Syllabus
Third Semester Courses in
BSc
Microbiology
(June 2024 onwards)

- **Core Courses:**
  - USMIC5001CR1 Microbial diversity and Eukaryotic structure
  - USMIC5001CR1PR Microbial diversity and Eukaryotic structure Practical
  - USMIC5002CR1 Chemistry of cellular components
  - USMIC5002CR1PR Chemistry of cellular components Practical

- **Vocational Skill Course:**
  - USMIC5001VS1 Quantitative analysis of biomolecules

- **Evaluation and Assessment Guidelines**

APPROVED SYLLABUS

ST. XAVIER'S COLLEGE-AUTONOMOUS MUMBAI-400 001

PRINCIPAL
ST. XAVIER'S COLLEGE
(AUTONOMOUS)
MUMBAI - 400 001.

BSc in Microbiology		
Course Title: **Microbial Diversity and Eukaryotic structure** **Course Code:** **USMIC5001CR1**		
Credits 3: Theory (3) = 45 hr		
No.	**Course Objectives**	
1. 2. 3. 4.	Explain bacterial diversity and characteristics of different taxonomic groups. Facilitate the understanding of eukaryotic cell structure and differences between prokaryotes and eukaryotes. Give an overview of eukaryotic cell diversity, including the three domains of life. Introduce different types of eukaryotic cells- fungi, algae and protozoa.	
CO	**Course Outcomes** **On completing the course, the learner will be able to**	**Bloom's Taxonomy Level (BT level)**
1.	Describe eukaryotic cell structure and discuss the diversity of eukaryotic cells, including fungi, algal protists, and protozoan protists.	Remember
2.	Discuss prokaryotic diversity, including classification, features, and significance of various groups.	Understand
3.	Correlate the characteristics of different microbial taxonomic groups to their niches, significance and roles in ecological habitats.	Apply
4.	Relate the structures of eukaryotic cell organelles to their functions.	Analyze

APPROVED SYLLABUS

UNIT I **DIVERSITY OF PROKARYOTES** (15)

A. **Actinomycetes**: General features, classification and significance. (1)

B. **Archaea:** General features, classification and significance (2)

C. ***Rickettsia, Chlamydia, Mycoplasma*** (2)
General features and medical significance

D. **Gliding bacteria and photosynthetic bacteria**: (2)
Cyanobacteria, green, and purple sulfur bacteria, myxobacteria

E. **Classification systems in prokaryotes** (1)
Bergey's manual of systematic bacteriology

E. **Viruses:** (7)

1. Definitions of virus, viroid and prion
2. Plant virus, animal virus, bacteriophages, archaeal phages, fungal phages
3. General structure of viruses; examples: Bacteriophage T4, Polio, TMV, Influenza and SARS CoV2
4. Viral classification
5. Cultivation of viruses: animal, bacteriophage and plant viruses

UNIT II **EUKARYOTIC CELL STRUCTURE AND FUNCTION** (15)

A. 1. Eukaryotic cell structure (2)

2. Differences between prokaryotic and eukaryotic cell structure

B. **External cell coverings and cell membrane: structure and function** (3)

1. Plasma membrane – Fluid mosaic model, membrane fluidity, functions
2. Cell walls and the extracellular matrix

C. **Cytoplasmic matrix** (7)

1. Single membrane organelles: Endoplasmic reticulum, Golgi complex
2. Double membrane organelles - Nucleus, Mitochondrion and Chloroplast: structure and function
3. Lysosomes, Vesicles, and Ribosomes: structure and function
4. Peroxisomes: structure and function
5. Cytoskeletal elements

D. Introduction to cell junctions (1)

E. Organelles of motility – structure and movement of flagella and cilia (2)

UNIT III DIVERSITY OF EUKARYOTES (15)

A. Overview of eukaryotic cell diversity (5)

1. Three domains of life
2. Eukaryotic cell cycle and cell division – mitosis and meiosis

B. Types of eukaryotic cells (10)

1. Fungi: morphology, nutrition, reproduction, classification and significance
2. Algal protists: cell structure, diversity, reproduction
3. Protozoan protists: morphology, nutrition, reproduction

References:

1. Chess, B. (2024). *Talaro's foundations in microbiology* (12th edition). McGraw Hill LLC.
2. Chess, B., & Talaro, K. P. (2021). *Talaro's Foundations in microbiology* (11th edition). McGraw.
3. Cooper, G. M. (2019). *The cell: A molecular approach* (8th ed). Sinauer Associates, Oxford University Press.
4. Willey, J. M., Prescott, L. M., Sandman, K. M., & Wood, D. H. (2020). *Prescott's microbiology* (11th edition). McGraw-Hill Education.
5. Willey, J. M., Sandman, K., Wood, D. H., & Prescott, L. M. (2023). *Prescott's microbiology* (12th edition, international student edition). McGraw Hill.

Evaluation (Theory, USMIC5001CR1): Total marks per course – 100

Formative Assessment for Learning

(continuous internal assessment - CIA to improve learning).

CIA - 40 marks

CIA 1: Written test - 20 marks.

CIA 2: Presentation/Assignment/ model -20 marks.

Summative Assessment of Learning

(focus on outcomes, quantitative data for outcomes of instruction)

End Semester Examination - 60 marks

One question from each unit for 20 marks, with internal choice.

Total marks per question with choice 25 - 30 marks.

APPROVED SYLLABUS

Distribution of Bloom's Taxonomy levels for the course assessment

Learning Levels	Remember	Understand	Apply	Analyze	Evaluate	Create
Percentage	10-15%	20-25%	20-25%	20-25%	-	-

****

APPROVED SYLLABUS

ST. XAVIER'S COLLEGE-AUTONOMOUS MUMBAI-400 001

BSc in Microbiology		
Course Title:	**Microbial diversity and Eukaryotic structure Practical**	
Course Code:	**USMIC5001CR1PR**	
Credits 1:	Practical (1) Number of hours: 30	
No.	**Course Objectives**	
1.	Introduce students to the identification and cultivation of different microbial groups	
CO	**Course Outcomes** **On completing the course, the learner will be able to**	**Bloom's Taxonomy Level (BT level)**
1.	Isolate and observe yeast, *Nocardia* and *Streptomyces* from various samples; cultivate oyster mushrooms	Apply
2.	Perform wet mount of pond water and hay infusion samples to observe bacteria, algae, and protozoa	Analyze
3.	Identify fungi such as *Aspergillus, Penicillium*, *Mucor*, and *Rhizopus*, using macroscopic and microscopic characteristics; identify *Spirogyra, Spirulina, Euglena*, Diatoms using microscopic characteristics	Analyze
4.	Observe and document the stages of mitosis in onion root tip cells and the stages of meiosis using permanent slides.	Analyze

S. No.	**Name of Practical**
1.	Gram stain and isolation of actinomycetes – *Nocardia* and *Streptomyces*
2.	Detection of phages – Demonstration
3.	Permanent slides of *Spirogyra, Spirulina, Euglena*, Diatoms
4.	Wet mount of pond water and hay infusion to observe bacteria, algae and protozoa
5.	Cultivation of yeast
6.	Wet Mount of *Aspergillus, Penicillium, Mucor and Rhizopus*
7.	Mushroom cultivation – Demonstration
8.	Study of mitosis in onion root tip
9.	Study of meiosis - Permanent slides.

References:

1. Cappuccino, J. G., & Sherman, N. (2014). *Microbiology: A laboratory manual* (10th edition). Pearson.
2. Willey, J. M., Prescott, L. M., Sandman, K. M., & Wood, D. H. (2020). *Prescott's microbiology* (11th edition). McGraw-Hill Education.

Evaluation (Practical, USMIC5001CR1PR): **Total marks practical course - 50**
CIA - 20 marks
End Semester Practical Examination - 30 marks.
Continuous practical evaluation will be done on the basis on the completion of the hands-on practical sessions

Distribution of Bloom's Taxonomy levels for the practical assessment

Learning Levels	Remember	Understand	Apply	Analyze	Evaluate	Create
Percentage	-	-	40-60%	50-60%	-	-

****

APPROVED SYLLABUS

BSc in Microbiology		
Course Title: Chemistry of cellular components **Course Code: USMIC5002CR1**		
Credits 3: Theory (3) = 45 hr		
No.	**Course Objectives**	
1. 2. 3. 4.	Introduce basic chemistry needed to understand biomolecules. Facilitate the learning of the basic building blocks of different types of biomolecules. Enable the understanding of the types of bonds and structures that make up the basic biological macromolecules. Explain basic concepts associated with enzymes as biocatalysts.	
CO	**Course Outcomes** **On completing the course, the learner will be able to**	**Bloom's Taxonomy Level (BT level)**
1.	Recognize and draw the basic monomers that make up carbohydrates, lipids, proteins and nucleic acids also state the significance and mechanism of action of enzymes	Remember
2.	Discuss the roles that biological macromolecules play in the functioning of cells, the effect of environmental parameters on enzyme catalyzed reactions and the concepts of coenzymes	Understand
3.	Demonstrate how conformation, configuration, chirality and structural changes influence properties and functions of biological macromolecules	Apply
4.	Compare different types of monomers, their structures under different conditions and the bonds between them in various macromolecules	Analyze, Evaluate

APPROVED SYLLABUS

UNIT I **CARBOHYDRATES AND LIPIDS** (15)

A. Introduction – atoms, bonds and molecules (2)

1. Types of atoms – Elements and their properties
2. Bonds and molecules
3. Water

B. Carbohydrates (7)

1. Ketoses and hexoses
2. Conformation vs configuration
3. Chirality – D vs L forms
4. Monosaccharides
5. Glycosidic linkages
6. Oligosaccharides & polysaccharides (starch, glycogen, cellulose, chitin)
7. Important examples: bacterial and algal cell wall, proteoglycan, glycolipids, glycoproteins

C. Lipids (6)

1. Fatty acids
2. Storage lipids
3. Structural lipids
4. Lipids as signal, cofactors and pigments

UNIT II **NUCLEIC ACIDS AND AMINO ACIDS** (15)

A. Nucleic acids (9)

1. Structure: bases, purines, pyrimidines, UV absorption, melting curve, GC content
2. RNA- types and stability
3. DNA- Features and forms, Watson and Crick model, A, B, Z forms, unusual structures (including triple helix)

B. Amino acids (6)

1. General structure of amino acids
2. Chirality- D vs L forms
3. Classes based on R groups
4. Non canonical amino acids
5. pH curve- pK and pI, zwitterionic form

UNIT III PROTEINS AND ENZYMES (15)

A. Proteins (5)

1. Proteins and peptide bond
2. Structural hierarchy: Primary, secondary (α-helix and β-pleated sheet, loops), tertiary and quaternary structure with one example (e.g. Collagen), Ramachandran plot
3. Types of post translational modifications and protein processing with examples (e.g. Insulin)

B. Enzymes (10)

1. Definition of enzymes,
2. Concept of activation energy and delta G in relation to enzymes
3. Induced fit hypothesis
4. Effect of pH, temperature, enzyme concentration, substrate concentration
5. Cofactors, coenzymes, prosthetic group
6. Multi-substrate reactions
7. Enzyme units

References:

1. Berg, J. M., Gatto, G. J., Hines, J. K., Tymoczko, J. L., & Stryer, L. (2023). *Biochemistry* (10th edition). W.H. Freeman and Company.
2. Chess, B. (2024). *Talaro's foundations in microbiology* (12th edition). McGraw Hill LLC.
3. Conn, E. E., Stumf, P., Bruening, G., & Doi, R. H. (Eds.). (1987). *Outlines of biochemistry* (5th edition) Wiley India.
4. Nelson, D. L., Cox, M. M., & Lehninger, A. L. (2017). *Lehninger principles of biochemistry* (7th edition). W.H. Freeman and Company; Macmillan Higher Education.
5. Willey, J. M., Prescott, L. M., Sandman, K. M., & Wood, D. H. (2020). *Prescott's microbiology* (11th edition). McGraw-Hill Education.

Evaluation (Theory, USMIC5002CR1): Total marks per course – 100

Formative Assessment for Learning
(continuous internal assessment - CIA to improve learning).

CIA - 40 marks

CIA 1: Written test - 20 marks.

CIA 2: Test / Assignment / Presentations / Infographics / Quiz / as prescribed - 20 marks.

Summative Assessment of Learning
(focus on outcomes, quantitative data for outcomes of instruction)

End Semester Examination - 60 marks

One question from each unit for 20 marks, with internal choice.

Total marks per question with choice 25 - 30 marks.

Distribution of Bloom's Taxonomy levels for the course assessment

Learning Levels	Remember	Understand	Apply	Analyze	Evaluate	Create
Percentage	0-10%	25-30%	20-30%	20-30%	0-5%	-

****

APPROVED SYLLABUS

BSc in Microbiology		
Course Title: Chemistry of Cellular Components Practical **Course Code: USMIC5002CR1PR**		
Credits: 1	Practical (1) Number of hours: 30	
No.	**Course Objectives**	
1. 2.	Instruct the students to use methods to analyze biomolecules Develop an understanding of enzyme kinetics	
CO	**Course Outcomes** **On completing the course, the learner will be able to**	**Bloom's Taxonomy Level (BT level)**
1.	Employ various assays to detect, quantify and study biomolecules	Apply
2.	Examine kinetics of enzymes to discuss concepts of catalytic efficiency, turnover and affinity	Analyze

S No Name of the Practical

1. Detection of biomolecules-Qualitative tests for Proteins, Amino Acids Carbohydrates, Nucleic Acids and Lipids
2. Study of Bacterial Enzymes - Study of Amylase, Casease, Urease, Catalase and Lipase Producers
3. Enzyme assay and calculation of enzyme units - amylase/lysozyme
4. Study of effect of pH, temperature and enzyme concentration on enzyme activity
5. Detection of biomolecules-Qualitative tests for Proteins, Amino Acids Carbohydrates, Nucleic Acids and Lipids

References:

1. Cappuccino, J. G., & Sherman, N. (2014). *Microbiology: A laboratory manual* (10th edition). Pearson.
2. Jayaraman, J. (1981). *Laboratory manual in biochemistry*. New Age International.
3. Plummer, D. T. (2008). *Introduction to practical biochemistry* (3rd edition). Tata McGraw-Hill.
4. Rao, B. S., & Deshpande, V. (2006). *Experimental biochemistry: A student companion*. Anshan.

Evaluation (Practical, USMIC5002CR1PR): **Total marks practical course - 50**

CIA - 20 marks

End Semester Practical Examination - 30 marks.

Continuous practical evaluation will be done on the basis on the completion of the hands-on practical sessions

Distribution of Bloom's Taxonomy levels for the course assessment

Learning Levels	Remember	Understand	Apply	Analyze	Evaluate	Create
Percentage	-	-	40-60%	40-60%	-	-

****

APPROVED SYLLABUS

BSc in Microbiology		
Course Title: Quantitative analysis of biomolecules **Course Code: USMIC5001VS1**		
Credits 2: Theory (1) = 15 hr Practical (1) = 30 hr		
No.	**Course Objectives**	
1. 2.	Introduce the basic methods of elemental analysis. Familiarize students with the basic analytical techniques used in microbiology and biochemistry.	
CO	**Course Outcomes** **On completing the course, the learner will be able to**	**Bloom's Taxonomy Level (BT level)**
1	Outline the elemental and molecular composition of microbial cells and learn the methods of elemental analysis	Remember
2	Describe the principles of analysis of biomolecules	Understand
3	Use laboratory equipment such as centrifuge, colorimeter and UV-visible spectrophotometer	Apply
4	Estimate different biomolecules using colorimetric methods.	Analyze
5	Determine the purity of DNA using UV-visible spectrophotometry	Evaluate

APPROVED SYLLABUS

UNIT I **QUANTITATIVE ANALYSIS OF BIOMOLECULES** (15)

A. Macromolecular composition of a microbial cell (1)

B. Methods of elemental analysis: Carbon, Nitrogen and Phosphorus (2)

C. Estimation of Proteins and amino acids (4)

1. Proteins by Biuret method (Direct and indirect)
2. Proteins by BCA (Bicinchoninic acid) method
3. Proteins by Micro Kjeldahl method
4. Proteins by spectrophotometric method
5. Amino acids by Ninhydrin method

D. Estimation of Carbohydrates (3)

1. Total carbohydrates by Anthrone method
2. Reducing sugars by DNSA method
3. Reducing sugar by Fehling's method

E. Extraction of Lipids by Soxhlet method (1)

F. Estimation of Nucleic acids (4)

1. General principles
2. Extraction of nucleic acids (DNA and RNA)
3. DNA by DPA method
4. RNA by Orcinol method
5. Nucleic acids by spectrophotometric method

References:

1. Jayaraman, J. (1981). *Laboratory manual in biochemistry*. New Age International.
2. Norris, J. R., & Ribbons, D. W. (Eds.). (1971). *Methods in microbiology* (Vol. 5B). Academic Press.
3. Plummer, D. T. (2008). *Introduction to practical biochemistry* (3rd edition). Tata McGraw-Hill.
4. Russell, P. J. (2009). *iGenetics: A molecular approach* (3. edition, international. ed). Cummings.

S. No.	Name of Practical
1.	Estimation of total sugar by Anthrone method (Demonstration)

2. Estimation of reducing sugars by DNSA method
3. Estimation of proteins by biuret method (indirect and direct)
4. Estimation of proteins by Micro Kjeldahl method (Demonstration)
5. Extraction of lipid by Soxhlet method (Demonstration)
6. Estimation of DNA by DPA method
7. Estimation of RNA by Orcinol method
8. Estimation of proteins and nucleic acids by spectrophotometric method

Evaluation (USMIC5001VS1): Total marks per course – 50

Formative Assessment for Learning
(continuous internal assessment - CIA to improve learning).

CIA - 20 marks

Summative Assessment of Learning
(focus on outcomes, quantitative data for outcomes of instruction)

End Semester Examination - 30 marks

Distribution of Bloom's Taxonomy levels for the assessment

Learning Levels	Remember	Understand	Apply	Analyze	Evaluate	Create
Percentage	0-5%	10-20%	35-40%	35-40%	5-10%	-

****

Syllabus
Third Semester Courses in
BSc
Microbiology
(June 2024 onwards)

- **Minor Courses:**
  - USMIC5001MN1 Diversity of Microscopic Life
  - USMIC5001MN1PR Diversity of Microscopic Life Practical

- Evaluation and Assessment Guidelines

APPROVED SYLLABUS

BSc in Microbiology		
Course Title: **Diversity of Microscopic Life** **Course Code:** **USMIC5001MN1**		
Credits 3: Theory (3) = 45 hrs		
No.	**Course Objectives**	
1. 2. 3. 4.	Explain bacterial diversity and characteristics of different taxonomic groups Facilitate the understanding of eukaryotic cell structure and differences between prokaryotes and eukaryotes. Give an overview of eukaryotic cell diversity, including the three domains of life Introduce different types of eukaryotic cells, with a focus on fungi, algae and protozoa.	
CO	**Course Outcomes** **On completing the course, the learner will be able to**	**Bloom's Taxonomy Level (BT level)**
1.	Describe eukaryotic cell structure and discuss the diversity of eukaryotic cells, including fungi, algal protists, and protozoan protists.	Remember
2.	Explain prokaryotic diversity, including classification, features, and significance of various groups.	Understand
3.	Relate the structures of eukaryotic cell organelles to their functions	Apply
4.	Correlate the characteristics of different microbial taxonomic groups to their niches, significance and roles in ecological habitats	Analyze

APPROVED SYLLABUS

UNIT I **DIVERSITY OF PROKARYOTES** (15)

A. **Actinomycetes and Archaea**: General features, classification and significance.

B. **Rickettsia, Chlamydia, Mycoplasma**: Overview of features and significance (2)

C. **Gliding bacteria and photosynthetic bacteria**: Key characteristics of Cyanobacteria, green, and purple sulfur bacteria. (2)

D. **Classification systems in prokaryotes**: Emphasis on Bergey's manual of systematic bacteriology. (1)

E. **Viruses** (7)

1. Definitions and general structure
2. Virus classification
3. Virus cultivation methods
4. Examples - Bacteriophage T4, Polio, SARS CoV-2

UNIT II **EUKARYOTIC CELL STRUCTURE AND FUNCTION** (15)

A. **Overview of eukaryotic cell structure:** General structure and types of cells (1)

B. **External Cell coverings and Cell Membrane: Structure and Function** (3)

1. Plasma membrane – Fluid mosaic model, membrane fluidity, functions
2. Cell walls and the extracellular matrix

C. **Cytoplasmic matrix** (8)

1. Single Membrane Organelles: Endoplasmic reticulum, Golgi complex
2. Double Membrane Organelles - Nucleus, Mitochondrion and Chloroplast: Structure and Function
3. Lysosomes, Vesicles, and Ribosomes: Structure and Function
4. Peroxisomes: Structure and Function
5. Cytoskeletal elements

D. **Organelles of motility** – Structure and movement of flagella and cilia (2)

E. **Differences in prokaryotic and eukaryotic cell structure** (1)

UNIT III DIVERSITY OF EUKARYOTES (15)

A. Overview of eukaryotic cell diversity (5)

1. Three domains of life
2. Eukaryotic cell cycle and cell division – Mitosis and Meiosis

B. Types of eukaryotic cells (10)

1. Fungi: Morphology, nutrition, reproduction, classification and significance
2. Algal protists: Cell structure, diversity, reproduction
3. Protozoan protists: Morphology, nutrition, reproduction

References:

1. Chess, B. (2024). *Talaro's foundations in microbiology* (12th edition). McGraw Hill LLC.
2. Chess, B., & Talaro, K. P. (2021). *Talaro's Foundations in microbiology* (11th edition). McGraw.
3. Cooper, G. M. (2019). *The cell: A molecular approach* (8th edition). Sinauer Associates, Oxford University Press.
4. Madigan, M. T., Bender, K. S., Buckley, D. H., Sattley, W. M., Stahl, D. A., & Brock, T. D. (2022). *Brock biology of microorganisms* (16th edition, global edition). Pearson.
5. Willey, J. M., Prescott, L. M., Sandman, K. M., & Wood, D. H. (2020). *Prescott's microbiology* (11th edition). McGraw-Hill Education.
6. Willey, J. M., Sandman, K., Wood, D. H., & Prescott, L. M. (2023). *Prescott's microbiology* (12th edition, international student edition). McGraw Hill.

Evaluation (Theory, USMIC5001MN1): Total marks per course – 100

Formative Assessment for Learning
(continuous internal assessment - CIA to improve learning).

CIA - 40 marks

CIA 1: Written test - 20 marks.

CIA 2: Presentation/Assignment/ model -20 marks.

Summative Assessment of Learning
(focus on outcomes, quantitative data for outcomes of instruction)

End Semester Examination - 60 marks

One question from each unit for 20 marks, with internal choice.

Total marks per question with choice 25 - 30 marks.

Distribution of Bloom's Taxonomy levels for the course assessment

APPROVED SYLLABUS

Learning Levels	Remember	Understand	Apply	Analyze	Evaluate	Create
Percentage	10-20%	20-30%	20-30%	20-30%	-	-

****

APPROVED SYLLABUS

BSc in Microbiology		
Course Title:	**Diversity of microbial life Practical**	
Course Code:	**USMIC5001MN1PR**	
Credits 1:	Practical (1) Number of hours: 30	
No.	**Course Objectives**	
1.	Introduce students to the identification and cultivation of different microbial groups	
CO	**Course Outcomes** **On completing the course, the learner will be able to**	**Bloom's Taxonomy Level (BT level)**
1.	Isolate and observe yeast, *Nocardia* and *Streptomyces* from various samples; cultivate oyster mushrooms	Apply
2.	Perform wet mount of pond water and hay infusion samples to observe bacteria, algae, and protozoa	Analyze
3.	Identify fungi such as *Aspergillus, Penicillium*, *Mucor*, and *Rhizopus*, using macroscopic and microscopic characteristics; identify *Spirogyra, Spirulina, Euglena*, Diatoms using microscopic characteristics	Analyze
4.	Observe and document the stages of mitosis in onion root tip cells and the stages of meiosis using permanent slides.	Analyze

S. No.	**Name of Practical**
1.	Gram stain and isolation of actinomycetes – *Nocardia* and *Streptomyces*
2.	Detection of phages – Demonstration
3.	Permanent slides of *Spirogyra, Spirulina, Euglena*, Diatoms
4.	Wet mount of pond water and hay infusion to observe bacteria, algae and protozoa
5.	Cultivation of yeast
6.	Wet Mount of *Aspergillus, Penicillium, Mucor and Rhizopus*
7.	Mushroom cultivation – Demonstration
8.	Study of mitosis in onion root tip
9.	Study of meiosis - Permanent slides.

References:

1. Cappuccino, J. G., & Sherman, N. (2014). *Microbiology: A laboratory manual* (10th edition). Pearson.
2. Willey, J. M., Prescott, L. M., Sandman, K. M., & Wood, D. H. (2020). *Prescott's microbiology* (11th edition). McGraw-Hill Education.

Evaluation (Practical, USMIC5001MN1PR): Total marks practical course - 50

CIA - 20 marks

End Semester Practical Examination - 30 marks.

Continuous practical evaluation will be done on the basis on the completion of the hands-on practical sessions

Distribution of Bloom's Taxonomy levels for the practical assessment

Learning Levels	Remember	Understand	Apply	Analyze	Evaluate	Create
Percentage	-	-	40-60%	50-60%	-	-

****

APPROVED SYLLABUS

Syllabus
Third/Fourth Semester Courses in Microbiology
(June 2024 onwards)

- **Open Elective Courses:**
  - **USMIC5001OE1 Microbiology in everyday life**

- **Evaluation and Assessment guidelines**

APPROVED SYLLABUS

ST. XAVIER'S COLLEGE-AUTONOMOUS ★ MUMBAI-400 001 ★

PRINCIPAL
ST. XAVIER'S COLLEGE
(AUTONOMOUS)
MUMBAI - 400 001.

SYBA /BA(MCJ) /BMS Microbiology		
Course Title: Microbiology in everyday life **Course code: USMIC5001OE1**		
Credits 2: Theory (2) = 30 hr		
No.	**Course Objectives**	
1	Explain the fundamental principles of microbiology and its relevance in everyday life.	
2	Facilitate the understanding of the diversity of microorganisms and their roles in human health, food production, and environmental processes.	
CO	**Course Outcomes** **On completing the course, the learner will be able to**	**Bloom's Taxonomy Level (BT level)**
1	Differentiate between various types of microorganisms and their characteristics	Remembering
2	Describe the roles of microorganisms in human health, food production, biotechnology and environmental processes.	Understanding
3	Suggest measures to modulate microbial activities	Applying

APPROVED SYLLABUS

ST. XAVIER'S COLLEGE-AUTONOMOUS MUMBAI-400 001

UNIT I **INTRODUCTION TO MICROBIOLOGY AND ITS ROLE IN HUMAN HEALTH, FOOD AND ENVIRONMENTAL PROCESSES** (15)

A. 1. **Introduction to the microscopic world: bacteria, fungi, protozoa, viruses, cultivation of bacteria, fungi and viruses** (3)

B. **Microbes in Food Production** (4)

1. Role of microbes in food fermentation (e.g., yogurt, cheese, bread)
2. Food spoilage and foodborne illnesses

C. **Microbes in Environmental Processes** (4)

1. Microbial roles in nutrient cycling (e.g., nitrogen fixation)
2. Bioremediation and microbial degradation of pollutants

D. **Microbes and Human Health** (4)

1. Role of microbiome in maintaining human health
2. Pathogenic microorganisms and infectious diseases

UNIT II **BIOTECHNOLOGY, CURRENT TOPICS AND ETHICS** (15)

A. 1. **Microbes and Biotechnology** (5)

1. Applications of microbes in biotechnology (e.g., genetic engineering, pharmaceuticals)

B. **Current Topics in Microbiology** (7)

1. Emerging infectious diseases
2. Antibiotic resistance

C. **Societal Implications of Microbiology** (3)

1. Biosecurity and bioterrorism

References:

1. Chess, B. (2024). *Talaro's foundations in microbiology* (12th edition). McGraw Hill LLC.
2. Chess, B., & Talaro, K. P. (2021). *Talaro's Foundations in microbiology* (11th edition). McGraw.
3. Madigan, M. T., Bender, K. S., Buckley, D. H., Sattley, W. M., Stahl, D. A., & Brock, T. D. (2022). *Brock biology of microorganisms* (16th edition, global edition). Pearson.
4. Willey, J. M., Prescott, L. M., Sandman, K. M., & Wood, D. H. (2020). *Prescott's microbiology* (11th edition). McGraw-Hill Education.
5. Willey, J. M., Sandman, K., Wood, D. H., & Prescott, L. M. (2023). *Prescott's microbiology* (12th edition, international student edition). McGraw Hill.

APPROVED SYLLABUS

Evaluation (Theory, USMIC5001OE1): Total marks per course - 50

Formative Assessment for Learning
(continuous internal assessment - CIA to improve learning).

CIA – 20 marks

Summative Assessment of Learning (focus on outcomes, quantitative data for outcomes of instruction).

End Semester Examination – 30 marks

One question from each unit for 15 marks, with internal choice. Total marks per question with choice – 20 to 25.

Distribution of Bloom's Taxonomy levels for the course assessment

Learning Levels	Remember	Understand	Apply	Analyze	Evaluate	Create
Percentage	30-40%	30-40%	20-30%	-	-	-

****

APPROVED SYLLABUS