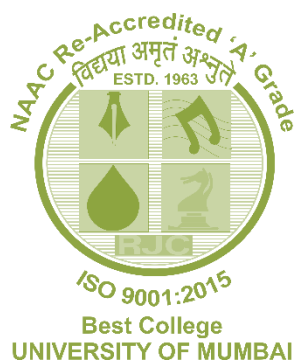


## Syllabus Framework as per LOCF



Hindi Vidya Prachar Samiti's  
**Ramniranjan Jhunjhunwala College**  
Of Arts, Science & Commerce  
(Autonomous College)

Affiliated to  
UNIVERSITY OF MUMBAI

## Syllabus Framework as per LOCF

**Program: M.Sc. BIOTECHNOLOGY**

**Program Code: RJSPBT**

*(CBCS 2020-2021)*

## **Syllabus Framework as per LOCF**

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## **Syllabus Framework as per LOCF**

### **THE PREAMBLE**

#### ***Why Biotechnology?***

Biotechnology is a fast-growing field of science where biological systems are used in diverse applications in the areas of fermentation, environment, diagnosis, treatment, agriculture, food industry etc. It is the most recent offshoot of biological sciences thriving on the latest technological advancements in engineering technology, recombinant DNA technology, computer sciences and many more. Biotechnology is an interdisciplinary field that brings together knowledge from diverse fields such as physics, statistics, mathematics, chemistry, microbiology, biological sciences, information technology, as well the most current technological advancements such as Artificial Intelligence and Machine Learning.

Biotechnology encompasses the study of all living beings including bacteria, archaeobacteria, fungi, algae, protozoa, helminths, plants, animals and viruses. It includes the basic understanding of each type of cell - prokaryotic, eukaryotic, viral particles along with their intracellular architecture, their anatomical features, their physiological and biochemical process and their molecular mechanisms of inheritance right from chromosomes, genes to the nucleic acids. Biotechnology as a field of science is the most application-oriented field where the knowledge gained in this course has direct and immediate application in the real world, be it pharmaceutical industry, food industry, diagnostics, personalized medicine, genetically modified crops and animals, bioprinting of organs, bioinformatics or clinical research.

#### ***Why Biotechnology in R J College?***

The Department of Biotechnology was established in 2002. In 2005 M.Sc. (By Papers & Research) and PhD Biotechnology approval from University of Mumbai was received. The department hosts 3 states of the art laboratories equipped with all the required instruments and facilities for carrying out practical sessions of UG and PG courses as well as research projects. Individualized and personal training is given to every student for various microbiology, molecular biology, biochemistry and medical diagnostics techniques that are a part of our extensive and inclusive UG and PG curriculum. Under autonomy, the

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department has made curriculum more robust by incorporating skill-based learning and Value-Added Courses (VACs) such as Fermented Foods and Beverages, Clinical Research etc., that impart practical knowledge of the subject to the students. These value-added courses are offered to students without any additional charge, from other subjects as well likewise Biotech students can complete VACs offered by other departments. These VACs, mini projects, internships and other co-curricular courses completed by the students help them to earn extra credits every year along with the credits earned by successfully completing the prescribed course work. The department organizes talks by eminent personalities from industry, research organizations and academia on a regular basis to acquaint the students with the current research and industrial developments.

The Department also offers PG Diploma courses such as Clinical Studies, Data Management & Medical Writing and Post Graduate Diploma in Industrial Hygiene and Safety that our students can opt for after graduation simultaneously with post-graduation or job. In 2019 the department has earned DBT Star college grant which is being used to procure more equipment and instruments so that each student can carry out the molecular biology and other such advanced experiments on an individual basis.

The Department also has its Departmental Library and reading area which the students use after their daily schedule. The library holds more than 1000 subject reference books and journals, and many e-books. Along with these there are books for preparing for Entrance Exams such as JAM, GATE, CSIR-NET, SET which the students can borrow and make the most of the resources and time available.

The department hosts its own [Website](#), showcasing various departmental activities such as competitions, field trips, festivals, and popular lecture series by eminent personalities, workshops and research projects. The department has its presence on various social media platforms such as **Facebook** and **Instagram**, this helps in interaction between our current students and alumni. We also have our official **YouTube** channel showcasing various practical techniques, student's videos and eminent talks.

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### ***Our Curriculum, Your Strength***

The syllabus for Biotechnology for the total six semesters is meticulously designed so as to make students understand the principles behind the complex biological processes and their applications in the real world. The syllabus evolves from semester I to semester VI with basics and essential biological concepts explained earlier and the advanced and the current techniques towards the last semester. In the undergraduate curriculum there is a full paper on Research methodologies. Also, our students are encouraged to carry out a small project of 2-3 months every year so that they get hands-on experience of doing research. We also have the topic of Entrepreneurship as a full paper in the undergraduate curriculum, this helps to enhance the entrepreneurial skills of our students. For hands-on Bioinformatics sessions the department has a computer lab with internet facility where the students can practice and can be assessed using online bioinformatics tools. As an applied component for third year graduate students in the V<sup>th</sup> and VI<sup>th</sup> semester we offer medical laboratory Technology (MLT). This subject introduces the students to the latest and advanced clinical and molecular diagnostic techniques making our students employable and industry ready immediately after graduation.

In our post graduate syllabi, the most advanced and relevant subjects such as nanotechnology, Genomics, IPR, Bioprocess Technology, Bioinformatics, Developmental biology have been incorporated. These will make the students ready for both industry as well as research-oriented endeavors. One entire semester of PG practical course work is dedicated to internship in any of the research institutions, academic institutes or industry. This gives our students an exposure to work away from the campus in the industrial set up, research set up, production set up or pharmaceutical or health care organizations and they get acquainted with the real-world projects and processes. These projects also help the students to directly get employment in the field of their choice or help them get research experience useful for their future research career. We organize regular interactions of our illustrious alumni with our current UG and PG students; this provides the students guidance in their studies and assistance in internships and placements.

## **Syllabus Framework as per LOCF**

### **PROGRAM OUTCOMES OF GENERAL UNDERGRADUATE DEGREE PROGRAMS**

Students of all undergraduate degree program at the time of graduation will be benefited will be able to

#### ***Critical Thinking***

Comprehend the matter they come across and be capable to take a sound viewpoint about things which will highlight their intellectual acumen as well as enable them to look at the world through multiple lenses

#### ***Effective communication***

Listen, speak, read and write. They should communicate properly by conveying their thoughts. They will use technology for communication. Students will be able to network with people using all available channels. They will be developing communication skills in English; Hindi and a local language would be an added advantage.

#### ***Social Interaction***

Respect each other and should be able to resolve conflicts and help in reaching amicable solution. They should be able to work in diverse teams. They should be able to distinguish when and what is socially acceptable.

#### ***Responsible citizen***

Contribute to Nation development through social service. Being empathetic and sympathetic to fellow beings.

#### ***Honesty and Integrity, Ethics***

Recognize different values and systems and respect them. In decision making moral values should be given prime importance.

## **Syllabus Framework as per LOCF**

### ***Environmental and Sustainability***

Environmental issues would be considered and problem solving with sustainable development would be chosen.

### ***Life Long learning***

Enjoy learning in every situation.

## Syllabus Framework as per LOCF

### Program Specific Outcome M.Sc. Program with Biotechnology

Biotechnology plays a pivotal role in our life. The courses have been designed to benefit all Biotechnology students to study various aspects of Biotechnology including its practical applications. Keeping in mind the need for employability and entrepreneurship topics have been included in the curriculum.

PSO1:	Understand the biochemistry of glycosaminoglycans, proteoglycans, glycoproteins, eicosanoids, DNA topology, Protein structure. Also, to study the concepts of neurobiology, Homeostasis of acid-base & water electrolyte balance, humoral, cellular & clinical immunity, genome sequencing and editing and various biophysical techniques.
PSO2:	Understand the concepts of reactions of metabolic pathways of Amino acids & nucleotides, lipoproteins, Protein folding, Autoimmunity, transplantation, Hypersensitivity, immunodeficiency, Psychoneuroimmunology, bioprocess technology, IPR and Biosafety
PSO3:	Understand the concepts of Genetic engineering of plants, Basics of Animal cell culturing, epidemiology of Viral, Bacterial, Fungal and Protozoal Infections, properties of biofilms, Impact of GMOs, Bioremediation methods, Assisted reproductive technology
PSO4:	Understand the concepts of synthesis, characterization & applications of nanoparticles, Proteomics, Genomics, New drug discovery process, use of various non-parametric statistical tests in data analysis, regression



## Syllabus Framework as per LOCF

### Biotechnology PG Core Course Program Outcome

PROGRAM OUTCOME	Part I Sem-I				Part I Sem-II			
	RJSPBT101	RJSPBT 102	RJSPBT103	RJSPBT 104	RJSPBT201	RJSPBT202	RJSPBT203	RJSPBT204
Core Competency	√	√	√	√	√	√	√	√
Critical Thinking	√	√	√	√	√	√	√	√
Analytical Reasoning	√	√	√	√	√	√	√	√
Research Skills	√	√	√	√	√	√	√	√
Problem Solving	√	√	√	√	√	√	√	√
Team Work	√	√	√	√	√	√	√	√

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PROGRAM OUTCOME	Part II Sem-III				Part II Sem-IV			
	RJSPBT301	RJSPBT302	RJSPBT303	RJSPBT304	RJSPBT401	RJSPBT402	RJSPBT403	RJSPBT404
Core Competency	√	√	√	√	√	√	√	√
Critical Thinking	√	√	√	√	√	√	√	√
Analytical Reasoning	√	√	√	√	√	√	√	√
Research Skills	√	√	√	√	√	√	√	√
Problem Solving	√	√	√	√	√	√	√	√
Team Work	√	√	√	√	√	√	√	√

## Syllabus Framework as per LOCF

### Teaching Learning Process

The teaching learning process in the learning outcomes-based curriculum framework in the subject of Biotechnology is designed to develop the cognitive skills of every learner. The course offers the requisite skills for research and industry jobs in the field of Biotechnology. All courses have practical as an integral part which promotes the learner to acquire the requisite skills for employment by experiential learning.

An interesting combination of teaching learning processes is adopted in which the teacher and learners are actively involved.

#### **Some of the salient teaching learning processes are**

- Class lectures
- Presentations
- Group Discussion, workshops
- Peer teaching and learning
- Flipped classroom, project-based learning, quiz, seminars, exhibitions, posters.
- Practical experimental design planning, analysis, interpretation, application of knowledge gained, field projects, mini projects
- Hands on usage of bioinformatics tools
- Technology enabled self-learning
- Internships
- MOOCs
- Gamification

The effective teaching strategies would address the requirements of learner to learn at their own pace. The teaching pedagogy adopted to ensure inculcate higher order skills in the learner. The entire program is also designed to foster human values, environmental consciousness for an equitable society. The teaching learning processes adopted would aim at participatory pedagogy.