MARIS STELLA COLLEGE (AUTONOMUS), VIJAYAWADA

A College with Potential for Excellence

NAAC Accredited & ISO 21001: 2018 Certified

PROGRAMME REGISTER 2023-2026

DEPARTMENT OF MICROBIOLOGY

INDEX

PROGRAMME OUTCOMES (POs)

2023-26

At the end of the programme students will have:

PO1: Essential Knowledge:
Comprehensive discipline knowledge and understanding, the ability to engage with different schools of thought and to apply their knowledge in practice including in multidisciplinary or multi professional contexts.

PO2: Creative and critical thinking and problem solving abilities:

Be effective problem solvers, able to apply critical and evidence-based thinking to conceive innovative responses to future challenges.

PO3: Teamwork and communication skills:

Be able to convey ideas and information effectively to a range of audiences for a variety of purposes and contribute in a positive and collaborative manner to achieving common goals.

PO4: Motivation and preparation in life-long learning:

Exhibit life-long skills; broad based multiple career oriented general skills; self and field based learning skills; digital skills; social responsibility and compassionate commitment; preparedness for living, learning and working in any environment

PO5: Professionalism and leadership readiness:

Be able to engage in professional behavior and have the potential to be entrepreneurial and take leadership roles in their chosen occupations and communities.

PO6: Intercultural and ethical competency:

Be responsible and effective global citizens whose personal values and practices are consistent with their roles as responsible members of society.

PO7: Self-awareness and emotional intelligence:

Be self-aware and reflective, flexible and resilient and act with integrity and take responsibility for their actions as empowered women.

PO8: Social responsibility:

Be sensitive to and demonstrate agency in matters of environment, gender and other social issues to promote an equitable society.

PROGRAMME SPECIFIC OUTCOMES

2023-26

At the end of the programme students will be able to:

PSO1: Interpret principles, classifications, concepts, theories and mechanisms.

PSO2: Analyze hypothesis, procedures, properties, experimental facts and draw conclusions.

PSO3: Apply techniques in solving problems, results, sample analysis and production.

PSO4: Develop communicative competence, creative and critical thinking, practical, technical and employability skills, social sensibility and responsibility.

COURSE OUTCOMES (COs)

2023-26

S. No	Sem	Course Code	Course Title	Course Outcomes
1.	I	23SCCCCB14	Introduction to Classical Biology	**CO1:**Understand the fundamental principles of taxonomic classification and ecological and environmental concepts.
				CO2: Gain knowledge of the classification, morphology, reproduction, and physiological processes of plants
				CO3: Develop a comprehensive understanding of the structure, hereditary, and molecular processes of prokaryotic and eukaryotic cells
				CO4: Acquire knowledge of the classification, physiology, and development of animals, including aquaculture.
				CO5: Learn about the different types of chemical bonds, the various branches of chemistry, and their applications.
2.	I	23SCCCAB14	Introduction to Applied Biology	**CO1:**Learn the basics of microbiology and immunology and their roles in health, disease, and the environment
				CO2: Explore the structure, function and metabolism of biomolecules.
				CO3: Outline the fundamentals of biotechnology and genetic engineering and their applications
				CO4: Demonstrate different analytical tools and techniques and their applications
				CO5: Gain knowledge on collection, storage and analysis of biological data using statistical and bioinformatics tools.
3.	II	23MBCCIM23	Introduction to Microbiology	**CO1:**Understand the historical significance of microbiology and the contributions of key scientists
				CO2: Recognize the classification of microorganisms and their place in the living world.
				CO3: Comprehend the scope and applications of microbiology, including the origin of microbial life and the distinction between eukaryotic and prokaryotic cells.
				CO4: Describe the characteristics of bacteria, archaea, fungi, algae, and protozoa.
				CO5: Describe viruses, including their nature, composition, and diversity in structure
4.	II	23MBP1IM21	Introduction to Microbiology – Practical	**CO1**:Implement safety protocols, handling hazardous materials, and practicing personal protective measures.
				CO2: Identify microscope parts, adjusting focus and diaphragm, and accurately observing and documenting microscopic images.

				CO3: Prepare smears, identifying different microorganisms, and interpreting microscopic characteristics.
5.	II	23MBCCBV23	Bacteriology & Virology	**CO1:**Understand the concept of prokaryotic diversity and taxonomy
				CO2: Identify and describe the salient features of various bacterial groups
				CO3: Comprehend the discovery, nature, and definition of viruses.
				CO4: Describe the replication processes of specific viruses
				CO5: Comprehend the concept of oncogenic viruses, and role of viruses in the ecosystem.
6.	II	23MBP2BV21	Bacteriology & Virology-Practical	**CO1:**Develop practical skills in the isolation, identification, and cultivation of bacteria.
				CO2: Acquire knowledge about the preparation of growth media and study host-pathogen interactions.
				CO3: Gain the ability to examine the bacteria through microscopy.
7.	III	23MBCCEM33	Eukaryotic Microorganisms	**CO1:** Recognize the traits, categories, and reproduction processes of algae, protozoa, and fungi.
				CO2: Acknowledge the significance of fungi in biotechnology, as well as their applications in agriculture, medicine, and food production.
				CO3: Recognize the importance of algae as a food source, in a variety of sectors, and in the environment.
				CO4: Recognize pathogenic protozoa and learn how they affect the environment and public health
8.	III	23MBP3EM31	Eukaryotic Microorganisms - Practical	**CO1:**Gain hands-on experience isolating, identifying, and cultivating fungus and algae.
				CO2: Learn how to prepare growth media and study the relationships between hosts and pathogens
				CO3: Acquire the capacity to use microscopy to analyze the vegetative and reproductive structures of particular genera.
9.	III	23MBCCBE33	Biomolecules & Enzymology	**CO1:** Recognize the several types of carbohydrates, such as polysaccharides, disaccharides, monosaccharides, and sugar derivatives, as well as their characteristics.
				CO2: Gain knowledge on classification, structures, roles in cell signaling and metabolism, and aspects of lipids and fatty acids.
				CO3: Learn about primary, secondary, tertiary, and quaternary structures of proteins their roles

				CO4: Acquire knowledge of base composition, nucleic acid-protein interactions, and the structure and functions of nucleic acids (DNA and RNA). Function of vitamins in metabolism.
				CO5: Acquire knowledge on taxonomy, structure, and modes of activity of enzymes, enzyme inhibition and the factors that affect enzyme activity.
10.	III	23MBP4BE31	Biomolecules & Enzymology-Practical	**CO1:**Demonstrate the ability to qualitatively identify monosaccharides and disaccharides
				CO2: Demonstrate proficiency in qualitatively identifying specific amino acids.
				CO3: Apply quantitative techniques to estimate DNA content.
11.	III	23MBCCMT33	Microbial & Analytical Techniques	**CO1:**Understand microscopy techniques, including bright field and electron microscopy, as well as staining methods.
				CO2: Know sterilization and disinfection techniques, such as physical methods and chemical agents.
				CO3: Perform tasks related to pure culture isolation, maintenance, anaerobic bacterial cultivation, and accessing Viable Non-Culturable Bacteria (VNBC).
				CO4: Understand spectrophotometry and chromatography techniques, including UV-visible spectrophotometry and various chromatographic methods.
				CO5: Gain knowledge of centrifugation, electrophoretic techniques, and the principles and applications of radioisotopes
12.	III	23MBP5MT31	Microbial & Analytical Techniques - Practical	**CO1:** Identify different types of microscopes, understand how to see microbial structures, and interpret microscope images easily.
				CO2: Prepare slides with stains, tell apart stained and unstained parts, and describe staining methods and how they color microbial cells.
				CO3: Learn how to stain bacteria, tell Gram-positive from Gram-negative, understand why Gram staining matters, and interpret stained slides.
13.	III	23MBCCCG33	Cell Biology & Genetics	**CO1:** Understand basic cell theory, cell parts, the cell cycle, and the importance of the cytoskeleton in simple terms.
				CO2: Comprehend the roles of the cell membrane, nuclear envelope, and nucleolus, and get a basic grasp of how cancer develops.
				CO3: Learn about protein movement inside cells, how cells communicate, programmed cell death, stem cells, and some special types of chromosomes.

				CO4: Gain understanding of Mendelian genetics, including how traits are inherited and the frequencies of different versions of genes.
				CO5: Grasp concepts like linked genes, genetic mixing, the Hardy-Weinberg Law, how traits evolve, and how sex is determined in simple language.
14.	III	23MBP6CG31	Cell Biology & Genetics - Practical	**CO1:** Master techniques for counting cells and assessing their viability accurately.
				CO2: Analyze mitosis and meiosis in onion root tips, recognizing their stages and importance.
				CO3: Identify and analyze cell ultrastructure using electron micrographs effectively.
15.	IV	23MBCCMG43	Molecular Biology & Microbial Genetics	**CO1:** Understand how genetic material works in cells, including its structure in different types of organisms and the importance of DNA and RNA.
				CO2: Explain DNA replication in prokaryotic organisms and enzymes and factors involved in the process.
				CO3: Recognize practical applications of extra chromosomal genetic elements like plasmids and transposons.
				CO4: Distinguish between traditional and contemporary views on genes, grasp gene structure, and the conversion of genetic information into functional molecules through transcription.
				CO5: Comprehend how genetic information is translated into proteins, and how bacteria manage the activity of their genes.
16.	IV	23MBP7MG41	Molecular Biology & Microbial Genetics - Practical	**CO1:** Understand isolation, purification and estimation of DNA and perform UV exposure
				CO2: Solve problems related to DNA and RNA characteristics, transcription, and translation processes.
				CO3: Prepare gels, load DNA samples, visualize DNA bands, analyze fragment size, and understand the principles of electrophoresis.
17.	IV	23MBCCPM43	Microbial Physiology & Metabolism	**CO1:** Understand the nutritional requirements of microorganisms and the different methods of nutrient uptake
				CO2: Comprehend microbial growth, including the definition of growth, generation time, and the different phases of growth.
				CO3: Gain knowledge of thermodynamics in biological systems, including concepts of free energy, enthalpy, and entropy.
				CO4: Understand microbial respiration, including aerobic and anaerobic respiration, chemoautotrophy, and fermentative modes.

				CO5: Differentiate the processes of oxygenic and anoxygenic photosynthesis
18.	IV	23MBP8PM41	Microbial Physiology & Metabolism - Practical	**CO1:** Understand how temperature and pH affect bacterial growth.
				CO2: Learn colony counting techniques for microbial enumeration.
				CO3: Analyze growth curve data to understand bacterial growth patterns.
19.	IV	23MBCCBB43	r DNA Technology, Biostatistics & Bioinformatics	**CO1:** Learn genetic engineering principles like restriction endonucleases and DNA transformation techniques.
				CO2: Understand vectors, basics of polymerase chain reaction, and applications of genetic engineering in industry, agriculture, and medicine.
				CO3: Gain knowledge of blotting techniques, DNA labeling, DNA sequencing, and basics of intellectual property rights.
				CO4: Learn about bioinformatic resources, sequence databases, sequence alignment, and the use of biostatistics in data analysis.
				CO5: Develop skills in measuring central tendency and dispersion, understanding types of data, and utilizing biostatistical software for analysis.
20.	IV	23MBP9BB41	r DNA Technology, Biostatistics & Bioinformatics - Practical	**CO1:** Perform plasmid DNA isolation and gel electrophoresis.
				CO2: Understand DNA fingerprinting principles and applications for genetic profiling.
				CO3: Utilize nucleic acid and protein databases for sequence analysis.
21.	V	23MBCCIM53	Immunology & Medical Microbiology	**CO1**: Explain the basics of Immunology and how the immune system identifies self and non-self
				CO2: Describe how innate and adaptive immunity work together to fight infections
				CO3: Understand how the immune system responds to a wide range of antigens.
				CO4: Learn the principles of diagnostic microbiology.
				CO5: Relate disease symptoms to their causes and identify pathogens.
22.	V	23MBP10IM51	Immunology & Medical Microbiology - Practical	**CO1:** Perform antigen-antibody reactions.
				CO2: Conduct biochemical tests to identify bacteria.
				CO3: Perform antibiotic sensitivity testing and identification of microorganisms
23.	V	23MBCCEB53	Environmental Biotechnology	**CO1:** Explore ecosystems and the microflora in soil, water, atmosphere, and living organisms.
				CO2: Learn about microbial interactions and focusing on plant-microbe and animal-microbe relationships.

				CO3: Understand the role of microbes in the carbon, nitrogen, phosphorus, and sulfur cycles
				CO4: Study solid waste disposal, liquid waste treatment, and microbial bioremediation
				CO5: Apply microorganisms in bioremediation processes.
24.	V	23MBP11EB51	Environmental Biotechnology - Practical	**CO1:** Assess soil properties and understand their effects on plant growth and soil fertility.
				CO2: Isolate bacteria and fungi from soil samples and understand nutrient cycling and plant health.
				CO3: Measure MPN, BOD and COD in wastewater in assessing pollution levels and wastewater treatment effectiveness.
25.	V	23MBEC11PM53	Pharmaceutical Microbiology	**CO1:** Understand biosafety and Manufacturing Practices (cGMP) in pharmaceutical industry
				CO2: Explain methods to detect microorganisms in pharmaceuticals.
				CO3: Describe molecular techniques for pathogen detection in quality control.
				CO4: Design media to identify microbes in pharmaceutical products.
				CO5: Follow and apply safety practices in pharmaceutical product development
26.	V	23MBP1211PM51	Pharmaceutical Microbiology - Practical	**CO1:** Conduct sterility tests for equipment.
				CO2: Apply disinfection and sterility methods to instruments in the lab.
				CO3: Check sterility of pharmaceutical products.
27.	V	23MBEC12AM53	Applied Microbiology	**CO1:** Identify opportunities for entrepreneurship and evaluate their potential.
				CO2: Understand the production and economics of fermentation products.
				CO3: Explain how biofertilizers and mushrooms are produced.
				CO4: Describe the processes of baking and brewing.
				CO5: Prepare a detailed project report (DPR) and understand patenting.
28.	V	23MBP1312AM51	Applied Microbiology - Practical	**CO1:** Create microbial consortia for composting.
				CO2: Report on the production of mushrooms or biofertilizers.
				CO3: Develop a sample detailed project report (DPR).
29.	V	23MBEC21DM53	Diagnostic Microbiology	**CO1:** Understand Collection of clinical samples for diagnosis.
				CO2: Learn about microscopic and culture methods for diagnosis.
				CO3: Apply serological and molecular diagnostic techniques.

				CO4: Understand antimicrobial sensitivity and resistance.
				CO5: Learn about advances in diagnostic microbiology.
30.	V	23MBP1421DM51	Diagnostic Microbiology - Practical	**CO1**: Collect, label, and transport clinical specimens.
				CO2: Isolate pure bacterial cultures and identify common bacteria
				CO3: Maintain and preserve stock cultures.
31.	V	23MBEC22IM53	Industrial Microbiology	**CO1**: Identify important microorganisms used in industries.
				CO2: Learn methods to screen biologically important microorganisms.
				CO3: Choose suitable fermentation methods for production.
				CO4: Understand key concepts in industrial microbiology, important microbes and its metabolites.
				CO5: Explain upstream and downstream bioprocessing steps.
32.	V	23MBP1522IM51	Industrial Microbiology - Practical	**CO1:** Understand and demonstrate microbial diversity by isolating microorganisms from natural environments.
				CO2: Observe microorganisms in fermented foods under a microscope, prepare fermented products and study physical and chemical changes.
				CO3: Perform small-scale microbial production organic acids and estimate the yield.
33.	V	23MBEC31AM53	Agricultural Microbiology	**CO1:** Study soil as a habitat for microorganisms, their diversity, and interactions.
				CO2: Understand microbial pathogenicity, virulence factors and plant defense mechanisms.
				CO3: Learn methods for managing plant diseases, including regulatory, chemical and biological approaches.
				CO4: Study key plant diseases caused by fungi, bacteria, viruses and viroids, focusing on their causes, symptoms.
				CO5: Explore plant growth-promoting bacteria, biofertilizers, mycorrhizae and their role in improving plant growth.
34.	V	23MBP1631AM51	Agricultural Microbiology - Practical	**CO1:** Understand soil composition, water activity, pH, soil profiles and soil fertility.
				CO2: Identify microorganisms present in soil and learn about Rhizobium's characteristics.
				CO3: Demonstrate field application techniques and identify plant diseases.
35.	V	23MBEC32DM53	Food & Dairy Microbiology	**CO1:** Understand factors affecting microbial growth, food contamination, and sources of contamination.
				CO2: Learn about the microflora in milk, contamination of raw milk and butter, and spoilage of various foods.
				CO3: Use dairy starter cultures in fermented dairy products, other fermented foods, and probiotics.

				CO4: Differentiate between foodborne diseases, intoxications, and infections.
				CO5: Apply food sanitation practices, control measures, follow HACCP guidelines, and test for pathogens in foods.
36.	V	23MBP1732DM51	Food & Dairy Microbiology - Practical	**CO1:** Learn MBRT method, standard plate count and MPN to assess milk quality.
				CO2: Evaluate the efficiency of milk pasteurization by enzymatic reactions.
				CO3: Isolate and identify food spoilage microorganisms and prepare fermented dairy products.

Mapping of COs with PSOs & POs

S. No	Sem	Course Code	Course Title	COs	PSOs	POs
1.	I	23SCCCCB14	Introduction to Classical Biology	CO1	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO4	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO5	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
2.	I	23SCCCAB14	Introduction to Applied Biology	CO1	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO4	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO5	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
3.	II	23MBCCIM23	Introduction to Microbiology	CO1	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO4	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO5	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
4.	II	23MBP1IM21	Introduction to Microbiology – Practical	CO1	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
5.	II	23MBCCBV23	Bacteriology & Virology	CO1	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO4	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO5	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
6.	II	23MBP2BV21	Bacteriology & Virology- Practical	CO1	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO8
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO8
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO8
7.	III	23MBCCEM33	Eukaryotic Microorganisms	CO1	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO4	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4

8.	III	23MBP3EM31	Eukaryotic Microorganisms - Practical	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
9.	III	23MBCCBE33	Biomolecules & Enzymology	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO4	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO5	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
10	III	23MBP4BE31	Biomolecules & Enzymology- Practical	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
11	III	23MBCCMT33	Microbial & Analytical Techniques	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO4	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO5	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
12	III	23MBP5MT31	Microbial & Analytical Techniques - Practical	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
13	III	23MBCCCG33	Cell Biology & Genetics	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO4	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO5	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
14	III	23MBP6CG31	Cell Biology & Genetics - Practical	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
15	IV	23MBCCMG43	Molecular Biology & Microbial Genetics	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO4	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO5	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4

16	IV	23MBP7MG41	Molecular Biology & Microbial Genetics - Practical	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
17	IV	23MBCCPM43	Microbial Physiology & Metabolism	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO4	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO5	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
18	IV	23MBP8PM41	Microbial Physiology & Metabolism - Practical	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
19	IV	23MBCCBB43	r DNA Technology, Biostatistics & Bioinformatics	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO5
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO5
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO5
				CO4	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO5
				CO5	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO5
20	IV	23MBP9BB41	r DNA Technology, Biostatistics & Bioinformatics - Practical	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO5
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO5
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO5
21	V	23MBCCIM53	Immunology & Medical Microbiology	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO4	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO5	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
22	V	23MBP10IM51	Immunology & Medical	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO8
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO8
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO8

			Microbiology - Practical			
23	V	23MBCCEB53	Environmental Biotechnology	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO4	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO5	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
24	V	23MBP11EB51	Environmental Biotechnology - Practical	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO8
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO8
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO8
25	V	23MBEC11PM53	Pharmaceutical Microbiology	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO4	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO5	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
26	V	23MBP1211PM51	Pharmaceutical Microbiology - Practical	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO8
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO8
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO8
27	V	23MBEC12AM53	Applied Microbiology	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO4	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
				CO5	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4
28	V	23MBP1312AM51	Applied Microbiology - Practical	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4
29	V	23MBEC21DM53	Diagnostic Microbiology	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO4	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO5	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
30	V	23MBP1421DM51		**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO8
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO8

			Diagnostic Microbiology - Practical	**CO3**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO8
31	V	23MBEC22IM53	Industrial Microbiology	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO5
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO5
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO5
				CO4	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO5
				CO5	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO5
32	V	23MBP1522IM51	Industrial Microbiology - Practical	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO5
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO5
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO5
33	V	23MBEC31AM53	Agricultural Microbiology	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO4	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO5	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
34	V	23MBP1631AM51	Agricultural Microbiology - Practical	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO8
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO8
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO8
35	V	23MBEC32DM53	Food & Dairy Microbiology	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO4	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO5	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
36	V	23MBP1732DM51	Food & Dairy Microbiology - Practical	**CO1**	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO3, PO4, PO8
				CO2	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8
				CO3	PSO1, PSO2,PSO3,PSO4	PO1, PO2, PO4, PO8

Mapping of Courses with PSOs

Course Title	PSO1 Qualitative Analysis	PSO2 Practical and Analytical Skills	PSO3 Logical and Critical Thinking	PSO4 Teamwork and Communication
Introduction to Classical Biology (CB)	✓	✓	✓	✓
Introduction to Applied Biology (AB)	✓	✓	✓	✓
Introduction to Microbiology (IM)	✓	✓	✓	✓
Introduction to Microbiology-Practical (IM-P)	✓	✓	✓	✓
Bacteriology & Virology (BV)	✓	✓	✓	✓
Bacteriology & Virology- Practical (BV-P)	✓	✓	✓	✓
Eukaryotic Microorganisms (EM)	✓	✓	✓	✓
Eukaryotic Microorganisms – Practical (EM-P)	✓	✓	✓	✓
Biomolecules & Enzymology (BE)	✓	✓	✓	✓
Biomolecules & Enzymology-Practical (BE-P)	✓	✓	✓	✓
Microbial & Analytical Techniques (MT)	✓	✓	✓	✓
Microbial & Analytical Techniques – Practical (MT-P)	✓	✓	✓	✓
Cell Biology & Genetics (CG)	✓	✓	✓	✓
Cell Biology & Genetics – Practical (CG-P)	✓	✓	✓	✓
Molecular Biology & Microbial Genetics (MG)	✓	✓	✓	✓
Molecular Biology & Microbial Genetics – Practical (MG-P)	✓	✓	✓	✓
Microbial Physiology & Metabolism (PM)	✓	✓	✓	✓
Microbial Physiology & Metabolism – Practical (PM-P)	✓	✓	✓	✓
r DNA Technology, Biostatistics & Bioinformatics (BB)	✓	✓	✓	✓

r DNA Technology, Biostatistics & Bioinformatics – Practical (BB-P)	✓	✓	✓	✓
Immunology & Medical Microbiology (IM)	✓	✓	✓	✓
Immunology & Medical Microbiology – Practical (IM-P)	✓	✓	✓	✓
Environmental Biotechnology (EB)	✓	✓	✓	✓
Environmental Biotechnology – Practical (EB-P)	✓	✓	✓	✓
Pharmaceutical Microbiology (PM)	✓	✓	✓	✓
Pharmaceutical Microbiology – Practical (PM-P)	✓	✓	✓	✓
Applied Microbiology (AM)	✓	✓	✓	✓
Applied Microbiology – Practical (AM-P)	✓	✓	✓	✓
Diagnostic Microbiology (DM)	✓	✓	✓	✓
Diagnostic Microbiology – Practical (DM-P)	✓	✓	✓	✓
Industrial Microbiology (IMB)	✓	✓	✓	✓
Industrial Microbiology – Practical (IMB-P)	✓	✓	✓	✓
Agricultural Microbiology (AM)	✓	✓	✓	✓
Agricultural Microbiology – Practical (AM-P)	✓	✓	✓	✓
Food & Dairy Microbiology (DM)	✓	✓	✓	✓
Food & Dairy Microbiology – Practical (DM-P)	✓	✓	✓	✓

Mapping of Courses with POs

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CB	✓	✓		✓				
AB	✓	✓		✓				
IM	✓	✓		✓				
IM-P	✓	✓	✓	✓				
BV	✓	✓		✓				✓
BV-P	✓	✓	✓	✓				✓
EM	✓	✓		✓				
EM-P	✓	✓	✓	✓				
BE	✓	✓		✓				
BE-P	✓	✓	✓	✓				
MT	✓	✓		✓				
MT-P	✓	✓	✓	✓				
CG	✓	✓		✓				
CG-P	✓	✓	✓	✓				
MG	✓	✓		✓				
MG-P	✓	✓	✓	✓				
PM	✓	✓		✓				
PM-P	✓	✓	✓	✓				
BB	✓	✓		✓	✓			
BB-P	✓	✓	✓	✓	✓			
IMB	✓	✓		✓				✓
IMB-P	✓	✓	✓	✓				✓
EB	✓	✓		✓				✓
EB-P	✓	✓	✓	✓				✓
PM	✓	✓		✓				✓
PM-P	✓	✓	✓	✓				✓

AM	✓	✓		✓				
AM-P	✓	✓	✓	✓				
DM	✓	✓		✓				✓
DM-P	✓	✓	✓	✓				✓
IM	✓	✓		✓	✓			
IM-P	✓	✓	✓	✓	✓			
AM	✓	✓		✓				✓
AM-P	✓	✓	✓	✓				✓
DMB	✓	✓		✓				✓
DMB-P	✓	✓	✓	✓				✓