

Board of Studies (BOS)

Sr. No.	Name	Category	Affiliation
1	Dr. Shilpa P.Jadhav	Head of the Department (Chairman).	-
2	Dr. Purvi Bhatt	Subject Expert outside parent university	Head, Associate Professor at SVKM's NMIMS Sunandan Divatia School of Science & Placement advisor for Biological sciences
3	Dr. Riyaz Sayyed	Subject Expert outside parent university	Head, Associate Professor at PSGVP Mandal's Arts, Science & Commerce College, Shahada, Nandurbar, India
4	Dr. Anjuman Surti	Subject Expert nominated by VC	Head Department of Microbiology, Sophia College for women, Bhulabhai Desai Road, Mumbai 400026
5.	Dr.Savanta Raut	Subject Expert From Same University	Associate Professor, Dept. Of Microbiology, Bhavans College(Autonomous), JP Rd, Old D N Nagar, Munshi Nagar, Andheri West, Mumbai, Maharashtra 400058
6.	Mr.Farhaan Makba	Subject Expert From Same University	Associate Professor, Dept. Of Microbiology, Royal College of Arts, Scienec And Commerce, Bhaktivedanta Swami Marg, Srishti Complex, Mira Road East, Penkar Pada, Mira Bhayandar, Maharashtra 401107
7	Dr. Girish. B. Mahajan	Industry/corporate sector/allied area relating to the placement	Vice President, HiMedia Laboratories Pvt Ltd
8	Dr. (Mrs.) Ajitha Nair	Postgraduate meritorious alumnus	Associate Professor, SIWS College, Wadala, Mumbai
9	Dr. Amita Kocharekar	Faculty of the department	-
10	Smt. Snehal Dabhade	Faculty of the department	-
11	Dr. Priyanka Naik	Faculty of the department	-

AC ITEM NO : AC/JUNE 23-4.28



Celebrating 64 Years of Glory

Parle Tilak Vidyalaya Association's

SATHAYE COLLEGE (AUTONOMOUS)

NAAC accredited 'A' Grade (3rd Cycle)

Dixit Road, Vile Parle (E), Mumbai-57

Affiliated to

University of Mumbai

**SYLLABUS FOR
F. Y. B. Sc. Minor Course
Department of Microbiology
Under NEP 2020**

To be implemented from Academic Year: 2023-202

Preamble

The NEP (National Education Policy) Minor course on Microbiology is designed to provide learners with a comprehensive understanding of the field's fundamental principles and applications. This course aims to equip students with essential knowledge and skills in microbiology, enabling them to appreciate the importance of microorganisms in various domains. An essential aspect of this course is understanding the interactions between microorganisms and the human body. Combining the NEP Minor course on Microbiology with the course on Microbial Evolution and Ecology, students will embark on an in-depth journey into the intricate dynamics of microbial life. By the end of the course, students will have gained a comprehensive understanding of microbiology, its historical significance, its diverse branches, and the critical roles microorganisms play in various ecosystems. They will be equipped with knowledge about the fundamental principles of microbial evolution and ecology, as well as the remarkable adaptations and ecological contributions of microorganisms. This course empowers students to appreciate the importance of microorganisms in the world around us and prepares them for further studies or careers in the field of microbiology.

STRUCTURE OF COURSE:

The Board of Studies in Microbiology in its meeting held on has discussed, finalized, and unanimously accepted the revised syllabus (as per NEP 2020 framework) prepared by the committee. The titles of the papers for F.Y.B.Sc. Minor (Microbiology) are given below.

Course Code	Course Title	Unit	Topics	Credits	No.of. Lectures
GBS1MICMN0123	General Microbiology	1	Introduction, history, and scope of Microbiology	2	30
		2	Microbial world		
		3	Microorganisms and their habitats		
GBS2MICMN0123	Microbial Evolution and Ecology	1	Introduction to ecology	2	30
		2	Biogeo-chemical cycles		
		3	Microbial diversity		

Course code: GBS1MICMN0123
Title: General Microbiology

Pre-requisites:

Knowledge of basic concepts of Prokaryotic and Eukaryotic Cell.

Course Objectives:

1. Understand the historical development of microbiology and the contributions of key scientists in shaping the field.
2. Explore the diverse scope of microbiology and its relevance in various scientific, industrial, and medical applications.
3. Examine the classification systems of microorganisms, including the three-domain classification and kingdom classification, and compare prokaryotic and eukaryotic microorganisms.
4. Investigate the habitats of microorganisms, including terrestrial, aquatic, atmospheric, and animal environments, and their roles within these ecosystems.

5. Study extremophiles and their ability to thrive in extreme conditions, such as high and low temperatures, pH levels, and salinity, as well as their significance in ecological processes like decomposition.

Course outcomes:

Course outcome	Description On Completion of the course learner will be able to:
CO1	Review the contribution of various Microbiologist and recognize the Scope and relevance of different branches of microbiology as a career choice
CO2	Describe the different classification systems and their importance and will be able to identify the classification of microbes according to those systems.
CO3	Make a use of Bergey's Manual for identification of microbes.
CO4	Describe the characteristics of prokaryotes, Eukaryotes and archaea and Distinguish between these 3 domains of life.
CO5	Discuss the microbial diversity in soil, air and aquatic environments.
CO6	Discuss the mechanism of adaptation of extremophiles and their diverse applications.

Course Content:

Course Code	Title	No. of credits/ lectures
GBS1MICMN0123	General Microbiology	2 Credits (30 L)
UNIT I	Introduction, history, and scope of Microbiology 1.1 History, scope, branches of microbiology and relevance of microbiology 1.2 Contribution of Antony Van Leeuwenhoek, Louis Pasteur, Robert Koch, Alexander Fleming, Ivanowsky, Martinus W. Beijerinck,	10 L 04 L 06 L
UNIT II	Microbial world 2.1 Position of microorganisms in the living world. Carl Woese's three kingdom classification systems and their utility. 2.2 Kingdom classification of Whittaker and 3 kingdom classification, comparison of the 3 domain of microorganisms- bacteria, archaea, eukarya; 2.3 Bergey's manual and introduction to classification of bacteria. Difference between prokaryotic and eukaryotic microorganisms.	10 L 03 L 04 L 03 L
UNIT III	Microorganisms and their habitats 3.1 Structure and function of ecosystem; Terrestrial environment: soil profile and soil microflora 3.2 Aquatic Environment: microflora of freshwater and marine habitats 3.3 Atmosphere: Aeromicroflora and dispersion of microbes; 3.4 Animal Environment: Microbes in/on human body (microbiomes) & animal (Ruminants) body; 3.5 Extreme habitats: Extremophiles: Microbes thriving at high & low temperature, pH. High hydrostatic & osmotic pressures, salinity and low nutrient level; Microbial succession in decomposition of plant organic matter.	10 L 02 L 02 L 01 L 02 L 03 L

	References: 1. Microbiology an Introduction. 6th Edition. Tortora, Funke and Case. Adisson Wesley Longman Inc. 1998. 2. Willey, Joanne M., Sherwood, Linda., Woolverton, Christopher J., Prescott, Lansing M. Prescott, Harley, and Klein's microbiology (7th). 3. Madigan M. T. Martinko J. M. & Brock T. D. (2006). Brock biology of microorganisms (11th ed.). Pearson Prentice Hall. 4. A.J.Salle, Fundamental Principles of Bacteriology 5. Maier, R.M., Pepper, I.L. and Gerba, C.P. (2009) Environmental microbiology. 2nd Edition, ELSEVIER. 387439. doi:B978-0-12-370519-8.00020-1	
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Course code: GBS2MICMN0123

Title: - Microbial Evolution and Ecology

Course Objectives:

1. Understand the fundamental principles of microbial ecology, diversity, and evolution, and recognize their importance in shaping ecosystems.
2. Explore the evolutionary history of life on Earth and comprehend the pivotal role of microorganisms and bioenergetics in this process.
3. Examine the mechanisms of microbial energetics and metabolism, and gain insights into the diverse ways microorganisms obtain and utilize energy.
4. Analyze the definitions and measurements of primary production and comprehend the significance of microbial biomass in biogeochemical cycles.
5. Explore the nitrogen, phosphorus, and sulfur cycling processes, as well as the intriguing phenomena of methanogenesis and methanotrophy, and recognize the contributions of microorganisms to these cycles.

6. Study the microbial ecology of various terrestrial ecosystems, including soil, forests, and tundra, and comprehend the complex interactions and adaptations of microorganisms in these environments.

Course Outcomes:

Course outcome	Description On Completion of the course learner will be able to:
CO1	Gain understanding of major concepts in microbial ecology, including processes controlling distributions of microbial biomass, rates of metabolism, and mechanisms regulating diversity.
CO2	Define the major forms of microbial life and describe forms of microbial metabolism
CO3	Explain how microbial biomass, activity, and diversity are quantified, including knowledge of assumptions underlying measurements of these properties.
CO4	Define major microbial-mediated processes catalyzing carbon and nitrogen cycling
CO5	Analyze contemporary techniques used to analyze microbial communities and community function.

Course Content:

Course Code	Title	No. of credits/ Hours
GBS2MICMN0123	Microbial Evolution and Ecology	2 Credits (30 Hours)
Unit I	INTRODUCTION TO ECOLOGY 1.1 Microbial Ecology, Diversity, and Evolution 1.2 The evolution of life on Earth and the role of microorganisms and bioenergetics 1.3 Microbial energetics and metabolism 1.4 The microbial tree of life	10 L 02 L 03 L 03 L 02 L
Unit II	BIOGEO-CHEMICAL CYCLES 2.1 Definitions and measurements of primary production 2.2 Measurements and distributions of microbial biomass 2.3 Nitrogen cycling, Phosphorus, and sulfur cycling 2.4 Methanogenesis and Methanotrophy	10 L 02 L 02 L 03 L 03 L
Unit III	MICROBIAL DIVERSITY	10 L 02 L

	3.1 Microbial ecology of terrestrial ecosystems (soil, forests, tundra) 3.2 Microbial ecology of aquatic ecosystems 3.3 Marine ecosystems 3.4 Extreme ecosystems (hot springs, deep subsurface, mine drainage) 3.5 Microbial interactions: Symbioses, allelopathy, syntropy, quorum sensing	02 L 02 L 02 L 02 L
	REFERENCE: 1) Madigan et al. (2011) Brock Biology of Microorganisms, 13th ed. (Pearson) 2) Atlas, R.M., and R. Bartha. 1998. Microbial Ecology: Fundamentals and Applications. 4th ed. (Addison-Wesley) 3) Kirchman DL (2008) Microbial Ecology of the Oceans (Wiley). 4) Madsen EL (2008) Environmental Microbiology - from genomes to biogeochemistry (Blackwell) Paper discussion: 1) Judson (2017): The energy expansions of evolution. Nature Ecology and Evolution 1: 1-9 2) Doolittle (2000): Uprooting the tree of life. Scientific American, 90-95. 3) Handelsman (2004) Metagenomics: Application of Genomics to Uncultured Microorganisms. Microbiology and Molecular Biology Reviews, 68: 669–685 4) Delong and Beja (2010). The light-driven proton pump proteorhodopsin enhances bacterial survival during tough times. PLoS Biol. 8: e1000359. 5) Biller et al. (2015). Prochlorococcus: The structure and function of collective diversity. Nature Reviews Microbiology 13: 13-27	

	6) Kuypers et al. (2018). The microbial nitrogen-cycling network. <i>Nature Reviews Microbiology</i>, 16: 263-276. 7) Delgado-Baquerizo et al. (2017) A global atlas of the dominant bacteria found in soil. <i>Science</i>, 359: 320-325. 8) Sunagawa et al. (2015). Structure and function of the global ocean microbiome. <i>Science</i>, 348: 1261359. 9) McFall-Ngai et al. (2013). Animals in a bacterial world, a new imperative for the life sciences. <i>PNAS</i> 110: 3229–3236.	
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EXAMINATION PATTERN

A) Continuous Internal Assessment (40 Marks):

Sr. No.	Particulars	Marks
1	One Assignment/Project work/Case study /Presentation /Seminar /Field visit reports/Book review etc. to be conducted in the given semester before Semester end examination.	15
2	One online/offline class test.	15
3	Active participation in routine class instructional deliveries.	05
4	Overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities	05

B) Semester End Theory Examination (60 Marks):

These examinations shall be of 2 Hours duration.

Following is the Question Paper Pattern

Questions Based On	Question No.	Options	Marks
Unit I	1A. Subjective questions	Any 2 out of 4	10
	1B. Objective questions	Any 5 out of 8	05
Unit II	2A. Subjective questions	Any 2 out of 4	10
	2B. Objective questions	Any 5 out of 8	05
Unit III	3A. Subjective questions	Any 2 out of 4	10
	3B. Objective questions	Any 5 out of 8	05
All Units (I, II, III)	4. Subjective questions	Any 3 out of 5	15
	TOTAL		60

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8	Dr. (Mrs.) Ajitha Nair	Postgraduate meritorious alumnus	Associate Professor, SIWS College, Wadala, Mumbai
9	Dr. Amita Kocharekar	Member Secretary	-
10	Smt. Snehal Dabhade	Faculty of the department	-
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