

**Department of Biotechnology**

**Five Year Strategic Plan**  
**(2026-2031)**

## **CONTENTS**

### SECTION I            Key Policy Recommendations and Intervention

- 1.1 ... Vision
- 1.2 ... Mission
- 1.3 ... Objectives
- 1.4 ... Action Plan
- 1.5 ... Research Development Strategy
- 1.6 ... Admission
- 1.7 ... Placement
- 1.8 ... Society Benefit

### SECTION II           Strategy Focus Area

- 2.1 ... Bioenergy
- 2.2 ... Industrial Biotechnology
- 2.3 ... Food Biotechnology
- 2.4 ... Clinical Biotechnology
- 2.5 ... Environmental Biotechnology
- 2.6 ... Intellectual Property & Patent Law
- 2.7 ... Biomaterials and Tissue Engineering
- 2.8 ... Vaccines, Drug Discovery & Drug development

### SECTION III           Strategy Planning Goal

- 3.1 ... Goal 1: Enhancement of Teaching and Learning
- 3.2 ... Goal 2: Promotion of Research and Innovation
- 3.3 ... Goal 3: Infrastructure and Laboratory Development
- 3.4 ... Goal 4: Industry Collaboration and Skill Development
- 3.5 ... Goal 5: Student Support and Career Development
- 3.6 ... Goal 6: Extension and Community Engagement
- 3.7 ... Goal 7: Entrepreneurship and Start-up Promotion
- 3.8 ... Goal 8: Financial Sustainability and Resource Generation through Consultancy
- 3.9 ... Goal 9: Quality Assurance and Governance

## **I. Key Policy Recommendations and Interventions**

NAAC and UGC assign the responsibility to the IQAC for planning, guiding and monitoring Quality Assurance (QA) and Quality Enhancement (QE) activities of the institution. With this background, the Faculty IQAC has undertaken the task of designing a Perspective Plan for the period of five years, commencing from academic year 2026-27 to academic year 2030-31, for balanced growth. The quality indicators of different criteria determined by NAAC have been taken into consideration as the base to create Quality Radars and to set out milestones for the future.

In the preparation of the Perspective Plan, the Faculty IQAC has taken initiatives to obtain inputs from all stakeholders, *viz.*, the management, the faculty, the administrative staff, students of the Faculty, the parents and the peer colleagues. Stakeholders' expectations, management policies, goals and objectives and the vision and the mission statement of our Faculty and the quality policy of the Faculty are also considered as a base for formulation of the perspective plan.

The prime role of IQAC is to suggest quality measures for the betterment of an institution. While preparing a road map for future growth, the members of the IQAC have considered Feedback from all the stakeholders and the recommendations specified in the meetings of the IQAC. Besides, innovative ideas as suggested by all the stakeholders are also carefully incorporated in perspective plan. Student feedback mechanism, self-appraisal and job satisfaction record of teachers, faculty training programs arranged by the Faculty as well as attended by teachers, faculty improvement programs, and introduction of the Research committee to play a proactive role in encouraging teachers for research, are some of the measures initiated with priority

A midterm review is proposed to be conducted by the end of the 1<sup>st</sup> and 3<sup>rd</sup> years 2026-27 and 2029-30, respectively, to appraise the extent to which goals have been achieved. In addition, keeping a scope for midterm correction, the IQAC also proposes an idea of reviewing the perspective plan if needed. This will enable the Faculty to take stock of the accomplishments and to relook into the action plans and untouched/ newer areas to lay stress upon. We hope this will facilitate the Faculty to realign the road map to reach the expectations of stakeholders in a harmonious way.

### **1.1 Vision**

Our vision is to train qualified biotechnologists who can use advanced processes and applications that will profoundly affect existing paradigms in agriculture, industry, healthcare and environmental restoration, thereby providing sustainable competitive advantages for today's society.

### **1.2 Mission**

- A. Motivate for biotechnology education programs to cultivate a high-quality workforce.
- B. Raise awareness of bioethical potential with social ethics.
- C. Inspiring innovation and creativity in young people with good research skills.
- D. Cultivate self-confident people who are making effective contributions to national development.

### **1.3 Objectives**

For the improvement of our department, we need to produce high-quality students so that they are able to cope with all the professional and personal challenges that are prevalent around the world and be able to do their respective jobs and contribute to the overall growth of their respective employment providers, countries and the world. Graduates must also have the most advanced R & D skills in their field.

- A. Carry out engineering practice in a wide range of industrial, social and practical applications.
- B. Pursue higher education, research and development, and other creative and innovative efforts in science, engineering, technology, and other professional occupations.
- C. Act in a responsible, professional and ethical manner.

### **1.4 Action Plan**

The Biotechnology Department aims to enhance academic excellence through innovative teaching and research-driven practices by developing new methodologies for effective learning and adopting an inquiry-based laboratory curriculum that promotes active participation and student responsibility. The department will guide students toward a research-oriented and critical thinking approach while fostering a collaborative and research-intensive environment with clearly defined course objectives. Emphasis will be placed on project-based learning and providing extensive hands-on experience through diverse experiments. To strengthen academic and research capabilities, the department will establish MoUs with reputed national and international universities and enhance collaboration with eminent scientists and global industries. Additionally, the department will focus on research in emerging areas of biotechnology while promoting extension activities and consultancy services to contribute to societal and industrial development.

### **1.5 Research Development Strategy**

The department will focus on emerging and high-impact research areas such as food biotechnology, environmental biotechnology, bioenergy, biomaterials for improving quality of life, and vaccine and drug discovery and development. Strengthening research in these domains will enhance opportunities for securing government funding and filing patents. The department will promote innovative, interdisciplinary, and creative research efforts while integrating research experiences into the undergraduate curriculum. Faculty members will be supported with adequate resources and recognition to encourage their contributions. Additionally, the department will continuously identify challenges in implementing its research policy and take timely and appropriate actions to overcome them, ensuring sustained research growth and excellence.

### **1.6 Admission**

- A. Frequent department and lab visits of higher secondary students and motivate them to choose Biotechnology as their career.
- B. Renovation of lab infrastructure and instruments for providing a better research facility will attract students to do M. Sc. M.Tech. And PhD as well.
- C. Advertising throughout India regarding the Biotechnology Programs of Rama University.

### **1.7 Placement**

- A. Inviting core biotechnology companies
- B. Motivating students for certification courses in various biotechnology industries will attract the core companies for better recruitment.

### **1.8 Society Benefit**

- A. Students will be equipped to leave the laboratory or classroom with the ability to critically discuss, analyze, and develop solutions to a wide range of biological issues. They will be nurtured as future leaders, actively participating in their areas of expertise and contributing to global services and economic development.
- B. The department will promote extension activities and consultancy services, encouraging students and faculty to engage with communities, industries, and research organizations to apply their knowledge for societal benefit, technological advancement, and real-world problem solving.

## **II. Strategic Focus Areas**

The Department of Biotechnology offers Bachelor's (B.Tech and B.Sc.), Master's (M.Tech and M.Sc.) and PhD. Degree Programs in Biotechnology. The Department aims to generate trained manpower in the areas of Biotechnology and attempts to integrate research and teaching to harness maximum potential. The course curriculum will not only equip the student with sound knowledge and expertise in relevant areas but will also create avenues for research and job opportunities in future and for self-employment. Department is equipped with ultra-modern equipment with state of the art laboratory facilities and has dedicated faculty engaged in the genetic improvement of Industrially, Agriculturally and medicinally important Plant & Microbes through recombinant DNA technology, as well as in understanding Genetic diversity using DNA based Molecular markers techniques. The department plans to focus in following five areas for the next five years:

### **2.1 Bioenergy**

Bioenergy is one of many diverse resources available to help meet our energy demand. It is a form of renewable energy that is derived from recently living organic materials known as biomass, which can be used to produce transportation fuels, heat, electricity, and products. Abundant and renewable bioenergy can contribute to a more secure, sustainable, and economically sound future by: reducing dependence on foreign oil, supplying domestic clean energy sources and revitalising the rural economy. With this in mind Department of Biotechnology aims to expand teaching and research activities in biodiesel production, enhancing the oil content of oil crops through genetic engineering and process optimisation for improving yield and reducing cost.

## **2.2 Industrial Biotechnology**

At present, a third wave of biotechnology – industrial biotechnology – is strongly developing. Industrial biotechnology (also referred to as white biotechnology) uses biological systems for the production of useful chemical entities. This technology is mainly based on biocatalysis and fermentation technology in combination with recent breakthroughs at the forefront of molecular genetics and metabolic engineering. This new technology has developed into a main contributor to the so-called green chemistry, in which renewable resources such as sugars or vegetable oils are converted into a wide variety of chemical substances such as fine and bulk chemicals, pharmaceuticals, bio-colourants, solvents, bio-plastics, vitamins, food additives, bio-pesticides and bio-fuels such as bio-ethanol and bio-diesel.

The application of industrial biotechnology offers significant ecological advantages. Agricultural crops are used as starting raw materials, instead of using fossil resources such as crude oil and gas. This technology consequently has a beneficial effect on greenhouse gas emissions and at the same time supports the agricultural sector producing these raw materials. Industrial biotechnology frequently shows significant performance benefits compared to conventional chemical technology.

### **Strategic Actions:**

1. Focus in industrial biotechnology will be on reducing chemical and toxic load in our effluent streams, developing non-fossil fuels that are ecofriendly and developing green technologies in Industrial processing.
2. Encourage public-private partnerships to promote investment in this sector.
3. Promotion of industrial biotechnology in strategic areas of manufacturing and developing green technologies.

## **2.3 Food Biotechnology**

Biotechnology refines and extends methods that produce new plants and animals. Biotechnology has a long history of use in food production and processing. For ten thousand years, fermentation, a form of biotechnology, has been used to produce wine, beer and bread. Selective breeding of animals such as horses and dogs has been going on for centuries. Selective breeding of essential foods such as rice, corn and wheat has created thousands of local varieties with improved yield compared to their wild ancestors. Biotechnology applications in the food-processing sector, therefore, target the selection and manipulation of micro-organisms to improve process control, product quality, safety, consistency and yield, while increasing process efficiency. In an effort to address the future expectations of stakeholders in post-harvest management and the food processing sector through food biotechnological research and development innovations, it becomes necessary to build a trained and expert workforce in this area. The department aims to bridge this gap by training and creating trained manpower and promoting research activities, especially in the probiotics area.

## **2.4 Environmental biotechnology**

Environmental biotechnology is a system of scientific and engineering knowledge related to the

use of microorganisms and their products in the prevention of environmental pollution through bio-treatment of solid, liquid, and gaseous wastes, bioremediation of polluted environments, and bio-monitoring of the environment and treatment processes. Given the limitations of current chemical and mechanical processes, the world is turning towards greener options of biotechnological interventions. The department of biotechnology aims to promote teaching, training and research activities in the areas relevant to waste management & environmental improvement, development & demonstration of wastewater-specific effective bioremediation options like natural attenuation to bio-stimulation, bio-augmentation or a combination of filtration, phytoremediation and microbial degradation, Bio-restoration technologies for restoration of degraded ecosystems.

### **2.5 Intellectual Property & Patent Law**

The development of capabilities for the effective management of Intellectual Property (IP) is an important element in securing the benefits of public and private sector research in biotechnology. In this context, filings of patents both in India and abroad are critical to the growth of the Department of Biotechnology.

**Strategic Actions:** Administration of the new intellectual property rights regime should be improved. This will be achieved by ·

1. Encouraging science graduates to pursue law for a better understanding of IPR-related issues.
2. Inclusion of IPR-related issues in the curriculum of the biotechnology department for facilitating the filing of international patents, license negotiation, dispute resolution, etc.
3. Training students and faculty in the strategy of intellectual property protection relating to assessment of patentability, prior art examination and technology transfer issues.

### **2.6 Biomaterials and Tissue Engineering**

Biomaterials serve as an integral component of tissue engineering. They are designed to provide an architectural framework reminiscent of native extracellular matrix to encourage cell growth and eventual tissue regeneration. Tissue engineering is an interdisciplinary field dedicated to the regeneration of functional human tissues. Despite the body having intrinsic self-healing properties, the extent of repair varies amongst different tissues, and may also be undermined by the severity of injury or disease. Given the rapidly growing importance of the field to society, and its potential to treat many terminal diseases.

### **2.7 Vaccines, drug discovery & Drug development**

COVID-19 has once again highlighted the need for vaccines to prevent deadly viral infections and death. Currently, the world is craving to develop vaccines for SARS-CoV-2, but it is still elusive. Further, the world is also looking for various drugs that can treat COVID-19. Seeing the importance of this area, the Department of Biotechnology aims to promote teaching and research activities in vaccine design, vaccine development approach and drug discovery using a bioinformatics approach. The department aims to upgrade bioinformatics labs with open source software to carry out research and teaching activities

### **III. Strategic Planning Goal**

The department will focus on the following key strategic areas:

1. Enhancement of Teaching and Learning
2. Promotion of Research and Innovation
3. Infrastructure and Laboratory Development
4. Industry Collaboration and Skill Development
5. Student Support and Career Development
6. Extension and Community Engagement
7. Entrepreneurship and Start-up Promotion
8. Financial Sustainability and Resource Generation through Consultancy
9. Quality Assurance and Governance

#### **3.1 Teaching and Learning Enhancement**

##### **Objectives**

1. Improve the quality of teaching through innovative pedagogical approaches.
2. Integrate modern biotechnology concepts into the curriculum.
3. Promote student-centred learning.

##### **Action Plans**

1. Expansion of ICT-enabled teaching methods such as smart classrooms and digital learning platforms.
2. Excellence in Outcome-Based Education (OBE).
3. Incorporate case studies, project-based learning, and problem-solving approaches for the students' knowledge enhancement.
4. Organise guest lectures and seminars by experts.
5. Organise hands-on training on essential of microbiology and molecular biology.
6. Implementation of value-added courses (non-credit courses).
7. Organise Faculty development programme at the level of the Institute.

##### **Expected Outcomes**

1. Improved student engagement and academic performance.
2. Better conceptual understanding of biotechnology principles.

#### **3.2 Research and Innovation**

##### **Objectives**

1. Encourage faculty and students to engage in high-quality research.
2. Increase publications and research collaborations.

### **Action Plans**

1. Develop research groups in specialised areas such as:
  - 1) Plant Biotechnology
  - 2) Microbial Biotechnology
  - 3) Medical Biotechnology
  - 4) Environmental Biotechnology
2. Encourage faculty to apply for research funding from national and International agencies.
3. Promote student research projects and dissertations through collaboration with other institutes and universities.
4. Organise National and International conferences and workshops at the Institute level.
5. Promote Student training and hands-on experience through collaboration with the research driven Institutes.
6. Promote MoUs with the reputed organisation for the enhancement of research opportunities at the department/Institute/ University level.

### **Expected Outcomes**

1. Increased number of research publications.
2. Increased University ranking and its H Index.
3. Improved research visibility of the department.

## **3.3 Infrastructure and Laboratory Development**

### **Objectives**

- Strengthen laboratory facilities for advanced biotechnology research and teaching.

### **Action Plans**

1. Upgrade/Installation of existing laboratories with advanced instruments:
  - 1) PCR machine
  - 2) Gel electrophoresis apparatus
  - 3) Gel documentation system
  - 4) Spectrophotometer
  - 5) Fermentation units
  - 6) CO<sub>2</sub> Incubator
2. Development of Bioinformatics Laboratory.
3. Improvement in Plant Tissue Culture Laboratory.

4. Implement proper laboratory safety and waste management systems.
5. Hiring of Lab technicians and lab attendants for the specialized labs
6. Improve biotechnology laboratories from BSL-1 to BSL-3.

### **Expected Outcomes**

1. Enhanced practical training for students.
2. Improved research capability of the department.
3. Undergraduate and postgraduate training for other institutes and universities (Consultancy basis)
4. Organise biosafety training for all programs
5. Faculty training in biosafety level-2 practices

## **3.4 Industry Collaboration and Skill Development**

### **Objectives**

- Provide industry exposure and practical skills to students.

### **Action Plans**

1. Establish MoUs with biotechnology companies and research institutes.
2. Organise industrial visits and internships.
3. Conduct hands-on training workshops in:
  - 1) Molecular biology techniques
  - 2) Bioinformatics tools
  - 3) Diagnostic techniques
4. Introduce short-term certificate courses.

### **Expected Outcomes**

1. Improved employability of biotechnology graduates.
2. Stronger industry-academia relationships.

## **3.5 Student Development and Support**

### **Objectives**

- Promote academic excellence and holistic development of students.

### **Action Plans**

1. Improve mentorship programs.
2. Improve career guidance and counselling.

3. Conduct of remedial classes for academically weaker students
4. Encourage students to participate in science competitions and research conferences.
5. Support preparation for competitive exams such as CSIR-NET, GATE and JAM, etc
6. Conduct soft skill and communication training programs.

### **Expected Outcomes**

1. Improved academic performance.
2. Higher placement and research opportunities.

## **3.6 Extension and Community Engagement**

### **Objectives**

- Apply biotechnology knowledge for societal benefit.

### **Action Plans**

1. Conduct awareness programs on health, nutrition, and hygiene.
2. Promote environmental sustainability initiatives.
3. Organise science outreach programs for school students.
4. Participate in science exhibitions and community projects.

### **Expected Outcomes**

1. Increased societal impact of biotechnology education.
2. Greater public awareness about biotechnology.

## **3.7 Entrepreneurship and Start-up Promotion**

### **Objectives**

- Encourage innovation and entrepreneurship among students.

### **Action Plans**

1. Promote the Biotechnology Innovation and Entrepreneurship Cell.
2. Conduct entrepreneurship development programs.
3. Encourage student start-up ideas and innovation projects.
4. Collaborate with incubation centres and start-up support organisations.

### **Expected Outcomes**

1. Development of biotechnology-based start-ups.

2. Increased innovation and commercialisation activities.

### **3.8 Financial Sustainability and Resource Generation through Consultancy**

#### **Objectives**

1. To promote financial independence and sustainability of the Department of Biotechnology through consultancy services, laboratory testing, training programs, and collaborative research with industries and external agencies.
2. To utilise departmental expertise and laboratory facilities to provide technical consultancy and analytical services to industries, research organisations, farmers, healthcare laboratories, and educational institutions.

#### **Action Plan**

1. Identification of Consultancy Areas
2. Collaboration with Industries and Organizations
3. Training and Skill Development Programs
4. Faculty Participation and Incentives
5. Encourage faculty members to participate in consultancy projects.
6. Provide recognition and incentives for faculty generating consultancy revenue.

#### **Expected Outcomes**

1. Generation of additional financial resources for departmental development.
2. Improved laboratory infrastructure and research facilities.
3. Strong industry–academia collaboration.
4. Enhanced practical exposure for students through real-world projects.
5. Increased research and consultancy reputation of the department.
6. Long-term financial sustainability and partial self-reliance of the department.

### **3.9 Quality Assurance and Governance**

1. Attain the accreditation of ISO as per the guidelines.
2. Provide incentives as per the faculty's individual research performance.
3. Facilitate faculty development programs (FDPs), workshops, and training sessions.
4. Strengthen feedback mechanisms from students, alumni, and stakeholders for quality enhancement.
5. Promote ethical practices and research integrity in all academic activities.

The implementation of the strategic plan will be monitored through:

1. Departmental meetings

2. Internal quality audits
3. Annual progress reports
4. Feedback from students and stakeholders

Performance indicators will include:

1. Research publications
2. Research funding obtained
3. Student placement statistics
4. Number of collaborations and MoUs
5. Participation in academic and outreach activities

**Student Strength**



<b>Total Student Enrollments</b>	<b>211</b>
<b>Total PhDs</b>	<b>5</b>
<b>Total PG Students</b>	<b>15</b>

**Faculty**

<b>Total Faculty</b>	<b>8</b>
<b>No. of Faculty with PhD</b>	<b>7</b>
<b>No. of Industry Faculty</b>	<b>NIL</b>
<b>No. of International Faculty</b>	<b>NIL</b>

**Research**



<b>Total Publications</b>	<b>3</b>
<b>Patents filed</b>	<b>3</b>
<b>Number of startups incubated</b>	<b>Under Discussion</b>
<b>Project Submitted</b>	<b>2</b>