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25 ANNIVERSARY
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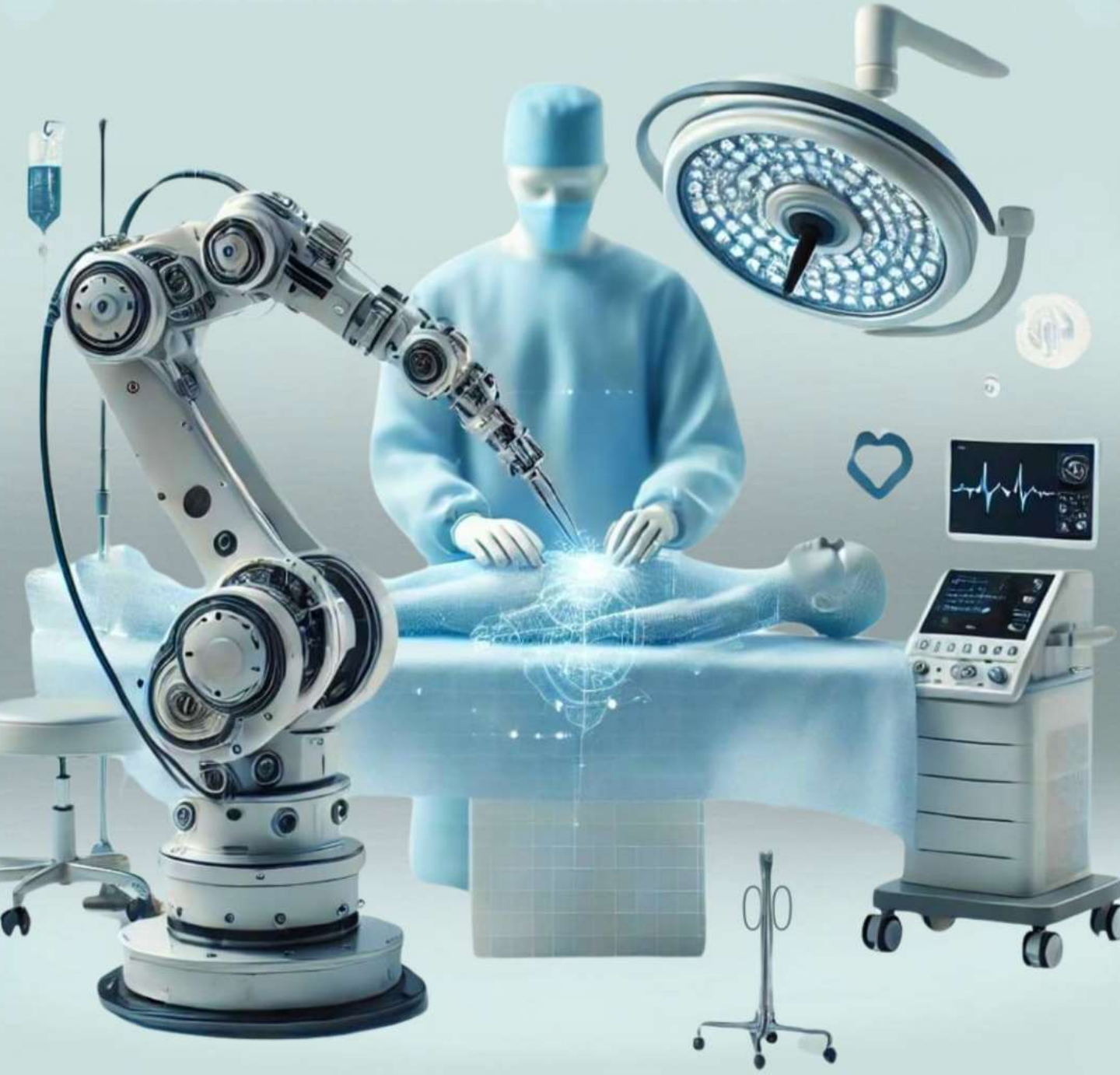
INNOVATING THE FUTURE OF LIFE AND MEDICINE



JUNE 2022
VOLUME III

SCHOOL OF ELECTRICAL AND COMMUNICATION
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

"Welcome to the third edition of our Biomedical Engineering magazine! This issue is a celebration of curiosity, innovation, and the incredible energy of our department. Inside, you'll find stories of students turning ideas into projects, faculty pioneering research that pushes the boundaries of medicine and technology, and glimpses of the collaborative spirit that makes our community unique. Every page is crafted with care to capture the creativity, passion, and achievements that make our department thrive. We hope this edition sparks your imagination, inspires new ideas, and reminds you that the future of healthcare innovation starts right here—with all of us, together.

HAPPY READING!"

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CONTENTS:

DEAN'S Desk

It is a delight to welcome you to the Volume 3 of our Biomedical Engineering magazine! Each issue is a window into the energy, creativity, and innovation that define our department, and this edition is no exception and I am proud to see how it continues to grow as a platform for showcasing talent and innovation.

The Department of Biomedical Engineering has steadily progressed through consistent academic excellence, strong faculty mentorship, and the active involvement of our students. The accomplishments and activities highlighted in this edition showcase the spirit of teamwork, perseverance, and curiosity that define our departmental culture. Beyond academics, the department has fostered an environment that encourages learning, collaboration, and a sense of responsibility toward society and healthcare.

I would like to sincerely appreciate the editorial team for their dedication in bringing together this meaningful compilation. Their thoughtful presentation of departmental activities, student initiatives, and academic pursuits makes this magazine a valuable record of our journey and achievements.

As we move forward, I encourage our students and faculty to continue striving for excellence, supporting one another, and contributing positively to the growth of the department. I am confident that the coming months will offer new opportunities for learning and achievement. I extend my best wishes to everyone associated with the department and congratulate the team on the successful release of this edition.

Prof. Dr. R S Valarmathi

Dean- School of Electrical & Communication

HoD's Reflection

As we present the third edition of our Biomedical Engineering departmental magazine, I take this opportunity to reflect on the steady progress and collective efforts of our department. This edition captures the academic journey, achievements, and experiences of our students and faculty, serving as a meaningful record of our growth over the past months.

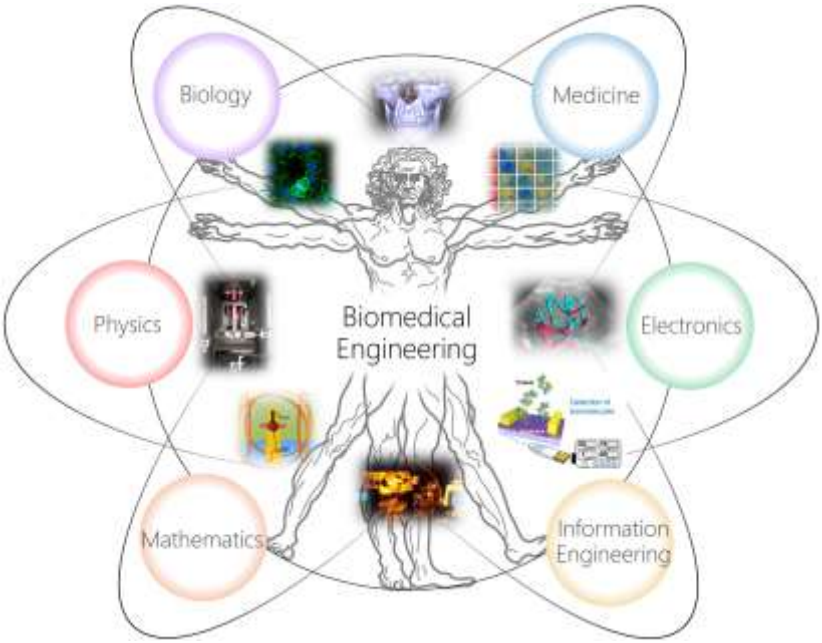
The Department of Biomedical Engineering continues to evolve through committed teaching, active student participation, and a supportive learning environment. Our students have shown sincerity and dedication in academics, projects, and co-curricular activities, while our faculty members have consistently guided and motivated them toward excellence. These combined efforts have strengthened the foundation of our department and enriched the overall academic experience.

This magazine brings together those moments—academic efforts, student initiatives, and departmental activities—into a shared narrative. It reflects the rhythm of departmental life and stands as a reminder that progress is often built through consistent effort rather than sudden milestones.

As we move forward, I hope our students continue to approach their learning with curiosity and purpose, and that the department remains a space where ideas are explored openly and growth is encouraged at every stage. The journey continues, and I look forward to seeing how it unfolds in the days ahead.

Dr. Masoodhu Banu

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-Wearable And Implantable Biosensing Technologies

An important development in the early year of 2022 was the intensified interest and progress in **wearable and implantable biosensing technologies** that support **continuous, real-time health monitoring**. Biomedical engineers have been pushing the boundaries of how health can be monitored outside the clinic by combining advances in microelectronics, flexible materials, and sensor miniaturization. Wearable biosensors — such as skin-mounted patches, smart textiles, and flexible electronic systems — have been increasingly designed to continuously track multiple physiological signals (like heart rate, temperature, and biochemical markers) with minimal discomfort. These devices use biocompatible, stretchable materials that conform closely to the body, enabling long-term monitoring and user comfort. In parallel, implantable microdevices are being engineered to provide localized diagnostics and even drug delivery functions, particularly for chronic conditions such as diabetes and cardiovascular diseases. The overall shift reflects a broader transformation in healthcare — from episodic, clinic-based checkups to **proactive, personalized monitoring** that empowers patients and clinicians with real-time data for early intervention and tailored treatment planning.

This trend grew out of the convergence of **BioMEMS (biomedical microelectromechanical systems)**, digital connectivity, and advances in materials science, enabling sensors to be more sensitive, smaller, and more integrated with everyday life. For students and researchers, this period marked a clear pivot toward creating devices that not only collect health data but do so **continuously, unobtrusively, and in real time** — an important step in patient-centered and preventive healthcare.

News in Trend – Organ on a Chip Systems

Between early 2022 and mid-2022, another major biomedical engineering trend was the rapid growth of **organ-on-a-chip (OoC) technology** — a field combining microengineering, microfluidics, and cell biology to mimic human organ functions on microchips. These miniaturized systems recreate key structural and functional features of tissues such as the lung, liver, and kidney in a controlled microenvironment. For research, this offered a powerful alternative to traditional cell cultures and animal models, which often fail to accurately reflect human physiological responses. OoC platforms enable scientists to study how organs respond to drugs, disease conditions, and mechanical cues with unprecedented fidelity. They allow multidimensional control over fluid flow, nutrient gradients, and cellular organisation, which helps in exploring new treatments, testing drug toxicity, and even understanding disease progression in a patient-specific way.

During this period, the trend was not just technical but conceptual — researchers moved toward **multi-organ models and modular designs** that can simulate interactions between different tissues and organ systems, laying the groundwork for a "body-on-a-chip" approach. These systems improved the predictive power of preclinical research and reduced reliance on animal studies, marking a shift in how biomedical research can **bridge the gap between lab studies and human clinical outcomes**. Organs-on-chips thus stood at the forefront of personalized medicine research, where patient-derived cells could one day be used to model individual health responses.

Vidhyadarshini (VTU12855)

Best Project

IOT based Real-Time Cardiac Monitoring for Remote Healthcare

The project titled **"IoT Enabled Real-Time Cardiac Monitoring for Remote Healthcare"** focuses on developing a smart, portable, and cost-effective system designed to continuously monitor a patient's heart rate and transmit the data to healthcare professionals in real time. With cardiovascular diseases being one of the leading causes of mortality worldwide, early detection and continuous monitoring are crucial in preventing life-threatening complications. Traditional cardiac monitoring systems are typically hospital-based and require frequent clinical visits, making them inconvenient for elderly patients, individuals with chronic heart conditions, and those living in rural or remote areas.

To address these challenges, the proposed system leverages Internet of Things (IoT) technology to enable remote and continuous cardiac monitoring beyond hospital settings. The system uses a pulse sensor such as the MAX30100, which operates on the principle of photoplethysmography (PPG). This sensor emits light into the skin and measures variations in reflected light caused by changes in blood volume during each heartbeat. These variations are converted into electrical signals corresponding to the heart's pulse.

An ESP32 microcontroller serves as the core processing unit of the system. It converts analog signals into digital form, filters noise, and calculates the heart rate in beats per minute (BPM). With built-in Wi-Fi and Bluetooth capabilities, the ESP32 transmits real-time data to cloud platforms such as ThingSpeak or Firebase using communication protocols like MQTT or HTTP. The cloud platform securely stores the data and presents it through interactive dashboards, enabling doctors and caregivers to monitor patients remotely via web or mobile applications.

Best Project

To enhance safety, the system incorporates an intelligent alert mechanism. If the heart rate falls below 60 BPM (bradycardia) or exceeds 100 BPM (tachycardia), automatic notifications are sent through mobile alerts, SMS, or email, ensuring timely medical intervention. Experimental results demonstrated high accuracy with minimal deviation compared to standard pulse oximeters, along with low latency suitable for real-time applications. The device is also energy-efficient, making it ideal for wearable and portable use.

Overall, this project exemplifies how IoT can revolutionize healthcare by creating a connected, patient-centered monitoring system. By integrating wearable sensors, embedded processing, wireless communication, and cloud computing, the system enhances accessibility to cardiac care, reduces hospital dependency, and supports preventive healthcare—marking a significant step forward in modern telemedicine.

Shrinidhi G S (VTU11687)

Alumni Spotlight

From lecture halls and lab benches to real-world impact, our alumni carry the spirit of Biomedical Engineering far beyond the campus. This edition's spotlight celebrates an alumna whose journey is a reminder that success is not defined by a single path, but by curiosity, adaptability, and persistence. What began as classroom discussions and project deadlines has evolved into a career shaped by continuous learning and purposeful problem-solving. Her story reflects the quiet determination and resilience that define our alumni community, inspiring current students to trust the process, embrace challenges, and believe that every small step taken today can shape a meaningful tomorrow.

As one alumna, **E Susmitha**, shared:

"When I look back at my time in the Department of Biomedical Engineering, I don't just remember lectures or exams—I remember the journey of discovering who I was becoming. Like many students, I began with excitement mixed with uncertainty. There were moments of confusion, long nights spent working on assignments and projects, and times when I questioned whether I was on the right path. But each challenge quietly shaped my confidence and taught me the value of persistence.

What truly made the difference was the learning environment. I learned how to approach problems thoughtfully, how to learn from mistakes, and how to keep going even when things did not go as planned. The guidance from faculty and the support of classmates played a crucial role in helping me grow, not just academically, but personally. Those experiences prepared me to face life beyond the campus with clarity and resilience.

B Pooja

Gallery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Venue : Dr. Rela Institute & Medical Centre
Date : 21st - 26th March 2022
Department of Biomedical Engineering


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