ST JOSEPH'S UNIVERSITY

BENGALURU-27

DEPARTMENT OF MICROBIOLOGY

SYLLABUS FOR UNDERGRADUATE PROGRAMME

For Batch 2026-2029

(STATE EDUCATION POLICY)

Part A			
1	Title of the Academic Program	B.Sc. Microbiology	
2	Program Code	**CMBT (Chemistry, Microbiology, Biotechnology)**	
3	Name of the University	St Joseph's University	
4	Objectives of the University	1. Academic Excellence 2. Character Formation 3. Social Concern	
5	Vision of the University	To form men and women for and with others, who through holistic education, strive for a just, secular, democratic, and ecologically sensitive society which empowers the poor, the oppressed, and the marginalized.	
6	Mission of the University	In keeping with the Jesuit heritage, the university aims at an integral formation of the staff and the students, to be men and women who will be agents of societal change, by enabling them to attain academic and human excellence in a teaching-learning environment that fosters intellectual curiosity, ceaseless enquiry, personal integrity, social commitment, creativity, critical thinking and innovation.	
7	Name of the Degree	Bachelor of Science (B.Sc.)	
8	Name of the Department offering the program	Microbiology	
9	Vision of the Department offering the program	• The Department intends to inculcate in the students an interest to explore the world of Microbiology and contribute to the rapidly expanding field. We wish to offer the society, a generation of humble yet aspiring young minds eagerly striving towards unraveling the mystery of science.	
10	Mission of the department offering the Program	• The Department of Microbiology aims at identifying one's potential to become a centre for augmenting and contributing continuously to the vibrant field of Microbiology. • We strive to create and provide an ambient learning atmosphere and prepare students for academia, industry and productive application of this knowledge in everyday life. • It emphasizes the impact of microbes on environment and the human activities.	
11	Duration of the Program	3 years (Six semesters)	
12	Total No. of Credits		
16	Program Specific Outcomes (PSOs)	PSO1	Students graduating from the Microbiology program will gain knowledge and understanding of concepts of microbiology and its application in pharma, food, agriculture, beverages, nutraceutical industries, etc.
		PSO2	Students will understand the distribution, morphology and physiology of microorganisms and demonstrate the skills in aseptic culturing of microbes including isolation, identification and maintenance.

		PSO3	Students will be learning and practicing professional skills in handling microbes and contaminants in laboratories and production sectors, exploring the microbial world and analyzing the specific benefits and challenges.
		PSO4	Students will be able to apply the knowledge acquired to undertake studies and identify specific remedial measures for the challenges in health, agriculture, and food sectors.
		PSO5	Students will also learn and build on proficiencies in science communication, teamwork and collaboration, enabled by regular innovative assignments and activities.
		PSO6	Students will be able to demonstrate the ability to identify key questions in microbiological research, optimize research methods, and analyze outcomes by adopting scientific methods, thereby improving the employability.

SUMMARY OF CREDITS IN MICROBIOLOGY

Semester 1	**Code Number**	**Title**	**No. of hours of Instructions**	**Number of Hours of Teaching per week**	**Number of credits**	**Continuous Internal Assessment (CIA) marks**	**End Semester Marks**	**Total marks**
Theory	MB 126	Introductory Microbiology and Microbiological Techniques	45	03	03	40	60	100
Practical	MB1P1 26	Introductory Microbiology and Microbiological Techniques	33	03	02	25	25	50
Total Number of credits:			**05**					

CORE COURSES (CC)	
Course Title	**Code Number**
Introductory Microbiology and Microbiological Techniques	MB 126

VALUE ADDED COURSES (VAC)	
Course Title	**Code Number**
Principles of Genetic Engineering	MBCC 01
Food Technology	MBCC 02
Principles of Biomedical Techniques and Ethics	MBCC 03

DEPARTMENT OF MICROBIOLOGY

Semester	I
Paper Code	**MB 126**
Paper Title	**Introductory Microbiology and Microbiological Techniques**
Number of teaching hours per week	03
Total number of teaching hours per semester	45
Number of credits	03

Objective of the Paper:
This paper introduces the students to the history of microbiology, contribution of scientists, scope and the diversity of Microorganisms. It gives an overview of the microbial world and the techniques used to visualize, cultivate and control microbes. This paper acts as the first step to gain insight about the basics of the vast field of Microbiology.

UNIT-I **History and scope of Microbiology**	**2**
History of microbiology, contribution of Scientists – Antony Von Leeuwenhoek, Louis Pasteur, Alexander Flemming, Rober Koch, Edward Jenner	1
Scope and relevance of Microbiology as a modern science	1
Branches of Microbiology	
UNIT- II **Introduction to Microorganisms**	**17**
a. Introduction to prokaryotic and eukaryotic cells:	1
Comparative study of cellular organization of prokaryotes and eukaryotes	
b. Bacteriology	10
Overview of a bacterial cell (morphology, ultra-structure and function)	
Structure and function of flagella, pili and capsule, cell wall (Gram positive and Gram negative), cell membrane, mesosomes, ribosomes, and genetic material.	
Inclusion bodies and reserve food materials.	
Endospore – structure, function, sporulation and germination.	
Reproduction in bacteria: binary fission	
c. Phycology	1
Overview of cyanobacterial cell (Ultrastructure and applications)	
d. Mycology	4
Overview of fungal cell (ultra-structure)	
Structure and of cell wall, cell membrane, flagella	
Reproduction in fungi: asexual and sexual	

e. Protozoology – General characters and type study- Entamoeba	1
UNIT-III **Introduction to Acellular life forms**	**9**
a. Virology Structure, Reproduction, Cultivation and Significance of Viruses: Bacterial- lytic T4, Plant- TMV, Animal- HIV. **b. Infectious particles**- Prions & Viroid (general characters and diseases)	7 2
UNIT-IV **Microbiological Techniques - Microscopy**	**7**
Microscopy Introduction to Concepts of Light- Reflection, Refraction, Diffraction, Interference, and Fluorescence. Light Microscopy-Bright field, Dark field, Fluorescence and Phase contrast Microscopy Electron microscopy -TEM and SEM	 1 4 2
UNIT V **Microbiological Techniques- Sterilization and disinfection**	**10**
Concept of sterilization and disinfection and its importance in Microbiology. **a. Factors affecting antimicrobial activity**: Population size, Population composition, Intensity of antimicrobial agent, Duration of exposure, Temperature, Local environment **b. Physical methods of sterilization:** Moist heat (Pasteurization), Moist heat under pressure (Autoclave), Dry heat (incineration, hot air oven) Filtration- membrane filter, HEPA filter Radiation (UV- rays, X- rays, ultrasonic rays) **c. Chemical agents used in sterilization:** Desired characteristics and mode of action of antimicrobial chemical agents**.** Alcohols, formaldehyde, phenol, halogens and heavy metals, and gaseous agents. **Efficacy testing of chemical agents**- Phenol coefficient test	1 6 3

NOTE: 10 hours of self-study (study materials and videos will be provided)

REFERENCES:

1	Black, J. G., & Black, L. J. (2008). *Microbiology: Principles and explorations*. Hoboken, NJ: John Wiley & Sons, Inc.
2	Madigan, M. T. (2017). *Brock Biology Of microorganisms*. Pearson.
3	Murphy, D. B., & Davidson, M. W. (2012). *Fundamentals of Light microscopy and Electronic Imaging.* John Wiley & Sons.

4	O.P. Sharma.(1992), *Textbook of Algae,* Tata McGraw-Hill.
5	Talaro, K. P. (2008*). Foundations in Microbiology: Basic principles* (11th ed.). McGraw-Hill.
6	Willey, J. M., Sherwood, L., & Woolverton, C. J. (2017). *Prescott's Microbiology.*

BLUEPRINT:

Code number: MB 126
Title of the Paper: Introductory Microbiology and Microbiological Techniques

Unit number	**Number of Hrs**	**Total marks for which the questions are to be asked (including bonus questions)**
Unit I	2	4
Unit II	17	32
Unit III	9	18
Unit IV	7	14
Unit V	10	20
	45	**88**
Maximum marks for the paper (Excluding bonus question) = 60		

Practical I

MB 1P1 26 - Introductory Microbiology and Microbiological Techniques
(3 hours/11 sessions)

Sr. No.	Experiment	Units
1	Microbiological laboratory standards and safety protocols.	1
2	Standard aseptic conditions of Microbiological laboratory.	
3	Study of a compound microscope.	1
4	Study of instruments - Autoclave, hot air oven, LAF and biosafety cabinets, incubator, membrane filter, colony counter. Applications of basic microbiological tools (Pipettes, Micropipette, Bunsen burner, Inoculation loop, Spreader).	
5	Preparation of media – NB, NA.	1
6	Isolation and identification of bacteria- spread plate, pour plate. Cultural characteristics and calculation of CFU	2
7	Pure culture techniques – streak plate (Simple, Continuous, Quadrant) methods.	1
8	Simple staining, Negative staining	1
9	Differential staining- Gram's staining	1
10	Structural staining- Endospore.	1
11	Bacterial motility- hanging drop.	1
12	Permanent slides – *Aspergillus, Penicillium, Rhizopus, Entamoeba* Spotters – T4, TMV, HIV Study of algae from pond water sample	1

Course outcomes for MB 126 and MB 1P1 26
At the end of the course, the student will be able to:

CO1	Learn the historical development of microbiology, its scope and importance.
CO2	Understand types of microbial life forms, their basic structures and functions.
CO3	Identify and use various laboratory techniques to culture and visualize microorganisms.
CO4	Apply basic disinfection and sterilization techniques for microbial growth control.
CO5	Assess the importance of microbes in all realms of life.