MARIS STELLA COLLEGE (AUTONOMOUS), VIJAYAWADA

A College with Potential for Excellence

NAAC Accredited & ISO 21001: 2018 Certified

PROGRAMME REGISTER: 2023-26

DEPARTMENT OF BIOTECHNOLOGY

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PROGRAMME OUTCOMES (POs)

2023-26

Students of all Undergraduate Programmes at the time of graduation will be able to possess

PO1: Essential Knowledge:

Have 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, 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:

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: Motivated, Self-directed, and Life-long Learning:

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

PO5: Professionalism and Leadership Readiness:

Engage in professional behaviour 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 and Effective Citizenship:

Exhibit social responsibility and compassionate commitment; Be sensitive to and demonstrate institution in matters of environment, gender and other social issues to promote an equitable society and sustainable development.

<h1 style="text-align: center; color: red;">PROGRAMME SPECIFIC OUTCOMES (PSOs)</h1>

<h2 style="text-align: center; color: red;">2023-26</h2>

At the end of the programme students will be able to possess/exhibit:

PSO1: Quantitative Analysis:

Interpret principles, classifications, concepts, theories and mechanisms learnt.

PSO2: Practical and Analytical Skills:

Analyse hypotheses, procedures, properties, experimental facts and draw conclusions.

PSO3: Logical and Critical Thinking:

Apply knowledge and techniques in sample analysis, problem-solving, results, and production.

PSO4: Teamwork and Communication:

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 (COs)
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	23BYCCBA23	Biomolecules & Analytical Techniques	**CO1:** Learn about classification, structure and properties of Carbohydrates, Proteins and Lipids.
				CO2: Enumerate structure and function of DNA, RNA, Vitamins and Bioenergetics.
				CO3: Understand the basic principles of Centrifugation, Chromatography and Electrophoresis.
				CO4: Learn about principles of Spectroscopy, Microscopy and Techniques.
				CO5: Explain the basics of Biostatistics.
4	II	23BYP1BA21	Biomolecules & Analytical Techniques - practical	**CO1:** Demonstrate proper use and record operation procedures for essential laboratory instruments.
				CO2: Employ qualitative and quantitative methods to identify and quantify different biomolecules (carbohydrates, proteins, DNA, RNA).
				CO3: Design, conduct, and analyze laboratory experiments to investigate enzyme activity and biomolecule separation techniques. comprehending the complex biological data.
5	II	23BYCCMC23	Microbiology & Cell biology	**CO1:** Explain the historical development of microbiology and the contributions of key figures.
				CO2: Demonstrate a comprehensive understanding of bacterial structure and growth.
				CO3: Apply fundamental techniques for isolation and manipulation of bacteria.
				CO4: Select and implement appropriate sterilization methods based on their principles and applications.
				CO5: Differentiate between different bacterial groups using basic staining techniques.
6	II	23BYP2MC21		**CO1:** Demonstrate proficiency in essential aseptic techniques and media preparation.

			Microbiology & Cell biology - Practical	**CO2:** Acquire the skills to isolate, identify, and characterize microorganisms.
				CO3: Develop essential laboratory skills and gain hands-on experience in microbiological practices.
7	III	23BYCCPA33	Plant & Animal Biotechnology	**CO1:** Learn about plant tissue culture techniques and secondary metabolites production.
				CO2: Learn about transgenesis and molecular markers.
				CO3: Learn about animal tissue culture techniques.
				CO4: Learn about transgenic animals and gene therapy.
				CO5: Learn about application of tissue culture techniques in plant breeding.
8	III	23BYP3PA31	Plant & Animal Biotechnology - Practical	**CO1:** Understands the principles of various plant and animal cell/tissue culture techniques.
				CO2: understands the commercial applications of various cell and tissue culture- based technologies in plants and animals.
				CO3: Ability to rationalize and develop strategies for incorporating novel traits in plants and animals through genetic engineering.
9	III	23BYCCMB33	Molecular Biology	**CO1:** To understand Molecular Biology which chiefly deals with interactions among various systems of the cell.
				CO2: Understands of chemical and molecular processes that occurs in and between the cells.
				CO3: Interpret most significant molecular and cell-based methods used today to expand our understanding of biology.
				CO4: Will be able to design and implement experimental procedures using relevant techniques.

				CO5: Understand the process of protein synthesis and Post Transcriptional Modifications and Processing of Eukaryotic RNA.
10	III	23BYP4MB31	Molecular Biology - Practical	CO1: Understand the basic concepts on the functioning of cell.
				CO2: Helps student in developing abilities to understand the fascinating aspects of hereditary material and information of gene functioning.
				CO3: The students will unravel mysteries regarding DNA and RNA functioning and their correlation with the protein functions in cell.
11	III	23BYCCGE33	Genetic Engineering	CO1: Understand the fundamental concepts of genetic engineering, including its history, scope, and recent advancements.
				CO2: Learn about the different molecular tools used in genetic engineering
				CO3: Learn about the restriction enzymes, Modifying enzymes, and ligation techniques.
				CO4: learn the strategies involved in plant and animal genetic engineering, considering the relevant guidelines and regulations.
				CO5: learn the application of recombinant DNA technology in biotechnological research.
12	III	23BYP5GE31	Genetic Engineering - Practical	CO1: The students will able to have the practical skills on basic genetic engineering techniques.
				CO2: The students will able to practise various basic techniques in Genetic Engineering.
				CO3: Develop practical skills in different laboratory equipment's and their handling.
13	III	23BYCCMT33	Metabolism	CO1: The student will be able to learn Carbohydrate catabolism.

				CO2: Understand the metabolism about Lipids and there importance.
				CO3: Illustrate about Amino Acid metabolism and its Biosynthesis.
				CO4: Learn about nomenclature and specificity of enzymes.
				CO5: Learn about fundamentals nucleic acids and their association with various metabolic diseases.
14	III	23BYP6MT31	Metabolism - Practical	**CO1:** Practice the biochemical parameters in biological system.
				CO2: Explain enzyme assay of salivary enzyme.
				CO3: Practice the estimation of amino acids, Protein, glucose.
15	IV	23BYCCIM43	Immunology	**CO1:** Classify and explain the types of antigen-antibody and hypersensitivity reactions.
				CO2: Discuss the mechanism, manifestations of clinical transplantations and autoimmune deficiency diseases.
				CO3: Enumerate the types of tumour antigens and explain cancer induction by oncogenes.
				CO4: Summarize the preparation of vaccines and monoclonal antibodies.
				CO5: understand about vaccines and its function know about vaccines.
16	IV	23BYP7IM41	Immunology - Practical	**CO1:** Experiment on antigen- antibody reactions
				CO2: Analyze the Total RBC count and Total leucocytes count.
				CO3: Learn the biochemical tests

17	IV	23BYCCBB43	Bioinformatics & Course Biostatistics	**CO1:** The student will be able to apply basic principles of biology, computer science and mathematics to address complex biological problems.
				CO2: Students are taught to operate various statistical software packages.
				CO3: Students are able to appreciate the importance of statistics in research and prepares them for a career in research.
				CO4: Students are able to Measurement of central tendency, standard deviations–parametric and nonparametric hypothesis testing.
				CO5: Students are able to understand t test, Correlation and regression. Chi square test. ANOVA.
18	IV	23BYP8BB41	Bioinformatics & Biostatistics - Practical	**CO1:** Concepts and overview for biostatistics for solving biological problems.
				CO2: Importance of biostatistics in biological sciences.
				CO3: Biological database handling and database management of different biological database.
19	IV	23BYCCMB43	Medical Biotechnology	**CO1:** Learn about the methods for chromosomal analysis & abnormalities.
				CO2: Learn about the difference between chromosomal and genetic disorders.
				CO3: Understand the biochemical and physiological complexity and Diseases.
				CO4: Learn about the fundamentals of cytoskeletal networks and their varied functions and their use in diagnostics. and Drug delivery systems.
				CO5: Demonstrate various methods to understand the subcellular reactions and molecular processes.

20	IV	23BYP9MB41	Medical Biotechnology - Practical	**CO1:** Plan and organize laboratory activities and develop further experimental strategies.
				CO2: Stay up-to-date about the regulations, methods, technologies and relevant biotechnological instruments, also through the use of bibliographic resources, fundamental in an ever-changing field.
				CO3: Acquired a study methodology and goal-oriented working skills to conduct research independently and in a team.

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, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
2.	I	23SCCCAB14	Introduction to Applied biology	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
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
3.	II	23BYCCBA23	Biomolecules & Analytical Techniques	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5, PO6, PO7
				CO2	PSO1, PSO2, PSO3, PSO4,	PO1, PO2, PO3, PO4, PO5, PO6, PO7
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5, PO6, PO7
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5, PO6, PO7
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5, PO6, PO7
4	II	23BYP1BA21	Biomolecules & Analytical Techniques - practical	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5, PO6, PO7
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5, PO6, PO7
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5, PO6, PO7
5	II	23BYCCMC23	Microbiology & Cell biology 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
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4

				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
6	II	23BYP2MC21	Microbiology & Cell biology 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
7	III	23BYCCPA33	Plant & Animal Biotechnology	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				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
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
8	III	23BYP3PA31	Plant & Anima-l Biotechnology -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	23BYCCMB33	Molecular Biology	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
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
10	III	23BYP4MB31	Molecular Biology -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	23BYCCGE33	Genetic Engineering	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5, PO6, PO7.
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5, PO6, PO7
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5, PO6, PO7
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5, PO6, PO7
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5, PO6, PO7
12	III	23BYP5GE31	Genetic Engineering	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5, PO6, PO7

					PSO	PO
			practical	CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5, PO6, PO7
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5, PO6, PO7
13	III	23BYCCMT33	Metabolism	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
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
14	III	23BYP6MT31	Metabolism - Practical	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO2	PSO1, PSO2, PSO3, PSO4 PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4 PO1, PO2, PO3, PO4
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
15	IV	23BYCCIM43	Immunology	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5, PO6, PO7
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5, PO6, PO7
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5, PO6, PO7
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5, PO6, PO7
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5, PO6, PO7
16	IV	23BYP7IM41	Immunology - Practical	CO1	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5, PO6, PO7
				CO2	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5, PO6, PO7

					PSO	PO
				CO3	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4, PO5, PO6, PO7
17	IV	23BYCCBB43	Bioinformatics & Course Biostatistics	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
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
18	IV	23BYP8BB41	Bioinformatics & Biostatistics - 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	23BYCCMB43	Medical Biotechnology	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
				CO4	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
				CO5	PSO1, PSO2, PSO3, PSO4	PO1, PO2, PO3, PO4
20	IV	23BYP9MB41	Medical Biotechnology - 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

Mapping of Courses with PSOs

Course Title	PSO1 Quantitative Analysis	PSO2 Practical and Analytical Skills	PSO3 Logical, Critical Thinking	PSO4 Teamwork and Communication
Introduction to Classical Biology	✓	✓	✓	✓
Introduction to Applied biology	✓	✓	✓	✓
Biomolecules & Analytical Techniques	✓	✓	✓	✓
Biomolecules & Analytical Techniques – practical.	✓	✓	✓	✓
Microbiology & Cell biology	✓	✓	✓	✓
Microbiology & Cell biology - Practical	✓	✓	✓	✓
Plant & Animal Biotechnology	✓	✓	✓	✓
Plant & Animal Biotechnology - Practical	✓	✓	✓	✓
Molecular Biology	✓	✓	✓	✓
Molecular Biology- Practical	✓	✓	✓	✓
Genetic Engineering	✓	✓	✓	✓
Genetic Engineering - Practical	✓	✓	✓	✓
Metabolism	✓	✓	✓	✓
Metabolism - Practical	✓	✓	✓	✓
Immunology	✓	✓	✓	✓
Immunology – Practical	✓	✓	✓	✓
Bioinformatics & Biostatistics	✓	✓	✓	✓
Bioinformatics & Biostatistics - Practical	✓	✓	✓	✓
Medical Biotechnology	✓	✓	✓	✓
Medical Biotechnology - Practical	✓	✓	✓	✓

Mapping of Courses with POs

Course	PO1 Essential Knowledge	PO2 Creative, Critical thinking and Problemsolving abilities	PO3 Teamwork and Communication skills	PO4 Motivated, Self-directed and Life-long Learning	PO5 Professionalism and Leadership Readiness	PO6 Intercultural and Ethical Competency	PO7 Self-awareness and Emotional Intelligence	PO8 Social Responsibility and Effective Citizenship
ICB	✓	✓	✓	✓				
IAB	✓	✓	✓	✓				
BA	✓	✓	✓	✓	✓	✓	✓	
BA-P	✓	✓	✓	✓	✓	✓	✓	
MC	✓	✓	✓	✓				
MC-P	✓	✓	✓	✓				
PA	✓	✓	✓	✓				
PA-P	✓	✓	✓	✓				
MB	✓	✓	✓	✓				
MB-P	✓	✓	✓	✓				
GE	✓	✓	✓	✓	✓	✓	✓	
GE-P	✓	✓	✓	✓	✓	✓	✓	
MT	✓	✓	✓	✓				
MT-P	✓	✓	✓	✓				
IM	✓	✓	✓	✓	✓	✓	✓	
IM-P	✓	✓	✓	✓	✓	✓	✓	
BB	✓	✓	✓	✓				
BB-P	✓	✓	✓	✓				
MB	✓	✓	✓	✓				
MB-P	✓	✓	✓	✓				