DECEMBER 2025

VIT®

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

SCHOOL OF ELECTRONICS ENGINEERING

SENSETRONICS

TECHNOLOGY - INNOVATION - FUTURE

ADVANCING TECHNOLOGY THROUGH ELECTRONICS EXCELLENCE

CONTENTS

DEAN'S MESSAGE

Dear VITians,

Warm greetings to each member of our vibrant VIT community!
It gives me immense pleasure to share some noteworthy updates and developments from the School of Electronics Engineering (SENSE) as we continue our journey of academic excellence and innovation.
In keeping with our commitment to providing a dynamic and industry-relevant education, we have recently undertaken a comprehensive review of our academic programs. The revised curriculum aims to integrate the latest trends in electronics and communication technologies, ensuring that our students stay well ahead in the rapidly changing engineering landscape. Enhanced laboratory infrastructure, advanced electives, and experiential learning modules are being introduced to strengthen both conceptual understanding and practical expertise.
At SENSE, research and innovation remain at the core of our mission. We are proud to announce new research initiatives supported by national and international funding agencies, along with collaborative projects involving industry leaders. These endeavors will empower our faculty and students to engage in impactful research addressing real-world technological challenges.
Furthermore, to strengthen the academia–industry interface, we are expanding partnerships with prominent organizations across the globe. Through internships, industrial visits, expert talks, and collaborative projects, our students are gaining invaluable exposure to contemporary practices and emerging technologies in the professional sphere.
It is with great enthusiasm that I present the 1st Issue of our Magazine, "Sensetronics," for the year 2025. This edition celebrates the remarkable achievements, milestones and contributions of our talented faculty and students, highlighting their dedication, creativity, and excellence.
I extend heartfelt appreciation to every member of the SENSE fraternity for their continuous support and contributions that make these accomplishments possible. Together, we move forward with renewed energy toward realizing the vision and mission of our institution.
Thank you, and let us continue to innovate, inspire, and impact the world through technology.

With best wishes,

Dr Jasmin Pemeena Priyadarsini M
Dean
School of Electronics Engineering (SENSE)
Vellore Institute of Technology, Vellore.

ECE ANTHEM

When the Circuits hum a silent, steady tune, And electrons dance beneath the silver moon, The future calls, a masterpiece to build— For those by Electronics and Communication thrilled.

With tiny Semiconductors, power takes its flight, The bedrock source of every beam of light. We master Signals and Systems, the language pure and fast, From whispers faint to messages that last.

In worlds of logic, rigid, sharp, and clean, We build the engines on the Digital screen. The mighty brain, the core of every quest, Housed in the Microprocessors, put to the test. The nimble Microcontrollers, small but ever grand, They put the power of compute in your hand.

Through air and wire, our vital messages flow, In Analog and Digital, watch the bandwidth grow. From fiber strands where light outruns the breeze, Optical Communication brings the world with ease. The rapid pulse of data, forever on the run, Connected by the laws of Computer Communication won.

Now step beyond the wire, where smart machines ignite, The interconnected vision, bathed in glowing light. The pulsing heart of progress, we make things truly see, With sensing woven into the vast expanse of IoT. We train the minds of silicon, to learn and to surmise, Empowered by the genius of AI and ML rise.

We filter sound and texture, make every image bright, With Digital Signal Processing, we conquer dark and light. In realms of sight and sensing, no detail is missed, Perfecting vision with the magic of Image Processing kissed.

Then comes the moment, the final, shining grace, The real-world challenge, finding its proper place. Through practical design and tireless, focused drive, Your Capstone Projects ensure your skills survive.

The path is paved for Innovation's endless might, From Silicon Valley dreams to stars that burn so bright. Choose ECE, and you will find your role defined: The Engineer who links the world and shapes the future of mankind!

-Dr.KATHIRVELAN J

HONOURS & RECOGNITIONS

- LIFETIME ACHIEVEMENT AWARD
- EXCEPTIONAL CONTRIBUTION AWARD

LIFETIME ACHIEVEMENT AWARD

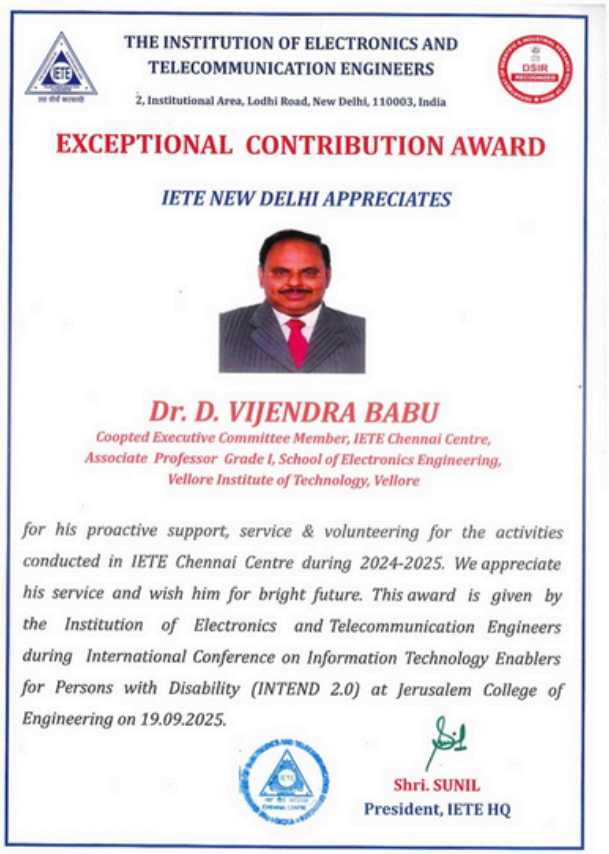
Our Honourable Vice Chancellor of Vellore Institute of Technology was conferred with the prestigious IETE Lifetime Achievement Award during the IETE Foundation Day Celebration 2025, held on 07 December 2025 at The Institution of Electronics and Telecommunication Engineers (IETE), Chennai Centre, Chennai-86. This distinguished honour recognizes her exceptional contributions to the fields of Engineering, Education, Research, and Institutional Leadership.

As part of the ceremony, she delivered the Foundation Day Address on the 2025 theme, “Indigenization of Hi-Tech and Critical Technologies.” In her address, she emphasized the strategic importance of developing indigenous technological capabilities, strengthening research ecosystems, and fostering innovation to address the nation’s emerging scientific and industrial requirements. She further highlighted the collaborative role of academia, industry, and professional bodies in advancing India’s journey towards self-reliance in critical technology domains.

The conferment of the Lifetime Achievement Award stands as a testament to her visionary leadership, impactful service, and enduring commitment to excellence in higher education and technological advancement. The academic fraternity takes immense pride in this remarkable achievement and extends its sincere congratulations on this well-deserved honour.

EXCEPTIONAL CONTRIBUTION AWARD

Dr.D.Vijendra Babu, Associate Professor Grade 1, Dept. of Embedded Technology, School of Electronics Engineering, VIT Vellore received Exceptional Contribution Award from Shri.Sunil, President IETE, New Delhi for the duration of 2024-2025 as Co-Opted Executive Member, IETE Chennai Centre during International Conference on Information Technology Enablers for Persons with Disability (INTEND 2.0), with theme, “Empowering Divyangjan (Persons with Disabilities) with Assistive Technologies”, on 19, September, 2025 @ Jerusalem College of Engineering, Chennai.



THE INSTITUTION OF ELECTRONICS AND TELECOMMUNICATION ENGINEERS

2, Institutional Area, Lodhi Road, New Delhi, 110003, India

EXCEPTIONAL CONTRIBUTION AWARD

IETE NEW DELHI APPRECIATES

Dr. D. VIJENDRA BABU

Coopted Executive Committee Member, IETE Chennai Centre,
Associate Professor Grade I, School of Electronics Engineering,
Vellore Institute of Technology, Vellore

for his proactive support, service & volunteering for the activities conducted in IETE Chennai Centre during 2024-2025. We appreciate his service and wish him for bright future. This award is given by the Institution of Electronics and Telecommunication Engineers during International Conference on Information Technology Enablers for Persons with Disability (INTEND 2.0) at Jerusalem College of Engineering on 19.09.2025.

Shri. SUNIL
President, IETE HQ

COLLABORATIONS & OUTREACH

- INDUSTRY–ACADEMIA CONCLAVE
- MOU REPORTS

INDUSTRY–ACADEMIA CONCLAVE

Overview

The Industry-Academia Conclave 2025 organized by the *School of Electronics Engineering (SENSE)* was inaugurated on 01 September 2025 at the Dr. M. Chenna Reddy Auditorium, VIT, Vellore. The event marked the beginning of a three-day conclave designed to strengthen collaboration between academia and industry under the theme *“Electronics Renaissance: Accelerating Indian Leadership for Global Sustainability.”*

Dignitaries and Guests:

Chief Guest: Mr. Saket Dwivedi, Country Head – Integration Partner Channel & University Relations, National Instruments, Bengaluru.
Guest of Honour: Mr. Sudheer Hundi, Director, Head of Network One OAM Team, Samsung R&D Institute India, Bengaluru.

Other Dignitaries Present:
Dr. Jayabarathi T., Registrar
Dr. Kanchana Bhaaskaran V. S., Vice-Chancellor
Dr. Sekar Viswanathan, Vice-President

Programme Highlights
The event commenced with the Invocation, followed by the Welcome Address by **Dr. Jasmin Pemeena Priyadarisini M,** Dean, SENSE.

Dr. Vinoth Babu K, Chair, IAC 2025, introduced the objectives of the conclave.

Dr. S. Sundar, HoD, Dept. of Embedded Technology, introduced the *Guest of Honour*.

Mr. Sudheer Hundi delivered an insightful address highlighting the importance of collaboration between research and industry innovation.

Exchange of MoUs were introduced by **Dr. Sri Adibhatla Sridevi** (Head, Department of Micro and Nano Electronics) and **Dr. Sathya P** (Head, Department of Sensor and Biomedical Technology).

Dr. Sekar Viswanathan, Vice-President, delivered the **Presidential Address**, emphasizing VIT's contribution to India's semiconductor and electronics ecosystem.

Dr. Sakthivel R, Associate Dean, introduced the *Chief Guest*.

Mr. Saket Dwivedi delivered the **Inaugural Address**, sharing perspectives on academic partnerships and the future of hardware innovation.

The session concluded with the **Vote of Thanks** by **Dr. Kannadassan D**, HoD, Communication Engineering.

The event ended with a group photograph at Dr. M.G.R. Block.

MOU REPORTS

As part of the **Industry–Academia Conclave 2025** organized by **Vellore Institute of Technology (VIT), Vellore**, a total of **eight strategic Memoranda of Understanding (MoUs)** were formally signed with leading technology-driven organizations across India. The initiative was undertaken to foster **collaborative research, innovation, technology transfer, and skill development,** aligning academic excellence with emerging industrial needs.

These partnerships aim to create a sustainable framework for **joint research projects, industrial internships, faculty training programs, product development, and consultancy activities,** thereby bridging the gap between theoretical knowledge and practical implementation. Each of the partnering organizations brings distinctive expertise, contributing to multidisciplinary advancement in domains such as **Artificial Intelligence, Internet of Things, Embedded Systems, Robotics, Extended Reality, Healthcare Technologies, and Industrial Automation**.
The MoUs were signed with the following organizations:

1. **Edutecnicia Private Limited, Kerala** – Specializes in AI-driven digital transformation, training, and product development, including *EDUBOT* and *MEDIBOT*, promoting collaboration in educational and healthcare innovations.

2. **HR Universal Systems Inc., Ghaziabad** – Offers turnkey solutions in process control, instrumentation, telecom, and photonics, supporting academic-industry integration through industrial projects and R&D assistance.

3. **Janitri Innovations Pvt. Ltd., Bengaluru** – A pioneer in AI-enabled maternal and neonatal monitoring, bringing opportunities for research collaboration in digital healthcare solutions

4. **5C Network, Bengaluru** – India's leading AI-powered radiology platform, facilitating cooperation in medical imaging, healthcare analytics, and AI-based diagnostics.

5. **Tenxhealth Technologies Pvt. Ltd., Coimbatore** – Focuses on AI, IoT, and cloud-based automation solutions across healthcare, education, and manufacturing, promoting interdisciplinary innovation.

6. **DigiToad Technologies, Bengaluru** – Engages in test and measurement, automation, wireless communication (5G/6G), and robotics, fostering research integration with academic initiatives.

7. **Advanced Reality Solutions LLP, New Delhi** – Specializes in Extended Reality (XR) and digital manufacturing, enabling immersive learning and technological skill development.

8. **Robonetics Automation Solutions LLP, Chennai** – Develops autonomous robotic systems (AGVs, AMRs, and conveyors), offering platforms for applied research in industrial robotics and automation.

STUDENTS ACHIEVEMENTS

- BEST PAPER AWARD IN A CONFERENCE
- HACAKATHON AWARD
- BEST PROJECT AWARDS IN STARTUPS

BEST PAPER AWARD IN A CONFERENCE

- **PAPER 1**

Paper Title:
FPGA BASED HARDWARE ACCELERATOR WITH EDGE INTELLIGENCE FOR ELECTRIC SCOOTER BATTERY HEALTH MONITORING

Conference details:
5th IEEE International Conference on Innovations in Power and Advanced Computing Technologies, i-PACT2025, Sep 25-26, 2025, Surabaya, Indonesia.

Author Names:
Paper ID- 60
Amruthavarshini R C - 24MES0015
K Athira – 24MES0023
Swarnima Verma – 24MES0005
Sujatha R- 15760,Department of Embedded Technology (Corresponding Author)

Abstract:
Li-ion battery health and performance monitoring in Electric Vehicles (EVs) is imperative for safety and durability. State of Health (SoH), State of Charge (SoC), Remaining Useful Life (RUL), and predictive fire detection are parameters that need to be monitored accurately without failing to prevent any malfunction and enhance operational efficiency. The conventional BMS relies on rule-based approaches without predictive analysis to facilitate real-time diagnostics. In this research, we compare various Machine Learning (ML) algorithms such as Support Vector Machines (SVM), Feedforward Neural Networks (FNN), and Random Forest (RF) for battery condition monitoring. Since the optimal operating conditions should be maintained and most unreliable working conditions such as heating can be encountered, we design and deploy an Edge-AI application based on Raspberry Pi 3B+ with MATLAB, and an AI accelerator based on the DE2-115 FPGA board, which allows us to estimate BMS parameters in real time. The thermal behaviour is investigated through the implementation of machine learning. The experimental results are present to validate the performance of the proposed approach from the aspects of the efficiency and reliability of the battery. Comparative analysis is done between the ML implementation on both devices to analyse the system effectiveness in displaying the very short span of time.

Research Significance:

The proposed system enhances Electric Vehicle (EV) safety, reliability, and performance by enabling accurate real-time prediction of SoH, SoC, RUL, and fire risks. Edge-AI deployment ensures faster decision-making with reduced latency and cloud dependency, improving energy efficiency and battery lifespan. It can be applied in EV fleets, smart grids, and renewable energy storage systems for predictive maintenance and cost optimization. Challenges include limited edge-computing resources, sensor noise, model generalization under diverse conditions, and real-time data synchronization. Future work may focus on hybrid AI models, adaptive learning, cybersecure BMS communication, and integrating digital twin frameworks for enhanced predictive accuracy and sustainability.

- **PAPER 2**

Paper Title:
A 90NM RING VCO WITH SLEEP-STACK BIASING FOR LOW POWER AND PHASE NOISE REDUCTION

Conference details:
5th IEEE International Conference on Innovations in Power and Advanced Computing Technologies, i-PACT2025, 25 – 26 September 2025, University Airlangga, Surabaya, Indonesia.

Author Names:
Dr. Sathya P, 11837, Department of Sensor and Biomedical Technology.
Santhosh Sri Kumaran Y (21BEC2129)
Jogindhiran K J (21BEC0472)
Poorna Chandra Kumar S (21BEC0337)

Abstract:
This paper presents a low-power ring voltage-controlled oscillator (VCO) that employs a sleep-stack biasing technique to enhance phase noise performance and power efficiency. Designed in a 90 nm CMOS technology with a 1.2 V supply, the proposed VCO achieves a center frequency of 2.84 GHz while consuming an average power of 50.18 µW. The phase noise at a 1 MHz offset is −134.74 dBc/Hz, resulting in a figure of merit (FoM) of −216.80 dBc/Hz. The design also supports a wide tuning range, with the output frequency spanning from 0.107 GHz to 3.69 GHz as the control voltage varies from 0.2 V to 1.4 V. These results demonstrate the effectiveness of the proposed architecture for low-power RF and communication applications requiring low phase noise and wide frequency tunability.

Research Significance:
A 5-stage Hybrid CS-CMOS (VCO) Ring Oscillator, implemented using 90nm CMOS technology. The architecture alternates between standard CMOS inverters and Current Starved Power Switching (CSPS) inverters.
This alternating arrangement allows the circuit to achieve both high-speed operation and tunability, with improved power efficiency and compact layout. It is especially useful in applications like mobile communication, radar systems, and satellite links operating in the S-band (2–4 GHz).
The architecture demonstrates its potential for integration in low-power RF applications such as PLL-based frequency synthesizers, IoT transceivers, and biomedical circuits. Future work may explore adaptive biasing methods or migration to FinFET-based processes to further enhance performance in next-generation communication systems.

- **PAPER 3**

Paper Title:
ANALYZING THE EFFECT OF IMPERFECT SIC IN RIS-AIDED NOMA SYSTEMS: OPTIMIZATION AND PERFORMANCE INSIGHTS

Conference details:
2025 IEEE International Conference on Electronics, Computing and Communication Technologies (CONECCT)10-13 July, 2025,Sterling's Mac Hotel, Bengaluru, India

Author Names:
1. Helen Sheeba John Kennedy - 22PHD0338
2. Anjana B S - 23PHD0081
3. Dipinkrishnan R - 20PHD0990
4. Vinoth Babu Kumaravelu - 11998 - Department of Communication Engineering
5. Satya Kumar Vankayala
6. Seungil Yoon

Abstract:
This study analyzes the performance under the impact of imperfect successive interference cancellation (SIC) in a non-orthogonal multiple access (NOMA) system enhanced by a reconfigurable intelligent surface (RIS). Closed-form expressions for both the outage probability and sum rate of the system are derived, considering the effects of imperfect SIC. Additionally, the power allocation factors are optimized to maximize the sum rate in the intelligent RIS-aided NOMA configuration. Results unequivocally demonstrate that, even under imperfect SIC conditions, the proposed RIS-aided NOMA system outperforms the conventional NOMA system in terms of outage probability and sum rate. Specifically, with 32 reflecting elements, the proposed system achieves the target outage at an SNR of ~-1.41 dB, whereas the conventional NOMA system requires an SNR of ~27 dB for a SIC error rate of 9%.

Research Significance:
This study advances next-generation wireless research by moving beyond idealized assumptions and explicitly addressing imperfect successive interference cancellation in practical systems. It derives exact analytical expressions for outage probability and sum rate in reconfigurable intelligent surface aided non-orthogonal multiple access, and validates them through simulations, ensuring strong theoretical reliability. The work also formulates and solves optimal power allocation to maximize sum rate despite SIC errors. Results demonstrate that integrating RIS with NOMA significantly outperforms conventional NOMA in both outage and throughput. Notably, a target outage is achieved at approximately −1.41 dB SNR using 32 reflectors under a 9 percent SIC error, while conventional NOMA requires about 27 dB. By highlighting RIS as a low-power, low-cost technology, the study supports solutions aligned with future 6G networks.

2025 IEEE CONECCT

BEST PAPER AWARD ACADEMIA

TRACK: Intelligent, Secure, and Sustainable Networks: Shaping the Future of Global Connectivity

presented to

J, HELEN SHEEBA *; B S, ANJANA; R, DIPINKRISHNAN ; KUMARAVELU, VINOTH BABU; VANKAYALA, SATYA KUMAR; YOON, SEUNGIL

for paper titled

Analyzing the Effect of Imperfect SIC in RIS-Aided NOMA Systems: Optimization and Performance Insights

in the International Conference on Electronics, Computing and Communication Technologies, IEEE CONECCT (July 10-13,2025) organized by IEEE Bangalore section at Sterling Mac Hotel Bangalore

Dr. Chandrakanta Kumar
Chair
IEEE Bangalore Section

Dr. Chengappa Munjandira
Vice Chair (TA)
IEEE Bangalore Section

Dr.Mohit Tahilani
TPC Chair
IEEE CONECCT 2025

Dr. Ashutosh Kedar
TPC Chair
IEEE CONECCT 2025

HACKATHON AWARD

Project Title:
Team SensoHealth - Smart Human Vitals Monitoring System

Hackathon details:
ELCIA Technical Summit 2025 (Sense2Scale Hackathon)

Winners Names:
1.Abisek S (23BEC0266)
2.Dhakshana Bala S(23BEC0212)
3.Kaarmukilan A G(23BEC0137)

Abstract:
The SensoHealth Smart Human Vitals Monitoring System is a holistic, real-time multi-sensor-based platform on the ESP32 microcontroller for round-the-clock physiological and environmental monitoring.Our system also employs six critical sensors including the AD8232 for ECG, DS18B20 for body temperature, ADXL345 for fall detection using accelerometer, MQ135 for air quality measurement, MAX30102 for heart rate and SpO_2, and BMP280 for barometric pressure and altitude. Sensor data is also streamed in real time through serial communication to a Python-based graphical visualization dashboard that provides real-time graphical display and automated CSV logging to local storage, and to ThingSpeak cloud for remote access.

The Vital Forecast module employs time-series analysis to predict upcoming trends in vital signs, and the system incorporates an intelligent Risk Index that classifies patients as low, medium, or high risk.Telegram Bot alerts are triggered by critical events to notify caregivers instantly.
After undergoing thorough individual sensor validation, 24-hour stability testing, and real-world stress testing with recorded test logs, the system reaches Technology Readiness Level 8 (TRL 8). The entire solution exhibits realistic deployment readiness with full data visualization, predictive analytics, and risk assessment capabilities for clinical research settings, telehealth applications, elderly care, and remote patient monitoring.

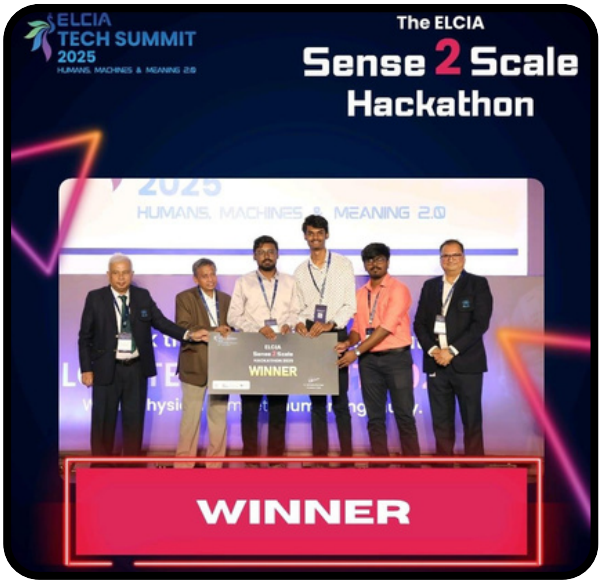
Potential Applications:
SensoHealth addresses the important requirement of making health monitoring affordable and continuous across care settings. The system is especially beneficial for older adults living in their own homes, where fall detection and automated alerts promote aging in place with safety. Chronic patients in rural settings receive value from ongoing remote monitoring, detecting complications early if hospital access is unavailable. The ambulatory form is ideal for use in ambulances, providing paramedics with real-time vital information during transport. Additional uses are home monitoring of post-surgery patients, telemedicine consultations with live data transfer, clinical trials, disaster relief, and sports medicine.

Challenges and Future Directions

Current limitations are WiFi reliance, which restricts rural roll-out, and the requirement of a networked computer to operate the dashboard. The rule-based algorithms can fail to identify intricate health patterns in multivariable populations. Future development should aim to develop standalone displays, offline buffering of data, and connectivity with hospital systems. Incorporating machine learning would enhance prediction accuracy, and personalized baselines would decrease false alarms. Making the system wearable with longer battery life and smartphone connectivity would greatly expand its practical use.

Certificate:

FIRST Place – Cash Price – 50000 INR



BEST PROJECT AWARDS IN STARTUPS

Student Name: Marimuthu R
Registration Number: 23PDD0014
Event Name: National Education Policy (NEP) Day Celebrations 2025
Event Date: 29th July 2025
Event Schedule & Venue:

- NEP Day Special Event (10:00 AM – 1:00 PM, MB 210)
- Student Innovation Showcase – Startup Competition (1:30 PM – 4:30 PM, CS Hall)

Achievement: Secured **2nd Prize** in *Student Innovation Showcase – Startup Competition*.
Guided By: Dr. S.Vidhya, Professor, SENSE, Assistant Director, Entrepreneurship Development Cell.
Description:
Developed and presented an innovative startup concept demonstrating creativity, feasibility, and societal impact, recognized with the **Second Prize** award.
Entitled: Linear Actuator-based Orthotic System for Elbow Extension and Flexion
This work presents the design, development, and evaluation of an orthotic system for elbow flexion and extension assistance based on linear actuators, intended for individuals with upper limb monoplegia, muscle atrophy, nerve injuries, or neuromuscular disorders. The system is controlled by an Arduino microcontroller and supports both manual and automatic operation modes. A 3D model was developed using Fusion 360, and a working prototype was fabricated to test its functionality. The device offers a range of motion (ROM) from 0° to 90°, with accurate and repeatable control of both flexion and extension. To validate mechanical performance, bench-top tests were conducted, including load, durability, and repeatability assessments. A statistical analysis using linear regression demonstrated a strong positive correlation between load and movement time, confirming the system's predictable and stable response under increasing loads. These findings indicate that the proposed orthotic device is lightweight (1.5 kg), portable, costeffective, mechanically robust, and functionally reliable, making it well-suited for rehabilitation applications both at home and in clinical settings.

Student Name: Pavihaa Lakshmi B
Registration Number: 21PHD0115
Event Name: National Education Policy (NEP) Day Celebrations 2025
Date: 29th July 2025
Event Schedule & Venue:

- NEP Day Special Event (10:00 AM – 1:00 PM, MB 210)
- Student Innovation Showcase – Startup Competition (1:30 PM – 4:30 PM, CS Hall)

Achievement: Secured **1st Prize** in *Student Innovation Showcase – Startup Competition*.
Guided By: Dr. S.Vidhya, Professor, SENSE, Assistant Director, Entrepreneurship Development Cell.
Description:
Developed and presented an innovative startup concept demonstrating creativity, feasibility, and societal impact, recognized with the **First Prize** award.
Entitled: VR Rehab for Deep Vein Thrombosis
Deep Vein Thrombosis (DVT) is a significant health concern characterized by the formation of blood clots in the deep veins, most often within the calf muscles of the lower limbs, which can lead to serious complications such as Pulmonary Embolism (PE). Conventional preventive strategies, including physical exercises, mechanical devices like intermittent pneumatic compression systems and compression stockings, often fall short due to discomfort, inconvenience, or poor patient adherence. To overcome these challenges, we developed a wearable smart insole integrated with a Virtual reality (VR) therapeutic platform designed to actively engage the calf muscles and improve circulation through immersive gameplay. Utilizing a custom-built Unity-based 2D game on the Oculus Quest 2 head-mounted display, our system creates a motivating and interactive VR environment that encourages natural leg movements. This approach aims to effectively reduce the risk of blood clot formation while providing a comfortable and engaging alternative for DVT prevention.

ACADEMIC & STUDENT PROJECTS

- ENGINEERS' DAY

ENGINEERS' DAY

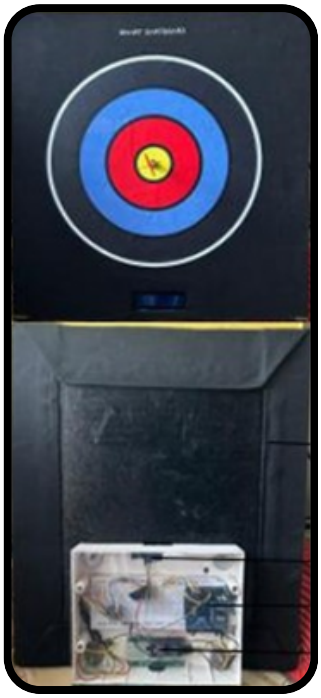
The School of Electronics Engineering (SENSE), VIT Vellore, actively participated in the University-level Project Expo organized as part of the Engineers' Day celebrations on 15th September 2025. The expo was held at the 'Foodys' venue within the VIT campus and took place from 9:00 AM to 6:00 PM. The event aimed to promote innovation, applied learning, and hands-on engineering practice, providing a dynamic platform for students to demonstrate their technical capabilities and creative problem-solving skills.

The expo showcased a diverse range of innovative and interdisciplinary projects, developed by students under the guidance of esteemed faculty mentors. These projects reflected strong foundations in Electronics and Communication Engineering, with applications spanning IoT, biomedical systems, robotics, smart electronics, and sustainable technologies.

Smart Dartboard with Automated Scoring (301 Game)

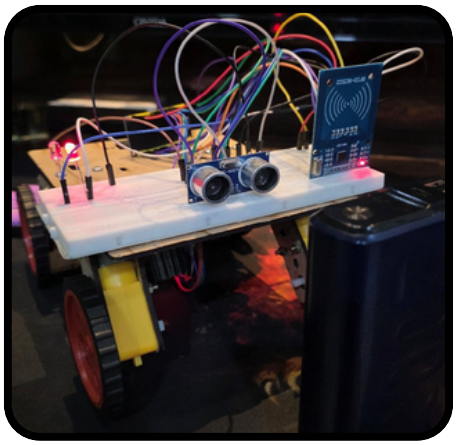
Faculty Mentor: Prof. Dr. Sundar S
Students: Sriganth C, Dhakshana Bala S

A smart sports analytics system developed using Velostat sensors and Arduino, enabling automated score detection and real-time display. The project enhances accuracy, reduces manual intervention, and introduces technology-driven innovation into traditional dart games.



Self-Powered Weather Station Using Recycled Materials
Faculty Mentor: Prof. Dr. Arunkumar Chandrasekhar
Student: Saanvi Chaudhary
A sustainable and eco-friendly weather monitoring system that generates its own power using recycled diaper waste materials. This project highlights innovation in renewable energy and environmental engineering.

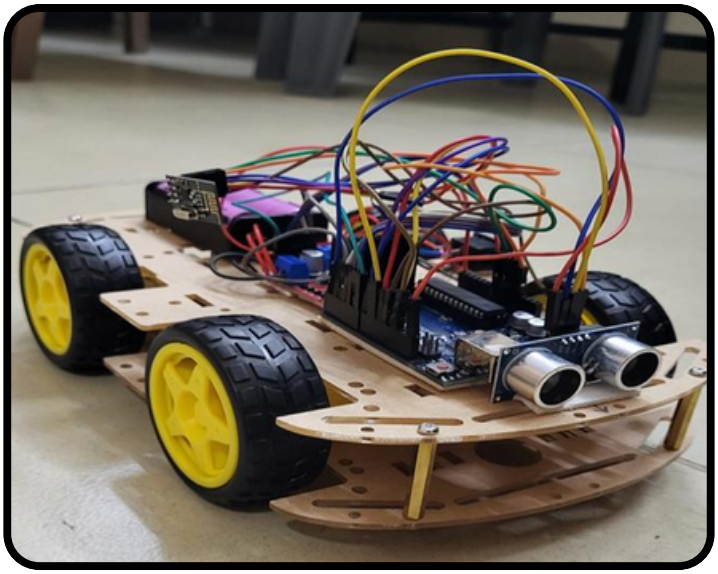
Healthcare Assistance Robot
Faculty Mentor: Prof. Dr. Sumit Kumar Jindal
Student: Gurpreet Singh
An intelligent biomedical robotic system designed for patient verification, symptom analysis, and precision medicine dispensing. The project demonstrates the integration of robotics, healthcare analytics, and automation to improve patient care efficiency.



MoveEase: Gesture-Controlled Smart Mobility System

Faculty Mentor: Prof. Dr. Naushad Manzoor Laskar
Students: Rakshith Parthipan, Raajaprasanna M

An assistive technology solution aimed at empowering physically challenged individuals through intuitive gesture-based mobility control. The system enhances accessibility, safety, and user independence.



INNOVATIONS & COMPETITIONS

- SENSE HACK
- ELECTROUTSAV

SENSE HACK

SENSE HACK 2025, an international-level 36-hour hackathon themed *"Advancing Technologies for the Betterment of Humanity,"* was successfully conducted from **6th to 7th December 2025** at the **Anna Auditorium, VIT Vellore**. Organized by **IEEE VIT** and **IEEE ComSoc VIT** in collaboration with the **Office of Students' Welfare**, **School of Electronics Engineering**, **Student Activity Council**, and **IEEE Madras Section**, the event brought together some of the brightest undergraduate innovators from across the country.

The hackathon witnessed enthusiastic participation from **21 institutions**, with **351 teams** registering and a total of **1,197 participants**. After a rigorous idea submission and screening process, **137 teams** comprising **484 students** were shortlisted for the on-site hackathon. To encourage early innovation, a **Best Freshers' Team Award** was introduced exclusively for first-year students, which received an overwhelming response

SENSE HACK 2025 stood out as a vibrant platform that fostered innovation, collaboration, and technical excellence. The event not only strengthened industry-academia engagement but also empowered students to develop impactful solutions aimed at improving society—truly embodying its theme of technology for humanity.Participants worked across **seven diverse tracks**, including Smart Healthcare & Well-being, Smart Cities & Infrastructure, Digital Education & Skill Development, Fintech & Digital Inclusion, Sustainable Environment & Green Technology, Cybersecurity & Digital Trust, and Open Innovation. The event emphasized real-world problem solving, innovation, and social impact through technology.

The hackathon was conducted in multiple phases, beginning with an opening ceremony and progressing through intense development, mentoring, and evaluation rounds. Teams received guidance from a distinguished panel of **industry experts and VIT faculty**, including alumni professionals from leading organizations and international mentors who joined virtually from the USA during the overnight phase. Their feedback played a crucial role in refining the participants' solutions.

The final day featured elimination rounds, keynote interactions, and a highly competitive final evaluation, culminating in a grand **Valedictory Ceremony**. Winners were announced and honored in the presence of senior university leadership, marking the successful conclusion

LIST OF WINNERS

1st Prize - Team Braillink

ANSEL VIVIAN REGO	CMR Institute of Technology
NAADIA GHALIB SHERIFF	Christ (Deemed to Be) University

2nd Prize - Team Hack Gang

ANUSHKA GATTANI	24BCE2283	Vellore Institute of Technology, Vellore
VEDIKA AGARWAL	24BCE2601	
PRISHA RAWAT	24BCE2545	
NAAYSHA JAIN	24BCE2572	

3rd Prize - Team git blame --my-teammates

DIVYAM AGRAWAL	24BIT0423	Vellore Institute of Technology, Vellore
KRISHANG ZINZUWADIA	24BCE2239	
NAKUL SINHA	24BCI0089	

Best Freshers Team Award - Team Time Pass

SUGANDHA GUPTA	25BEC0343	Vellore Institute of Technology, Vellore
MANISHKA SINGH	25BCE0982	
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ELECTRO UTSAV

1. Introduction

"Reflecting on the words of Edward Teller, who stated that 'The Science of Today is the Technology of Tomorrow,' where our students transformed complex electronic theories into 'magical' real-world solutions during this exhibition called “ElectroUtsav 2025”. It provided a glimpse into the future through its display projects.

ElectroUtsav 2025, the annual technical project exhibition, was organized with great enthusiasm to provide a platform for students to demonstrate their technical prowess and innovative thinking. The event aimed to bridge the gap between theoretical knowledge and practical application, encouraging students to solve real-world problems through engineering solutions. The exhibition was organised by School of Electronics Engineering during the fall semester 2025-2026 on November 8th, 2025 from 9.00 am to 5.00 pm. The event was inaugurated by DEAN SENSE Jasmin Pemeena Priyadarsini M, Asso Dean SENSE Dr. Sakthivel R, Head of the Department, D. Kannadassan, Communication Engineering, Dr. Sundar S, Embedded Technology, Dr. Sri Adibhatla Sridevi, Micro and Nanoelectronics, Dr. P. Sathya, Sensor and Biomedical.

The exhibition was held at various hall in Technology tower for both UG and PG students to showcase their talent in both hardware and software projects. The exhibition is based on course projects given to students for various subjects taught during the fall semester. Ten best projects from each are collected and showcased during the exhibition from each subject. The various subject professors encouraged the student to participate in the exhibition.

2. Event Overview

The day commenced with an inaugural address throughout the day, the venue witnessed high engagement from students, faculty from departments, and the panel of judges. The exhibition got an overwhelming response from both the students and the faculty. The projects spanned various domains including Embedded Systems, Robotics, Power Electronics, and IoT, VLSI, Biomedical, Embedded systems etc. reflecting a deep understanding of the diverse domains and subjects present in the curriculum. The scale of the event is summarized below:

Category	Details
Total Projects Displayed	455
Total Subjects/Project Guide	52
Student Participants	1210
Faculty Coordinators	16
Total winner teams for cash prices	27

3. Evaluation and Judging

A panel of distinguished experts served as the Judges for the event. They evaluated the projects based on innovation, technical complexity, presentation skills, and societal impact (**SDG**), Implementation, Outcome. The judges adopted an interactive "Walk-through" method: diagrams, flowcharts, reports and live demonstration. Every team was required to provide: Two rounds of judges were involved in the judging to select the winners by interacted with each team, providing valuable feedback and questioning the practical viability of the prototypes. Prices were distributed separately for UG students and PG students. From each year we have selected first price, second price, third prices for hardware and software separately. Cash price of around 1 lakh was distributed to the winners and certificate was given to all participants.

4. Valedictory and Prize Distribution

The valedictory and prize distribution was organized on November 11, 2025 at Shakespeare Gallery at 11.30 am. The highlight of the event was the Valedictory Ceremony, was graced by our Honorable Vice-Chancellor Dr. V. S. Kanchana Bhaaskaran Madam. In her inspiring address, she lauded the students for their creativity and emphasized the importance of indigenous innovation in today's technology-driven world.

The much-awaited awards were presented by VC Madam to the following projects:

S.NO	YEAR	Reg.No	Students Name	Title of Project	Guide	Category	Prize
1	B.Tech First Year	25BDS0184	Hasini Reddy	Car Tracking / Object tracking using live a Live Webcam Feed	Sidharth Gautam	Software	1
		25BAI0131	Aarav Gupta				
		25BAI0127	Yaksh Malhotra				
		25BAI153	Gurirath Singh Khurana				
2		25BAI0009	AKSHAD GULHANE	CLDMS: Comprehansive Land and Driver Monitoring System	Sidharth Gautam		2
		25BAI0076	Nripendra Tyagi				
		25BAI0031	Siddanth S M				
		25BAI0089	Shashwat Goel				
		25BAI0041	Avantika Chauhan				

S.NO	YEAR	Reg.No	Students Name	Title of Project	Guide	Category	Prize
3	B.Tech Second Year	24BDS0148	Gunik Bathla	Mini CNC Writing Machine	Dr.Avinash chandra	Hardware	1
		24BDS0169	Garv Gupta				
4		24BEC0084	Parveshh Prabhu	Machine Learnig based Force training for an end actuator of robotic arm	Dr.Veerapu Gowtham		2
		24BEC0585	Battamsetty Vijay Prabhat Sai				
5		24BEC0150	Adit Goyal	Remote Controlled Obstacle Avoiding Robot Dog	Dr.Bubhaditya Bhattychiryya		3
		24BEC0445	Shivam Gupta				
		24BEC0436	Vedant Bhosekar				
6	B.Tech Second Year	24BVD0008	S TARUN	Audio signal encryption and decryption for secure data transfer	Dr.Kalaivani S	Software	1
		24BVD0034	DARSHAN PALANISWAMY SUBASHINI				
		24BVD0044	YADU S KRISHNAN				
		24BVD0230	DHANISHKA K P				
7		24BEC0590	SATWIK GUPTA	DESIGN OF BRAIN COMPUTER INTERFACE WITH A SLEEP CLASSIFICATION USING FPGA	Dr. DEBASHISH DASH		2
		24BEC0767	MITHILESH ANGAL				
		24BEC0657	SANIKA JAMKHEDKAR				
		24BEC0655	EKANSHI YADAV				
8		24BEC0140	ASHUTOSH SAKHARE	FPGA BASED DIGITAL DUTY CYCLE GENERATOR	Dr. VETRIVEERAN RAJAMANI		3
		24BEC0355	Advita R Prabhu				
		24BEC0357	Shivani Vinod				

S.NO	YEAR	Reg.No	Students Name	Title of Project	Guide	Category	Prize
9	B.Tech Third Year	23BEC0143	VISWANAD RAM R	SMART GLASSES - EMPOWERING PARALYTIC PATIENTS THROUGH EYEMOVEMENT INTERACTION	Dr. Nisha J S	Hardware	1
		23BEC0278	SHRINIKETH RAJA VIDYA				
		23BEC0335	JANANI SHREE S				
		23BEC0398	HARSHINI M				
10		23BEC0254	Raghava Reddy	Gesture-controlled wheel chair with adaptive terrain speed	Dr.R.Rajesh		2
		23BEC0311	P Kodanda rama harshavardhan				
		23BEC0346	B.V Amogh Satwik				
		23BEC0151	Pujith sai venkat K				
11		23BEC0201	Isha Aravinthan	Smart Automotive lighting with blind spotawareness and radar Visualization System	A Bagubali		3
		23BEC0222	S Kavya				
		23BEC0444	Gokulapriya S				
12	B.Tech Third Year	23BEC0378	Meenakshi Sundaram M	Meta material Antenna	Dr.Chirstana Josphine Malathi	Software	1
		23BEC0187	Abishek Guru				
		23BEC0174	Sanjay C				
		23BEC0156	Gowthaman				
		23BEC0005	Arjun				
13		23BEC0014	Tarun Rithvik B	Shared AI-Human Control for Aircraft Autopilot in Low-Visibility Landing	A Bagubali		2
		23BEC0115	Krithik B				
		23BEC0158	Mohammad Oomar Farooq S				

S.NO	YEAR	Reg.No	Students Name	Title of Project	Guide	Category	Prize
14	B.Tech Third Year	23BEC0143	TARUN RITHVIK B	MediScan: Deep-Learning based Diagnostic Imaging Classifier	Padmini T.N	Software	2
		23BEC0278	KRITHIK B				
		23BEC0335	ADARSH SOMU PALANIAPPAN				
		23BEC0398	MOHAMMAD OOMAR FAROOQ S				
15		23BEC0201	SURYANSH RAI	Simulation of a Robust Covert Communication system using Steganography and Modulation Techniques over Noisy channels	Dr.Thanikaiselvan V		3
		23BEC0222	KABILAN S				
		23BEC0444	ADHEESH RAJ MATHUR				
16	B.Tech Second Year	24BML0027	PRATIK KUMAR	BIOMEDICAL	Dr. Sharmila N	Hardware	1
		24BML0017	UDAY KRISHNAN KHANDELWAL				
17	B.Tech Fourth Year	23BEC0014	DAKSH ARORA	IMAGE CORRECTION AND COMPRESSION ALGORITHM IMPLEMENTATION ON FPGA	Dr. JAYAKRISHNAN P		2
18	B.Tech Fourth Year	22BML0004	NISHITHA JAIN	DETERMINATION OF HBA1C FROM RETINAL IMAGES	Dr. Jeeva J B	Software	1
		22BML0009	PRIYOMEDHA GHOSH				
		22BML0022	KAUSHIK R HARAN				
		22BML0068	KHARE SOHAM AMIT				
19		22BML0020	JASSIKA	MEDICAL IMAGING AGENT	Dr. Jeeva J B		2
		22BML0023	VRISHA PARIKH				
		22BML0099	AAREN JAIN				

S.NO	YEAR	Reg.No	Students Name	Title of Project	Guide	Category	Prize
20	B.Tech Fourth Year	22BEC0985	HEPZIBA SUSAN	USE OF LLMs FOR OPTIMIZTAION OF RTL GENERATION & EDAAUTOMATION	G. Sumathi	Software	3
21	M.Tech	25MES0062	M MANOJ	Smart wearable device for real time monitoring	Dr. Shanmugasundaram M	Hardware	1
		25MES0064	J RAGHUL RICHARD				
22		25MEA0007	Atharv Anil bhagwat	Smart Adaptive Vehicle Headlamp system with LDR and Ultrasonic sensor	Dr.D.Vijenda Babu		2
		25MEA0008	Kiran Yadav				
		25MEA0014	S.Yukesh Kumar				
23		25MES0011	KAITLYN	A Real-Time Posture Correction System for Sedentary Environments Using Embedded Sensors	Dr. B. Karthikeyan		3
		25MES0039	SARAN KISHORE C				
24	M.Tech	25MES0048	SANJAY R	Gesutre Based Air Writing	Dr. Shanmugasundaram M	Software	1
		25MES0057	SARAN DEEPAN				
25		25MBE0017	T PRIYA DHARSINI	MACHINE LEARNING–BASED APPROACH FOR AUDIOMETRIC ANALYSIS	Dr. Sivakumar R		1
26		25MBE0007	KEVIN SAMRAJ W	CONVERGENCE OF AI AND ELECTROOCULOGRAPHY	Dr. Sivakumar R		2
27		25MBE0010	DIPTMAN GUPTA,	DIGITAL PLATFORM FOR DOCTORS IN REMOTE AREA	Dr. Sasikumar K		3
		25MBE0002	ENTEAMEN YENGKHOM				

We extend our heartfelt congratulations to all the prize winners and the project guides.

5. Conclusion

ElectroUtsav 2025 was concluded successfully on November 8th, 2025 with a high note, leaving participants motivated to further refine their projects. The event served as a vital bridge between academic theory and industrial application. This exhibition has set a high benchmark for technical excellence within the department, and the insights gained will undoubtedly inspire more robust research and development in the coming academic year. It served as a testament to the institution's commitment to excellence in technical education. The success of the event was a result of the collective efforts of the DEAN, HOD's, students, coordinators, project guides, judges, TRA, lab technicians, sense school staffs.

This edition of ElectroUtsav 2025, we pause to express our deepest gratitude to everyone who made this event a reality. The event coordinators would like to sincerely thank VIT management, VC madam, DEAN, HOD, for their unwavering support. We also extend our gratitude to the professors who mentored these students, ensuring that every project was backed by sound engineering principles. Professors. We thank our students for their hard work which set a new benchmark for this school, let this exhibition be the first step toward your journey as industry leaders. We express our special thanks to CTS TEAM for publishing in websites and digital panel boards, VIT students outreach, VIT finance and VIT PRO staffs.

"ElectroUtsav 2025: Empowering Minds, Transforming Technology."

STARTUPS

- PISTAR TECH

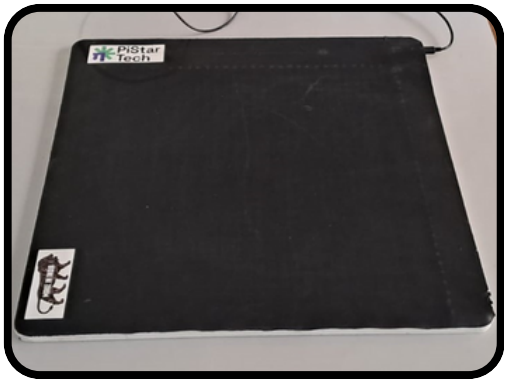
STARTUP-PISTAR TECH

PiStarTech Private Limited: Innovating Smart Sensing for Health, Comfort, and Well-Being

PiStarTech Private Limited is a health-tech startup driven by AI-enabled, smart sensor–integrated solutions aimed at promoting correct seating and standing postures. Incorporated on 04 May 2021, the company was founded with a vision to translate advanced research in flexible electronics and sensor systems into scalable, real-world products that enhance healthcare and ergonomics. Shortly after its inception, PiStarTech was incubated at the IIITH Centre for Innovation and Entrepreneurship (CIE) in May 2021, where it established strong technical and business foundations, and later expanded its innovation ecosystem by joining the VIT Technology Business Incubator (VIT TBI) in October 2023.

Flagship Products:
1. Posture Perfect Smart Chair
Posture Perfect is PiStarTech's flagship ergonomics solution tailored for modern work environments. The smart chair features a high-resolution pressure sensor array integrated into the seat and backrest to monitor sitting posture in real time. Through intelligent analytics, it identifies poor posture habits, prolonged static sitting, and uneven load distribution, delivering timely, actionable feedback. Designed for offices, educational institutions, and remote workers, Posture Perfect addresses the rising incidence of musculoskeletal disorders associated with sedentary lifestyles.

2. Podiascanner Mat
The PodiaScanner Mat is an advanced plantar pressure and foot health assessment solution developed by PiStarTech. Equipped with a high-density array of pressure sensors, it accurately captures plantar pressure distribution and balance during standing, enabling objective, data-driven evaluation of foot loading patterns. Designed for clinics, hospitals, and diagnostic centers, PodiaScanner supports applications in podiatry, orthopedics, rehabilitation, sports science, and preventive healthcare, bridging traditional foot assessment with modern digital diagnostics.



Global Launch and International Presence

PiStarTech achieved a major global milestone with its official product launch at GITEX Asia in April 2025, winning the pitch competition and earning an invitation to a fully sponsored showcase at GITEX Dubai in October 2025. By presenting its Smart Chair and PodiaScanner Mat to international partners, investors, and customers, PiStarTech marked its strong entry onto the global technology stage and reaffirmed its vision of becoming a globally recognized leader in smart health and ergonomics solutions.

About the Founder:

Dr. Anis Fatema, Founder and CEO of PiStarTech Private Limited, is a distinguished technologist and academic with expertise in flexible electronics, sensor systems, and embedded hardware. Currently serving as an Assistant Professor at VIT, she seamlessly integrates research excellence with entrepreneurial vision, guiding PiStarTech to develop innovative, user-centric technologies that deliver meaningful real-world impact.

MEDIA & COMMUNICATION

- COMMUNITY RADIO
- PODCAST

COMMUNITY RADIO AND PODCAST

Arivom Aayiram: H2-Go
Tune into VIT Community Radio's Arivom Aayiram: H2-Go! Join RJs Humaira, RSK, and Anand as they host Dr. Muthuraja Soundrapandian from the School of Electronics Engineering. Discover the future of transport as he discusses hydrogen-fueled vehicles, innovative projects, and an upcoming hydrogen cycle demo exclusively for VITians.
Language: Tamil

Youth Perspectives on Engineering and Sustainability
DATE: 15th September 2025
The Next Wave: Young Engineers Shaping a Sustainable Future showcases the transformative power of experiential engineering education in nurturing socially responsible innovators. On Engineers' Day, Dr. Debashish Dash (SENSE) facilitated insightful discussions with four students—Ananya, Aditya Pratap, Aditya, and Nandita—highlighting how academic learning aligns with real-world sustainability challenges and the **SDG**s. Their stories reflect thoughtful observation, contextual awareness, and innovative thinking, underscoring the importance of interdisciplinary, human-centered engineering in building a resilient and sustainable future.

EMERGENT TRENDS & TECHNOLOGY

- UPCOMING TECHNOLOGIES

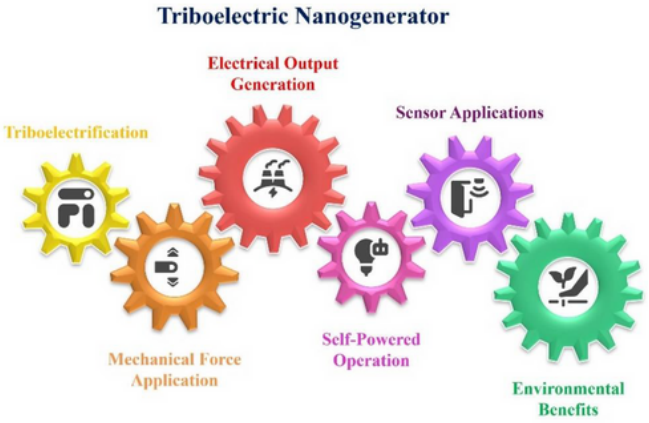
UPCOMING TECHNOLOGIES

Dr. Arunkumar Chandrasekhar
Associate Professor, SENSE
Department of Sensor and Biomedical Technology

Self-Powered Triboelectric Nanogenerators: The Future of Energy and Sensing

Imagine a world where every little motion you make—whether walking, typing, or even the gentle fall of raindrops—could be captured and turned into electricity without needing batteries or bulky power sources. That's the fascinating idea behind Triboelectric Nanogenerators (TENGs), a breakthrough technology changing how we harvest energy and power sensors. The way they work is based on a simple, everyday phenomenon you've probably noticed: the static electricity you get when rubbing certain materials together, like when a balloon makes your hair stand up. This is called the triboelectric effect.

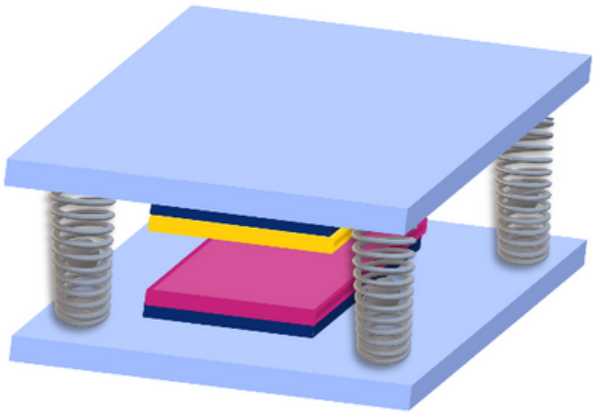
When two different materials touch and then separate, they create a small electric charge. Scientists have taken this concept and miniaturized it, layering materials that generate electricity when they move or are pressed by things like vibrations, body movements, or wind. Even though the electricity generated is small, it's enough to power tiny devices, opening exciting new possibilities for energy harvesting.



Schematic diagram of the detailed TENG applications

What makes TENGs so impressive is that they don't need any external power source—they generate their own electricity. This means they can create power anytime and anywhere there's mechanical energy, making them ideal for things like wearable gadgets, environmental sensors, and small electronics. Imagine clothes that produce power as you move or sensors that keep an eye on remote environments without ever needing a battery change.

Another great feature is their flexibility. TENGs can be made from a variety of materials, including organic and biodegradable ones, which makes them not just innovative but also eco-friendly. Their light and adaptable design lets them fit onto curved surfaces or be woven into fabrics, opening up endless possibilities for how they can be used. Besides generating power, TENGs are also excellent at sensing. Because the electricity they produce responds to movement or pressure, they can detect things like motion, vibrations, and touch. This makes them especially valuable in healthcare, where TENG sensors can monitor a patient's heartbeat or movements without bulky equipment, providing a more comfortable and seamless experience.



TENG device structure

Despite being a relatively new technology, TENGs offer great promise for creating sustainable, autonomous devices that reduce reliance on traditional power sources and minimize environmental impact. Research is ongoing to improve their power output and durability, making the future of electricity generation and sensor technology more accessible and eco-friendlier.

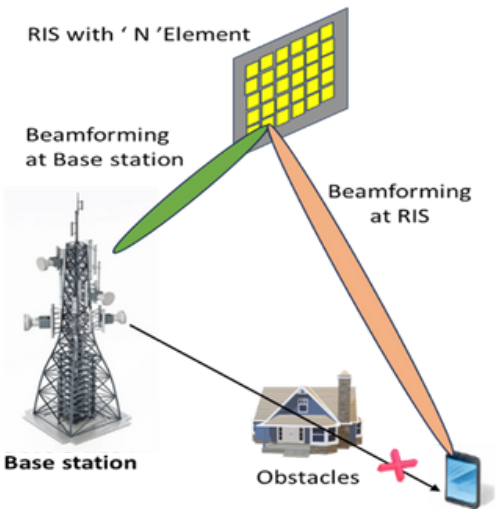
In summary, triboelectric nanogenerators are opening a new era—where energy is harvested all around us and devices become smarter, more efficient, and self-sufficient. Keep an eye on this fascinating technology, as it's set to revolutionize not only how we power our gadgets but how we interact with the world itself.

Dr. Poongundran Selvaprabhu
Associate Professor, SENSE
Department of Communication Engineering

Smart Propagation Environments with Multi-RIS Architectures in 6G

The future of wireless technology will change with 6G and beyond. This next generation will feature incredible data speeds, dependable connectivity, and sustainable design. A major technology behind this shift is the Reconfigurable Intelligent Surface (RIS). This meta surface is made up of tiny reflecting elements that can adjust the direction, phase, and amplitude of wireless signals. Instead of just responding to the current wireless environment, RIS allows us to control it. Imagine "smart mirrors" floating in the air, guiding waves around obstacles. When combined with Massive MIMO, RIS helps build high-capacity networks that use less energy by optimizing signal paths.

In recent years, researchers have explored how RIS integrates with Massive Multiple-Input Multiple-Output (MIMO) technology. MIMO uses several antennas to boost signal strength, while RIS enhances this by redirecting signals smartly. Together, they greatly improve coverage, lower energy use, and provide secure high-speed connections. Early research mainly looked at single-RIS systems, where one surface reflects signals to expand coverage. More recent studies highlight the benefits of multi-RIS systems, which provide better spectral efficiency and more flexibility for wireless networks.



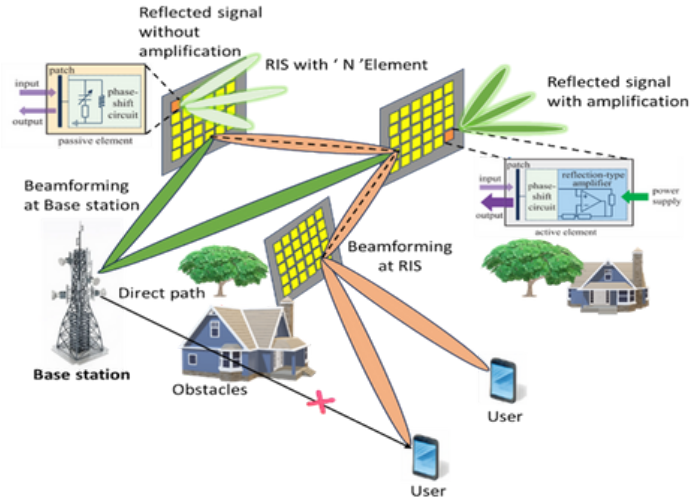


Illustration of Multi-RIS-assisted multiuser MIMO system.

Illustration of single-RIS-assisted multiuser MIMO system.

Beyond system-level developments, RIS can be divided into two types based on hardware design: Passive RIS and Active RIS. Passive RIS consists of reflecting elements that change the phase of incoming signals without amplification. This design is very energy-efficient and cost-effective, but it struggles with long-distance communication due to double path loss. On the other hand, Active RIS has electronic components like amplifiers that can strengthen reflected signals while adjusting their phase. Active RIS not only reflects signals but also includes circuitry that amplifies them.

This feature helps it tackle significant path loss and extend coverage, especially in mm-Wave and THz communication bands, although it requires more power and is more complex. Researchers are also looking into hybrid RIS designs that mix passive and active elements to balance energy efficiency and performance.

Recent research work shows that multi-RIS systems support smarter beamforming, better resource allocation, and greater energy savings using advanced optimization and machine learning methods. For example, reinforcement learning algorithms enable RIS elements to adjust in real time, optimizing wireless signals even in tough environments like smart cities and industrial IoT settings. The potential uses span 5G and 6G cellular networks, improving indoor access, aiding disaster recovery, and promoting eco-friendly communication and sustainability. RIS is a groundbreaking technology that is set to transform how devices, vehicles, and sensors connect within future intelligent ecosystems. With its two hardware types—Passive RIS, which is energy-efficient but limited by signal loss, and Active RIS, which incorporates amplifiers to reduce path fading at the expense of higher power needs—RIS is paving the way for smarter and more adaptable 6G networks.

Tiny but Powerful – Advances in Embedded MEMS Pressure Sensing Systems

Dr. Sumit Kumar Jindal
Professor, SENSE
Department of Embedded Technology

Introduction

Pressure sensing plays a vital role in modern technology-from smartwatches and vehicles to medical implants and industrial systems. Recent advances in MEMS (Micro Electro Mechanical Systems) pressure sensors and embedded systems are transforming how we collect, process and use data at the micro scale.

Recent Developments in MEMS Pressure Sensors

Modern MEMS pressure sensors are becoming smaller, faster and more reliable. Improved silicon and silicon carbide (SiC) materials now allow these sensors to operate in extreme temperatures and harsh environments such as aerospace and chemical industries. Integrated on-chip electronics enable self-calibration, digital interfaces and built-in diagnostics, simplifying system design and improving accuracy.

Smarter Embedded Systems

Embedded systems have evolved beyond simple data logging. The newest microcontrollers integrate edge AI and machine learning capabilities, allowing devices to analyze sensor data locally. This reduces power use and cloud dependency-leading to smarter, energy-efficient sensor nodes. Ultra-low-power sleep modes and efficient power management have extended battery life significantly.

Smart Synergy

When combined, these technologies create “smart sensors” that can compress data, detect anomalies, and even correct themselves. They are revolutionizing fields such as automotive safety, industrial IoT and biomedical monitoring.

Future Scope

- Self-powered nodes: Energy harvesting for maintenance-free operation.
- Edge AI: Predictive analytics and self-healing sensors.
- Harsh-environment sensing: SiC sensors for extreme conditions.
- Medical wearables: Biocompatible, real-time health tracking.
- Secure connectivity: Standardized digital interfaces for easy integration.

Conclusion

The fusion of MEMS pressure sensors and embedded intelligence is redefining how machines “feel” their environment. The future is about smaller, smarter, and self-sufficient systems that sense and respond intelligently everywhere from human bodies to deep space.

Dr. Rajesh N
Associate Professor, SENSE
Department of
Communication Engineering

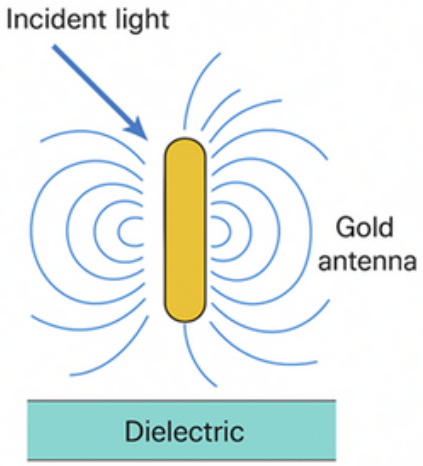
Plasmonic Antennas: Bridging Light and Nanotechnology

Introduction

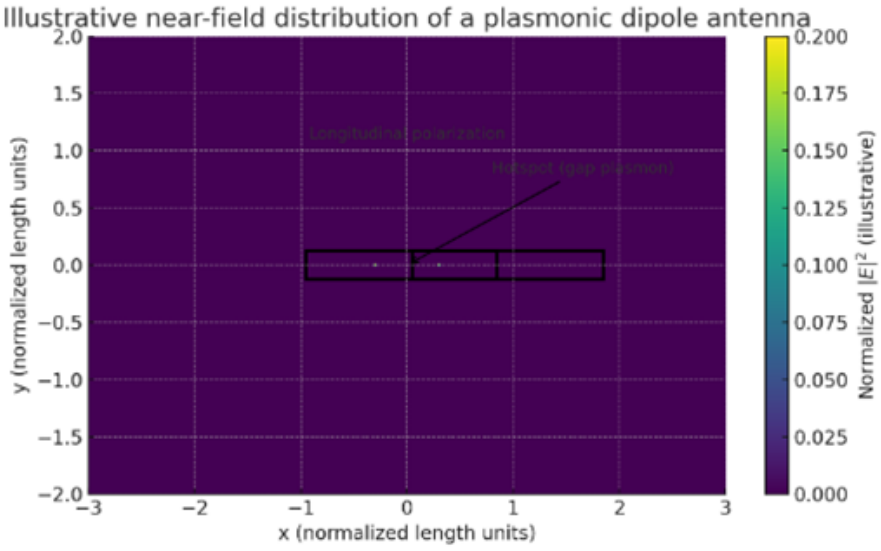
Plasmonic antennas are nanoscale structures that mimic the role of conventional antennas but operate at optical and infrared frequencies. By exploiting the phenomenon of surface plasmon resonances (SPRs), these antennas confine and manipulate electromagnetic waves beyond the diffraction limit, enabling enhanced light–matter interactions at the nanometer scale. Their unique ability to localize electromagnetic energy into subwavelength regions makes them a cornerstone in emerging nanophotonic and optoelectronic technologies.

Working Principle

At the heart of plasmonic antennas lies the excitation of surface plasmons, which are collective oscillations of free electrons at the interface of a metal and a dielectric. When incident light of the appropriate frequency interacts with a metallic nanostructure (commonly gold, silver, or aluminum), it induces coherent electron oscillations that generate highly confined electromagnetic fields. These confined fields behave like “hot spots,” where the local field intensity is amplified many times compared to the incident wave.



Plasmonic dipole



Plasmonic antennas come in various designs such as dipole, bowtie, and Yagi–Uda types, each tailored to achieve specific resonance characteristics. Their operation can be compared to radiofrequency antennas, but scaled down to interact with visible and infrared light. By adjusting parameters such as geometry, size, and material composition, plasmonic antennas can be engineered to resonate at desired optical frequencies.

Figure showing a plasmonic dipole antenna: a pair of gold nanorods on a dielectric substrate , with incident light exciting localized surface plasmons that concentrate electromagnetic fields at the antenna gap. In a dipole plasmonic antenna driven along its axis (longitudinal mode), the near field concentrates intensely in the nanogap, producing a “hotspot” (gap plasmon) with $|E|^2$ enhanced by orders of magnitude relative to the incident field.

Smaller gaps, sharper tips, and resonant rod length (≈ λeff/2, where λeff < λ0 due to plasmonic dispersion) all boost this localization. The field decays evanescently away from the metal on a scale of a few tens of nanometers, while the far field resembles a classical dipole radiation pattern. With transverse polarization, the hotspot largely vanishes and the lobes move to the rod ends. A high-index substrate pulls and asymmetrizes the field toward the interface, and metal losses (Im{εm}) limit Q and penetration depth inside the metal.

Applications

1. Sensing and Biosensing: Plasmonic antennas are widely employed in surface-enhanced Raman spectroscopy (SERS), where the strong local field enhancement improves molecular detection sensitivity down to the single-molecule level.
2. Photovoltaics: They enhance light absorption in solar cells by trapping and scattering incident light, thereby improving efficiency.
3. Optical Communication: Plasmonic antennas enable ultrafast signal modulation and nanoscale optical interconnects, promising compact, high-bandwidth data transfer.
4. Quantum Optics: By controlling emission properties of quantum emitters, plasmonic antennas play a role in single-photon sources and quantum information systems.
5. Medical Diagnostics and Therapy: Near-field enhancement is utilized in biomedical imaging and photothermal therapy.

Research Avenues

Despite their promise, plasmonic antennas face critical challenges, primarily ohmic losses in metals, which lead to energy dissipation and reduced efficiency. Current research explores hybrid plasmonic-dielectric systems, two-dimensional materials (such as graphene), and alternative low-loss plasmonic materials (e.g., titanium nitride, transparent conducting oxides). Another active direction is in metasurface-based plasmonics, where arrays of engineered nanoantennas enable multifunctional optical devices such as flat lenses and holograms. Furthermore, integration with quantum dots, 2D semiconductors, and nanomechanical systems is opening new possibilities for tunable, reconfigurable, and multifunctional nanophotonic platforms.

Conclusion

Plasmonic antennas provide a powerful pathway to bridge light and matter at the nanoscale. By concentrating optical energy into subwavelength volumes, they offer unprecedented opportunities across sensing, energy harvesting, communications, and quantum technologies. Continued advances in materials, fabrication, and design strategies are expected to overcome present challenges and drive the field toward transformative real-world applications.

Dr. SHILPI RUCHI KERKETTA
Assistant Professor, SENSE
Department of Micro and Nanoelectronics

Microwave-Based Diagnostic Systems: A New Frontier in Osteoporosis and Fracture Detection

Microwave antenna technology is gaining attention as a reliable and non-invasive approach for the early detection and diagnosis of osteoporosis and bone fractures. Osteoporosis is a progressive condition characterized by reduced bone mineral density, leading to fragile bones and increased fracture risk, particularly among the elderly and post-menopausal women. Conventional diagnostic techniques such as DEXA, CT, and MRI are effective but often limited by high cost, radiation exposure, and poor accessibility in rural or resource-constrained regions.

Microwave sensing offers a radiation-free alternative by transmitting electromagnetic waves through biological tissues and analyzing changes in the dielectric properties of bone, which vary with mineral loss and porosity. Since these dielectric variations appear in the early stages of osteoporosis, microwave antennas can potentially enable early diagnosis before severe structural damage occurs. Various antenna designs—including monopole, patch, Vivaldi, and metamaterial antennas—operating in the 1–8 GHz frequency range have been developed to balance penetration depth and image resolution while improving sensitivity.

Recent advancements integrate machine learning algorithms such as support vector machines, random forests, and deep neural networks to analyze microwave scattering parameters (S11 and S21). These data-driven methods enhance classification accuracy between healthy and osteoporotic bones, assist in estimating bone mineral density, and help predict fracture risk. Safety evaluations indicate that the specific absorption rate (SAR) remains well within international safety standards, ensuring suitability for repeated and long-term use.

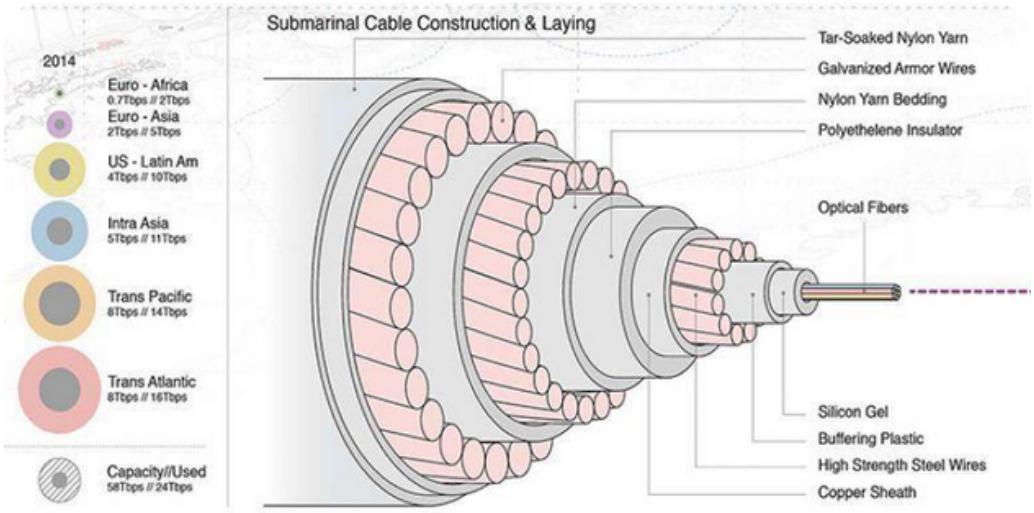
Although challenges such as limited penetration for deep bones, soft-tissue interference, and the need for large-scale clinical validation remain, microwave antenna technology represents a significant advancement in biomedical sensing. By combining electromagnetics, signal processing, and artificial intelligence, it has the potential to enable safe, affordable, and accessible bone health monitoring, improving early intervention and quality of life for millions worldwide.

Dr. SANGEETHA N
Assistant Professor, SENSE
Department of Embedded Technology

The Invisible Highways of Light: How Optics Power the Internet

When we click a link, join a video call, or stream a game, we rarely think about the invisible force powering it all—light. Optical communication forms the backbone of our digital world, carrying information as pulses of light across continents, beneath oceans, and into our homes.
The journey of light-based communication began long before the internet. Ancient civilizations used mirrors and reflective surfaces to signal across distances, and in the 19th century, Alexander Graham Bell's photophone transmitted sound using sunlight. The true breakthrough came in the 1970s with the development of optical fibers — ultra - pure glass strands capable of transmitting data at extraordinary speeds. This innovation reshaped global connectivity, with the first transatlantic fiber-optic cable going live in 1988.

Today, a hidden network of submarine fiber-optic cables lies beneath the oceans, carrying over 95% of the world's international internet traffic. Though thin at their core, these cables are protected by multiple layers of engineering—buffering gels, copper sheaths, steel armoring, and insulating coatings—to withstand deep-sea pressure, corrosion, and human activity. This robust design ensures uninterrupted global communication, where even a single break could disrupt entire regions.



On land, optical fibers run beneath cities and rural landscapes, linking homes, businesses, and data centers—the digital nerve centers of the modern world. Compared to satellites, fiber optics offer unmatched speed, reliability, and efficiency.

Pushing the limits even further, researchers in Japan have recently achieved a record-breaking data transmission speed of 1 petabit per second over long distances. This milestone signals a future of ultra-fast, seamless connectivity, proving that light continues to shape the next wave of global communication—faster and more powerful than ever before.

ALUMNI SPOTLIGHT

Balu Chaturvedula
SVP & Country Head, Walmart
Global Tech India
Bengaluru, Karnataka, India
Batch of 1992

As the Senior Vice President (SVP) & Country Head, Balu leads Walmart Global Tech's vision in India, driving a culture of innovation and supporting the delivery of exceptional shopping experiences for Walmart's customers, members and associates.

He oversees the development and deployment of scalable, leverageable capabilities and systems across the enterprise. Balu's hands-on approach and forward-thinking vision for the future of retail have been crucial in nurturing high-performance teams. With nearly three decades of experience in the industry, he has been deeply invested in aligning technology with business goals and leading teams that consistently deliver impressive results. Balu has also played a key role in developing and nurturing supply chain talent in India. His expertise spans across digital eCommerce, retail, web portals, search, content, platforms and embedded devices.

Balu is particularly passionate about meeting new people, building relationships and helping businesses grow.

CREATIVE CORNER

- POEMS
- PUZZLES

POEMS

The Rise of Electronics

Electronics hum in every breath we take,
Adapting swiftly, no system they forsake.

Circuit theory solves our daily strife,
Becoming the pulse and rhythm of our life.

Sustainable electronics profit a compassionate light,
They craft a future - joyful, balanced, and bright.

Electronics in my thoughts and dreams start to grow,
New species born from currents' of electronics flow.

-Dr.Kannadassan D

Whispers of the Earth

Beneath the sky's embracing blue,
The trees stand tall, the grasses dew,
A breeze that hums a soft refrain,
Through mountain paths and golden grain.

The river sings to stone and sand,
Its voice shaped gently by the land,
While morning sun on forest floor
Paints golden light through green galore.

The stars await the dusk's return,
As fireflies in silence burn,
And every leaf, and every breeze,
Speaks in the tongue of ancient trees.

So pause, and listen—still, and true,
The soul of Earth speaks back to you.

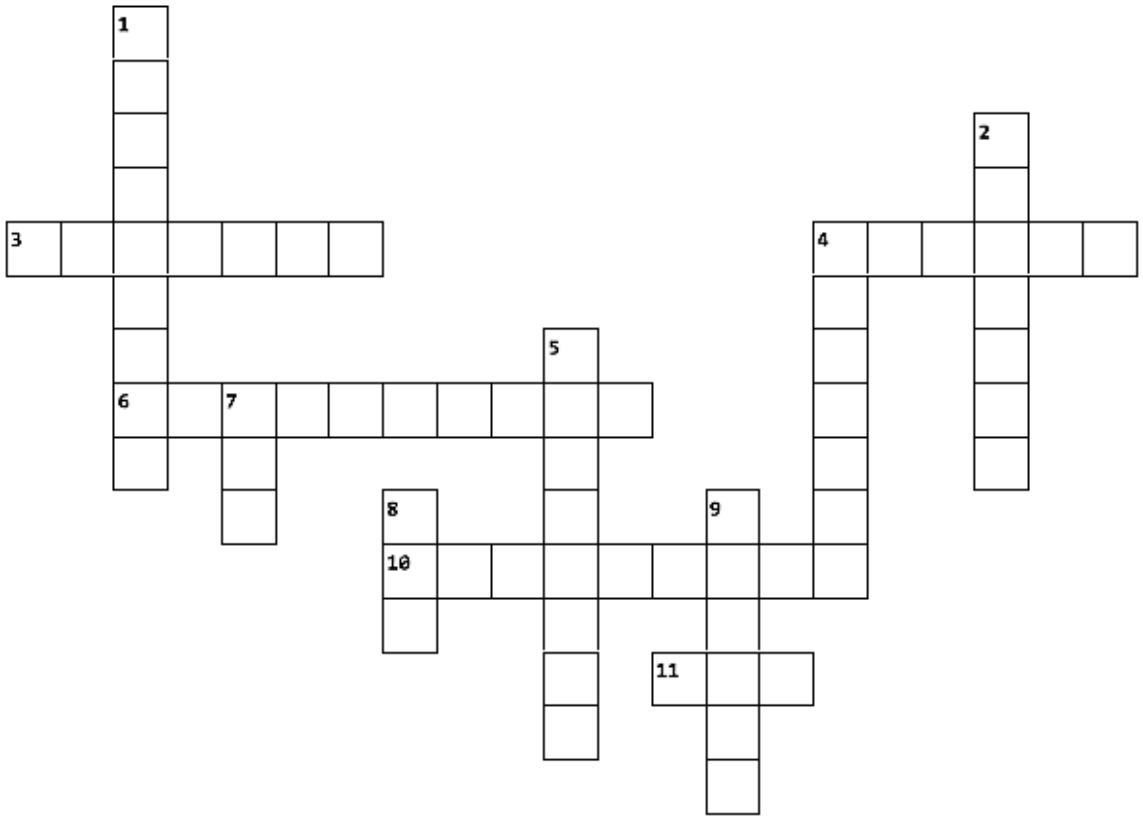
LIFETRONICS

-Dr. Sri Adibhatla Sridevi

నాడు ..
ఓ పల్లెటూళ్ళో చిన్ని ఇంట్లో కన్న తల్లి
కొడుకుకై ఎదురు చూసి చూసి కళ్ళు కాయలయి
అతడెపుడో రాసిన చివికిన ఉత్తరం ముక్కని
గుండెలకి హత్తుకుని కను మూసింది తల్లడిల్లి
నేడు ...
అదే ఊళ్ళో అంతే చిన్నింట్లో మరో తల్లి
తనివి తీరా కొడుకుని చూసి మనసు తీరా మాటలాడి
ఆ వరాన్ని తనకిచ్చిన ఓయంత్రాన్ని *(?)*
గుండెలకి హత్తుకుని నిదరోయింది తృప్తిగా

నాడు ..
నవ్వుతూ తుళ్ళుతూ కలలెన్నో కంటూ
చీకు చింత లేని ఓ యువ విద్యార్థి
తృటిలో తండ్రి గుండె ఆగి ఒంటరైపోయె
జీవిత పోరాటంలో అలిసి కల కరిగిపోయె
నేడు ...
గుండె గుట్టు గూడంగా విప్పి చెప్పే
ఓ యంత్రం సాక్షిగా వైద్యం ఫలించి
సేద తీరి తిరిగి ఉద్యోగాన చేరి
పిల్లల కలలు నిజం చేసాడో కన్నతండ్రి
నాడు..
దివిసీమలో ఊరంత ఉప్పెన
ఊరంత ఊడ్చిపెడితే
ఏరయిన ఇంటికి కన్నీటితో సెలవిచ్చి
రోడ్డున పడిందో కుటుంబం
నేడు ..
పసిగట్టి ప్రమాదం ముందుగానే
ఊరంతనీ గట్టెక్కించిన ప్రభుత్వం
ఆ సమాచారం ఇచ్చిన ఉపగ్రహాన్ని
తలచుకుంటూ సేదతీరింది హాయిగా
ఇప్పుడు..
ఆకలేసి ఓ బ్రహ్మచారి మీట నొక్కి ఆర్డరు పెట్టినా ...
నడపలేని ఓ ముసలవిడ ఏప్ లోవాహనం బుక్ చేసినా ....
ఉత్సాహంగా ఓ విద్యార్థి వీడియోలలో విషయాలు నేర్చినా ...
అత్యవసరంగా ఓ ఇల్లాలు ఆన్ లైన్లో వెచ్చాలు తెప్పించినా ...
ఎవరైనా ఎపుడైనా ఏం చేసినా వారి చెతిలో ఉండేదేమిటి
ఓ “ఎలక్ట్రానిక్ యంత్రం”
అందులో ఉండేదేమిటి ? "అధిక సాంద్రతర అనుసంధాన శకలం"
అదే.. అదే.. "వి ఎల్ యెస్ ఐ చిప్"
అందుకే మేమంటాం ఇది కాదు “ఎలక్ట్రానిక్స్” ఇదే “లైఫ్ ట్రానిక్స్”

CROSSWORD



Across

3. Measure of data transmission speed (7)
4. Circuit used to remove unwanted frequencies (6)
6. Basic semiconductor device for switching (10)
10. Device that increases signal power (9)
11. Ratio of signal power to noise power (3)

Down

1. Wireless technology for short-range communication (9)
2. Medium used to transmit electromagnetic waves (7)
4. Mathematical transform used in signal analysis (7)
5. Process of encoding information onto a carrier (8)
7. Conversion of analog signal to digital form (3)
8. Device that converts digital signals to analog (3)
9. Information-carrying waveform (6)

Answers: 1) BLUETOOTH 2) CHANNEL 3) BITRATE 4) FILTER 5) MODULATE 6) TRANSISTOR 7) ADC 8) DAC 9) SIGNAL 10) AMPLIFIER 11) SNR

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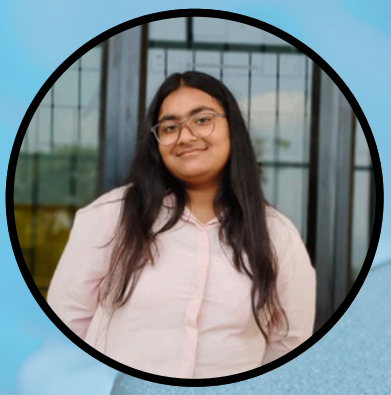

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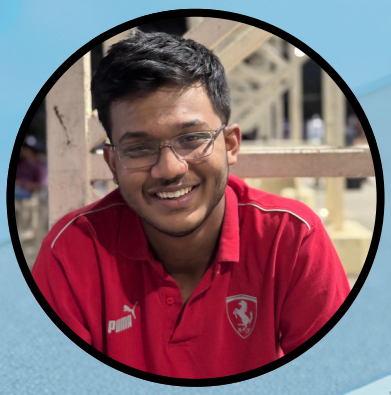

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