



Rayat Shikshan Sanstha's
Karmaveer Bhaurao Patil College Vashi, Navi Mumbai
(Autonomous)

Name of the Faculty: Science and Technology


Name of the Program: Bachelor of Science

Program Outcomes (POs)

PO-1	Disciplinary Knowledge and Skills: Acquire the comprehensive and in-depth knowledge of various subjects in sciences such as Physics, Chemistry, Mathematics, Microbiology, Bio-analytical Science, Computer Science, Data Science, Information Technology and disciplinary skills and ability to apply these skills in the field of science, technology and its allied branches.
PO-2	Communication and Presentation Skills: Develop various communication skills including presentation to express ideas evidently to achieve common goals of the organization.
PO-3	Creativity and Critical Judgement: Facilitate solutions to current issues based on investigations, evaluation and justification using an evidence-based approach.
PO-4	Analytical Reasoning and Problem Solving: Build a critical and analytical attitude in handling problems and situations.
PO-5	Sense of Inquiry: Curiously raise relevant questions based on highly developed ideas, scientific theories and their applications including research.
PO-6	Use of Digital Technologies: Use various digital technologies to explore information/data for business, scientific research and related purposes.
PO-7	Research Skills: Construct, collect, investigate, evaluate and interpret information/data relevant to science and technology to adapt, evolve and shape the future.
PO-8	Application of Knowledge: Develop a scientific outlook to create consciousness against the social myths and blind faith.
PO-9	Moral and Ethical Reasoning: Imbibe ethical, moral and social values to develop virtues such as justice, generosity and charity as beneficial to individuals and society at large.
PO-10	Leadership and Teamwork: Work cooperatively and lead proactively to achieve the goals of the organization by implementing the plans and projects in various field-based situations related to science, technology and society at large.
PO-11	Environment and Sustainability: Create social awareness about the environment and develop sustainability for the betterment of the future.
PO-12	Lifelong Learning: Realize that pursuit of knowledge is a lifelong activity and in combination with determined efforts, positive attitude and other qualities to lead a successful life.


Program
Coordinator


BOS Chairman


Principal



Name of the Faculty: Science and Technology
Name of the Specific Program: **B.Sc. Microbiology**
Program Specific Outcomes (PSO)

At the end of the two-year program, the student will be able to understand -

PSO-1	Understand the various aspects of microbial world and history of microbiology
PSO-2	Differentiate and classify different types of microorganism and its characteristics
PSO-3	Distinguish between Prokaryotes and Eukaryotes with respect to their ultra-structure and functions
PSO-4	Understand & differentiate the requirement of nutrients and environmental conditions for the growth of microorganisms
PSO-5	Apply the knowledge of basic instrumentation, basic techniques in microbiology and control of microorganism
PSO-6	Explain and describe types and functions of different biomolecules found in living cells
PSO-7	Describe the aspects of microbial ecology and industrial microbiology
PSO-8	Illustrate the basic immunology and medical microbiology


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Title of Specific Program: B.Sc. Microbiology		
Course Code	Title of Course	Course Outcomes
		After successful completion of each course in learner will be able to;
Semester-I		
UGMB101	Fundamentals of Microbiology-I	<p>CO1. Understand the importance of Microbiology and Microbes. [2] *</p> <p>CO2. Diagrammatically explain the Ultrastructure of the Prokaryotic cells. [4] *</p> <p>CO3. Distinguish between Prokaryotic and Eukaryotic cell structure. [4] *</p> <p>CO4. Describe the pathogenic potential of <i>Rickettsia</i>, <i>Coxiella</i>, <i>Chlamydia</i>, <i>Mycoplasma</i> & protozoa. [2] *</p> <p>CO5. Predict common ancestor from the Phylogenetic tree. [5] *</p> <p>CO6. Study the Microscopic Morphology of Microorganisms: [3] *</p> <p>CO7. Differentiate microbes and their niche, nutrition, mode of reproduction. [4]</p>
UGMB102	Fundamentals of microbiology-II	<p>CO1. Understand & differentiate the requirement of nutrients and environmental conditions for the growth of microorganisms [4]*</p> <p>CO2. Describe various types of nutrient media for isolation and cultivation of bacteria [2]*</p> <p>CO3. Exemplify different methods for control of microorganisms with respect to Physical, Chemical and Biological methods. [2]*</p> <p>CO4. Handle microscope and various analytical instruments</p> <p>CO5. Explain the typical growth curve of bacteria. 2*</p> <p>CO6. Apply sterilization for culture media and lab equipment [3]*</p> <p>CO7. Design/organize an experiment to isolate and culturing bacteria in given sample 6*4*</p> <p>CO8. Enumeration of Microorganisms by different methods [5]*</p> <p>CO9. Differentiate between different staining procedures</p>
Semester-II		
UGMB201	Basic Biochemistry & Microbial Ecology	<p>CO1. Schematically & diagrammatically describe structure of genetic material. [4] *</p> <p>CO2. Justify on water as a Universal solvent. [5] *</p> <p>CO3. Illustrate the mechanism of Virus survival in host. [2] *</p> <p>CO4. Schematically represent the detection methods for Viruses. [4] *</p> <p>CO5. Compare freshwater and Marine Ecosystem. [4] *</p> <p>CO6. Assemble components of soil & prepare flow chart of soil</p>



		<p>formation process. [6] *</p> <p>CO7. Isolate Microorganism from various sources [3] *</p> <p>CO8. Detect carbohydrates using qualitative tests in the given sample. [3]*</p>
UGMB202	Applied and Medical Microbiology	<p>CO.1 Explain substrates and media used for industrial fermentation processes [2]*</p> <p>CO.2 Compare between different types of fermenters 4*</p> <p>CO.3 Demonstrate the different components of the immune system with respect to its structure and role. [3]*</p> <p>CO.4 Illustrate types of immunity and immune responses 3*</p> <p>CO.5 Differentiate different types of infections and their mode of transmission [4]*</p> <p>CO.6 Describe emerging infections and examples of some prevalent emerging infections [2]*</p> <p>CO.7 Design an experiment to isolate cultivate microorganisms from different sources. [6]*</p>
Semester-III		
UGMB301	Biochemistry and Genetics	<p>CO1: Schematically represent Metabolic Pathways [4] * & Organic reaction mechanism[4] *</p> <p>CO2: Describe and diagrammatically represent carbohydrate metabolic reactions as Glycolysis, HMP & TCA cycle.[5]*</p> <p>CO3: Illustrate the skills on estimation Biomolecules & Analytical Techniques[4] *</p> <p>CO4: Explain Mendelian genetics [3] *</p> <p>CO5: Schematically/diagrammatically represent the organization of chromosomes in Prokaryotes and Eukaryotes [4] *</p> <p>CO6: Explain the characteristics of Genetic code[3] *</p>
UGMB302	Introduction to Medical Microbiology and Microbial Taxonomy	<p>CO1: Distinguish between vectors and vehicles and comprehend methods of control of diseases. [4]*</p> <p>CO2: Examine infections caused by <i>Staphylococci</i>, <i>Streptococci</i>, <i>Salmonella</i> and <i>Escherichia coli</i> and elaborate on different prevention, control and treatment methods for skin and gut infections. [4]*</p> <p>CO3: Apply Biochemical tests, understand its purpose and select it for microbial identification and characterization. [3]*</p> <p>CO4: Compare the traditional methods with rapid methods and understand their advantages and drawbacks. [5]</p> <p>CO5: Paraphrase microbial taxonomy and importance in research and</p>



		<p>elaborate on Numerical Taxonomy. [2]*</p> <p>CO6: Evaluate the origins of Bergey's Manual of Systematic Bacteriology and its relevance in taxonomy. [5]*</p>
UGMB303	Environmental Microbiology	<p>CO1: Choose a device for sampling and a method for detecting microorganisms from the air. [5]*</p> <p>CO2: Discuss air sanitation methods [2]*</p> <p>CO3: Schematically explain the water purification system and wastewater treatment. [4]*</p> <p>CO4: Justify the impact of marine microorganisms. [5]*</p> <p>CO5: Summarize soil sampling and cultural methods to study soil flora. [2]*</p> <p>CO6: Compare and contrast between physiological methods & immunological methods to study soil flora [4]*</p>
Semester-IV		
UGMB401	Biochemistry & Basic Analytical Techniques	<p>CO1: Describe the microbial growth & its measurement. [2]*</p> <p>CO2: Describe and distinguish between various types of Transport mechanisms of various essential nutrients involved in the metabolism of a cell. [4]*</p> <p>CO3: Illustrate/derive Michaelis-Menten equation & Lineweaver Burk plot. [3]*</p> <p>CO4: Describe and diagrammatically represent Allosteric effects in enzyme catalyzed reactions. [4]*</p> <p>CO5: Understand the general principle & diverse types of analytical techniques viz. Chromatography, Centrifugation, Electrophoresis. [4]*</p> <p>CO6: Describe & schematically/diagrammatically represent the analysis of Biomolecules with respect to analytical techniques viz. Chromatography, Centrifugation, Electrophoresis. [4]*</p>
UGMB402	Medical microbiology and Biodiversity	<p>CO1: Illustrate different conditions of the respiratory tract and nervous system and their relation to systemic infections. [3]*</p> <p>CO2: Evaluate and compare different methods of diagnosis of pathogens. [5]*</p> <p>CO3: Distinguish different barriers of the immune system and their significance. [4]*</p> <p>CO4: Illustrate various cells of the immune system and enlist different functions [1]* [2]*</p> <p>CO5: Distinguish between various Extremophiles growing in different extreme environments. [4]*</p> <p>CO6: Account for the molecular adaption in Extremophiles [2]*</p>



UGMB403	Applied Microbiology	<p>CO1: Justify various ill effects of microbial contamination in Milk. [5]*</p> <p>CO2: Categorize different types of dairy products & diagrammatically/ schematically represent dairy products [4]*</p> <p>CO3: Justify food as a substrate for Microorganism[5]*</p> <p>CO4: Describe methods of preservation of Industrial cultures. [2]*</p> <p>CO5: Describe characteristics of ideal production medium, types of production media, raw materials used for and sterilization of production media. [2]*</p> <p>CO6: Schematically represent the production process of Ethanol, Citric acid and Beer. [4]*</p>
Semester-V		
UGMB501	Microbial Genetics -I	<p>CO1: Describe roles of all the enzymes and proteins involved in DNA replication.[2]*</p> <p>CO2: Compare and contrast between Prokaryotic and Eukaryotic DNA replication.[4]*</p> <p>CO3: Forecast effect of Mutations on gene expression and regulation.[6]*</p> <p>CO4: Compare & contrast between Composite and Non-composite Transposons, IS elements and Transposons.[4]*</p> <p>CO5: Solve analytical problems on Genetics.[4]*</p> <p>CO6: Perform mutation experiments by UV survival curve and identify it by performing Gradient Plate Technique. [3]*</p>
UGMB502	Medical Microbiology and Immunology I	<p>CO1: Justify the role of Quality Control in accurate diagnosis [5]*</p> <p>CO2: Justify spread of Skin, Respiratory and Urinary tract infection & understanding clinical manifestation [5]*</p> <p>CO3: Monitor the Prophylactic Measures to minimize risk of infection [4]*</p> <p>CO4: Distinguish the organs of Immune system based on their structure and function [4]*</p> <p>CO5: Attribute the mechanism of B-Cells and T-cells in Humoral and Cell Mediated Immune Response respectively [4]*</p> <p>CO6: Study the characteristics of standard cultures to make diagnosis from patient sample [3]*</p>



UGMB503	Microbial Biochemistry-I	<p>CO1: Distinguish between various types of Transport Mechanisms involved in the transport of essential nutrients in the metabolism of a cell. [4]*</p> <p>CO2: Illustrate and paraphrase complexes present in ETC of Mitochondria. [3]*</p> <p>CO3: Measure the Energetics of glycolysis, TCA and ED pathway [5]*</p> <p>CO4: Construct fermentative pathways that are present in microorganisms [6]*</p> <p>CO5: Determine a qualitative and quantitative assay for the Phosphatase enzyme [5]*</p> <p>CO6: Discriminate between Homo-fermentative and Hetero-fermentative microorganisms [5]*</p>
UGMB504	Industrial Microbiology And Bioprocess Technology	<p>CO1: Apply knowledge of screening methods for isolating new industrial strains.[3]*</p> <p>CO2: Set up Inoculum development process for industrial scale fermentations. [6] *</p> <p>CO3: Diagrammatically explain continuous and Batch sterilization process for sterilization of media. [4]*</p> <p>CO4: Relate importance of detection of variables and control. [4]*</p> <p>CO5: Prepare a flow chart of Wine, Vinegar, Baker's yeast and Microbial enzyme production. [4]*</p> <p>CO6: Apply chemical estimation methods to determine concentration of alcohol and sugar in prepared wine. [3]*</p>
Semester-VI		
UGMB601	Microbial Genetics -II	<p>CO1: Diagrammatically represent Transformation, Transduction and Conjugation, as well as Homologous Recombination.[4]*</p> <p>CO2: Paraphrase methods of cloning and screening the clones.[2]*</p> <p>CO3: Solve analytical problems on restriction mapping .[5]*</p> <p>CO4: Summarize viral genomes, enzymes and envelops.[2]*</p> <p>CO5: Compare and contrast between different methods of virus visualization and enumeration.[4]*</p> <p>CO6: Study enrichment and isolation of Coliphages.[3]*</p>
UGMB602	Medical Microbiology and Immunology II	<p>CO1: Predict risk of Nosocomial infection in health care workers and enlisting Nosocomial infection [5]*</p> <p>CO2: Suggest appropriate Chemotherapeutic drug & find out alternate drug of choice [4]*</p>



		<p>CO3: Summaries the ABO blood group systems for Transfusions and Transplantation [2]*</p> <p>CO4: Analyze Antigen Antibody interactions for variety of Immunological assays [4]*</p> <p>CO5: Test the effect of antibiotics against the pathogens by Kirby Bauer method [4]*</p> <p>CO6: Distinguish the blood groups based on ABO system [4]*</p>
UGMB603	Microbial Biochemistry -II	<p>CO1: Distinguish the Lipids and mention its functions [4]*</p> <p>CO2: Illustrate Catabolism and Anabolism of Nucleotides and Amino acids [3]*</p> <p>CO3: Identify the terms involved in the regulation of metabolic pathways[2]*</p> <p>CO4: Discriminate between Regulation of transcription by positive & negative control and evaluate the role of DNA Binding Proteins[5]</p> <p>CO5: Discriminate mechanisms of Light and Dark reactions which are part of Photosynthesis [5]*</p> <p>CO6: Measure proteins by Folin Lowry's method [5]*</p>
UGMB604	Bioprocess Technology - II	<p>CO1: Diagrammatically/ schematically represent Effluent Treatment steps. [4]*</p> <p>CO2: Choose correct method of recovery for a particular product. [5]*</p> <p>CO3: Differentiate between ATC and PTC media [4]*</p> <p>CO4: Exemplify various biological and physical indicators used for Sterility Assurance. [2]*</p> <p>CO5: Prepare a flow chart for manufacturing process of Streptomycin, Vitamin B12, Glutamic acid, Mushroom and Vaccines. [4]*</p> <p>CO6: Perform agar diffusion type of Bioassay to determine concentration of Streptomycin and Vitamin B12. [3]*</p>
Applied Component [Biotechnology]		
UGMBEC	Concepts in Biotechnology	<p>CO1: Correlate between Modern and Traditional Biotechnology. [2] *</p> <p>CO2: Illustrate the cloning and selection process for Cloned genes.[3] *</p> <p>CO3: Differentiate various branches of Bioinformatics [4]*</p>



501		<p>CO4: Understand aspects of industrial production of Cheese, Yoghurt, Biopolymers, Ascorbic acid and Indigo [2]*</p> <p>CO5: Solve analytical problems in Bioinformatics [4]*</p> <p>CO6: Set up Immobilization of <i>Saccharomyces cerevisiae</i> using sodium alginate and perform Invertase assay [6]*</p>
Applied Component [Biotechnology]		
UGMBEC 601	Applied Biotechnology	<p>CO1: Explain the application of microbes as Biofertilizers [2]*</p> <p>CO2: Justify the use of bacteria and their natural system for the delivery of genes. [4]*</p> <p>CO3: Apply the principles of gene manipulation for bioremediation of Xenobiotics. [4]*</p> <p>CO4: Construct a diagrammatic representation on disease diagnosis and drug designing. [5] *</p> <p>CO5: Produce Nanoparticle by chemical & microbial methods. [6]*</p> <p>CO6: Isolate and cultivate <u>Azotobacter</u>, <u>Rhizobium</u>, Phosphate solubilizers and prepare Biofertilizers. [6]*</p>

Note: Numbers in bracket () indicates cognitive levels of revised Blooms Taxonomy as follows:

(1): Remembering, (2): Understanding, (3): Applying, (4): Analysing, (5): Evaluating, (6): Creating



Sr. No	Course Code	Name of Course Coordinator	Signature
SEM-I			
1	UGMB101	Ms. Mrunalini Patil	<i>Patil</i>
2	UGMB102	Mr. Arjun Potinde	<i>Arjun Potinde</i>
SEM-II			
3	UGMB201	Ms. Mrunalini Patil	<i>Patil</i>
4	UGMB202	Mr. Arjun Potinde	<i>Arjun Potinde</i>
SEM-III			
5	UGMB301	Mr. Sandesh Gharge Dr. Rajeshri Ghorpade	<i>S. Gharge</i> <i>R. Ghorpade</i>
6	UGMB302	Mr. Arjun Potinde	<i>Arjun Potinde</i>
7	UGMB303	Ms. Dhanashri Pachhade	<i>D.P. Pachhade</i>
SEM-IV			
8	UGMB401	Ms. Dhanashri Pachhade	<i>D.P. Pachhade</i>
9	UGMB402	Mr. Arjun Potinde	<i>Arjun Potinde</i>
10	UGMB403	Mr. Sandesh Gharge Ms. Darshana Raut	<i>S. Gharge</i> <i>Raut</i>
SEM-V			
11	UGMB501	Mr. Vineet Kala	<i>Vineet</i>
12	UGMB502	Ms. Dhanashri Pachhade Mr. Arjun Potinde	<i>D.P. Pachhade</i> <i>Arjun Potinde</i>



13	UGMB503	Dr. Rajeshri Ghorpade Mr. Vineet Kala	
14	UGMB504	Dr. Keshav Shinde Ms. Dhanashri Pachhade	
SEM-VI			
15	UGMB601	Mr. Vineet Kala	
16	UGMB602	Ms. Dhanashri Pachhade Mr. Arjun Potinde	
17	UGMB603	Dr. Rajeshri Ghorpade Ms. Mrunalini Patil	
18	UGMB604	Dr. Keshav Shinde Ms. Dhanashri Pachhade	
Applied Component [Biotechnology]			
19	UGMBEC501	Mr. Sandesh Gharge Ms. Darshana Raut	
Applied Component [Biotechnology]			
20	UGMBEC601	Mr. Sandesh Gharge Ms. Darshana Raut	

Course
Coordinator

Program
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BOS Chairman

Principal