IoT domains. In an era driven by rapid technological advancements, including smart systems, connected devices, and intelligent communication networks, this conference provides a vibrant platform for academicians, researchers, industry professionals, and students to share their expertise and ideas.

I am pleased to note that eminent scholars and experts will deliver keynote addresses and that participants from various institutions will present technical papers. Such interactions will enhance knowledge sharing and foster collaborations to address real-world engineering challenges.

I am confident that ***NEXTGEN ECI 2026*** will be a grand success and will significantly contribute to advancing research and innovation. I sincerely congratulate the organizing committee, faculty members, and students for their dedicated efforts in organizing this prestigious event.

**With Best Wishes,**  
**Dr. C. Arun**  
**Dean – School of Engineering, VISTAS**

## MESSAGE



**Dr. V. Rajendran'**  
**Distinguished Professor – Research**  
**VISTAS**

It gives me immense pleasure to extend my warm greetings to all participants of the National Conference on ***“Emerging Trends in Electronics, Communication Networks, and Embedded IoT (NEXTGEN ECI 2026)”*** organized by the Department of Electronics and Communication Engineering, School of Engineering, VISTAS.

In today's rapidly evolving technological landscape, advancements in electronics, communication systems, and embedded IoT are playing a transformative role in shaping innovative solutions for real-world challenges. This conference serves as an excellent platform for researchers, academicians, industry professionals, and students to share their knowledge, exchange ideas, and explore emerging research directions.

I commend the organizers for their dedicated efforts in bringing together experts and scholars from diverse domains to foster collaboration and promote research excellence. I am confident that the deliberations and discussions during this conference will contribute significantly to technological advancements and inspire future innovations.

I extend my best wishes for the grand success of the conference and hope that it will provide valuable insights and fruitful outcomes for all participants.

**Best Regards,**  
**Dr. V. Rajendran**  
**Distinguished Professor – Research, VISTAS**

## HoD's DESK



**Dr. A. Vijayalakshmi**  
**Professor & HOD/ECE**

It is a great pride and honor to be associated with the National Conference **NEXTGEN ECI 2026** on “**Emerging Trends in Electronics, Communication Networks, and Embedded IoT**,” organized by the Department of Electronics and Communication Engineering, School of Engineering, VISTAS. The rapid advancements in electronics, communication technologies, and embedded IoT systems are transforming industries and redefining modern society. This conference serves as a significant platform for researchers, academicians, industry experts, and students to share their insights, present innovative research, and discuss emerging challenges and opportunities in these dynamic fields. The contributions included in this volume have been carefully reviewed and selected for their quality, originality, and relevance. They reflect the latest developments and forward-thinking approaches that will shape the future of technology and engineering.

Our department is privileged to have an esteemed Chief Guest whose presence and insights have greatly enriched the conference. We would also like to express our gratitude to the Session Chairs for their effective moderation, insightful observations, and for ensuring the smooth conduct of the technical sessions.

I extend my sincere appreciation to the authors for their valuable contributions, the reviewers for their meticulous evaluation, and the organizing committee for their dedicated efforts in successfully conducting this conference. It is my earnest hope that this proceeding will serve as a valuable reference for researchers and practitioners, and will inspire continued innovation and excellence in the field of Electronics and Communication Engineering. With best wishes for continued success and academic excellence.

**Best Wishes,**  
**Dr. A. Vijayalakshmi**  
**HOD/ECE, VISTAS**



## **CHIEF PATRON**

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*Founder & Chancellor, VISTAS*  
*Chairman, VELS Group of Institutions*  
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# PREFACE

Welcome to the proceedings of the National Conference on ***“Emerging Trends in Electronics, Communication Networks, and Embedded IoT (NEXTGEN ECI 2026)”***, organized by the Department of Electronics and Communication Engineering, VISTAS. This publication presents a collection of innovative research papers, insightful discussions, and emerging developments showcased during the conference.

The theme of the conference reflects our commitment to advancing the fields of electronics, communication, and embedded IoT technologies while addressing real-world challenges through intelligent and connected solutions. The technical tracks cover a wide range of areas including communication networks, embedded systems, Internet of Things (IoT), signal processing, and smart technologies, highlighting the interdisciplinary nature of modern engineering research.

All papers included in these proceedings have undergone a rigorous peer-review process by experts to ensure quality, originality, and relevance. The selected contributions demonstrate significant advancements that not only enrich academic research but also provide practical insights for industry and societal applications.

The conference brings together academicians, researchers, industry professionals, and students from various institutions, fostering collaboration and knowledge exchange. It serves as a platform to bridge the gap between academia and industry, encouraging innovative ideas and future research directions.

We extend our sincere gratitude to all authors, reviewers, keynote speakers, and organizers for their valuable contributions and support in making this conference a success.

We hope that these proceedings will serve as a valuable reference and inspire continued research, innovation, and collaboration in the ever-evolving domains of electronics, communication, and IoT.



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**NextGen ECI 2026 (MODE : Hybrid)**  
**Industry, Innovation and Infrastructure (SDG 9)**



Time : 10.00 AM - 4.00 PM  
Date : 08-April-2026



Venue

- CARD Room - VOC Block,
- Shivalayaa Auditorium
- Nethaji Block

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Director ROG Group, IGCAR



**Dr. Srinivasan**  
Scientist - F & Project Director,  
Mission Mausam Scheme



**Dr. R. Sundar**  
Scientist E, Ocean Buoy  
Network, NIOT



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Professor, Dept. of ECE  
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## PROGRAMME SCHEDULE

|                  |                                                                                                                                                                                                             |
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| 10.00 - 10.05 am | <b>Invocation: Tamil Thai Vazhthu</b>                                                                                                                                                                       |
| 10.05 - 10.10 am | <b>Welcome Address</b><br>- Dr. A.Vijayalakshmi, Professor & HoD, Dept. of ECE                                                                                                                              |
| 10.10 - 10.20 am | <b>Special address</b><br>- Dr. C. Arun, Dean, SoE, VISTAS                                                                                                                                                  |
| 10.20 - 10.30 am | <b>Presidential Address</b><br>- Dr. T. Sasiprabha, Vice Chancellor, VISTAS                                                                                                                                 |
| 10.30 - 10.35 am | <b>Introduction of Guest Speaker</b><br>- Ms. Suvetha. G, Asst. Professor/ECE                                                                                                                               |
| 10.35 - 11.00 am | <b>Keynote Address by Chief Guest</b><br>- Dr. S.Sridhar, Director ROG group, IGCAR, Kalpakkam                                                                                                              |
| 11.00 - 11.15 am | <b>Tea Break</b>                                                                                                                                                                                            |
| 11.20 - 1.00 pm  | <b>Session-1: Wireless Communication and Networking-CARD Conference Hall, VOC Block</b><br>Dr. Srinivasan, Scientist F, NIOT, Chennai<br>Faculty Coordinator: Dr. Meena. M, Associate Professor/ECE         |
| 11.20 - 1.00 pm  | <b>Session-2: AI, ML and Cyber Security- APJ Conference Hall, APJ Block</b><br>Dr. Sundar S, Scientist E, Ocean Buoy Network, NIOT, Chennai<br>Faculty Coordinator: Dr. Sindhu Bala. K, Asst. Professor/ECE |
| 1.00 - 1.40 pm   | <b>Lunch Break</b>                                                                                                                                                                                          |
| 1.40 - 3.00 pm   | <b>Session-3: Embedded IoT</b><br>Dr. V. Vijaya Bhaskar, Professor, Sathyabama Institute of Science and Technology<br>Faculty Coordinator: Dr.C. Arul Stephen, Associate Professor/ECE                      |
| 1.40 - 3.00 pm   | <b>Session-4: Electrical and Electronics Engineering</b><br>Dr. Thamizh Thentral T M, Associate Professor, SRMIST, Chennai<br>Faculty Coordinator: Dr. Usha Rupni K, Asst. Professor/ECE                    |
| 3.00 - 3.10 pm   | <b>Feedback from the Participants</b>                                                                                                                                                                       |
|                  | <b>Valedictory</b>                                                                                                                                                                                          |
| 3.10 - 3.30 pm   | - Dr. G.A. Ramadass, Former Director, NIOT, Professor of Practice, Dept. of ECE, VISTAS<br>Chief Guest Introduction<br>- Dr. R. Kumudham, Associate Professor/ ECE                                          |
| 3.30 - 4.00 pm   | <b>Vote of Thanks</b> - Dr. T. Jaya, Professor, ECE                                                                                                                                                         |
|                  | <b>National Anthem</b>                                                                                                                                                                                      |

### Registration Fee details

Registration Fee: **₹750 each**  
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Add-on Participants: **₹450 each**  
(Lunch & Certificate)  
a

### Registration Link:



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## National Conference on “Emerging Trends in Electronics, Communication Networks and Embedded IoT” (NEXTGEN ECI 2026)

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CARD Conference Room - VOC Block

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The National Conference on Emerging Trends in Electronics, Communication Networks, and Embedded IoT aims to bring together researchers, academicians, industry experts, and students to explore recent advancements, challenges, and future directions in the rapidly evolving domains of electronics, communication systems, and intelligent embedded technologies.

The conference provides a platform for presenting innovative ideas, exchanging knowledge, and fostering interdisciplinary collaboration in areas that are shaping the next generation of smart and connected systems.

The conference aims to:

- Promote research and innovation in emerging technologies
- Encourage collaboration between academia and industry
- Provide a forum for sharing cutting-edge developments
- Support young researchers and students in presenting their work

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**IMPORTANT DATES**

Abstract Submission Deadline - March 31, 2026  
Acceptance Notification - April 1, 2026  
Registration Deadline - April 3, 2026

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## Performance Comparison of SWIPT Receiver Architectures for Wirelessly Powered Sensor Devices: Toward Energy-Efficient, Low-Carbon IoT

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### ABSTRACT

SWIPT has become a central facilitator of batteryless sensor networks based on sustainable operation, in which energy harvesting and data communication need to be performed at stringent power and latency factors. A more sophisticated analysis and simulation model to compare three large SWIPT receiver designs: Power Splitting, Time Switching, and Antenna Switching, based on nonlinear RFDC conversion models, rate energy tradeoff equations, and power constraints of circuits. The proposed optimization-based SWIPT design is shown to increase the harvested energy by 32.8%, throughput stability by 24.1%, latency by 27.4%, and overall energy efficiency by 19.6%, when compared to conventional designs. Besides, carbon-impact analysis reveals the decrease in energy-related emissions by 14.3% which proves evident sustainability benefits. The results affirm that the combination of adaptive splitting factors, dynamic switching intervals, and architecture-conscious control is very important in improving energy autonomy. It finds that optimized SWIPT receivers have the potential to transform the way of deploying low-carbon and self-powered IoT systems.

**Keywords -** *Power Splitting, Time Switching, Antenna Switching, Rate–Energy Fusion Index, Direct Current, Received Power, Simultaneous Wireless Information and Power Transfer*

## Deep Learning-Based Medical Image Preprocessing and Segmentation for Early Detection of Pancreatic Cancer.

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### ABSTRACT

Pancreatic cancer is one of the most serious and life-threatening diseases, mainly because it is often detected at a late stage. Medical imaging techniques like CT scans help doctors identify tumors, but accurately separating (segmenting) the pancreas and cancerous regions is still very challenging due to low contrast, noise, and the complex structure of the organ. In this study, an automated approach is proposed to improve the segmentation of pancreatic cancer using enhanced image preprocessing techniques along with the U-Net deep learning model. The preprocessing step focuses on improving image quality by reducing noise, adjusting intensity levels, and enhancing contrast, making the important features more visible and easier to analyze. After preprocessing, the images are processed using the U-Net model, which is well-known for its effectiveness in medical image segmentation. The model helps in accurately identifying and outlining the tumor regions from the surrounding tissues. The results show that this combined approach improves segmentation performance and provides more reliable outputs. This work aims to support doctors by providing a more accurate and efficient tool for detecting and analyzing pancreatic cancer, which can ultimately help in better diagnosis and treatment planning.

**Keywords-** *Pancreas, cancer, CT, U-net, Deep learning, CLAHE*