

## Department of Biotechnology

### Programme Outcomes, Programme Specific Outcomes and Course Outcomes

#### Programme outcomes (POs), Program Specific outcomes (PSOs) and Course outcomes (COs) of the Programmes offered by the University

Programme code	Programme Name	Department
BTB	M.Sc. Biotechnology	Department of Biotechnology

#### Programme outcome (POs):

The M.Sc. Program of Biotechnology at Sant Gadge Baba Amravati University , started in 1994, aims to train students in Biotechnology wherein engineering and technology principles could be used to probe biological questions or to develop technologies, devices and systems that require substantive expertise in Biology, Agriculture, Pharmaceutical, Industrial, as well as Clinical Research components. The students in this program acquire knowledge, critical thinking skills and experience in conducting cutting edge research. This program develops human capital for advanced scientific research and entrepreneurship.

The programme has been aligned with the National Biotechnology Development Strategy (2015-2020) aligned by DBT, Govt. of India, which provides a strategic roadmap for India's emergence as a global biotechnology innovation and manufacturing hub, which also highlighted importance of human resource development and need for nurturing tailor-made human capital for advanced strategic research and entrepreneurship.

## **Programme Specific Outcomes (PSOs):**

**PSO1:** Postgraduate students will be able to demonstrate and apply their knowledge of cell biology, biochemistry, microbiology and molecular biology to solve the problems related to the field of biotechnology.

**PSO2:** Postgraduate students will be able to demonstrate and apply the principles of bioprocess engineering in the design, analysis, optimization and simulation of bioprocess operations.

**PSO3:** Students will be able to gain fundamental knowledge in animal and plant biotechnology and their applications.

**PSO4:** Students will be equipped to understand three fundamental aspects in biological phenomenon: a) what to seek; b) how to seek; c) why to seek?

**PSO5:** Student will be able to (a) Describe fundamental molecular principles of genetics; (b) Understand relationship between phenotype and genotype in human genetic traits; (c) Describe the basics of genetic mapping; (d) Understand how gene expression is regulated.

**PSO6:** Students will be able to (a) To elaborate concepts of biochemistry with easy to run experiments; (b) To familiarize with basic laboratory instruments and understand the principle of measurements using those instruments with experiments in biochemistry.

**PSO7** Students will be able to understand various facets of molecular procedures and basics of genomics, proteomics and metabolomics that could be employed in early diagnosis and prognosis of human diseases.

**PSO8:** Students will be able to gain hands on experience in gene cloning, protein expression and purification. This experience would enable them to begin a career in industry that engages in genetic engineering as well as in research laboratories conducting fundamental research.

### Course Outcomes (COs):

S.No.	Name of the course	Course Code	Course Outcome
1.	Cell Biology	1BTB1	sensitize the students to the fact that as we go down the scale of magnitude from cells to organelles to molecules, the understanding of various biological processes becomes deeper and inclusive.
2.	Macromolecules and Enzymology	1BTB2	Students should be able to: <ul style="list-style-type: none"><li>● Gain fundamental knowledge in biochemistry;</li><li>● knowledge of biochemical principles with specific emphasis on different metabolic pathways and regulators</li><li>● Understand the molecular basis of various pathological conditions from the perspective of biochemical reactions.</li></ul>
3.	Microbes: Physiology and Genetics	1BTB3	To introduce field of microbiology with special emphasis on microbial diversity, morphology, physiology and nutrition; methods for control of microbes and host-microbe interactions. Students should be able to <ul style="list-style-type: none"><li>● Identify major categories of microorganisms and analyze their classification, diversity, and ubiquity;</li></ul>

			<ul style="list-style-type: none"> <li>● Identify and demonstrate structural, physiological, genetic similarities and differences of major categories of microorganisms;</li> <li>● Identify and demonstrate how to control microbial growth;</li> <li>● Demonstrate and evaluate interactions between microbes, hosts and environment.</li> </ul>
4	Biology of The Immune System	1BTB4	<p>To learn about structural features of components of immune system as well as their function, development of immune system and mechanisms by which our body elicits immune response.</p> <p>It will help Students to predict about nature of immune response that develops against bacterial, viral or parasitic infection, and prove it by designing new experiments.</p>
5.	Molecular Biology	2BTB1	<p>Students should be able to understand basics of genetics and classical genetics covering prokaryotic/phage genetics to yeast and higher eukaryotic domains.</p> <p>On successful completion of this course, student will be able to:</p> <ul style="list-style-type: none"> <li>• Describe fundamental molecular principles of genetics;</li> <li>• Understand relationship between phenotype and genotype in human genetic traits;</li> <li>• Describe the basics of genetic mapping;</li> <li>• Understand how gene expression is regulated.</li> </ul>

6.	Bioprocess Engineering and Technology	2BTB2	<p>Students should be able to:</p> <ul style="list-style-type: none"> <li>● Appreciate relevance of microorganisms from industrial context;</li> <li>● Carry out stoichiometric calculations and specify models of their growth;</li> <li>● Give an account of design and operations of various bioreactors and downstream processes;</li> <li>● Calculate yield and production rates in a biological production process, and also interpret data;</li> <li>● Critically analyze any bioprocess from market point of view;</li> <li>● Give an account of important microbial/enzymatic industrial processes</li> </ul>
7.	Plant Biotechnology	2BTB3	The objectives of this course are to introduce students to the principles, practices and applications of plant biotechnology, plant tissue culture, plant genomics, genetic transformation and molecular breeding of plants.
8.	Animal Cell Science & Technology	3BTB1	To introduce students to the principles, practices and application of animal biotechnology in Tissue Engineering, Vaccines and biopharmaceuticals.
9.	Genetic Engineering	3BTB2	The objectives of this course are to teach students with various approaches to conducting genetic engineering and their applications in biological research as well as in biotechnology industries. Genetic engineering is a technology that has been developed based on fundamental

			understanding of the principles of molecular biology and this is reflected in the contents of this course.
10.	Biostatistics and Bioinformatics	3BTB3	<p>The objectives of this course are to provide theory and practical experience of the use of common computational tools and databases which facilitate investigation of molecular biology and evolution-related concepts. Student should be able to :</p> <ul style="list-style-type: none"> <li>• Develop an understanding of basic theory of these computational tools;</li> <li>• Gain working knowledge of these computational tools and methods;</li> <li>• Appreciate their relevance for investigating specific contemporary biological questions;</li> <li>• Critically analyse and interpret results of their study.</li> </ul>
11.	Environmental Biotechnology	4BTB1	<p>This course aims to introduce fundamentals of Environmental Biotechnology. The course will introduce major groups of microorganisms tools in biotechnology and their most important environmental applications. On completion of course, students will be able to understand the use of basic microbiological, molecular and analytical methods, which are extensively used in environmental biotechnology.</p>
12.	Industrial Biotechnology	4BTB2	<p>The objectives of this course are to introduce students to developments/ advances made in field of microbial</p>

			<p>technology for use in human welfare and solving problems of the society.</p> <p>On completion of this course, students would develop deeper understanding of the industrial Biotechnology and its applications.</p>
13	Phytosecondary metabolites (E1)	2BTB4/4BTB3	<p>This course will give a broad overview of research and development carried out in phytosecondary metabolites and their applications.</p>
14	Drug Discovery (E2)	2BTB4/4BTB3	<p>This course will give a broad overview of research and development carried out in industrial setup towards drug discovery.</p> <p>On completion of this course, students should be able to understand basics of R&amp;D in drug discovery and should be able to apply knowledge gained in respective fields of pharmaceutical industry.</p>
15	Molecular Marker (E3)	2BTB4/4BTB3	<p>The objectives of this course are to sensitize students about recent advances in molecular biology and various facets of molecular medicine which has potential to profoundly alter many aspects of modern medicine. Students should be able to understand various facets of molecular procedures and basics of genomics, proteomics and metabolomics that could be employed in early diagnosis and prognosis of human diseases.</p>
16	Projects		<p>The purpose of this course is to help students organize</p>

		<p>ideas, material and objectives for their dissertation and to begin development of communication skills and to prepare the students to present their topic of research and explain its importance to their fellow classmates and teachers.</p> <p>Students should be able to demonstrate the following abilities:</p> <ul style="list-style-type: none"><li>• Formulate a scientific question;</li><li>• Present scientific approach to solve the problem;</li><li>• Interpret, discuss and communicate scientific results in written form;</li><li>• Gain experience in writing a scientific proposal;</li><li>• Learn how to present and explain their research findings to the audience effectively.</li></ul>
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