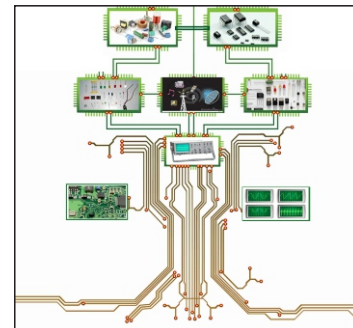


ELECTRONICA

Newsletter

Department of Electronics & Communication Engineering



Volume 11

Issue 1

Jul - Dec 2025

Vision

- To be one of the premier institutions of Engineering and Management education through excellence in academics, research, innovation and entrepreneurship with global standards.

Mission

- To impart world class value-based education in Engineering and Management.
- To provide thrust for research activities by establishing centers of excellence in sustainable innovative technologies and collaborate with industries to carry out interdisciplinary research.
- To generate highly skilled and competent manpower with leadership qualities, team spirit and concern for society and environment.
- To nurture organizational culture conducive for faculty to be competent and set higher standards.

Vision and Mission of the Institute

Vision

- To be a centre of excellence in Electronics and Communication Engineering through holistic education in academics, research, innovation and entrepreneurship.

Mission

- To produce highly skilled and globally competent professionals in Electronics and communication through academic excellence, with a strong emphasis on societal concerns and ethical standards.
- To nurture progressive research and innovation through Industry collaborations, Centres of Excellence and Start-ups.
- To instil leadership skills in students, enabling them to succeed as entrepreneurs and lead diverse teams in solving real-world problems.

Program Education Objectives

After 2 to 3 years of graduation, the students will have the ability to:

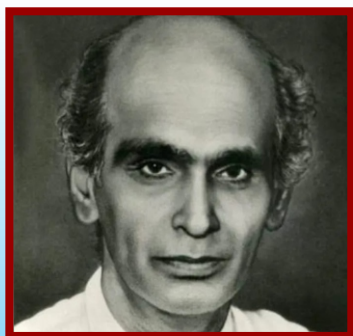
- Solve real world engineering problems by adapting the technological changes through continuous learning to enable global competency.
- Participate actively in advanced learning and multidisciplinary research by designing and developing innovative and cost-effective solutions.
- Exhibit professional skills, effective communication, team work and ethics as an individual/team player/entrepreneur.
- Implement engineering solutions with an empathy to societal values and environmental concern.

Vision and Mission of the Department

What's inside...

- About the Department
- Technical Articles
- Staff Achievements
- Student Achievements
- Departmental Events

And more...



Gopalswamy Doraiswamy Naidu Revered as the 'Edison of India,' GD Naidu is often credited with influencing the Industrial Revolution in India. The creator of the first electric motor in the country is also acknowledged for his wondrous inventions like the mechanical calculator, the ticket vending machine, early electric razor, fruit juice extractor, kerosene-run-fan and a projection TV.



Vidyayamruthamashnutha

B. N. M. Institute of Technology

An Autonomous Institution under VTU. Approved by AICTE.

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"The future belongs to those who believe in the beauty of their dreams." – Eleanor Roosevelt

Greetings from the heart of the Electronics and Communication Engineering Department! With this new edition of Electronica, we open yet another chapter in our shared journey through circuits, codes, signals, and stories that shape the technological landscape. Every breakthrough begins with a spark, an idea, a question, a challenge that refuses to be ignored. This edition celebrates that spark. From innovative projects and insightful research to the remarkable achievements of our students and faculty, these pages capture the pulse of a discipline that never stands still.

As technology advances at lightning speed, so does our responsibility to imagine, design, and implement solutions that matter. You will find not only technical insights but also narratives of perseverance, collaboration, and creativity because engineering is as much about human ingenuity as it is about precision and logic. To all those who contributed, your work is the energy that keeps Electronica vibrant. To our readers, your curiosity is the circuit that keeps this initiative alive. Together, we create more than just a newsletter; we create a chronicle of ideas and aspirations. So, immerse yourself in these pages. Let the innovations inspire you, let the challenges provoke you, and let the possibilities excite you because the story of ECE is still being written, and you are part of it.

Happy Exploring!



Editorial Team

ABOUT THE DEPARTMENT

The Department of Electronics & Communication Engineering, established in 2001, admits 120 UG students (plus 12 lateral entry) and 24 PG students specializing in VLSI and Embedded Systems annually. The department boasts of a highly qualified faculty with an average of Twenty years of experience, including alumni from premier institutes like IITs and universities from Netherlands and Germany and professionals with rich industry exposure. The department provides a vibrant academic environment, enabling students to achieve distinctions, high pass percentages, and excellent placements in reputed companies such as Aisan Industry Co., Ltd., ICHINOSE Co., Ltd., Aisin Automotive, National Instruments, Nokia, Siemens, Cadence, Synopsys, MathWorks and IT giants like TCS, Infosys, and Wipro. Its autonomous syllabus emphasizes practical learning, project-based teaching, and research, preparing students for MS programs in top international universities. The department organizes international IEEE conferences, workshops, and seminars, ensuring continuous learning through professional bodies like IEEE, ISTE, and IEI. Students benefit from technical skill development programs, internships, and industrial visits that enhance their industry readiness. Soft skills and personality development classes are conducted to support students' holistic growth. Over the years, students have secured 23 university ranks (17 UG, 6 PG) with 11 gold medals, and 10 Autonomous ranks with Gold medals, reflecting their outstanding academic performance. The department has established 22 industry MOUs, Centers of Excellence in Healthcare and Smart Technologies, and fosters innovative lab projects and internships at reputed institutions. The department has received Major Grants from CSR [Infineon] : Rs. 6.5 Lakhs and ICSSR Grants: Rs. 12 Lakhs. Students actively participate in technical, cultural, and sports events, bringing accolades to the department and enriching their overall experience. The first batch of autonomous graduated in the year 2025 with excellent results and good placement packages.

Dr. Yasha Jyothi M Shirur
Professor & Head, Dept. of ECE

Technical Articles

Autonomous AI Scientists: The Future of Discovery Without Humans

Artificial intelligence (AI) is reshaping scientific discovery, paving the way for autonomous AI scientists that can design experiments, analyze data, and generate research papers without direct human intervention. AI-driven research is already being implemented in various fields, with institutions like Argonne National Laboratory and Carnegie Mellon University pioneering automated laboratories. These AI systems integrate machine learning, robotics, and automation to conduct complex scientific tasks at unprecedented speeds and precision. By leveraging AI technologies, research institutions can accelerate discoveries in areas such as drug development, materials science, and climate research, unlocking new opportunities for innovation beyond human capability. The potential of AI scientists extends to generating hypotheses, executing large-scale experiments, and providing data-driven insights, making scientific advancements more efficient and accessible.

Despite the advantages, autonomous AI scientists raise significant ethical and practical concerns. Questions arise about the reliability, reproducibility, and transparency of AI-generated discoveries. While AI models can analyze vast datasets and identify patterns beyond human perception, there remains a risk of biases, errors, and unintended consequences. Moreover, ethical dilemmas surrounding AI-driven research include concerns over decision-making autonomy and compliance with regulatory standards. Additionally, the rise of AI scientists may disrupt traditional research roles, altering the dynamics of scientific collaboration and employment in academia and industry. Ensuring responsible AI use requires human oversight, ethical



safeguards, and robust validation mechanisms to maintain the credibility and trustworthiness of AI-driven scientific endeavors.

Looking ahead, the integration of AI in scientific research will continue to evolve, with AI augmenting rather than replacing human scientists. Future developments may include AI-assisted collaboration, the fusion of AI with quantum computing for advanced problem-solving, and self-sustaining AI laboratories capable of conducting continuous research. However, the role of human oversight will remain essential in ensuring AI's ethical application and mitigating potential risks. As AI-driven scientific discovery advances, balancing automation with human judgment will be crucial to maximizing its benefits while upholding the integrity of research. If managed responsibly, autonomous AI scientists could revolutionize the pace and scope of innovation, making groundbreaking discoveries more attainable and impactful for society.

Source: <https://www.nature.com/articles/s41586-022-04950-w>

**Rathik
VI ECE B**

DeepSeek AI: A New Challenger in the AI Landscape

Artificial Intelligence (AI) technologies are rapidly transforming industries, and DeepSeek AI is emerging as a key player in this evolving landscape. This Chinese AI start-up has gained recognition for developing state-of-the-art large language models (LLMs) that rival those of OpenAI and Meta. Its latest model, DeepSeek V3, features 671 billion parameters and was trained in just two months at a cost of \$5.58 million, significantly lower than industry standards. Unlike other AI firms that rely on vast computational power, DeepSeek employs innovative techniques such as Multi-head Latent

Attention (MLA) and Mixture-of-Experts (MoE) to achieve outstanding efficiency and performance. These advancements allow DeepSeek's AI models to handle complex Natural Language Processing (NLP) tasks, including text generation, summarization, and translation, with impressive accuracy and lower computational costs.

DeepSeek's emergence comes at a time when China faces increasing restrictions on access to advanced semiconductor technology due to U.S. sanctions. Rather than being hindered by these challenges, DeepSeek has



leveraged them to drive innovation in hardware optimization, minimizing computational expenses while maintaining high-quality AI models. By refining training techniques and optimizing data transfer, DeepSeek has demonstrated that cutting-edge AI development does not necessarily require massive financial investment.

Source: infoq.com [Cloud2Data](#)

Additionally, the company has embraced an open-source philosophy, sharing research findings and pretrained model weights with the global AI community, fostering collaboration and accelerating AI advancements beyond its research lab.

Despite its rapid progress, DeepSeek faces stiff competition from AI giants such as OpenAI, Google DeepMind, and Meta, which have vast resources and established user bases. Moreover, regulatory and geopolitical hurdles pose challenges to the company's long-term expansion and access to high-performance AI chips. However, DeepSeek's achievements highlight that efficiency and ingenuity can sometimes outperform brute-force computational power. If the company continues on its trajectory of innovation and collaboration, it could play a pivotal role in shaping the future of AI, making high-performance models more accessible and efficient while contributing to global advancements in artificial intelligence.

Nandish C K
1BG22EC062

Locked In Orbit: The Magic of Space Docking

On January 16, 2025, ISRO achieved a historic milestone by successfully executing SpaDeX (Space Docking Experiment), marking a crucial step toward India's ambitions in human spaceflight, space station development, and satellite servicing. Space docking enables refueling, repairs, and crew transfers in orbit, essential for long-duration space missions and future space station operations.

The Science Behind Docking

Space docking is a complex maneuver where two spacecraft—the Chaser (actively maneuvering) and the Target (stationary)—connect while orbiting at 28,000 km/h. This requires precise trajectory control, real-time adjustments, and advanced docking mechanisms to ensure a secure connection. The Chaser spacecraft is the active vehicle responsible for approaching and docking with the target. It must precisely adjust its speed, trajectory, and orientation to ensure a successful connection. The Target spacecraft remains in a stable orbit and is designed to passively receive the docking spacecraft, providing the necessary interface for secure attachment.

ISRO's SpaDeX followed ESA's International Docking System Standard (IDSS), which promotes interoperability with global docking systems. The Chaser spacecraft was equipped with an Autonomous Docking System, featuring LiDAR-based navigation, AI-assisted

trajectory planning, and micro-thrusters for fine adjustments. The Target was designed with a passive Soft Capture Mechanism, inspired by NASA's Soft Capture Docking Mechanism (SCDM), which allowed for secure engagement once contact was made.

There are two primary docking models used in space missions: soft docking and hard docking. Soft docking ensures an initial connection using shock absorbers and guiding pins, allowing the spacecraft to align correctly before forming a rigid connection. Once properly aligned, hard docking takes place, where mechanical latches and electrical interfaces fully secure the connection, enabling power and data transfer between the spacecraft. ISRO's docking mechanism integrated both soft and hard docking, ensuring a secure and efficient process.

ISRO's SpaDeX followed a combination of soft docking and hard docking techniques to ensure a secure and efficient connection. Initially, soft docking was used to establish a gentle contact between the Chaser and the Target spacecraft, utilizing shock absorbers and guiding pins for precise alignment. Once the alignment was confirmed, the system transitioned to hard docking, where mechanical latches and electrical interfaces fully secured the connection, enabling power and data transfer. This dual-stage docking approach enhanced stability and ensured a reliable link between the spacecraft, aligning



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Advanced Technologies Powering SpaDeX

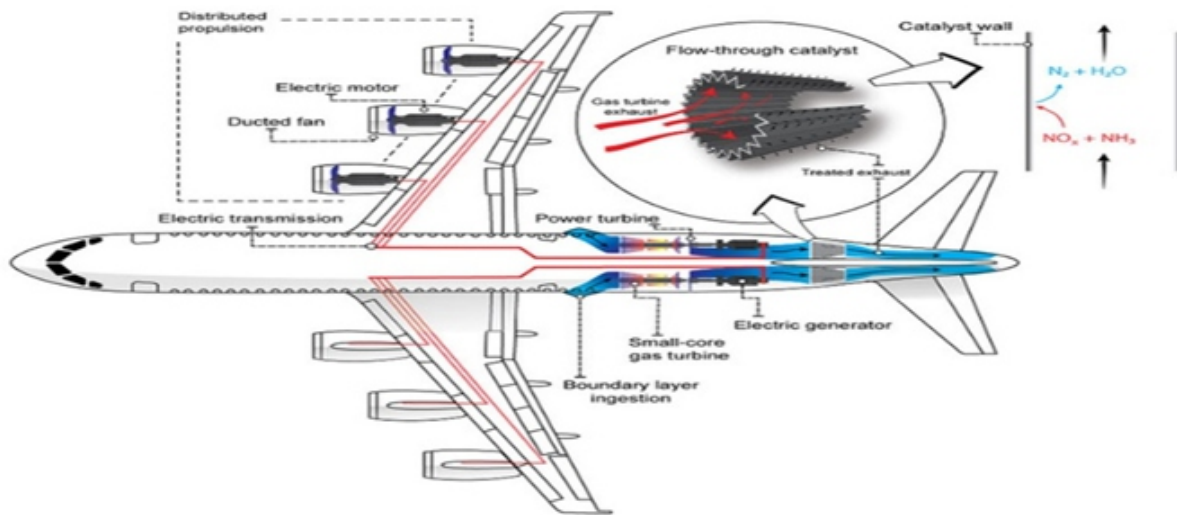
ISRO employed high-accuracy sensors, AI-driven trajectory planning, and precision actuators for docking. Star trackers, LiDAR sensors, Ka-band radar, and AI-powered fault detection ensured a smooth approach. Inter-Satellite Links, optical communication, and AI-based machine vision enabled real-time monitoring and last-minute corrections. Micro-thrusters, reaction wheels, and AI-powered docking controllers facilitated fine adjustments, ensuring perfect alignment.

A Game-Changer for India's Space Future

Beyond satellite servicing, docking technology plays a crucial role in deep-space missions, enabling the assembly of large space structures in orbit. Autonomous docking relies heavily on embedded systems, AI-powered trajectory planning, LiDAR-based navigation, real-time telemetry, and high-bandwidth optical and RF communication technologies—all integral to the ECE domain. With SpaDeX, ISRO has taken a bold step toward self-reliance in space technology, showcasing the capabilities of advanced control systems, AI-driven decision-making, and fault-tolerant communication networks. These innovations enhance India's standing in global space exploration and provide a foundation for future ECE-driven research in AI-embedded systems, real-time communication protocols, and adaptive guidance systems.

MAHIMA M HEBBAR
1BG22EC048

The Future of Flight: How Electric Aircraft Are Revolutionizing Aviation



HYBRID ELECTRIC AIRCRAFT



ROLLS-ROYCE EV AIRCRAFT

Over the past decade, the transportation industry has experienced a transformative shift toward sustainability, with electric vehicles (EVs) reshaping road travel. Now, this revolution is reaching new heights as electric aircraft have emerged as groundbreaking innovations in aviation. With mounting concerns over climate change, escalating fuel costs, and the global push for greener alternatives, the aerospace sector is investing heavily in electric propulsion technology. But just how close is it to witnessing a fully electric commercial flight? Exploring the groundbreaking technological advancements and pressing challenges that are shaping the future of electric aviation.

The Rise of Electric Aviation

Aviation accounts for about 2-3% of global carbon dioxide (CO_2) emissions, a significant contributor to climate change. As the world shifts toward cleaner energy solutions, aircraft manufacturers and startups are developing electric planes that could transform air travel. Companies like Airbus, Boeing, and innovative startups such as Eviation and Vertical Aerospace are pushing the boundaries of electric propulsion to create more sustainable, efficient, and quieter aircraft. Electric aircraft come in different forms, from hybrid-electric planes to fully electric models.

Hybrid-electric aircraft use a combination of fuel and battery power, while fully electric planes rely solely on battery technology. The latter is the ultimate goal, but current battery limitations make hybrid models more practical for now. Hybrid models can help bridge the gap, reducing emissions while allowing longer flight ranges, making them a viable short-term solution as battery technology evolves.

Innovations Powering the Change

Battery innovation is key to electric aircraft development, yet jet fuel remains far superior in energy density. Researchers are working on solid-state and lithium-sulfur batteries to improve energy storage and efficiency. Electric propulsion systems are another breakthrough. Unlike traditional jet engines, electric motors are quieter, emission-free, and require less maintenance. Companies like Rolls-Royce and magniX are leading advancements in this field, focusing on regional and urban air mobility solutions. Additionally, improvements in aerodynamics and lightweight materials are enhancing aircraft efficiency, helping maximize limited battery power.

Challenges and Roadblocks

Despite the potential of electric aviation, several challenges must be addressed for widespread adoption. The biggest hurdle is battery weight and energy density—current batteries are much heavier than jet fuel for the same energy output, limiting flight range and payload capacity.

Infrastructure is another obstacle. Airports and airlines must invest in charging stations and power grid upgrades to support electric aviation. Additionally, regulatory approvals and safety certifications need to evolve to accommodate new propulsion technologies, a process that can take years. Governments and aviation authorities are working with manufacturers to ensure electric aircraft meet stringent safety and performance standards before commercial deployment.

A Greener Future for Aviation

Electric aviation is ushering in a new era of sustainable flight. With advancements in battery technology and infrastructure, all-electric commercial flights are becoming increasingly feasible. While long-haul electric flights remain a challenge, regional and urban air mobility solutions are emerging rapidly.

Beyond environmental benefits, electric aircraft could lower operational costs, making air travel more accessible. Innovation in battery storage, renewable energy, and aerospace engineering is accelerating progress. Collaboration between governments, private companies, and research institutions will be key in shaping this future. The transition is no longer a question of “if” but “when,” marking the dawn of a cleaner, greener aviation industry.

Neha N
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Staff Achievements

Awards and Recognition

- **Dr. Ashwini S Savanth** was invited as Judge for Project Exhibition of Final Year BE students in ECE department of KSIT on 5th December 2025.
- **Dr. Manjunath G. Asuti** was invited as Judge for National Level Project Expo on 4th December 2025.
- **Dr. Priyadarshini K Desai**, PhD Thesis Selected for GraTE-7 Graduate Thesis Evaluation in 7 Minute (GraTE-7), co-hosted with IEEE Conference Future Network World Forum (FNWF 2025) scheduled from 10-12 Nov,2025

Patents

- Patent Filed with Patent no: 202541049443 **Title: Household Power Consumption Monitoring and Prediction Using Real-Time Sensing and Machine Learning.** Patentee: BNM Institute of Technology, Bengaluru. Inventors: **Vinay Gowda D J, Dr. Keerti Kulkarni, Dr. Priyadarshini K Desai, Dr. Yasha Jyoti M Shirur.** Date of Filing: 22/05/2025. Date of Publication: 06/06/2025.
- Faculty inventors **Jyoti R Munavalli, Sakshi Sunil ,Harshaprada and Bindu S** published a patent titled **“Intelligent Key Reminder System with Wireless user notification”** on 5th September 2025.
- Faculty inventors **Jyoti R Munavalli, Priya Sankpal and Sumathi A** published a patent titled **“Quantum Computing Framework for Cross-Disciplinary Simulation, Secure Processing, Intelligent System Control,**

and Predictive Optimization in Engineering and Management Applications” on 12th September 2025.

- Faculty inventors **Aneesh M S, Deekshith M V, Hamsini Bhat V, Kandacharam Deepshika, Kshitija K M, Jyoti R Munavalli and Sumathi A** filed for a patent titled “**AI-controlled Hybrid Battery Thermal Management System for Electric Vehicles**” on 8th December 2025.
- Patent Filed with Patent no: 202541130418 A Title: **Smart Hearing Protection with Integrated Water Cutoff and Real Time Alerts** Patentee: **BNM Institute of Technology, Dr. Bhuvana Suganthi D, Bharath S, Chaithra A, Dr. Yasha Jyothi M Shirur, Dr. Smitha Gayathri D** Inventors: **BNM Institute of Technology, Dr. Bhuvana Suganthi D, Bharath S, Chaithra A, Dr. Yasha Jyothi M Shirur, Dr. Smitha Gayathri D** Date of Filing: 22/12/2025.

Scopus Journal Publications

- **Venkatesh Bhandage, Nijaguna Gollara Siddappa, Nagaraj Bhat, Manjunath G. Asuti and Praveenkumar S Challagidad** published a paper titled “**Tumour GAN-based augmentation and hybrid deep learning model for classification of brain tumour using MRI images**”, in International Journal of Ad Hoc and Ubiquitous Computing, Vol. 50, No.3, pp 123-136, 2025.
- **Manjunath G. Asuti, Nirmalkumar S. Benni, Arun Kumar G, Ananda M. H., Rekha P. and Sudarshan Bhat** published a paper titled “**Memristor-Based Priority Encoder and Decoder Circuit**”, in Micro and Nanosystems, Volume 18, Issue, 2026, e18764029422867, DOI: 10.2174/0118764029422867251204044832.
- **Priyadarshini K. Desai, Keerti Kulkarni and Champa P. N.** published a paper titled “**Design and Analysis of Wideband, High Gain, Self-Isolated Multiple Antenna for mm-Wave Application**”, in Journal of Communications, vol. 21, no. 1, pp. 12-19, 2026, doi:10.12720/jcm.21.1.12-19.
- **V Kusanur, Priyadarshini K Desai, TM Hemanth and KM Manjunath** published a paper titled “**Performance Analysis of Underwater Communication Using Li-Fi Across different Water Qualities**”, in JCM, Vol.20(5): 589-595, 2025, Doi:10.12720/jcm.20.5.589-595.

CARE Journal Publications

- **Dr. Lakshmi Bhaskar, Varshini M and Sahana K R** published a paper titled “**GLOBAL SEA LEVEL PREDICTION USING MACHINE LEARNING**”, in International Journal of Novel Research and Development, 2025, ISSN 2456-4184.
- **Jyotirmay H R, Monisha R, Niharika H and Ashwini S Savanth** published a paper titled “**A Survey on Intelligent Vision-Based Systems for Surface Defect Detection in Electric Vehicle Components**”, in International Journal of Engineering and Science Invention, Volume 14 Issue 10 October 2025 PP 13-17, DOI: 10.35629/6734-14101317.
- **Ashwini S Savanth, P S Ravindranath, Sukruth Raghavendra R, Rashmitha R Shet, and Shamitha M** published a paper titled “**Beyond Line-of-Sight Vision Assistance for Forklift Operations**”, in International Research Journal of Engineering and Technology, Volume 12, Issue 7, 2025.
- **Sakshi Shivakumar, Vivek Raviraj D, Dr. Yasha Jyothi M Shirur** “**Low Power-Aware ATPG for Scan Based Testing**” International Journal of Science and Engineering Invention (IJSEI). Vol. 11, Issue 11 No. 10 (Nov. 2025), Pp-161–167. DOI: <https://doi.org/10.23958/ijsei/vol11-i11/304>, UGC Care Journal. Open Access Publication ISSN: 2455-4286. <https://ijsei.in/index.php/ijsei/article/view/304>.
- **Sriraksha Srinivas, Pujitha Padmanabha, Sudipta Sunil, Dr. Yasha Jyothi M Shirur** “**ASIC-Oriented RTL Implementation of ASCON-128 for IoT Devices**”. International Journal of Science and Engineering Invention (IJSEI). Vol. 11, No. 10 (Oct. 2025), Pp-117–121. DOI: <https://doi.org/10.23958/ijsei/vol11-i10/298>. UGC Care Journal. Open Access Publication ISSN: 2455-4286.

- **Lochana Palani, Jagruthi B, Dr. Yasha Jyothi M Shirur “Design and Implementation of a Neural Processing Element (NPE) for Edge AI Applications”** International Journal of Science and Engineering Invention (IJSEI). Vol. 11, No. 10 (Oct. 2025) Pp- 141-147 DOI: <https://doi.org/10.23958/ijsei/vol11-i10/300>. UGC Care Journal. Open Access Publication ISSN: 2455-4286. <https://ijsei.in/index.php/ijsei/article/view/300>
- **Pratheek S K, Rathik, Srikanth B R and Sunitha S V** published a paper titled **“A Survey on Real-Time Water Surveillance Boat with Object Detection and Conveyor Belt Retrieval”**, in International Journal of Scientific Research in Computer Science, Engineering and Information Technology, Volume 11, Issue 6, Pg. No 185-192, doi:10.32628/CSEIT2511631.
- **Niranjan D N, Tilak Naidu R, Vijay Aditya and Dr. Sunitha S V** published a paper titled **“A Survey on Wireless Charging of Electric Vehicles”**, in International Journal of Scientific Research in Computer Science, Engineering and Information Technology, vol 11, issue 6, pg no: 128-136, doi:10.32628/CSEIT2511621.
- **S V Vikas, Srinivas BV, Sharan Sheshadri, and Keerthi Kulkarni** published a paper titled **“A Survey on Master–Slave FPV Drone Systems for Military Reconnaissance and Coordinated Aerial Operations”**, in Int. J. Sci. Res. Comput. Sci. Eng. Inf. Technol, vol. 11, no. 5, pp. 198–204, Oct. 2025, doi: 10.32628/CSEIT2511719.
- **Kshitij Satish, Shamanth V, Suhaas B R, and Dr Keerti K** published a paper titled **“Wearable AI System for Real Time Threat Detection and Dual Spectrum Analysis”**, Int. J. Sci. Res. Comput. Sci. Eng. Inf. Technol, vol. 11, no. 5, pp. 182–187, Oct. 2025, doi: 10.32628/CSEIT2511721.
- **Amithesh Y, Dhyuthi K A, Rathna V and Priyadarshini K Desai** published a paper titled **“Survey on AI based Network Anomaly Detection for next generation wireless communication system for performance enhancement”**, in International Research Journal of Engineering and Technology, Volume: 10, Issue: 03, 2024, ISSN: 2395-0072.
- **Adithya M Bhat, Anuchinmayee C, K J Shreesha and Priyadarshini K Desai** published a paper titled **“A Survey on Trends of Touchscreen Solenoid Door Lock System”**, in International Research Journal of Engineering and Technology, Volume: 12 Issue: 10, ISSN: 2395-007.
- **Vinay Gowda D J, Tarun B G and Sudarshan** published a paper titled **“Concrete Testing Device for In-Site Strength Evaluation and Aging Prediction of RCC Structures”**, in International Journal of Scientific Research in Computer Science, Engineering and Information Technology, Volume 11, Issue 6, 2025, CSEIT2511647, ISSN: 2456-3307.

Quiz

1. Which semiconductor device is commonly used as a fast electronic switch in communication circuits?
2. If an antenna were a musical instrument, which property would be like its 'tuning'?
3. In optical fiber communication, which phenomenon allows light to propagate through the fiber core?
4. Which modulation technique varies the frequency of the carrier signal to transmit information?
5. If a microprocessor were a band, which part would be the drummer keeping everyone in rhythm?
6. Which electronic component acts like a traffic light, allowing current to flow in only one direction while blocking it in the other direction?

ECE ROADMAP

3 YEARS TO A FUTURE-READY CAREER IN ELECTRONICS & COMMUNICATION ENGINEERING

BUILD TODAY • INNOVATE TOMORROW • LEAD THE NATION



**SEMICONDUCTOR
MISSION**



Digital India
Power To Empower



NEP 2020
Transforming Education
Empowering India



Ministry of Education
Government of India



5G/6G

1 STRENGTHENING CORE FUNDAMENTALS (YEAR 1)

Focus: Build a strong academic and practical base

MASTERING CORE SUBJECTS

- Analog & Digital Electronics
- Signal Processing & Communication Systems
- Microprocessors & Microcontrollers
- Control Systems & Instrumentation
- VLSI Basics

PROGRAMMING & TOOLS

Languages: Python, MATLAB, Verilog, C/C++

Tools: Cadence, Xilinx, LabVIEW

MINI PROJECTS & HACKATHONS

- IoT-based smart automation systems
- FPGA-based digital design experiments
- Wireless sensor network prototypes

LEVERAGING NATIONAL PLATFORMS

swayam NPTEL Skill India

Free courses on SWAYAM, NPTEL & Skill India

CERTIFICATIONS

Short-term certifications from Coursera, IEEE & Government skill portals

YEAR 1 GOAL: Build a strong academic and practical base, enabling exploration of advanced areas aligned with industry and national priorities.

2 BUILDING SPECIALIZED SKILLS & INDUSTRY READINESS (YEAR 2)

Focus: Develop domain expertise & industry exposure

SPECIALIZATION DOMAINS

- VLSI & Semiconductor Industry
- Communication & Networking
- Embedded Systems & IoT
- AI & ML Applications in ECE

INDUSTRY INTERNSHIPS & PROJECTS

Engage with startups & semiconductor firms supported under Atmanirbhar Bharat initiative.

RESEARCH & PUBLICATIONS

Participate in research encouraged by NEP 2020's emphasis on innovation. Publish in IEEE & Scopus-indexed journals/conferences.

INSTITUTIONAL SUPPORT

- Ministry of Education's Innovation Cell (MIC)
- Institution's Innovation Council (IIC) for incubation & mentorship

YEAR 2 GOAL: Develop domain expertise and identify a clear career direction—industry, higher studies, research or entrepreneurship.

3 PREPARING FOR THE COMPETITIVE WORLD (YEAR 3)

Focus: Convert skills into career opportunities & impact

(a) CAREER OPPORTUNITIES IN INDIA & ABROAD

- Core Electronics Jobs** – semiconductor firms, telecom companies, PCB design houses, embedded systems firms
- Government Sector** – DRDO, ISRO, BEL, BHEL, BSNL & other public enterprises
- IT & Software Careers** – AI-ML, cloud computing, cybersecurity, data science

(b) HIGHER STUDIES & RESEARCH

- National Exams – GATE, CSIR-NET, UPSC ESE
- Global Studies – GRE, TOEFL/IELTS for MS/PhD in VLSI, communication, robotics, signal processing
- NEP 2020 Support – multidisciplinary research & international collaboration

(c) ENTREPRENEURSHIP & STARTUPS

- Startups in IoT, EV electronics, smart grids, healthcare devices
- Leverage schemes – Atal Innovation Mission, Startup India, MSME support programs
- Utilize university incubation centers enabled by NEP 2020

YEAR 3 GOAL: Transition confidently into the professional world with technical depth, adaptability and an entrepreneurial mindset.

KEY FUTURE TRENDS FOR ECE ENGINEERS

- SEMICONDUCTOR MANUFACTURING IN INDIA**
Driven by Semiconductor Mission & global chip demand
- 5G & 6G COMMUNICATION**
Enabling smart cities, IoT ecosystems & next-gen telecom
- AI-DRIVEN ELECTRONICS**
Edge AI, healthcare devices & smart automation
- AUTOMOTIVE ELECTRONICS & EVs**
Intelligent transportation, BMS, sensors & autonomous systems
- SUSTAINABLE ELECTRONICS**
Renewable energy integration, power electronics & green communication

SKILLS TO CULTIVATE



Strong Fundamentals



Programming & Tools



Problem Solving & Innovation



Teamwork & Communication



Adaptability & Lifelong Learning



Ethics & Nation Building

"The future of India is being engineered today. Be skilled. Be innovative. Be the change."

Did You Know

- The human brain contains roughly 86 billion neurons.
- Octopus have three hearts and blue blood.
- A day on Venus is longer than its year.
- Water can exist naturally on Earth as a solid, liquid, and gas.
- Apollo 11 Moon Landing was the first mission to land humans on the Moon.
- The largest organ in the human body is the skin.
- Honey Bee communicate through movements known as the "waggle dance."
- The speed of light in a vacuum is about 299,792 kilometers per second.
- Australia is home to more than 10,000 beaches.

Conference Publications

- **Shriharini Suresh and Pranathi A** presented a paper titled “**ECG Signal Analysis for Heart Rate Variability and Cardiac Event Detection**” in the **2025 IEEE International Conference on Compute, Control, Network & Photonics (ICCCNP)** held in Bangalore, India, 2025, pp. 1–6, doi: 10.1109/ICCCNP63914.2025.11233528.
- **Amulya R Prasad, Bhoomika K, Jahnavi A R, Subodh Kumar Panda, Rekha P, and Bindu S** presented a paper titled “**Integrated DAM Automation System**” in the **IEEE International Conference for Women in Innovation, Technology & Entrepreneurship (ICWITE)**, 2025, doi: 10.1109/ICWITE64848.2025.11306959.
- **S Kishore, Sumukh G, Tharun R, Subodh Kumar Panda, Bindu S, and Rekha P** presented a paper titled “**Design and Verification of a Proactive Lane Guidance System using System Verilog**” in the **Third International Conference on Emerging Applications of Material Science and Technology (ICEAMST)**, 2025, doi: 10.1109/ICEAMST67459.2025.11335635.
- **Sumukh G, Tharun R, S Kishore, Subodh Kumar Panda, Rekha P, and Bindu S** presented a paper titled “**Verification and Synthesis of Multi-Master Multi-Slave AXI4 Stream Interconnect using System**” in the **Third International Conference on Emerging Applications of Material Science and Technology (ICEAMST)**, 2025, doi: 10.1109/ICEAMST67459.2025.11335930.
- **Priyadarshini S, Neha S Hosamath, Subodh Kumar Panda, Smitha Gayathri D, Bindu S, and Rekha P** presented a paper titled “**Design and Verification of a 16-Bit Multi-Slave SPI Protocol in System Verilog Slave AXI4 Stream Interconnect using System**” in the **5th International Conference on Mobile Networks and Wireless Communications (ICMNWC)**, 2025, doi: 10.1109/ICMNWC66779.2025.11354444.
- **Smitha Gayathri D, Arpitha Kulkarni, Subodh Kumar Panda, Rachana R, Shreesh, and Keerthana** presented a paper titled “**Soil Nutrient Prediction and Crop Recommendation System: Conventional to Modern Methods of Soil NPK Sensing**” in the **International Conference on Intelligent and Innovative Technologies in Computing, Electrical and Electronics (IITCEE)** organized by B N M Institute of Technology, 2025, doi: 10.1109/IITCEE64140.2025.10915247.
- **Shamanth K S, Tilak Prasad K M, Sumanth B, Rekha P, Subodh Kumar Panda, and Bindu S** presented a paper titled “**Comparative Analysis of Common Source Amplifiers with Resistive and Diode Connected Loads in 45nm and 90nm Technologies**” in the **2025 IEEE International Conference on Compute, Control, Network & Photonics (ICCCNP)**, 2025, doi: 10.1109/ICCCNP63914.2025.11233719.
- **Neha S Hosamath, Priyadarshini S, Nazim Khan, Bindu S, Yasha Jyothi M Shirur, and Subodh Kumar Panda** presented a paper titled “**Design and Comparative Analysis of Logic Styles for Low-Power and High-Speed Applications in 45nm and 90nm CMOS Technology**” in the **5th International Conference on Mobile Networks and Wireless Communications (ICMNWC)**, 2025, doi: 10.1109/ICMNWC66779.2025.11354420.
- **Rakshitha A, Shilpa R, Bindu S, Neha S Hosamath, Subodh Kumar Panda, and Smitha Gayathri D** presented a paper titled “**Gate-level Comparison of CMOS and GDI Logic Gates with the Design of a 16-Bit Kogge-Stone Adder using GDI Technique**” in the **2025 IEEE International Conference on Compute, Control, Network & Photonics (ICCCNP)**, 2025, doi: 10.1109/ICCCNP63914.2025.11233572.
- **M. Roy, V. Bhandage, A. Jeyabose, S. Prabhu, and Manjunath G. Asuti** presented a paper titled “**Synergizing EEG and MRI for Autism Classification: Exploring the Feasibility of Machine Learning Models**” in the **2025 International Conference on Cognitive, Green and Ubiquitous Computing (IC-CGU)** held in Bhubaneswar, India, 2025, pp. 1–7, doi: 10.1109/IC-CGU67042.2025.11337976.
- **M. N. Kumar, C. G, G. G. R, Sudarshan Bhat, and Manjunath G. Asuti** presented a paper titled “**Real-Time Tracking and Control in Smart Hydroponics: Advancing Urban Farming Solutions**” in the **2025 IEEE 7th International Conference on Computing, Communication and Automation (ICCCA)** held in Greater Noida, India, 2025, pp. 1–6, doi: 10.1109/ICCCA66364.2025.11325708.

- Shreyas S, Manjunath G. Asuti, and Sudarshan Bhat presented a paper titled “Modelling and Analysis of Battery Thermal Management Systems using Simulink for Electric Vehicles” in the **2025 5th International Conference on Mobile Networks and Wireless Communications (ICMNWC)** held in **Tumkur, India, 2025**, pp. 1–6, doi: 10.1109/ICMNWC66779.2025.11354364.
- D. N. Niranjana, R. Tilak Naidu, V. Aditya, S. Bindu, M. K. Prashanth, and K. Kulkarni presented a paper titled “Analysis of ECG Signal for the Detection of Arrhythmia and Atrial Fibrillation” in the **2025 5th International Conference on Mobile Networks and Wireless Communications (ICMNWC)** held in **Tumkur, India, 2025**, pp. 1–5, doi: 10.1109/ICMNWC66779.2025.11354404.
- Suhaas B R, Shamanth, and Keerti Kulkarni presented a paper titled “Assessing Urban Heat Vulnerability through Remote Sensing” in **ETCC-2025** organized by **PES University, 2025**, doi: 10.1109/ETCC65847.2025.11108370.
- Shriniketana Kalale, Subramanya D, Varshini R, and Keerti Kulkarni presented a paper titled “Detection and Extraction of Sound Vibrations from Silent Videos using MATLAB” in the **2025 IEEE 2nd International Conference on Information Technology, Electronics and Intelligent Communication Systems (ICITEICS)** held in **Bengaluru, India, Aug 30–31, 2025**, doi: 10.1109/ICITEICS64870.2025.11340842.
- Niveditha, G. K. Shashank, R. R. Sumanth, P. K. Desai, and N. Hemanth Prasad presented a paper titled “Design and Analysis of SRAM Circuits at 45nm Technology Using Sleeper Cells” in the **2025 Second International Conference on Computing, Semiconductor, Mechatronics, Intelligent Systems and Communications (COSMIC)** held in **Mangalore, Karnataka, India, 2025**, pp. 330–336, doi: 10.1109/COSMIC67569.2025.11380847.
- Mahima S K and Priyadarshini K. Desai presented a paper titled “A Study on Beamforming Capabilities of Yagi-Uda versus Short Dipole Antennas” in the **2025 Second International Conference on Computing, Semiconductor, Mechatronics, Intelligent Systems and Communications (COSMIC)** held in **Mangalore, Karnataka, India, 2025**, pp. 1–6, doi: 10.1109/COSMIC67569.2025.11380950.
- Disha R, Kubra Khanum, Mandaara S, Yasha Jyothi M Shirur, B S Prathibha, Rekha P “Cost Effective Fluoride Removal from Drinking Water for Rural Communities: A Sustainable Treatment” presented in **2025 International Conference on Emerging Technologies in Electronics and Green Energy (ICETEG)**, JSS Science and Technology University, Mysuru held on 8th to 10th October 2025.
- T. R, S. G, S. Kishore, B. S, N. Sheshaprasad and Yasha Jyothi M. Shirur, "Design and Implementation of 4-Bit Ripple Carry Adder using SC-SS Technique," **2025 IEEE International Conference on Compute, Control, Network & Photonics (ICCCNP)**, **Bangalore, India, 2025**, pp. 1-6, doi: 10.1109/ICCCNP63914.2025.11233675.
- Abhishek P, Anaghaa R, Likith B G, Dr. Yasha Jyothi M Shirur “Design and Synthesis of All Digital Phase Locked Loop with optimized Digital Controlled Oscillator” presented at the **6th IEEE India Council International Subsection Conference** organized by **IEEE Rourkela Subsection and IEEE India Council** held at **National Institute of Technology, Rourkela** from 21st to 23rd August 2025. <https://ieeexplore.ieee.org/document/11254432>

Books/Book Chapters

- D. Smitha Gayathri, K.R. Usha Rani, Yasha Jyothi M Shirur Vehicular Power Line Communication published in book **Digital Convergence in Intelligent Mobility Systems** published by by Scrivener (Wiley) publication on 11.07.2025. <https://onlinelibrary.wiley.com/doi/chapter-epub/10.1002/9781394275274.fmatter>
- Reena Kulkarni and Keerti Kulkarni authored the book “**Industrial Cyber-Physical Systems: Building Resilience for Industry 4.0**” published by **Book Bytes International Publications**, Sept 2025, ISBN: 978-81-991695-3-1.

Departmental Events

Industrial visit to DSEdify Pvt. Ltd, Bangalore

The IEEE-GRSS BNMIT Student Branch Chapter (SBC14831F), in association with the Department of Electronics and Communication Engineering, organized a one-day industrial visit to DSEdify Pvt. Ltd., Bangalore, on 4th July 2025. Forty-five students, guided by faculty advisor Dr. Keerti Kulkarni, attended the visit, aimed at bridging academic learning with industry practices.



The session included an introductory presentation on the company's mission and work culture, followed by interactive sessions with professionals from product development, instructional design, and technology support. Students explored AI-driven e-learning tools, witnessed live demonstrations, and gained insights into career opportunities in the edtech sector. Refreshments were provided, and the visit was highly enriching.

Internship on “Modelling and Analysing Dynamic Systems using MATLAB Simulink”

The Department of Electronics and Communication Engineering, in association with the ISTE Student Chapter – BNMIT and IEEE SPS Student Branch, organized an internal internship on “Modelling and Analysing Dynamic Systems using MATLAB Simulink” from 21st July to 9th August 2025 for the 3rd semester B.E. 2024 batch guided by Dr. Yasha Jyothi M Shirur, Head of the Department.



The program introduced students to electronic system modelling through Simulink. Sessions covered fundamentals of electronic circuits, control systems, communication, and signal processing, with hands-on activities in analog/digital modulation and circuit design. The internship concluded with a quiz, project presentations, and Simulink Onramp certification, enhancing technical skills and collaborative learning.

Artificial Intelligence in Drug Discovery: Bridging High-Content Screening to Target Discovery

The Department of Electronics and Communication Engineering at B.N.M. Institute of Technology (Autonomous), Bengaluru, in association with the IEEE Signal Processing Society – BNMIT Student Branch Chapter and IEEE Engineering in Medicine & Biology Society (EMBS) – BNMIT Student Branch Chapter, organized a technical talk on “Artificial Intelligence in Drug Discovery: Bridging High-Content Screening to Target Discovery” on 4th July 2025, BNMIT Campus.



The session, attended by 140 participants, aimed to highlight the pivotal role of research in accelerating innovation in Artificial Intelligence and to inspire contributions to AI-driven biomedical research. Delivered by Prof. Arvind Rao from the University of Michigan, the talk explained how AI converts microscopy images into quantifiable data, analyses cellular responses to compounds, and links high-content screening to target identification.

Alumni Talk on “From Textbooks to Targets: RF Systems in Real-World Engineering”

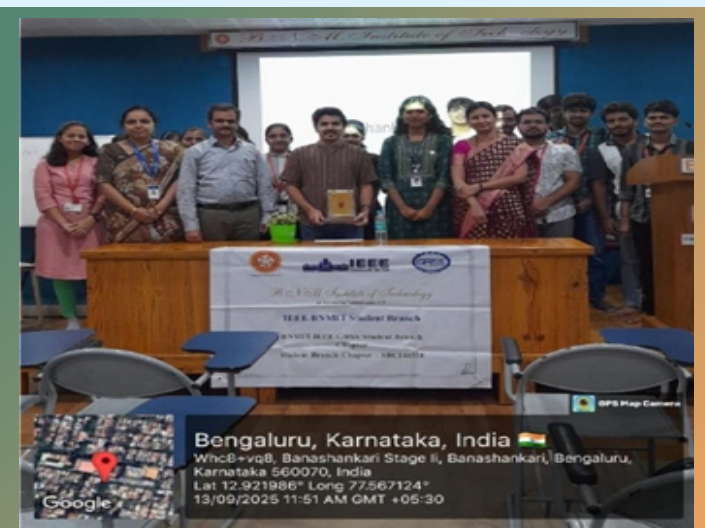
The Department of Electronics and Communication Engineering organized an Invited Alumni Talk on “From Textbooks to Targets: RF Systems in Real-World Engineering” on 12th August 2025 under the IEEE-GRSS Student Branch Chapter.



The session, attended by 110 students and guided by faculty advisor Dr. Keerti Kulkarni, was delivered by alumnus Varun R. Chaturvedi from the Radar Division of Bharat Electronics Ltd. (BEL), Bangalore. The talk connected theoretical RF concepts to practical satellite and radar operations, emphasizing electromagnetic waves, RF circuits, and sensors. He also discussed system costs and career opportunities in companies working on radar and satellite technologies.

Talk on “Machine Learning for Climate Science & Earth Observation”

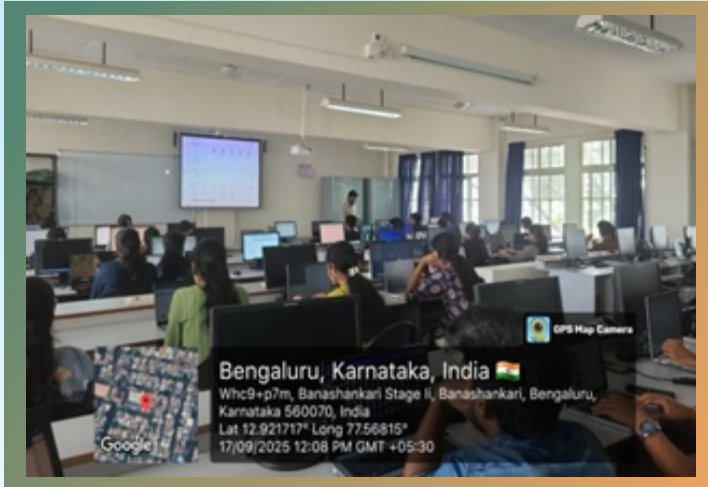
The IEEE-GRSS BNMIT Student Branch Chapter organized an Invited Talk on “Machine Learning for Climate Science & Earth Observation” on 13th September 2025. The session was attended by 68 students and guided by faculty advisor Dr. Keerti Kulkarni.



The invited speaker, Mr. Aman Bagrecha, Geospatial Scientist at GalaxEye Space and Young Professional Chair of IEEE GRSS, Bangalore Chapter, addressed students enrolled in the elective “Machine Learning for Earth Science.” He discussed emerging geospatial techniques for climate analysis, highlighting remote sensing applications in defense operations, carbon footprint assessment, machine learning algorithms, open-source tools, and freely available datasets for academic projects and research.

Workshop on “MATLAB for Intelligent Image Processing”

The IEEE-GRSS BNMIT Student Branch Chapter (SBC14831F) organized a workshop on “MATLAB for Intelligent Image Processing” on 17th September 2025 from 10:00 AM to 4:00 PM in N504. The session, attended by 50 students and guided by faculty advisor Dr. Keerti Kulkarni, was delivered by Mr. Avinash V, Application Engineer at CoreEI Technologies, Bangalore.



The workshop aimed to expose 5th semester students to real-world satellite and biomedical images beyond the regular curriculum. Participants were introduced to fundamental image processing techniques, including filtering, segmentation, enhancement, and feature extraction using MATLAB tools and toolboxes. Hands-on demonstrations and practical exercises enabled students to analyse complex image datasets effectively, enhancing their technical skills and understanding of real-time applications in remote sensing and biomedical imaging domains.

IEEE GRSS Debate Competition

The IEEE-GRSS BNMIT Student Branch Chapter (SBC14831F) organized the “IEEE GRSS Debate Competition” on 9th October 2025 at N401, BNMIT, under the guidance of faculty advisor Dr. Keerti Kulkarni. The two-hour event was attended by 18 students and was judged by Ms. Deepa R. P. The debate focused on themes such as “Satellites and Space Exploration: Progress for Humanity or Global Risk?” and “Technology and Policy: Who Leads the Future?”.



Participants presented well-researched arguments, engaged in rebuttals, and expressed diverse viewpoints on emerging technological and policy challenges. The competition evaluated students on content knowledge, communication skills, rebuttal ability, teamwork, and audience engagement. Overall, the event successfully enhanced critical thinking, research ability, and confidence in public speaking, while promoting awareness of technological advancements and their societal impact.

Medical Screening Camp on “Healthy Women – Healthy Society”

The IEEE GRSS BNMIT Student Branch Chapter (SBC14831F) organized a medical screening camp titled “Healthy Women – Healthy Society” on 27th October 2025 at BNM Institute of Technology, Banashankari. The event was conducted as part of Pink October 2025 by IEEE GRSS and IEEE Women in Engineering (WIE) in association with the Centre of Excellence in Healthcare and Smart Technology.



The camp aimed to promote women's health awareness and early detection of common health issues. A total of 32 women aged 25 years and above participated in the screening and consultations conducted by medical experts from Sagar Chandramma Hospitals, including Dr. Hymavati Raje (Breast Oncologist), Sri. Paniel J (Medical Manager), and Dr. Sonali Pulse. The event concluded successfully, highlighting the importance of regular health checkups and preventive healthcare for women's well-being.

Breast Cancer Awareness Talk

The IEEE Geoscience and Remote Sensing Society (GRSS) in association with IEEE Women in Engineering (WIE) at B.N.M. Institute of Technology organized a Breast Cancer Awareness Talk on 30th October 2025 at the N401 Seminar Hall, which was attended by 30 participants. The session was delivered by Dr. (Mrs.) Pushpa Srinivas, a distinguished Obstetrician and Gynaecologist and consultant at Sagar and Agadi Hospitals, Bengaluru.



Dr. Pushpa Srinivas emphasized the importance of early detection, regular screening, and genetic testing in preventing breast cancer. She explained screening methods such as mammograms, ultrasounds, and MRIs, along with common risk factors, treatment options, and healthy lifestyle practices that can reduce the risk of breast cancer. The interactive session helped participants understand preventive care and dispel common myths, making the event both informative and impactful.

Menstrual Hygiene Awareness Talk

The IEEE Geoscience and Remote Sensing Society (GRSS) in association with IEEE Women in Engineering (WIE) at B.N.M. Institute of Technology organized a Menstrual Hygiene Awareness Talk on 31st October 2025 at the N401 Seminar Hall, attended by 22 participants. The session was delivered by Mrs. Vedashree, an NGO worker associated with Health for Women, Bengaluru.



Mrs. Vedashree emphasized the importance of maintaining proper menstrual hygiene and discussed its connection with various health risks and cancers in women. The talk, mainly aimed at students, also highlighted the use of eco-friendly sanitary napkins and compared the advantages and disadvantages of different sanitary napkin brands available in India. The interactive session helped participants understand the correct usage and importance of hygienic practices during menstruation.

Answers

1. MOSFET

4. FM

2. Resonant Frequency

5. The Clock signal

3. Total internal reflection

6. Diode

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