BIOENGINEERING AND BIOTECHNOLOGY CLUB OF CBIT

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY TM
1979

DEPARTMENT OF BIOTECHNOLOGY

VOLUME - 1
2022-23

BIOPULSE

- THE PULSE OF PROGRESS IN BIOTECHNOLOGY

Department Vision and Mission

Department Vision

To excel in education, research, and entrepreneurship in various fields of Biotechnology for contribution to the evolving needs of the society

Department Mission

- To provide an excellent educational experience to the undergraduate students of Biotechnology through quality teaching and advanced curriculum with roots into the fundamentals, that enables students to become leaders in their chosen field of Biotechnology
- To provide vibrant learning and research environment that enables students to focus on lifelong learning to transform into entrepreneurs and renowned researchers
- To instill the spirit of innovation and creativity in young minds through participation in International and National level conferences/hackathons combined with a deep awareness of ethical responsibilities to profession and society

Programs Offered

B.Tech.
The program is designed to suit the needs of the young technology graduates looking to make a mark in a highly competitive market.

Placements
CBIT's Biotech students, riding on the back of the knowledge and skills acquired during the 4 years spent at the campus, have found placement in a number of big companies. These firms include IT giants like Wipro, Tech Mahindra, CTS, and Infosys along with major firms from other sectors, like Biological E. Limited, Deloitte, and Dr. Reddy's.

Students got placed in various companies like Dr. Reddy's Lab, Capgemini, Accenture, Generation Cognizant, Wipro, MuSigma, TCS, Winred Technologies etc.

Department Vision and Mission

B.Tech. (Biotechnology) Program Educational Objectives (PEOs)

The Biotechnology department is dedicated to graduating engineers who

- will demonstrate successful careers in the industry through scientific thinking, interpreting, analyzing experimental results, and pursue higher education, and research in reputed national and international institutes.
- will demonstrate leadership and initiative to advance professional and organizational goals with a commitment to ethical standards of profession, teamwork, and respect for the diverse cultural background.
- will be involved in lifelong /self-learning to keep abreast with the constantly evolving technologies for establishing start-ups and becoming successful entrepreneurs.
- will be committed to the creative practice of engineering and other professions in a responsible manner contributing to the socio-economic development of the society.

B.Tech. (Biotechnology) Program Outcomes (POs)

1. Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.
2. Problem Analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.
4. Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis, and interpretation of data, and synthesis of the information to provide valid conclusions.
5. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling to complex engineering activities, with an understanding of the limitations.
6. The Engineer and Society: Apply to reason informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and Teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication: Communicate effectively on complex engineering activities with the engineering community and the society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Principal's Message

Dr. P. Ravinder Reddy

Professor and Principal of CBIT

Dear All,

It is with great pride and warmth that I welcome you to Chaitanya Bharathi Institute of Technology (CBIT), one of the country's distinguished institutions and a symbol of excellence in technical education. Since its establishment in 1979, CBIT has steadily grown into a respected academic community and a source of pride for both Telugu States, known for its strong foundation in academics, research, and overall student development.

As the Principal, Dr. P. Ravinder Reddy, I am pleased to share that CBIT continues to pursue its vision of becoming a "Centre of Excellence in Technical Education and Research." Our dedication to innovation and academic quality is evident through our consistent achievements, including multiple NBA accreditations since 1998 and a prestigious NAAC A++ accreditation (Cycle 3, 2023). With modern facilities, advanced laboratories, and a committed faculty, CBIT ensures that students receive an education aligned with the changing needs of Industry 5.0.

Our curriculum is thoughtfully structured, keeping in line with AICTE standards, the National Education Policy (NEP-2020), and Outcome-Based Education (OBE). This academic framework encourages creativity, logical thinking, problem-solving, and innovation, helping students grow into confident and industry-ready professionals.

We strongly believe that meaningful education goes beyond textbooks. CBIT fosters an ecosystem that supports entrepreneurship, research, and industry engagement. Through our Entrepreneur Development Centre (EDC), incubation programs, and various industrial collaborations, students are encouraged to transform their ideas into real-world outcomes. With excellent opportunities for placements, research projects, publications, patents, and leadership development, CBIT offers a platform where students can truly excel.

Alongside academics, our 56+ student clubs create a vibrant campus culture and promote holistic development. These clubs help students build essential life skills, discover new interests, and learn the value of teamwork and social responsibility.

As an institution focused on practical and impactful learning, we continue to uphold the "5Ps"—Placements, Publications, Projects, Patents, and Participatory Administration. These principles guide our mission of continuous growth and student success.

I invite each of you to make the most of the opportunities available at CBIT, contribute to its legacy, and strive for excellence in everything you pursue. Together, let us build a future defined by knowledge, innovation, and leadership.

Wishing you a rewarding and enriching learning journey at CBIT!

HOD's Message

Dr. Rajasri Yadavalli

Associate Professor and HOD,

Department of Biotechnology, CBIT

Welcome to the **Department of Biotechnology** at CBIT!

Established in the year 2005, the Department of Biotechnology at Chaitanya Bharathi Institute of Technology (CBIT) has been at the forefront of providing exceptional education, pioneering research, and hands-on training in diverse and evolving domains of biotechnology. With a strong commitment to academic excellence and innovation, we equip our students with cutting-edge knowledge and practical expertise in core disciplines such as **Plant, Animal, Industrial, Environmental, and Medical Biotechnology**, alongside specialized fields like **Computational Biology and Bioprocess Engineering**.

Recognizing the **interdisciplinary nature** of biotechnology and its far-reaching applications, our department has embraced modern, transformative domains that are shaping the future of the industry. These include **Biomaterials, Tissue Engineering, Biosimilars, Drug Design & Delivery, Nanobiotechnology, and Structural Biology**. Our focus on advanced analytical instrumentation and emerging technologies bridges the crucial gap between academic research and industrial application, ensuring that our students remain at the forefront of scientific advancements.

To foster experiential and participatory learning, our students gain firsthand exposure to the real-world biotechnology landscape through visits to prestigious research organizations and industry leaders such as **CSIR-CCMB, IICT, CDFD, NIAB, Dr. Reddy's Laboratories, and IISc Bangalore**. These immersive experiences enable students to engage with cutting-edge research, interact with industry professionals, and understand the latest technological innovations.

Beyond academics, our department places a strong emphasis on **career development and leadership growth**. Students benefit from a dynamic ecosystem of **industry internships, research collaborations, national and international seminars, technical workshops, club activities, and career fairs**. These opportunities not only enhance their technical competencies but also cultivate critical thinking, problem-solving, and entrepreneurial skills essential for thriving in the biotechnology industry.

Furthermore, we take immense pride in our faculty and students' active participation in societal and environmental initiatives. Through **sustainable research, community-driven projects, and entrepreneurial ventures**, our department remains steadfast in its mission to create a positive impact on the world. By nurturing a spirit of innovation, ethical responsibility, and scientific inquiry, we empower our students to become future leaders, researchers, and entrepreneurs who drive meaningful change in biotechnology and beyond.

At the Department of Biotechnology, CBIT, we are dedicated to fostering a **culture of excellence, curiosity, and transformative learning**. We invite you to embark on this exciting journey of discovery and innovation with us and become a part of a community that is shaping the future of biotechnology.

Wishing you a rewarding and enriching academic experience!

Importance of the Bioengineering and Biotechnology Club of CBIT (BBCC)

In an era where biotechnology is revolutionizing healthcare, sustainability, and industry, the Bioengineering and Biotechnology Club at CBIT stands as a beacon of innovation and excellence. This dynamic platform empowers students to push the boundaries of science, develop cutting-edge solutions, and shape the future of biotechnology. With a strong emphasis on skill development, the club provides hands-on exposure to advanced techniques such as CRISPR, bioinformatics, molecular biology, and bioprocessing. Through research projects, industry collaborations, and mentorship, students gain the expertise needed to excel in academia and the biotech sector. Practical training, workshops, and access to lab facilities help members bridge the gap between theoretical knowledge and real-world application. Beyond technical growth, the club fosters leadership, teamwork, and entrepreneurial thinking. Members engage in hackathons, innovation challenges, and startup incubation programs, transforming ideas into real-world solutions. The club also offers exposure to cutting-edge trends like biomaterials, synthetic biology, computational biology, and regenerative medicine, equipping students with the skills to tackle some of the world's most pressing challenges.

Networking opportunities with leading researchers, industry experts, and alumni ensure that students are well-prepared for careers in biotechnology, pharmaceuticals, healthcare, and environmental sciences. Whether aspiring to work in research, industry, or entrepreneurship, members gain invaluable insights into higher education prospects, placement opportunities, and startup mentorship. More than just a student organization, the Bioengineering and Biotechnology Club is a gateway to global opportunities. From participation in prestigious biotech competitions like iGEM to collaboration with international researchers and institutions, students have the chance to contribute to scientific advancements on a larger scale. Additionally, community-oriented projects such as biowaste management, water purification, and public health awareness campaigns allow members to make a meaningful social impact. At its core, the club is a hub for curiosity, innovation, and collaboration—a space where students not only learn but actively contribute to advancements that shape society. Whether you are passionate about pioneering new medical breakthroughs, solving global sustainability challenges, or leading the next wave of biotech startups, this club provides the resources, mentorship, and opportunities to help you succeed.

Faculty Coordinator's Message

Dr. G. Vijaya Laxmi
Associate Professor
Department of Biotechnology, CBIT

It is with great enthusiasm that I introduce you to the Bioengineering & Biotechnology Club at Chaitanya Bharathi Institute of Technology (CBIT), a vibrant and dynamic platform dedicated to fostering innovation, research, and hands-on learning in the ever-evolving fields of biotechnology and bioengineering.

As the Faculty Coordinator, Dr. G. Vijaya Laxmi, I take immense pride in guiding and mentoring students as they explore groundbreaking domains such as Biomaterials, Tissue Engineering, and Nano-biotechnology. Our club serves as an intellectual hub where curiosity meets creativity, allowing students to bridge the gap between theoretical knowledge and practical applications.

Through interactive workshops, insightful seminars, industrial visits, and research-driven internships, we provide students with unparalleled exposure to cutting-edge technologies and real-world challenges. These initiatives not only enhance academic learning but also equip students with essential problem-solving skills, technical expertise, and industry-relevant experience, ensuring they are well-prepared to thrive in their careers.

Beyond academics, our club strongly emphasizes leadership, teamwork, and entrepreneurial spirit. We encourage students to take the initiative in driving research projects, collaborative innovations, and socially impactful solutions. Whether you are passionate about scientific discovery, technological advancements, or pioneering your own biotech startup, this club is the ideal environment to learn, explore, and grow.

By joining the Bioengineering & Biotechnology Club, you will become part of a forward-thinking community dedicated to shaping the future of biotechnology. Together, we will embark on an inspiring journey of knowledge, exploration, and innovation, working towards breakthroughs that positively impact society and the global scientific community.

We invite you to be a part of this exciting venture—connect, collaborate, and contribute to the ever-expanding world of biotechnology.

Let's learn, innovate, and make a difference!

Student President`s Message

Hey everyone!

I'm J Caleb Joel Raj, the President of the Bioengineering & Biotechnology Club at CBIT. If you're excited about biotechnology, research, and innovation—or even if you're simply curious about fascinating areas like Tissue Engineering, Nano-Biotechnology, or Drug Design—you're in the right place to explore, experiment, and grow.

Our club is built on creativity, learning, and hands-on experience. We bring science beyond textbooks through practical workshops, industry interactions, and engaging projects that help you apply what you learn in real scenarios. Whether you're eager to work with modern biotech tools, dive into emerging research fields, or connect with professionals in the industry, we provide opportunities that help you gain real exposure and meaningful skills.

Biotechnology is more than scientific knowledge—it's about making an impact. That's why we focus not just on technical growth but also on leadership, critical thinking, and innovation. As the biotech world transforms rapidly, our aim is to help students grow into problem-solvers and creators who can contribute to healthcare, sustainability, and technological progress.

At the core of our club is a dedicated team that loves exploring new ideas and pushing scientific boundaries. From hosting events and student-driven competitions to supporting research initiatives, we work together to shape a vibrant and inspiring space for learning.

So whether you want to learn something new, experiment with bold ideas, work on research, or simply connect with people who share your enthusiasm, I invite you to join us on this exciting journey. Let's explore, create, and build the future of biotechnology—together.

Welcome to the Bioengineering & Biotechnology Club at CBIT!

J Caleb Joel Raj

4th Year, Department of Biotechnology, CBIT

HLA Typing Awareness

01 *HLA Typing Awareness in partnership with DKMS-BMST Foundation*

BBCC and Chaitanya Spandana Conduct HLA Typing Awareness and Registration Drive:

The Bioengineering and Biotechnology Club (BBCC), CBIT, in collaboration with Chaitanya Spandana, successfully organized an HLA Typing Camp on April 18-19, 2023, at the Assembly Hall, CBIT. The initiative was conducted in partnership with DKMS-BMST Foundation, India, a non-profit dedicated to combating blood cancer and other blood disorders, such as thalassemia and aplastic anemia.

The event aimed to raise awareness about blood stem cell transplantation and to register potential donors among the youth. Over the course of two days, the camp attracted 927 enthusiastic participants from various streams, including Biotech, CSE, and IT. Each day featured informative sessions on Blood Cancer and Human Leukocyte Antigen (HLA) typing, highlighting the significance of HLA as a biomarker for organ and stem cell donation and the challenges of finding donors in India. Students actively participated in the DNA sample collection, where trained volunteers demonstrated the cheek swab procedure. Each donor received a unique ID for future reference. The second day included a myth-busting session addressing common fears and misconceptions about blood and stem cell donation, followed by the continuation of registration and swab collection.

The event concluded with a closing ceremony by members of BBCC and Chaitanya Spandana, leaving students informed, motivated, and registered for a noble cause. This initiative not only educated the participants but also contributed significantly to building a robust donor database in India, reinforcing the spirit of social responsibility among CBIT students.

Alchemy of Soaps

02 *Alchemy of Soaps - soap making workshop*

BBCC and Chaitanya Parivrita Host "Alchemy of Soaps" Workshop:

The Bioengineering and Biotechnology Club (BBCC), CBIT, in collaboration with Chaitanya Parivrita, organized an engaging workshop titled "Alchemy of Soaps" on February 3, 2023, at the Plant Tissue Culture Lab, Department of Biotechnology. The event witnessed an enthusiastic participation of 50 students, eager to explore the art and science behind soap making.

The workshop was graced by Dr. Pavani Anumukonda, Professor at Sri Venkateshwara College of Pharmacy, Hyderabad, who guided the participants through the step-by-step process of soap creation. Students actively engaged in hands-on sessions, experimenting with different ingredients and designs to craft their personalized soaps. The session not only focused on the practical aspects but also offered insights into the chemistry and techniques involved in soap making, making it both educational and enjoyable.

At the end of the workshop, participants left with their handcrafted soaps along with the materials and knowledge to continue exploring soap making independently. The event successfully combined creativity, learning, and fun, providing a platform for students to enhance their practical skills and express their innovation.

The "Alchemy of Soaps" workshop was a memorable experience, fostering teamwork, curiosity, and enthusiasm among the students. It highlighted BBCC's commitment to promoting hands-on learning experiences, while celebrating the creativity and diverse talents of the CBIT student community.

Faculty Accomplishments

Dr. Rajasri Yadavalli
Associate Professor and HOD, Department of Biotechnology, CBIT
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Dr. Rajasri Yadavalli, Associate Professor at CBIT, has over 18 years of experience in teaching and research with a strong focus on sustainable biofuels, wastewater treatment, and circular bioeconomy. Her work centers on microalgal biotechnology, especially using Chlorella pyrenoidosa to enhance lipid production for clean biofuel while simultaneously treating dairy effluent. She is currently optimizing energy-efficient bioreactors that improve microalgal growth and boost lipid yield under controlled stresses.
Alongside research, she serves as co-chair of CBIT's Green Audit Committee and contributes to academic bodies. She has also collaborated with BRSI to promote biotechnology among school students and has guided numerous B.Tech and M.Tech projects. Her publications and mentorship continue to inspire sustainable innovation.

Dr. Ashoutosh Panday
Professor, Department of Biotechnology, CBIT

Dr. Ashutosh Panday is an exceptionally well-qualified professor with a rich experience in biotechnology and energy studies. Currently, he is a professor in the Department of Biotechnology, Chaitanya Bharathi Institute of Technology, Hyderabad, and has been in service since 2022. Earlier, he was working as a professor at the University of Petroleum and Energy Studies, UK from 2010 to 2022 and made an excellent contribution toward the development of energy and material science. He received his PhD from the University of Massachusetts, Amherst, USA in 2006. He did advanced research in chemistry, materials science, or chemical engineering. His background is based on the B.Tech degree from the Indian Institute of Technology (IIT) Kanpur, which he received in 1992.
It was his educational basis that lay down the foundation for his research interest and expertise. He has published 12 papers and received more than 1,000 citations for his works, with an h-index of 7. The research areas of Catalytic Processes, Production of Sustainable Material, Polymer Science and related issues concerning Industrial Material's Resilience, like Hydrogen-induced Cracking in Pipeline Steels, etc. His works and research innovation have been much referred to and cited. This points to relevance and impact on the fields of his study.

Faculty Accomplishments

Dr. V. Aruna
Associate Professor, Department of Biotechnology, CBIT

Dr. V. Aruna is an inspired faculty in the Biotechnology department of CBIT. In short, her outstanding contributions have been seen both in teaching and research, especially in cancer research, antimicrobial activity, and the field of biotechnology. With a Ph.D. in biotechnology and more than 19 years of teaching and research experience, Dr. V. Aruna joined CBIT as an Assistant Professor in Biotechnology in August 2006. Nanobiotechnology, Bioinformatics and Plant biotechnology are among her areas of expertise. She has held important departmental and institutional positions, such as timetable coordinator (2006–22) and NBA coordinator (2008–18). In addition to earning a state award and University First Rank in her master's program, she won the Best Teacher Award in 2019. Dr. Aruna has written book chapters, directed undergraduate projects, published 21 journal articles (19 of which are worldwide), and been invited to lecture and provide resources at national seminars and refresher courses. She is a Life Member of the Indian Science Congress (Membership No. L244648) and Life Member of the Indian Botanical Society.

Dr. G. Vijaya Laxmi
Associate Professor, Department of Biotechnology, CBIT

Dr. G. Vijaya Laxmi is a distinguished academic and researcher in biotechnology, agriculture, and plant sciences at CBIT. Up to 2022, her work has focused on plant tissue culture, sustainable agriculture, crop improvement, and biotechnology applications that address real-world agricultural challenges. She has contributed significantly to research through publications in reputed journals, including computational analyses on marine cyanobacteria and studies aimed at enhancing plant growth and metabolite production. Her academic contributions also include authoring book chapters and early innovations involving hydrogels and bio-based agricultural solutions.

Dr. Vijaya Laxmi has been principal investigator for several projects funded by major national agencies such as DBT, SERB, and UGC. These projects explored themes like optimized nutrient delivery, stress-tolerant plant systems, and biotechnological applications for sustainable farming. Alongside research, she has played an active role in academic development, organizing workshops, seminars, and training programs in biotechnology and molecular biology. She has also guided numerous undergraduate and postgraduate students, encouraging research culture within the department. Through her scholarly work, mentorship, and institutional involvement, Dr. Vijaya Laxmi established herself as a key contributor to biotechnology and plant sciences at CBIT by 2022.

Faculty Accomplishments

Dr. C. Obula Reddy
Assistant Professor, Department of Biotechnology, CBIT

Dr. C. Obula Reddy is an Assistant Professor of Biotechnology at CBIT, joining on 14 August 2006 with a Ph.D. in Biotechnology, M.Tech, and M.Sc (First). He has nearly two decades of teaching and research experience with specialization in Biotechnology. He is a Member of the Indian Science Congress Association (ISCA, No. L24120). He has guided over 40 B.Tech projects, coordinated departmental and institutional activities including NAAC and industry interaction, received multiple Best Teacher appreciations, published 16 international papers, and contributed to national and international conferences. A peer-reviewed review study titled "Impact of various factors on the stability of biodiesel" was co-authored by Dr. Reddy and published in the Journal of Biotech Research. The article looks at the effects of feedstock type, temperature, oxidation, water, catalysts, and fatty acid composition on the storage stability of biodiesel, which is a major obstacle to the fuel's wider use. The paper outlines techniques to increase oxidation stability, describes the use of FTIR and NMR in degradation studies, and summarizes the major variables influencing biodiesel quality.

Dr. S. Sumitra
Assistant Professor, Department of Biotechnology, CBIT

Dr. S. Sumitra is an Assistant Professor in the Department of Chemical Engineering, with over 15 years of dedicated teaching and academic experience. She earned her Ph.D. in Chemical Engineering from Osmania University (OU), where her research focused on key aspects of chemical and biochemical processes. Dr. Sumitra has made significant contributions to her field, with five research publications in peer-reviewed journals and six book chapters on topics such as downstream processing and enzyme biotechnology (EBT).

As an educator, Dr. Sumitra is deeply committed to fostering academic excellence and hands-on learning. She specializes in the Principles of Downstream Processing, a core area of chemical engineering that involves the extraction and purification of valuable products from raw materials. Her expertise in enzyme biotechnology has helped students understand advanced applications in biotechnology, healthcare, and environmental sustainability. In addition to her teaching responsibilities, Dr. Sumitra serves as the Placement Coordinator, where she plays a vital role in guiding students toward successful career paths. Her extensive network within the industry has enabled her to connect students with key opportunities in chemical engineering and biotechnology fields. Dr. Sumitra's unwavering commitment to her students, her academic contributions, and her dedication to institutional development reflect her passion for nurturing the next generation of engineers.

Faculty Accomplishments

Dr. Bishwambhar Mishra,
Assistant Professor, Department of Biotechnology, CBIT

Dr. Bishwambhar Mishra, who holds a Ph.D. in biotechnology, joined the CBIT Department of Biotechnology on June 2, 2019, as an assistant professor. He has around seven years of teaching experience and four years of research experience, with a focus on Microbial Technology and Industrial Biotechnology. He is an annual member of the Association of Microbiologists of India (2022–2023) and a lifetime member of the Biotech Research Society of India. AICTE-SPICES Coordinator and Board of Studies member are just two of the academic and departmental positions that Dr. Mishra has held. In addition to receiving the Best Teacher Award (2021–2022) and other research/academic honors, he was named in the AD Scientific Index (2022–2023) and held the position of Topic Editor for Frontiers magazines. High-impact reviews and original research on waste valorization for biomaterials, microbial and nanotechnological applications, pollutant remediation, biofuel production, food packaging technologies, probiotic and anticancer studies, and other topics have been published in Scopus/SCIE-indexed international journals by Dr. Mishra. His work covers a wide range of interdisciplinary topics, including sustainable bioprocesses, biopolymer nanocomposites, industrial microbiology, and environmental biotechnology. Additionally, Dr. Mishra has presented at international conferences and written chapters for scholarly books published by Springer, Elsevier, and Wiley, demonstrating a strong dedication to improving both basic science and practical biotechnology solutions.

Dr. C. Nagendranatha Reddy
Assistant Professor, Department of Biotechnology, CBIT

Dr. C. Nagendranatha Reddy, Assistant Professor with a Ph.D. in Environmental Engineering and Biology, specializes in sustainable biotechnology, focusing on biofuel production, bioremediation, and waste-to-energy technologies. With more than six years of research and four years of teaching experience, he has contributed to advancing waste biorefineries and microbial electrochemical systems that support a circular bioeconomy. His 2016 review on waste biorefinery models became an important reference for understanding how waste can be converted into energy and valuable by-products. He has also worked extensively on microbial fuel cells, including a 2019 study showing how algae can enhance electricity generation while supporting nutrient recovery. His research on bioelectrochemical anaerobic digestion has helped improve methane production from organic waste. Dr. Reddy has also contributed to wastewater treatment, especially for challenging contaminants like azo dyes. Recent studies include converting agro-industrial waste into biomaterials and evaluating microplastic contamination in food. His work on postbiotics in food preservation further highlights his commitment to sustainable solutions. He is also a recipient of the BIORESTEC 2018 Impactful Research Award.

Faculty Accomplishments

Dr. K. Dharmalingam,
Assistant Professor, Department of Biotechnology, CBIT

Dr. K. Dharmalingam, Assistant Professor with a Ph.D. and M.Tech. in Industrial Biotechnology, specializes in hydrogel technology, biomaterials, nanomedicine, drug solubility, and microwave synthesis. Up to 2022, he built a strong research profile with publications in international journals focusing on hydrogels, nanocomposites, and biopolymers designed for medical, environmental, and industrial applications. His work on polysaccharide-based films contributed to sustainable food packaging, while his cellulose-based hydrogel films showed promising results for wound healing and biomedical use.

He also explored innovative material synthesis for improved drug solubility and studied microwave-assisted processes for faster and cleaner production of functional biomaterials. His early contributions in biopolymer research supported advancements in medical dressing materials, controlled drug delivery, and environmentally friendly packaging solutions. By 2022, Dr. Dharmalingam had already established himself as a committed researcher whose work strengthened the fields of biomaterials and applied biotechnology, laying a solid foundation for future scientific advancements.

Dr. B. Sumithra,
Assistant Professor, Department of Biotechnology, CBIT

Dr. B. Sumitra is an Assistant Professor in the Department of Biotechnology at CBIT, with expertise in genetic engineering, in silico data analysis, and medical biosensors. Up to 2022, she has contributed extensively to international publications, book chapters, and conference presentations, while actively organizing workshops and training programs in biotechnology. One of her notable achievements is the 2022 Springer chapter "Plant-derived Drugs for Alzheimer's and Other Neurological Disorders," which highlights medicinal plants with therapeutic potential against Alzheimer's, Parkinson's disease, and dementia, providing insights into future phytochemical-based treatments. She has also worked on marine microbial enzymes and vegetable waste recovery, emphasizing sustainable and applied biotechnology approaches. Through her research, Dr. Sumitra has advanced knowledge in neuroprotective plant compounds and environmental biotechnology applications. Her contributions have been recognized for their scientific relevance and potential impact in the fields of neurobiology, medical biosensors, and sustainable biotechnology, reflecting her commitment to both research excellence and knowledge dissemination among students and the broader scientific community.

Faculty Accomplishments

Dr. Kiran Yellappa Vajanthri,
Assistant Professor, Department of Biotechnology, CBIT

Dr. Kiran Yellappa Vajanthri is an Assistant Professor at CBIT, joining the institution on October 8, 2021. He holds a Ph.D. in Biomedical Engineering, an M.Tech in Biotechnology & Medical Engineering, and a B.E. in Biotechnology, with over six years of teaching and research experience. Dr. Kiran specializes in biomaterials and tissue engineering and has actively contributed to departmental and institutional activities, including mentorship, results coordination, NIRF department coordination, and organizing academic, research, and social events. He has published fifteen international journal articles and presented in several conferences. His work has been recognized with multiple awards, including the Best Poster Award for "PVA Bentonite Composites for Wound Dressing" (2014) and the Institute Doctoral Fellowship at IIT (BHU). He was also selected for specialized training in Human iPS cells under the ASHD-CiRA Program in Japan (2017). Dr. Kiran is committed to advancing research and teaching in tissue engineering, biomaterials, and biotechnology.

Dr. Sanjeeb Kumar Mandal,
Assistant Professor, Department of Biotechnology, CBIT

Dr. Sanjeeb Kumar Mandal joined the CBIT Department of Biotechnology on May 26, 2021, as an assistant professor. He has a first-class B.Tech, an M.Tech, and a Ph.D. in Biotechnology with distinction. Microbiology and Environmental and Food Biotechnology are his areas of specialization. Dr. Mandal has served in a number of departmental and institutional capacities, such as student mentor, NBA Coordinator, Results Analysis and Placement Coordinator, and Innovation Ambassador. He was previously a member of the International Biodeterioration and Biodegradation Society (UK), Biochemical Society (UK), and ISTE. He is currently a member of the Indian Initiative for Management of Antibiotic Resistance. In addition to receiving numerous research honors from VIT University and the JEB International Best Paper Award (2018), he has mentored around thirty B.Tech students. Dr. Mandal has made a substantial contribution to applied biotechnology research by publishing widely in Scopus/SCI-indexed journals on biodegradation, wastewater treatment, bioflocculants, food waste valorization, probiotics, and environmental remediation.

STUDENT ACHIEVEMENTS

We proudly recognize the achievement of Mr. Abdul Muqueeth, a 4th-year B.Tech Biotechnology student from Chaitanya Bharathi Institute of Technology (CBIT), Hyderabad. Under the direction of Dr. B. Sumithra, he worked on developing new vaccine candidates against Mycobacterium TB, the bacterium that causes tuberculosis, using an in silico method.

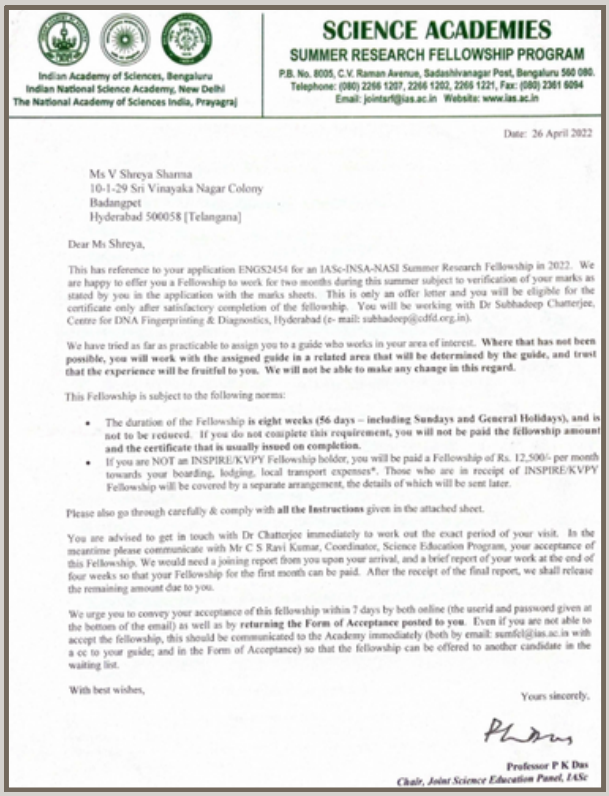
The suggested vaccine designs showed promise as a possible tuberculosis vaccine after their qualities were evaluated before experimental work and they were judged prepared for wet lab testing. The International Conference on Drug Discovery was organized in partnership with BITS Pilani Goa Campus, Schrödinger Inc., USA at BITS Goa, 10-11-22 to 11-11-22. Our Principal Prof. P. Ravinder Reddy and HoD Dr. Y. Rajasri were among the CBIT teachers and authorities who honored the accomplishment.

Abdul Muqueeth

We are delighted to announce that Ms. V Shreya Sharma from Badangpet, Hyderabad, has been offered the prestigious Science Academies Summer Research Fellowship Program for 2022.

This highly competitive two-month fellowship, offered by the Indian Academy of Sciences (IASc), the Indian National Science Academy (INSA), and The National Academy of Sciences India (NASI), allows students to work on a research project.

Ms. Sharma will be working with Dr. Subhadeep Chatterjee at the Centre for DNA Fingerprinting & Diagnostics (CDFD), Hyderabad. The duration of the fellowship is eight weeks, offering an invaluable opportunity for hands-on experience in advanced scientific research.



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Date: 26 April 2022

Ms V Shreya Sharma
10-1-29 Sri Vinayaka Nagar Colony
Badangpet
Hyderabad 500058 [Telangana]

Dear Ms Shreya,

This has reference to your application ENGS2454 for an IASc-INSA-NASI Summer Research Fellowship in 2022. We are happy to offer you a Fellowship to work for two months during this summer subject to verification of your marks as stated by you in the application with the marks sheets. This is only an offer letter and you will be eligible for the certificate only after satisfactory completion of the fellowship. You will be working with Dr Subhadeep Chatterjee, Centre for DNA Fingerprinting & Diagnostics, Hyderabad (e- mail: subhadeep@cdfd.org.in).

We have tried as far as practicable to assign you to a guide who works in your area of interest. **Where that has not been possible, you will work with the assigned guide in a related area that will be determined by the guide, and trust that the experience will be fruitful to you. We will not be able to make any change in this regard.**

This Fellowship is subject to the following norms:

- The duration of the Fellowship **is eight weeks (56 days – including Sundays and General Holidays), and is not to be reduced. If you do not complete this requirement, you will not be paid the fellowship amount and the certificate that is usually issued on completion.**
- If you are NOT an INSPIRE/KVPY Fellowship holder, you will be paid a Fellowship of Rs. 12,500/- per month towards your boarding, lodging, local transport expenses*. Those who are in receipt of INSPIRE/KVPY Fellowship will be covered by a separate arrangement, the details of which will be sent later.

Please also go through carefully & comply with **all the Instructions** given in the attached sheet.

You are advised to get in touch with Dr Chatterjee immediately to work out the exact period of your visit. In the meantime please communicate with Mr C S Ravi Kumar, Coordinator, Science Education Program, your acceptance of this Fellowship. We would need a joining report from you upon your arrival, and a brief report of your work at the end of four weeks so that your Fellowship for the first month can be paid. After the receipt of the final report, we shall release the remaining amount due to you.

We urge you to convey your acceptance of this fellowship within 7 days by both online (the userid and password given at the bottom of the email) as well as by **returning the Form of Acceptance posted to you**. Even if you are not able to accept the fellowship, this should be communicated to the Academy immediately (both by email: sumfel@ias.ac.in with a cc to your guide; and in the Form of Acceptance) so that the fellowship can be offered to another candidate in the waiting list.

With best wishes,

Yours sincerely,

Professor P K Das
Chair, Joint Science Education Panel, IASc

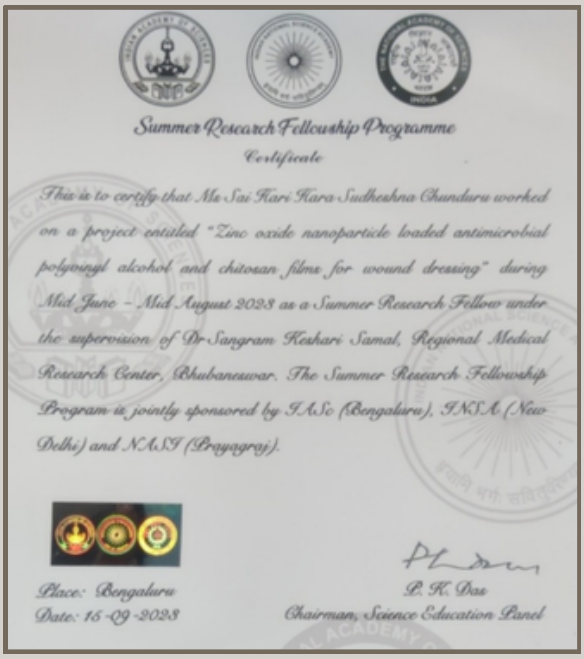
V Shreya Sharma

STUDENT ACHIEVEMENTS

We proudly recognize the research achievement of Ms. Sai Kari Hara Sudheshna Chunduru, who successfully completed the prestigious Summer Research Fellowship Programme during Mid-June to Mid-August 2023.

This fellowship, jointly sponsored by the Indian Academy of Sciences (IASc), INSA, and NASI, allowed her to work on a project titled: "Zinc oxide nanoparticle loaded antimicrobial polyvinyl alcohol and chitosan films for wound dressing."

Ms. Chunduru conducted her research under the supervision of Dr. Sangram Keshari Samal at the Regional Medical Research Center, Bhubaneswar. Her work highlights an innovative contribution to biomedical materials, focusing on developing advanced, antimicrobial solutions for wound care.



Summer Research Fellowship Programme

Certificate

This is to certify that Ms Sai Kari Hara Sudheshna Chunduru worked on a project entitled "Zinc oxide nanoparticle loaded antimicrobial polyvinyl alcohol and chitosan films for wound dressing" during Mid June – Mid August 2023 as a Summer Research Fellow under the supervision of Dr Sangram Keshari Samal, Regional Medical Research Center, Bhubaneswar. The Summer Research Fellowship Program is jointly sponsored by IASc (Bengaluru), INSA (New Delhi) and NASI (Prayagraj).

Place: Bengaluru
Date: 15-09-2023

P. K. Das
Chairman, Science Education Panel

Sai Kari Hara Sudheshna

ANNAMALAI UNIVERSITY

Accredited with 'A' Grade by NAAC

Department of Chemical Engineering

Paper ID : CBSD-102

4th International Conference (Online)

on

"Challenges in Chemical and Biochemical Engineering for Sustainable Development (CBSD)"

23rd & 24th March, 2022

Certificate for Best Paper Award

This is to certify that Dr./Mr./Mrs./Ms.

Mahitha Pyla

Student,Chaitanya Bharathi institute of technology, Hyderabad

has presented a paper on

Development and evaluation of stimuli-responsive hydrogel films containing carboxymethyl cellulose, soy protein isolate and grapefruit seed extract for potential application in treating atopic dermatitis

and won the best paper award in the 4th International Conference (Online) on

"Challenges in Chemical and Biochemical Engineering for Sustainable Development (CBSD)"

held between 23 and 24th February, 2022 at Annamalai University, Annamalai Nagar, Tamilnadu.

Dr. P. MULLAI, Conference chair, CBSD-2022
Dr. R. DHANASEKAR, Head, Dept. of Chemical Engineering, Annamalai University
Dr. A. MURUGAPPAN, Dean, FEAT, Annamalai University
Dr. K. SEETHARAMAN, Registrar(i/c), Annamalai University

Mahitha Pyla

We are proud to recognize the outstanding research of Mahitha Pyla, a student from Chaitanya Bharathi Institute of Technology, Hyderabad.

Mahitha Pyla won the Best Paper Award at the 4th International Conference (Online) on "Challenges in Chemical and Biochemical Engineering for Sustainable Development (CBSD)". The conference was held on March 23rd & 24th, 2022, by Annamalai University.

Her winning paper focused on the "Development and evaluation of stimuli-responsive hydrogel films containing carboxymethyl cellulose, soy protein isolate and grapefruit seed extract for potential application in treating atopic dermatitis." This achievement underscores her innovative work in sustainable and biomedical engineering solutions.

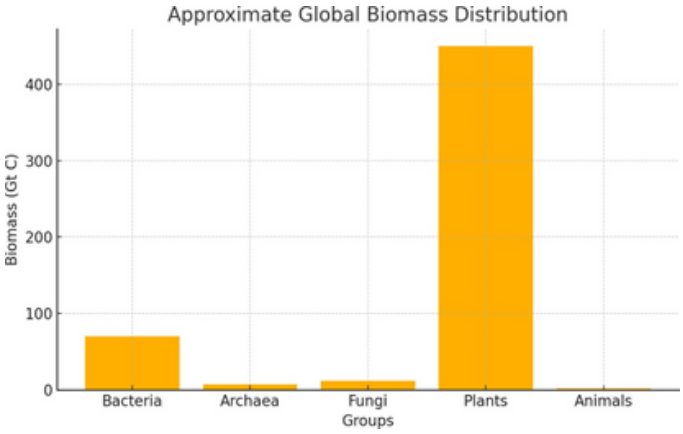
STUDENT SPOTLIGHT

Microbes: The Invisible Architects of our Planet

Microbes are often described as tiny organisms that live in the shadows of life, yet they quietly shape the world in ways we rarely notice. From the soil beneath our feet to the deepest ocean vents, they form a hidden network that keeps natural systems running smoothly. Their presence feels almost poetic, a reminder that the smallest beings can carry the greatest responsibilities. What makes microbes remarkable is their ability to build, break down, recycle, and renew. They drive essential cycles of carbon, nitrogen, and sulfur, allowing ecosystems to grow and recover. Without them, plants would struggle to absorb nutrients, oceans would lose their balance, and the atmosphere would look very different from what it is today. Their work is constant, steady, and vital.

In recent years, science has started to appreciate microbes not just as helpers but as innovators of nature. They inspire new ideas in biotechnology, environmental restoration, and even space research. Whether it is bacteria that digest plastic or microbial communities that support coral survival, their adaptability continues to surprise us.

As students of life sciences, we often look at grand discoveries and futuristic technologies, yet the most powerful lessons come from these microscopic architects. They remind us that complexity can emerge from simplicity, and that unseen forces often hold the world together. Understanding microbes givesus a clearer view of the planetand a deeper respect for the quiet brilliance of life at the smallest scale.



~Duggi Reddy Navya Sree, IVth Year,
B.Tech. Biotechnology

Plastic-Eating Enzymes: Biotech's Answer to Pollution

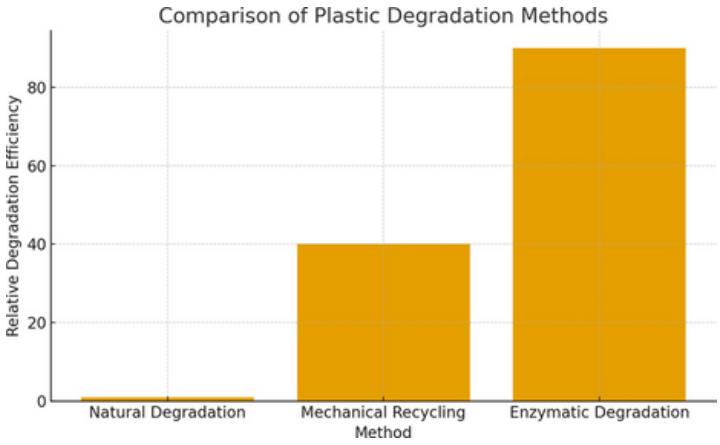
Plastic pollution has become one of the most persistent environmental challenges of our time. Among the many solutions being explored, plastic-eating enzymes have gained significant attention for their potential to break down materials that normally remain in the environment for centuries. These enzymes, often produced by certain bacteria or fungi, can degrade plastics into simpler compounds that are easier to reuse or recycle.

One widely studied example is an enzyme capable of breaking down PET, a common plastic used in bottles and packaging.

Researchers have found ways to enhance the activity of such enzymes through protein engineering, allowing them to work faster and under more practical conditions. This progress has encouraged hopes for biodegradable waste management systems that rely on biological processes instead of harsh chemical treatments. The appeal of plastic-eating enzymes lies not only in their efficiency but also in their sustainability. Since they operate under mild conditions, they reduce the energy requirements and environmental burden associated with conventional recycling.

STUDENT SPOTLIGHT

At the same time, they offer possibilities for circular economyapproaches where plasticwaste can be converted into valuable raw materials.
Although this field is still developing, it represents an inspiring blend of microbiology, environmental science, and engineering. For students in biotechnology, it shows how small molecular tools can contribute to large-scale environmental solutions. As research advances, plastic-eating enzymes may become an important part of global efforts to manage plastic waste and promote a cleaner, more responsible future.



~Sri Harshini Kothamasu, IVth Year,
B.Tech. Biotechnology

Eco-Engineering

Eco-Engineering is an emerging field of biotechnology that applies biological principles to protect and restore the environment. In an age dominated by industrialization and climate change, it provides sustainable, science-driven solutions to reduce pollution and maintain ecological balance.
At the heart of eco-engineering lies bioremediation, where microorganisms are harnessed to degrade pollutants and detoxify contaminated environments. Complementary techniques like phytoremediation use plants to absorb heavy metals and improve soil and water quality. These natural processes replace chemical-intensive methods, ensuring cleaner and greener alternatives.
Another critical domain is bioenergy, which utilizes algae, microbes, and organic waste to generate renewable fuels, reducing dependence on fossil resources. Industries are increasingly adopting biodegradable materials and bio-based waste management systems, promoting a circular economy that minimizes waste and emissions.

Eco-engineering demonstrates how biotechnology can be a force for healing transforming environmental challenges into opportunities for regeneration. It urges scientists and innovators to work in harmony with nature, ensuring that progress goes hand in hand with preservation. Through eco-engineering, biotechnology becomes not just a tool for advancement but a guardian of the planet's future.

~Aishwarya C V S, IVth Year,
B.Tech. Biotechnology

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Organs-on-Chips: The Future of Drug Discovery

Organs-on-chips represent a promising step forward in modern biomedical research. These small, transparent devices contain living cells arranged in patterns that mimic the structure and function of human organs. By recreating conditions similar to those inside the body, they offer a realistic way to study how tissues respond to drugs, toxins, or disease signals. One of the major advantages of organs-on-chips is their ability to provide detailed insights without relying heavily on animal testing. Since the cells are exposed to controlled mechanical and chemical cues, researchers can observe how they behave in real time. This helps in understanding complex processes such as inflammation, molecular transport, and tissue repair. As a result, drug developers gain a clearer picture of a compound's safety and performance before moving to clinical trials. Another important benefit is the potential for personalization. By using patient-derived cells, these devices can model individual responses, which may support more precise treatment strategies. This idea is still developing, but it reflects a growing shift toward personalized medicine.

Although the technology is still evolving, organs-on-chips offer a cleaner and more efficient platform for early drug testing. Their combination of biological accuracy and engineering design makes them a valuable tool for future innovation. For students in biotechnology, this field highlights how interdisciplinary thinking can lead to meaningful progress in healthcare and encourages us to explore new ways of bridging biology with technology.

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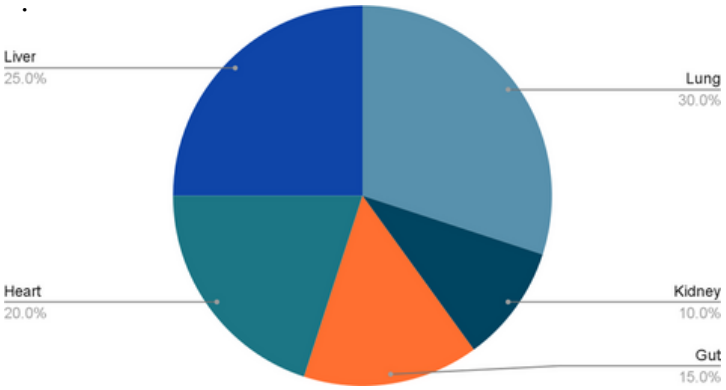

~Gorremuchu Jeremiah Paul, IVth Year,
B.Tech. Biotechnology.

The Digital Side of Biology

Gene therapy has entered an important new phase driven by rapid progress in gene-editing technologies, delivery systems, and treatment strategies. Among these innovations, CRISPR-based tools remain the most powerful and versatile. The development of advanced CRISPR platforms such as base editors and prime editors now allows researchers to make precise nucleotide changes without creating harmful double-strand breaks. This significantly reduces off-target effects and enhances safety, making these tools highly suitable for correcting disease-causing mutations.

In addition, CRISPR fusion systems paired with DNA recombinases, polymerases, and ligases have expanded the scope of editing by enabling efficient insertion of larger DNA fragments, thereby increasing the number of genetic disorders that can be addressed. Alongside CRISPR, several alternative gene-editing systems are gaining momentum. Mobile genetic elements, transposon-based technologies, and epigenetic editors offer new ways to achieve stable gene insertion or long-term gene regulation without directly altering the DNA sequence. These approaches are particularly valuable for managing complex diseases that require sustained control of

gene expression. A major area of focus in gene therapy is the treatment of inherited brain disorders, where precision, timing, and safety are critical. Modern viral vectors such as adeno-associated viruses, combined with methods like gene addition, gene silencing, and epigenetic modulation, are being tested in animal models, human cell systems, and early clinical trials. These strategies aim to overcome the challenges posed by the blood–brain barrier and the intricate nature of neural tissues.

Gene-editing advancements are also influencing transplant medicine. Progress in xenotransplantation supported by multi-gene editing in donor animals is helping reduce immune rejection and improve compatibility. At the same time, regenerative approaches involving stem cells, organoids, and 3D bioprinting are moving toward creating patient-specific tissues, offering potential solutions to the global shortage of donor organs.

Together, these developments ranging from CRISPR innovations and alternative editing platforms to improved delivery systems and regenerative technologies are shaping the future of gene therapy. With sustained research and careful clinical translation, gene therapy holds remarkable promise for treating conditions that were once considered incurable.

~Syeda Umamah Fatima, III[rd] Year,
B.Tech. Biotechnology

Microbial Factories

Microorganisms have long been recognized as powerful partners in biotechnology, and the idea of using them as miniature factories continues to shape modern scientific progress. These tiny cells carry out complex biochemical reactions with remarkable precision, making them valuable tools for producing a wide range of useful compounds. From antibiotics and enzymes to biofuels and biodegradable plastics, microbes help meet growing industrial and environmental needs.

One of the most important features of microbial factories is their ability to be engineered. By introducing specific genes or modifying existing pathways, scientists can guide microbes to produce desired products with higher efficiency. This approach not only reduces production costs but also supports cleaner and more sustainable methods compared to traditional chemical processes. For example, engineered bacteria can generate insulin for medical use, while certain yeast strains are optimized to produce bioethanol.

Microbial factories also offer flexibility. They grow quickly, adapt to controlled conditions, and require relatively simple resources. This makes them ideal for large-scale fermentation systems where consistent output and quality are essential. At the same time, ongoing research continues to improve their stability and productivity.

As biotechnology advances, microbial factories will remain central to innovation. Their ability to merge biology with industry opens new possibilities for medicine, agriculture, and environmental management. For students like us, understanding these systems helps us appreciate how small organisms can create significant impact and inspires deeper curiosity about the unseen world that supports so many aspects of human life.

~Adithi Reddi Kamana, III[rd] Year,
B.Tech. Biotechnology

STUDENT SPOTLIGHT

Sustainable Biotechnology: From Biofuels to Waste Cleanup Solutions

Sustainable biotechnology signifies a promising front in achieving global environmental and economic balance. Since the world is increasingly concerned about fossil fuel depletion and the accumulation of various kinds of waste, biotechnology offers innovative and renewable approaches to mitigate environmental damage. Biotechnology combines scientific knowledge of biological systems with technological innovation to develop eco-friendly, cost-efficient, energy-efficient solutions. The most prominent area associated with sustainable biotechnology is biofuel production. Through microbial fermentation and enzyme degradation processes, renewable biomass comprising agricultural residues, algae, and organic waste yields bioethanol, biodiesel, and biogas. Advanced genetic modification in microorganisms has further optimized the production of biofuels through increased substrate utilization efficiency and tolerance against toxic intermediates. Algal biotechnology, in particular, has great potential due to its high lipid productivity and low land requirements, which also allow it to capture atmospheric carbon dioxide.

Apart from the production of energy, bioremediation and waste management are two other important applications of sustainable biotechnology. Microorganisms capable of degrading such toxic compounds as hydrocarbons, heavy metals, and plastics are being exploited in contaminated environments. Genetic and metabolic modifications in microbes enable the breakdown of pollutants into harmless by-products, offering a natural and sustainable alternative to chemical methods. The development of biosorbents and biofilms enhances the efficiency of removal of such recalcitrant organic pollutants from soil and water systems. In the near future, integration between bioinformatics, systems biology, and synthetic biology will drive sustainable biotechnological solutions forward. These interdisciplinary tools can optimize metabolic pathways and predict environmental impacts more effectively. Sustainable biotechnology thus stands at the crossroads of innovation and environmental stewardship, driving the transition toward a green and circular bioeconomy.

~Divyamshu Surabhi, IIIrd Year,
B.Tech. Biotechnology

The Power of Genes: How CRISPR is Shaping the Future of Medicine

CRISPR, short for Clustered Regularly Interspaced Short Palindromic Repeats, is a revolutionary gene-editing technology that has transformed modern biology. Originally discovered as part of a natural immune defense system in bacteria, CRISPR enables scientists to locate, cut, and modify specific DNA sequences with remarkable precision. This ability to target genes so accurately has opened a wide range of possibilities across medicine, agriculture, and biotechnology.

In the medical field, CRISPR has allowed researchers to explore treatments for genetic disorders that were previously difficult to address. It has shown promising results in correcting mutations responsible for diseases such as sickle cell anemia, cystic fibrosis, and muscular dystrophy. The technology also helps scientists study how genes contribute to various conditions, improving our understanding of complex disorders and enabling the development of more effective therapies. Beyond medicine, CRISPR is being used to develop disease-resistant crops, improve agricultural productivity, and create environmentally friendly biotechnological solutions. Despite its potential, ethical concerns continue to surround its use, particularly when it

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comes to editing human embryos or making genetic changes that can be inherited by future generations. As CRISPR continues to advance, it highlights the power of scientific innovation. When applied responsibly, it holds the potential to cure diseases, strengthen global food security, and contribute to a healthier, more sustainable future.

~Kirthikha Shanmuga Sunder, IInd Year,
B.Tech. Biotechnology

Quantum Biology: Bridging Physics and Life Sciences

Quantum biology is revealing a hidden layer of life, one where the principles of quantum physics help explain and even detect diseases long before traditional methods can. Among the most promising frontiers of this field is its impact on early cancer detection, a challenge that has long limited the success of cancer treatment. By bridging physics and life sciences, researchers are uncovering quantum-level signatures that could transform how we diagnose and understand cancer.

At the heart of this revolution is the idea that molecules inside our cells vibrate, absorb energy, and exchange electrons in ways that are deeply influenced by quantum mechanics. When cells become cancerous, their molecular structure and metabolic pathways change, altering their quantum vibrational fingerprints. Techniques such as Raman spectroscopy, quantum resonance imaging, and ultrafast laser analysis can detect these subtle shift changes far too small for conventional biology to observe.

A powerful real-world example is the development of quantum-based biosensors, originally created for advanced physics experiments. These sensors can measure minute energy differences and detect abnormal molecular vibrations in blood or tissue samples, allowing identification of cancer markers at extremely early stages. In parallel, quantum dots tiny semiconductor nanoparticles are helping visualize tumors with extraordinary clarity, improving detection and guiding targeted therapies.

This merging of quantum physics with biological understanding marks a transformative step in cancer research. It suggests that the earliest signs of cancer may not be visible in tissues or even genes, but in the quantum behavior of molecules themselves. As quantum biology advances, it promises a future where cancer can be detected earlier, diagnosed more accurately, and treated with unprecedented precision changing the landscape of medicine forever.

~Madikunta Divyasree, IInd Year,
B.Tech. Biotechnology

RNA Therapeutics: Lessons from mRNA Vaccines

The recent success of messenger RNA (mRNA) vaccines has reshaped the way we think about modern medicine. For many years, RNA was viewed mainly as a messenger that carried genetic instructions, yet its potential as a therapeutic tool remained largely unexplored. The rapid development of mRNA-based vaccines during the pandemic changed that perception and opened a new path for biomedical innovation. One of the most striking lessons from these vaccines is the power of speed. Traditional vaccine platforms often take years to design and test, but mRNA technology allowed researchers to move from sequence identification to vaccine candidates in a remarkably

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short time. This agility showed how adaptable RNA can be when paired with strong genomic data and a clear understanding of target proteins.

Another important insight is the value of delivery systems. Lipid nanoparticles played a major role in stabilizing the fragile RNA molecules and helping them enter cells effectively. Their success highlighted how chemistry and molecular engineering can work together to solve biological challenges. The experience with mRNA vaccines also reminded us of the importance of public trust and clear communication. Scientific breakthroughs can only make an impact when people understand and accept them. As research continues, RNA therapeutics are expanding into fields such as cancer immunotherapy, rare genetic disorders, and personalized medicine. The journey of mRNA vaccines has shown that small molecules can inspire big changes, and it encourages young scientists like us to imagine what else RNA can do for the future of healthcare.

~Anshika Gupta, IInd Year,
B.Tech. Biotechnology

COVID-19 and the Biotech Boom: How a Pandemic Accelerated a Decade of Innovation

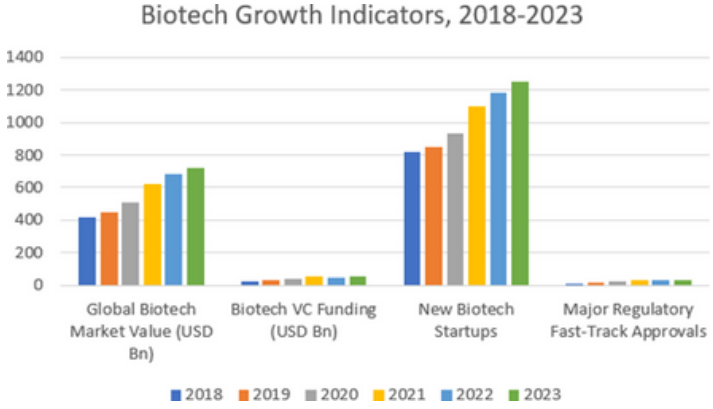
The COVID-19 pandemic, though a global crisis, became an unprecedented catalyst for innovation in the biotechnology sector. What would have taken a decade of gradual advancement occurred within months, transforming biotech from a specialized scientific domain into one of the world's most influential industries. Writing in 2023, it is evident that COVID-19 reshaped research priorities, funding patterns, regulatory systems, and global collaboration at a scale never seen before. One of the most remarkable accelerators was the rapid adoption of mRNA vaccine technology. Although mRNA platforms were under development for years, the pandemic pushed them into mainstream deployment, proving their safety, scalability, and speed. This success has sparked expanded research into mRNA-based therapeutics for cancers, genetic disorders, and infectious diseases beyond COVID- 19.

Simultaneously, biomanufacturing capacity saw massive upgrades. Government funding and private investments surged, enabling companies to scale production of vaccines, diagnostics, and biologics. Regulatory agencies such as the FDA and EMA also adapted, introducing fast-track approvals and emergency authorization pathways that showed how efficiency and safety can coexist when supported by strong data.

Another major transformation occurred in digital biotechnology. AI-driven drug discovery, bioinformatics, and cloud-based clinical trials accelerated timelines and reduced development costs. Remote monitoring, decentralized trials, and real-time data analytics became standard tools.

The pandemic also boosted public and investor confidence. Venture capital investments in biotech nearly doubled between 2019 and 2021, and global R&D spending reached record highs.

As we look beyond COVID-19, the momentum continues. The pandemic has permanently changed the pace of biotech innovation, opening doors for better preparedness, personalized medicine, and faster therapeutic development ushering in a new era for global health.



~Srikanth Muthyala & Amogh Bellurkar,
Ist Year, B.Tech. Biotechnology

Notes