

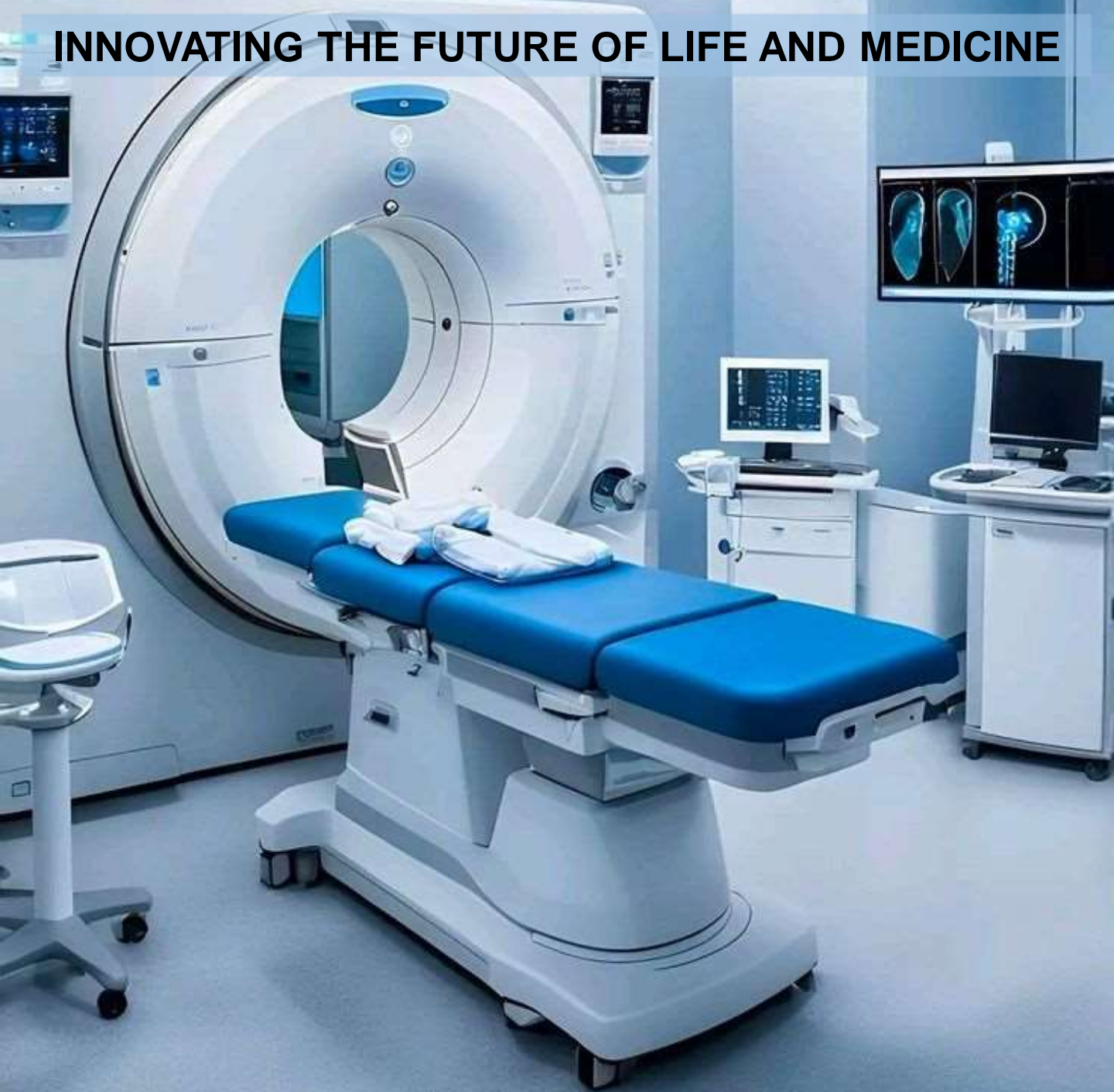


Vel Tech
Rangarajan Dr. Sagunthala
R&D Institute of Science and Technology
(Deemed to be University Estd. u/s 3 of UGC Act, 1956)



BIOVERSE

INNOVATING THE FUTURE OF LIFE AND MEDICINE



JAN 2026

SCHOOL OF ELECTRICAL AND COMMUNICATION

VOLUME X

DEPARTMENT OF BIOMEDICAL ENGINEERING

Institute Vision

To create, translate and disseminate frontiers of knowledge embedded with creativity and innovation for a positive transformation of emerging society.

Institute Mission

- M1:** To nurture excellence in teaching, learning, creativity and research; translate knowledge into practice
- M2:** To foster multidisciplinary research across science, medicine, engineering, technology and humanities
- M3:** To incubate entrepreneurship; instill integrity and honour
- M4:** To inculcate scholarly leadership towards global competence and growth beyond self in a serene, inclusive and free academic environment

Department Vision

To be recognized as an excellent centre in Biomedical Engineering for imparting quality technical education that leads to transformative advancements in healthcare industries

Department Mission

- M1:** To infuse critical thinking skills by providing a strong foundation that enables the students for continuing education
- M2:** To create an ambience of academic excellence with state-of-the-art laboratories to compete globally
- M3:** To establish a dynamic research environment that integrates advanced healthcare technologies for innovation and progress

Program Education Objectives

- PEO1:** Exhibit proficiency in designing and analyzing healthcare solutions to cater to the needs of the medical industry and societal needs
- PEO2:** Demonstrate professional networking in a diverse team setting and collaborate among peers with ethical practices in the workplace, ensuring integrity
- PEO3:** Reinforce lifelong learning practices for professional advancement not limited to higher studies and research.

Program Special Outcomes

- PSO1:** Apply critical reasoning to analyse, identify and solve solutions for problems related to Brain-Computer Interface (BCI)
- PSO2:** Design an effective interface between biological and electronic systems.
- PSO3:** Apply the knowledge of Artificial intelligence in healthcare engineering to solve real-time problems

Magazine Credits

From the Magazine Team

This magazine emerges as a record of experiences, accomplishments, and lessons learned. Carefully curated with dedication and creativity, this edition captures the essence of our department's journey—one marked by continuous learning, innovation, and resilience. The magazine brings together student achievements, technical explorations, and creative endeavors that highlight the multifaceted nature of our academic environment. May this magazine serve as a source of motivation, pride, and lasting memories.

HAPPY READING !

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DEAN'S Desk



As we begin a new academic year and present the January 2026 edition of our departmental magazine, it is rewarding to reflect on the steady growth of the Biomedical Engineering department. Over the years, this publication has evolved into a meaningful record of our department's progress, innovation, and shared vision.

The past year has been marked by continued advancement and adaptation. As science, technology, and healthcare evolve rapidly, our academic approach has expanded beyond traditional classrooms to emphasize interdisciplinary learning, real-world application, and societal relevance. In this landscape, Biomedical Engineering plays a vital role in connecting engineering principles with healthcare needs.

Our department has consistently demonstrated strength in integrating emerging technologies with core engineering foundations. Of particular note is the focus on translating academic learning into practical solutions that address clinical and societal challenges.

This balance of academic rigor and social responsibility reflects our institutional values. I extend my sincere appreciation to the Department of Biomedical Engineering and the editorial team for their efforts in capturing these achievements. May this edition inspire continued innovation, collaboration, and a strong commitment to advancing healthcare in the year ahead.

Prof. Dr. R S Valarmathi

Dean- School of Electrical & Communication

HoD'S Reflection



As we welcome the new year and present the January 2026 edition of our departmental magazine, it is encouraging to reflect on the steady progress of the Biomedical Engineering department. Over time, this magazine has evolved into a meaningful platform that highlights our academic growth, innovation, and shared vision.

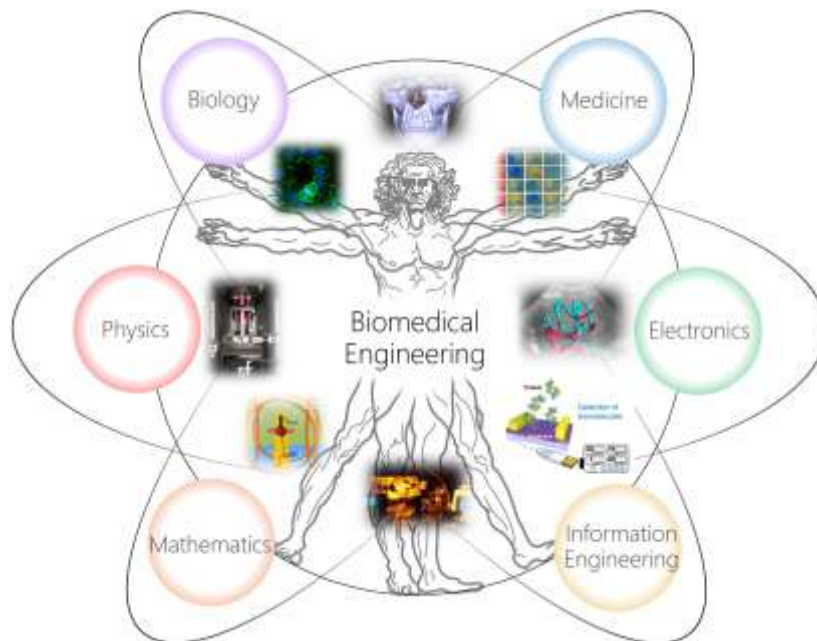
The department has consistently promoted learning beyond the classroom. Curiosity is encouraged, ideas are explored, and innovation is nurtured. The pages that follow reflect this journey. They feature academic achievements, technical initiatives, industry and research engagements, and creative contributions by students and faculty. Together, these efforts showcase the department's evolving identity and its commitment to real-world healthcare challenges.

This edition also reflects the spirit of collaboration that defines our department. Faculty mentorship, peer learning, and teamwork have played a vital role in shaping meaningful outcomes. Such collective efforts continue to strengthen our academic environment and prepare students for future challenges.

May this edition serve as a reflection of our collective efforts and a source of motivation for the future. I extend my sincere appreciation to the editorial team for their dedication in presenting this account of our department's progress.

Dr. Balasubramaniam. D

About the Department



The Department of Biomedical Engineering was established in the year 2017 with the objective of bridging engineering principles with medical and biological sciences to address challenges in healthcare. The department offers B.Tech. and Ph.D. programs, aimed at developing skilled professionals and researchers capable of contributing to healthcare technology, medical device development, and biomedical research. Emphasis is placed on outcome-based education, hands-on learning, and research-oriented training. With a focus on emerging areas such as medical imaging, biomechanics, biomedical signal processing, and artificial intelligence in healthcare, the department strives to produce graduates who are industry-ready, research-driven, and socially responsible.

Skills Enrichment Program

The **Biomedical Engineering Department** organized a **Skills Enrichment Program** to enhance the technical knowledge and practical abilities of students. The main objective of this program was to provide students with additional learning opportunities beyond the regular academic curriculum and help them develop industry-relevant skills.

During the program, students were introduced to various emerging technologies and tools related to biomedical engineering. Experts and faculty members conducted sessions on topics such as medical instrumentation, biomedical signal processing, programming fundamentals, and the application of modern technologies in healthcare. Hands-on training sessions and demonstrations were also included to give students practical exposure and improve their problem-solving abilities. The program encouraged students to actively participate in discussions, practical activities, and collaborative learning. It helped them understand real-world biomedical applications and strengthened their analytical and technical skills. Students also gained confidence in using different software tools and biomedical devices, which are essential for research and professional development.

Overall, the **Skills Enrichment Program** was highly beneficial for the students as it improved their knowledge, creativity, and technical competence. The initiative by the Biomedical Engineering Department played an important role in preparing students for future academic projects, research activities, and career opportunities in the biomedical and healthcare industries.

In addition, the program created a platform for students to interact with faculty members and peers, allowing them to exchange ideas and learn from each other's experiences. Such

Skills Enrichment Program



News in Trend- AI Wearable Cracks the Stress Code

Machine learning-powered wearables are revolutionizing stress monitoring, potentially transforming mental health management and preventive care for chronic. Researchers at UC Irvine unveiled the Smart Quantitative and Comprehensive Stress Assessor and Sub-Classifier (SQC-SAS) in late January 2026, a wearable bioelectronic device that simultaneously tracks molecular biomarkers like sweat cortisol alongside physiological signals such as heart rate and skin conductance. These multimodal inputs provide a comprehensive, real-time stress profile that traditional methods cannot match.

In everyday life, stress triggers complex biochemical and physiological responses that contribute to widespread health issues, from anxiety and depression to cardiovascular disease and obesity—conditions affecting over half of adults in recent global surveys. While conventional cortisol tests require invasive blood draws in clinical settings and single-signal wearables like heart rate monitors often yield inaccurate readings due to factors like exercise or diet, SQC-SAS delivers wireless, battery-free, automated monitoring accessible anywhere.

For individuals with chronic stress or at-risk populations, this technology enables early intervention by providing objective data that self-reports or sporadic checkups miss, paving the way for personalized wellness plans and therapies.

SQC-SAS represents a paradigm shift in biomedical engineering by integrating multimodal biosensors with AI-driven analysis to decode stress dynamics with unprecedented accuracy. Its graph-based machine learning model synchronizes disparate signals into actionable insights, overcoming the pitfalls of isolated metrics and enabling precise sub-classification of stress types. This innovation bridges wearable tech and molecular biology, accelerating the development of proactive health tools that could reduce the societal burden of stress-related disorders and redefine everyday mental health tracking.

News in Trend- Stem Cell Based Living Drugs

Stem cell engineering is unlocking scalable "off-the-shelf" immune therapies, potentially revolutionizing treatments for cancer, infections, and autoimmune diseases. Researchers at UBC and BC Children's Hospital Research Institute announced a breakthrough on January 8, 2026, demonstrating how to reliably produce helper T cells—key orchestrators of immune responses—from stem cells in controlled lab conditions. These cells mimic natural human helper T cells, complete with diverse receptors and specialized subtypes that activate killer T cells and coordinate immunity.

In clinical practice, current cell therapies rely on patient-specific cells, which are costly, time-intensive to produce, and inaccessible for many, limiting their reach despite successes against blood cancers and other diseases. Helper T cells are essential because they amplify immune attacks on tumors or pathogens, yet generating them in a scalable fashion has remained a major hurdle—until now, when precise control of the Notch signaling pathway during stem cell differentiation solved the problem.

For patients facing aggressive cancers or chronic infections, this advance enables mass-produced, ready-to-use therapies that could slash costs and treatment delays while improving efficacy through balanced helper-killer T cell combinations.

This discovery represents a paradigm shift in biomedical engineering by cracking the code for reproducible immune cell manufacturing from renewable stem cell sources. By tuning developmental signals like Notch at exact time points, the method yields functional cells ready for biomanufacturing scale-up, bridging lab innovation and real-world therapies. This paves the way for affordable next-generation "living drugs" that enhance immunotherapy outcomes and expand access to precision medicine globally.

K Sahitya(VTU27297)

Best Project

GENERATIVE ARTIFICIAL INTELLIGENCE BASED AUGMENTATION TECHNIQUE FOR DIGESTIVE SIGNAL APPLICATIONS

The project titled “Generative Artificial Intelligence Based Augmentation Technique for Digestive Signal Applications” focuses on solving a major challenge in biomedical signal processing: the lack of sufficient Electrogastragram (EGG) data. EGG signals represent the electrical activity of the stomach and are useful for diagnosing digestive disorders. However, collecting such data is time-consuming and limited in availability.

❖EGG_Paper-5.pdf NoneTo address this issue, the project proposes a data augmentation approach using Generative Adversarial Networks (GANs), specifically a Deep Convolutional GAN (DCGAN). The system consists of two main components: a Generator and a Discriminator. The generator creates synthetic digestive signals from random noise, while the discriminator evaluates whether the signals are real or artificially generated. Through continuous competition, both models improve, resulting in highly realistic synthetic signals that closely resemble actual EGG data.

❖EGG_Paper-5.pdf NoneThe methodology involves several stages. First, real EGG signals are collected and preprocessed using filtering and artifact removal techniques to eliminate noise and interference. The signals are then segmented and normalized to prepare them for training. The DCGAN model is trained iteratively, where the generator learns to produce signals that can “fool” the discriminator, and the discriminator becomes better at distinguishing real from fake signals. Additionally, a frequency-based loss function using Fast Fourier Transform (FFT) is included to ensure that the generated signals maintain correct physiological frequency characteristics.

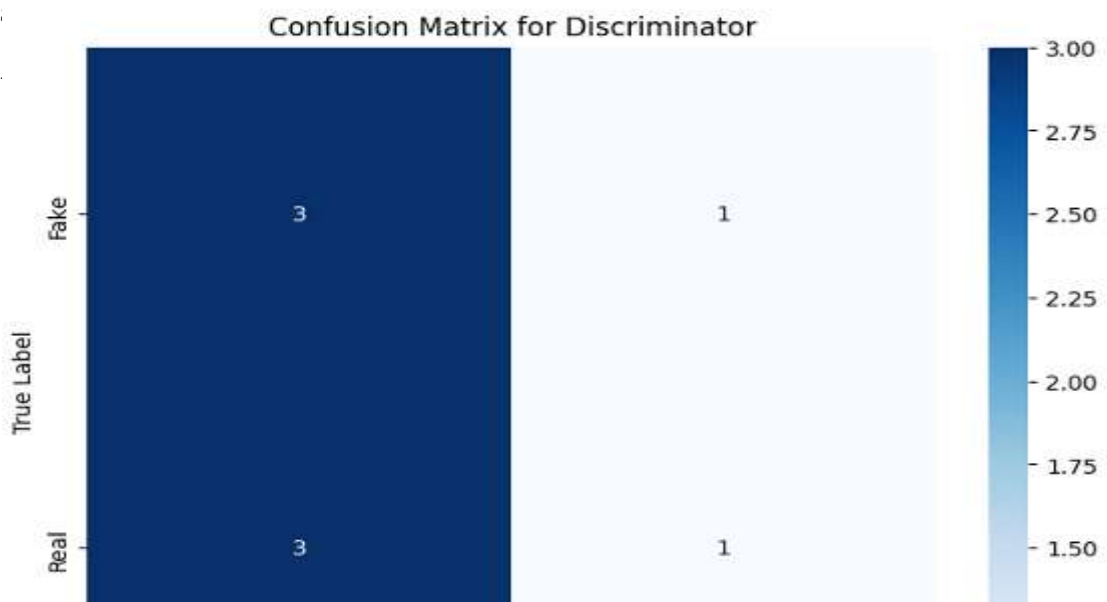
The model’s performance is evaluated using both time-domain and frequency-domain techniques. Metrics such as Mean Squared Error (MSE) and FFT analysis confirm that the generated signals closely match real EGG signals in structure and frequency range.

Best Project

Results show that the generator successfully produces realistic signals, even making it difficult for the discriminator to differentiate between real and synthetic data. [EGG_Paper-5.pdf](#)

This project has significant applications in healthcare, particularly in improving diagnostic systems, supporting medical research, and training machine learning models with limited data. It also contributes to advancements in non-invasive diagnostics and aligns with global goals such as improved healthcare access and innovation.

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C Shanmukha Sai Ganesh(VTU27371)

Alumni Spotlight

My time in the Biomedical Engineering Department has been a remarkable journey of learning, growth, and discovery. The department not only provided me with strong technical knowledge but also encouraged me to develop a broader perspective toward healthcare and innovation.

The faculty members were always approachable and supportive, creating a positive learning environment where students were motivated to excel. Their mentorship helped me strengthen my analytical thinking and inspired me to explore new advancements in biomedical technology.

A key highlight of my experience was the opportunity to work on various projects and participate in technical activities. These experiences enhanced my practical understanding and gave me the confidence to apply my knowledge in real-life situations. The department's focus on skill development and industry readiness played a crucial role in shaping my career path.

Beyond academics, the department also emphasized personal growth by encouraging teamwork, leadership, and effective communication. The friendships and experiences I gained during this time have left a lasting impact on me.

I am thankful to the department for guiding me at every step and helping me achieve my goals. It has been a proud journey, and I wish the department continued success in nurturing future biomedical engineers.

-MD Azharuddin

Gallery

