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R&D Institute of Science and Technology
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NAAC A++

BIOVERSE

INNOVATING THE FUTURE OF LIFE AND MEDICINE

JUNE 2025 SCHOOL OF ELECTRICAL AND COMMUNICATION

VOLUME IX 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 is a reflection of the people, ideas, and shared moments that shape our academic journey. It represents the collective spirit of a community that learns together, grows through challenges, and continuously strives to innovate throughout the year.

This edition brings together faculty perspectives, student accomplishments, technical progress, and creative expressions that capture the dynamic energy of our academic environment. Each section highlights a commitment to learning, innovation, and personal development, showing how diverse efforts come together to build a vibrant and evolving community. Beyond celebrating achievements, the magazine also acknowledges the curiosity, experimentation, and perseverance that make those successes possible.

May this magazine stand as a testament to the power of collaboration and the meaningful outcomes that can be achieved when individuals work together with a shared purpose.

HAPPY READING!"

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(Assistant Professor)

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DEAN'S Desk

The release of this edition of our departmental magazine offers an opportunity to pause and appreciate the direction in which the Biomedical Engineering department continues to move. This publication reflects a year of focused effort, thoughtful exploration, and steady progress by both faculty and students, capturing the momentum that defines our academic environment today.

Over the past year, higher education has continued to evolve alongside rapid developments in healthcare and technology. In response, our institution has strengthened its emphasis on applied learning, interdisciplinary thinking, and meaningful engagement beyond the classroom. Biomedical Engineering stands at the intersection of these shifts, contributing solutions that align technical expertise with real healthcare needs.

What is especially encouraging is the department's growing ability to convert ideas into impact. Through academic initiatives, collaborations, and hands-on problem-solving, students and faculty alike have demonstrated how engineering knowledge can be directed toward addressing practical clinical challenges.

This edition reflects that spirit of purpose and responsibility. I commend the Department of Biomedical Engineering and the magazine team for their commitment to documenting these efforts. As we look ahead, may this volume motivate our community to remain inquisitive, collaborative, and dedicated to improving healthcare through innovation and engineering excellence.

Prof. Dr. R S Valarmathi

Dean- School of Electrical & Communication

HoD'S Reflection

As we present this edition of the departmental magazine, it is a moment to reflect on the steady progress and collective efforts of the Biomedical Engineering department. Over the past academic period, the department has continued to strengthen its academic foundations while adapting to the evolving demands of healthcare, technology, and interdisciplinary learning.

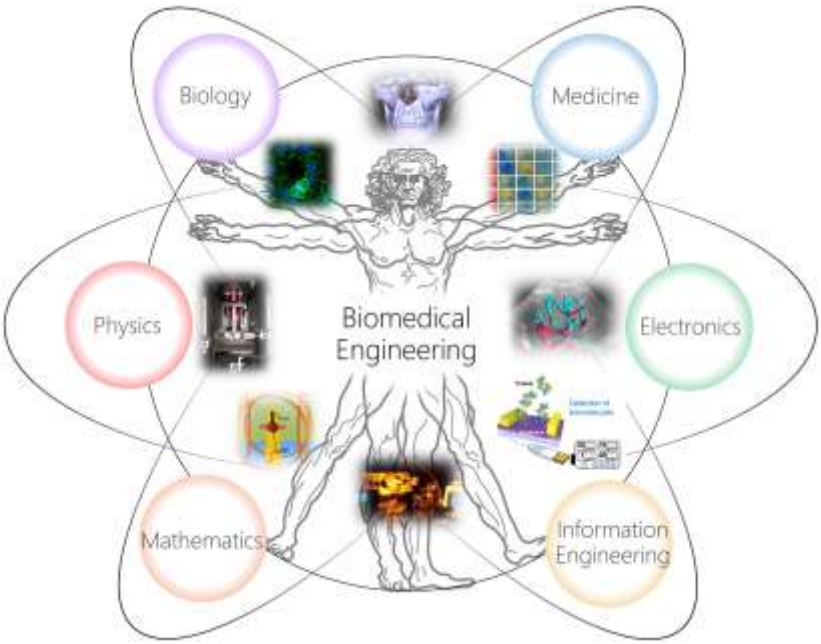
The department continues to promote learning that extends beyond textbooks and classrooms. Students are encouraged to question, explore new ideas, and engage with challenges critically. Such an environment nurtures innovation, strengthens academic foundations, and helps students develop confidence in applying their knowledge to real-world contexts.

The pages that follow capture this journey in meaningful ways. They highlight academic achievements, technical initiatives, research efforts, and creative expressions that showcase the evolving identity of the department. Together, these contributions reflect the active involvement of students in shaping a dynamic and forward-looking academic community.

May this volume serve both as a reflection of past efforts and as motivation for future endeavors. I sincerely appreciate the dedication of the students and the editorial team in compiling this thoughtful representation of our department's progress, and I encourage our learners to continue striving for excellence with curiosity and purpose.

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.

News in Trend – Smart Bandages

Smart biomedical devices are revolutionizing wound care by delivering personalized treatments directly to injury sites, slashing healing times and infection risks.

Researchers at Caltech unveiled the Smart Bandage in June 2025, a flexible electronic patch embedded with sensors, therapeutics, and wireless controls that monitors tissue regeneration in real-time. This thin, biocompatible device tracks pH, temperature, oxygen levels, and biomarkers while releasing antibiotics or growth factors on demand via smartphone adjustments.

Chronic wounds affect 2% of the U.S. population, costing $25 billion yearly in treatments that often fail due to poor monitoring and delayed interventions—especially dangerous for diabetics facing amputation risks. The Smart Bandage's breakthrough integrates stretchable electronics with drug-eluting hydrogels, enabling closed-loop therapy that adapts to healing progress and prevents bacterial biofilms 10x more effectively than traditional dressings.

For patients with slow-healing injuries, this means outpatient management with 40% faster closure rates and remote physician oversight, transforming post-surgical and ulcer care.

This invention represents a paradigm shift in medical device technology by merging flexible bioelectronics, AI-driven analytics, and localized pharmacotherapy into a disposable patch. Its multilayer design overcomes bulkiness in prior prototypes while enabling scalable manufacturing, bridging diagnostics and therapeutics to redefine wound management from reactive bandaging to proactive regeneration.

News in Trend – Hyperfine Swoop Portable MRI

Portable medical imaging is bringing advanced diagnostics to patients' bedsides, transforming emergency and critical care worldwide.

Hyperfine's next-generation Swoop portable MRI scanner received FDA clearance on June 2, 2025, featuring Optive AI for enhanced image quality and a lighter design ideal for ICUs, ERs, and rural clinics. This radiation-free device delivers full brain scans in minutes at the point of care, enabling rapid stroke triage and trauma assessment without patient transport.

Traditional MRI machines weigh tons and require shielded rooms, delaying critical diagnoses for stroke victims where every minute counts—millions suffer permanent brain damage yearly due to access gaps. Swoop's compact system uses ultra-low-field magnets and deep-learning reconstruction to match high-field accuracy while fitting through standard doorways.

For stroke teams and neurologists, this means immediate imaging that accelerates thrombolysis windows, cutting treatment delays by hours and improving outcomes in underserved areas.

Swoop represents a paradigm shift in biomedical engineering by shrinking superconducting magnet technology into portable form factors with AI augmentation. Its low-power operation and cloud connectivity overcome infrastructure barriers, enabling scalable neuroimaging that bridges urban hospitals and remote clinics while paving the way for whole-body portable systems.

Gauri Pramod (VTU21593)

Best Project

IoT Based Phototherapy for Neonatal Jaundice

The project titled **"IoT Based Phototherapy for Neonatal Jaundice"** focuses on developing a smart, efficient, and affordable treatment system to manage neonatal jaundice effectively. Neonatal jaundice is a common medical condition in newborns caused by elevated levels of bilirubin in the bloodstream, resulting in yellow discoloration of the skin and eyes. Although mild jaundice is often harmless, severe cases can lead to complications such as kernicterus and permanent neurological damage if not treated at the right time. Early detection and continuous monitoring are therefore essential to ensure safe and effective treatment.

Phototherapy is the standard treatment for neonatal jaundice, where blue light with a specific wavelength (typically around 460–490 nm) helps convert excess bilirubin into water-soluble forms that can be excreted naturally by the infant's body. The proposed system improves traditional phototherapy units by integrating Internet of Things (IoT) technology to enable real-time monitoring and intelligent control of treatment parameters.

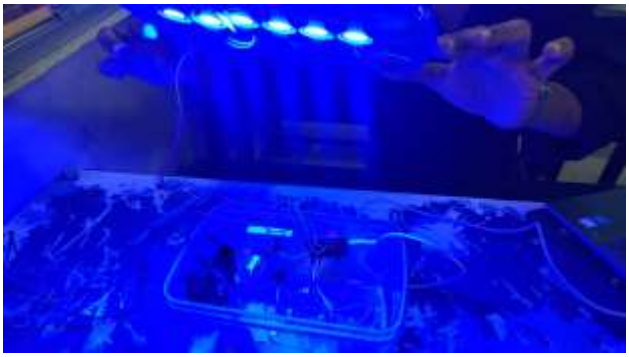
The system uses high-intensity blue LEDs as the primary light source, ensuring uniform light distribution and optimal irradiance levels. Temperature sensors are included to monitor the baby's environment and prevent overheating, while light intensity sensors ensure that the therapeutic range is consistently maintained. A microcontroller serves as the central processing unit, collecting sensor data, regulating light output, and maintaining safe operational conditions.

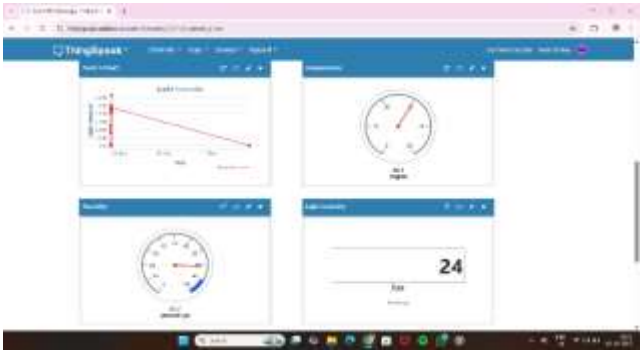
One of the key innovations of this project is IoT connectivity. The microcontroller transmits real-time treatment data to a cloud-based platform through Wi-Fi. Healthcare providers can access live data, monitor treatment duration, and observe parameter trends through a user-friendly dashboard. In case of abnormal temperature or light intensity levels, the system generates instant alerts, ensuring timely corrective action.

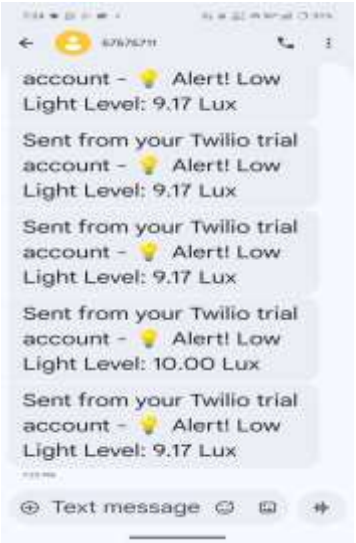
Best Project

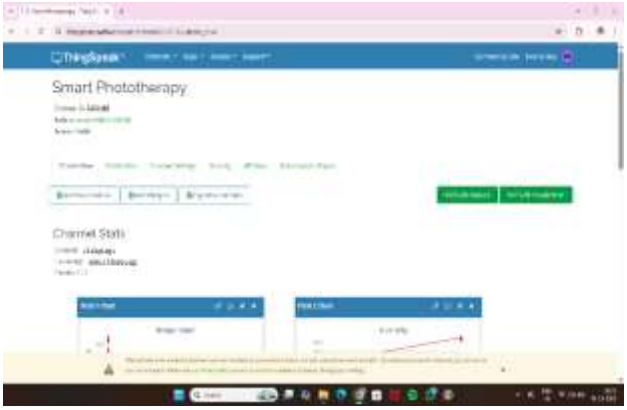
The device is designed to be portable, energy-efficient, and cost-effective, making it particularly suitable for rural healthcare centers and low-resource settings where advanced neonatal care facilities may be limited. By integrating embedded systems, sensor monitoring, and cloud connectivity, this project enhances safety, accuracy, and accessibility in neonatal treatment.

Overall, the IoT-based phototherapy system represents a significant step toward smart neonatal healthcare, combining medical science and engineering innovation to improve treatment outcomes and ensure safer care for newborns.









S K Manjoor Ahemed(VTU27218)

Alumni Spotlight

I am delighted to share my experience as an alumnus of the Biomedical Engineering Department. My time in the department has been incredibly enriching, both academically and personally. The department provided a strong platform where theoretical knowledge was effectively integrated with practical applications, helping me gain a deeper understanding of biomedical concepts and technologies.The faculty members were highly knowledgeable, approachable, and always ready to guide us. Their mentorship played a crucial role in shaping my problem-solving abilities and encouraging me to explore innovative ideas in the field of biomedical engineering. They consistently motivated us to push our limits and stay curious about advancements in healthcare technology.The hands-on training sessions, laboratory work, and project-based learning were some of the most impactful aspects of my academic journey. These experiences not only strengthened my technical skills but also enhanced my confidence in handling real-world challenges. The exposure to workshops, seminars, and internships further prepared me for industry expectations.The department also fostered a collaborative and supportive environment among students, which helped in developing teamwork, leadership, and communication skills. The friendships and memories I built during this time are truly invaluable.I am sincerely grateful to the department for nurturing my skills and guiding me toward a successful future. The knowledge and values I gained here continue to influence my professional journey. I extend my heartfelt thanks and best wishes to the department for its continued excellence and growth in the field of biomedical engineering

Pittu Pavan Sai Kumar Reddy

Gallery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