

# VANITA VISHRAM WOMEN'S UNIVERSITY

(Managed By: Vanita Vishram, Surat)

1<sup>st</sup> Women's University of Gujarat



VANITA VISHRAM  
WOMEN'S UNIVERSITY  
SURAT

## SCHOOL OF SCIENCE AND TECHNOLOGY

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DEPARTMENT OF MICROBIOLOGY

B.Sc. MICROBIOLOGY

SEMESTER 1

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SYLLABUS

AS PER **NEP-2020**

W.E.F 2023-24



**VANITA VISHRAM WOMEN'S UNIVERSITY, SURAT**  
**SCHOOL OF SCIENCE AND TECHNOLOGY**  
**Department of Microbiology**  
**BSc Microbiology Program**  
**F.Y. B.Sc.**  
**Semester I**

**MBM201-1C: Fundamentals of Microbiology (T)**

**Credit 3T+1P**

**Contact Hour per week 3+2**

**Outline of the Course:**

<b>Course type</b>	Theory+ Practical
<b>Level of the Course</b>	200-299 Intermediate level
<b>Course category</b>	Discipline specific course (Major)
<b>Purpose of Course</b>	The main purpose of this course is to give students knowledge about landmark discoveries in microbiology, nomenclature and classification of living organisms. Students may have exposure to different scopes and fields of microbiology. The main objective of course is to give theoretical ideas about microbial techniques like staining and different types of microscopy to students. Students should gain the idea about fundamental tools and techniques used in microbiology
<b>Course Objectives</b>	<ul style="list-style-type: none"><li>• Students may a good knowledge of the development of microbiology and the contributions made by prominent scientists in this field and characteristics of different microorganisms and methods to organize/classify them.</li><li>• Gain knowledge regarding different fields and scope of microbiology</li><li>• Understand internal as well as external features of eukaryotes</li><li>• Understand internal as well as external features of prokaryotes</li><li>• Hands on practical for</li></ul>
<b>Minimum weeks per Semester</b>	15 (Including Class work, examination, preparation, holidays etc.)
<b>Last Review /</b>	June 2023



<b>Revision</b>	
<b>Pre-requisite</b>	Elementary knowledge of Biology.
<b>Teaching Methodology</b>	Class Room Teaching, Discussion and Assignments, laboratory practical
<b>Evaluation Method</b>	Continuous And Comprehensive Evaluation (CCE) (50%) Semester End Evaluation (SEE) (50%)

Units	Particulars	% Weightage of Unit	Minimum Nos. of Hours
<b>1</b>	<b>Classification of organisms and evolution of microbes</b> Nomenclature and Classification systems - Binomial nomenclature, Whittaker's five kingdom, Three Domain classification system  Members of Microbial world, Difference between prokaryotes and eukaryotes, Theories of origin of life (RNA based evolution, Endosymbiotic theory, Evolution of microbial cells and species)	16 %	07
<b>2</b>	<b>History and Scope of Microbiology</b> Science of Microbiology, History of Microbiology (Golden Era and Modern era of Microbiology) <b>Major field of microbiology:</b> Microbial Genetics , Immunology, Epidemiology, Medical and Clinical Microbiology, Microbial Ecology, Agriculture Microbiology, Environment Microbiology, Industrial and Fermentation Microbiology, Space Microbiology	18 %	08
<b>3</b>	<b>Eukaryotic cell structures</b> - Diversity of Eukaryotic cells, size, Shape and cell organization, Eukaryotic cell envelopes, Cytoplasm and cell organelles, Flagella and cilia	22 %	10
<b>4</b>	<b>Prokaryotic cell structures</b> - Size, shape and arrangements,	44 %	20



	Cell wall and cell membrane, Structures external to cell wall, Structures internal to cell wall, Endospores		
<b>MBM201-1C: Fundamentals of Microbiology (P)</b>			
<b>Practical</b>			
<ol style="list-style-type: none"><li>1. Monochrome staining using basic stain. (Positive and Negative Staining)</li><li>2. Differential staining Techniques - Gram Staining by Hucker' s Modification method, Acid fast staining – study using permanent slide</li><li>3. Capsule staining (Maneval' s method)</li><li>4. Endospore staining – Cold method</li><li>5. Spirochetes staining (Fontana's method)</li><li>6. Cell wall staining (Dyar's method)</li><li>7. Cytoplasmic membrane staining - Demonstration</li><li>8. Metachromatic granules staining-Albert's method</li></ol>			
<b>REFERENCE</b>			
<b>References books:</b>			
<ol style="list-style-type: none"><li>1. Tortora, G.J., Funke, B.R. and Case, C.L. Microbiology: An Introduction. Pearson Education, Singapore, (2004).</li><li>2. Prescott, M.J., Harley, J.P. and Klein, D.A. Microbiology. 10th Edition WCB McGraw Hill, New York, (2002).</li><li>3. Black J.G. Microbiology- Principles and Explorations. John Wiley &amp; Sons Inc. New York, (2002).</li><li>4. Pelczar, MJ Chan ECS and Krieg NR, Microbiology McGraw-Hill.</li><li>5. Madigan, Martinko, Bender, Buckley, Stahl. Brock Biology of Microorganisms. Pearson</li><li>6. Eugene W. Nester, Denise G. Anderson, C. Evans Roberts, Martha T. Nester. Microbiology, a Human Perspective, 6th Edition, Mc GRAW-HILL.</li><li>7. H. A. Modi. Handbook of Elementary Microbiology Vol.1. Akta Prakashan</li><li>8. Patel, R. J., &amp; Patel, R. K., (2015). Experimental Microbiology, Vol. 1, 9th ed., Aditya.</li><li>9. Cappuccino, J.G., (2016). Microbiology: A Laboratory Manual, 11th ed., Pearson Education (Singapore) Pvt. Ltd.</li><li>10. Aneja, K.R., (2003). Experiments in Microbiology, Plant Pathology, Tissue Culture and Mushroom Production Technology, 4th ed., New Age International Publishers.</li></ol>			
<b>Web contents:</b>			
<a href="https://www.researchgate.net/publication/49801393_Advances_in_Microscopy_Techniques">https://www.researchgate.net/publication/49801393_Advances_in_Microscopy_Techniques</a>			

**COURSE OUTCOMES:**



CO1	Students will understand the contribution of scientists in early days and development of microbiology as a field
CO2	Students will have understanding for different fields and scope of microbiology
CO3	Students can identify the external features of eukaryotes
CO4	Students can identify internal as well as external features of prokaryotes

**COURSE OUTCOMES MAPPING**

Unit No	Title of the Unit	Course Outcome			
		CO1	CO2	CO3	CO4
1	Classification of organisms and evolution of microbes				
2	History and Scope of Microbiology				
3	Eukaryotic cell structures				
4	Prokaryotic cell structures				

**COURSE ARTICULATE MATRIX**

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1						
CO2						
CO3						
CO4						



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**Semester I**

**MBM202-1C: Basic Techniques in Microbiology (T)**

**Credit 3T+1P**

**Contact Hour per week**

**3+2**

**Outline of the Course:**

<b>Course type</b>	Theory
<b>Purpose of Course</b>	The main objective of course is to give hands on training about microbial techniques like staining and different types of microscopy to students. Students gain the idea about fundamental tools and techniques used in microbiology.
<b>Course Objective</b>	CO 1. Students will have a good knowledge of fundamentals of microbial techniques. CO 2. Gain knowledge Students will learn the different tools and microscopy to observe structures of microorganism. CO 3. Understand internal as well as external features of microbes by staining techniques. CO 4. The course gives knowledge of media used for various purposes along with their ingredients along with the methods and factors to be considered for culturing microbes in the laboratory conditions
<b>Minimum weeks per Semester</b>	15 (Including Class work, examination, preparation, holidays etc.)
<b>Last Review / Revision</b>	June 2023
<b>Pre-requisite</b>	Elementary knowledge of Biology.
<b>Teaching Methodology</b>	Class Room Teaching, Discussion and Assignment



<b>Evaluation Method</b>	Continuous And Comprehensive Evaluation (CCE) (50%) Semester End Evaluation (SEE) (50%)
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Units	Particulars	% Weightage of Unit	Minimum Nos. of Hours
1	<b>Techniques in Microbiology - I</b> <b>Light Microscopy</b> - Specimen Preparation for Light Microscopy, Principle, Construction & Applications of - Bright field Microscope, Dark field Microscope, Phase contrast Microscope, Fluorescence Microscope	28 %	12
2	<b>Techniques in Microbiology - II</b> <b>Electron Microscopy</b> - Specimen Preparation for Electron Microscopy, Principle, Construction & Applications of - Transmission Electron Microscope, Scanning Electron Microscope, Electron Cryotomography. <b>Advanced Microscopy</b> Confocal and Differential Interference Microscope, Scanning probe microscope, Live cell imaging	28 %	13
3	<b>Staining Techniques</b> Definition & theories of staining, Types of stain, properties and role of fixatives, Mordants, decolouriser, accentuators, Monochrome staining (Negative and Positive staining), Differential staining (Gram staining & Acid fast staining), Special staining (Capsule, endospore, spirochete, cell wall, flagella, metachromatic)	22 %	10
4	<b>Isolation and Cultivation of microorganisms</b> Culture Media – types and applications, Cultivation of aerobic and anaerobic bacteria, Enrichment and isolation of	22 %	10



	pure cultures, Maintenance and preservation of pure cultures		
<b>MBM202-1C: Basic Techniques in Microbiology (P)</b>			
<b>Practical</b>			
<ol style="list-style-type: none"><li>1. Study of Light Microscope</li><li>2. To study the principle, operation, applications and care of important instruments (autoclave, incubator, hot air oven, light microscope, pH meter, laminar airflow, Centrifuge, Colorimeter, bacteriological filter assembly) used in the microbiology laboratory</li><li>3. Study of bacterial motility by Hanging Drop Technique.</li><li>4. Preparation of media (broth, plate, slant and stab)</li><li>5. Cultivation of microorganism on culture media (Nutrient agar, Mac Conkey Agar, EMB Agar, Sabourds agar)</li><li>6. Isolation of pure cultures of bacteria by streaking/spread plate method/pour plate method</li><li>7. Measurement of dimensions of fungal structures by Ocular and stage Micrometer</li></ol>			
<b>REFERENCE</b>			
References books:			
<ol style="list-style-type: none"><li>1. Tortora, G.J., Funke, B.R. and Case, C.L. Microbiology: An Introduction. Pearson Education, Singapore, (2004).</li><li>2. Prescott, M.J., Harley, J.P. and Klein, D.A. Microbiology. 10th Edition WCB McGraw Hill, New York, (2002).</li><li>3. Black J.G. Microbiology- Principles and Explorations. John Wiley &amp; Sons Inc. New York, (2002).</li><li>4. Pelczar, MJ Chan ECS and Krieg NR, Microbiology McGraw-Hill.</li><li>5. Madigan, Martinko, Bender, Buckley, Stahl. Brock Biology of Microorganisms. Pearson</li><li>6. Eugene W. Nester, Denise G. Anderson, C. Evans Roberts, Martha T. Nester. Microbiology, a Human Perspective, 6th Edition, Mc GRAW-HILL.</li><li>7. H. A. Modi. Handbook of Elementary Microbiology Vol.1. Akta Prakashan</li></ol>			
Web contents:			





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**COURSE OUTCOMES:**

CO1	Handling of microorganisms in the laboratory
CO2	Students will have skilled to understand and handle instruments in laboratory like microscopes
CO3	Students can principles of different stains and staining techniques
CO4	Students can perform microbial culturing methods in aseptic conditions

**COURSE OUTCOMES MAPPING**

Unit No	Title of the Unit	Course Outcome			
		CO1	CO2	CO3	CO4
1	Techniques in Microbiology I				
2	Techniques in Microbiology II				
3	Staining Techniques				
4	Isolation and Cultivation of microorganisms				

**COURSE ARTICULATE MATRIX**

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1						
CO2						
CO3						
CO4						



EFFECTIVE FROM ACADEMIC YEAR 2023-24

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**Semester I**

**MBE201-1C: Introduction to Microbiology (T)**

**Credit 3T+1P**

**Contact Hour per week**

**3+2**

**Outline of the Course:**

<b>Course type</b>	Theory
<b>Purpose of Course</b>	The main purpose of this course is to give students knowledge about landmark discoveries in microbiology, nomenclature and classification of living organisms. Students may have exposure to different scopes and fields of microbiology. The main objective of course is to give theoretical ideas about microbial techniques like staining and different types of microscopy to students. Students should gain the idea about fundamental tools and techniques used in microbiology
<b>Course Objective</b>	CO 1. Students may a good knowledge of the development of microbiology and the contributions made by prominent scientists in this field and characteristics of different microorganisms and methods to organize/classify them. CO2. Understand internal as well as external features of prokaryotes CO 3. Understand the microscopy and staining techniques in microbiology CO4. Gain knowledge regarding isolation and cultivation of microorganisms
<b>Minimum weeks per Semester</b>	15 (Including Class work, examination, preparation, holidays etc.)
<b>Last Review / Revision</b>	June 2023
<b>Pre-requisite</b>	Elementary knowledge of Biology.



<b>Teaching Methodology</b>	Class Room Teaching, Discussion and Assignment
<b>Evaluation Method</b>	Continuous And Comprehensive Evaluation (CCE) (50%) Semester End Evaluation (SEE) (50%)

Units	Particulars	% Weightage of Unit	Minimum Nos. of Hours
<b>1</b>	<p><b>History and Development of Microbiology</b></p> <p>Brief history of microbiology (milestone events), Nomenclature and Classification systems - Binomial nomenclature, Whittaker's five kingdom, Three Domain classification system</p> <p>Members of Microbial world, Difference between prokaryotes and eukaryotes, Morphology and cell structure of major groups of microorganisms eg. bacteria, algae, fungi, protozoa and unique features of viruses</p>	16 %	07
<b>2</b>	<p><b>Prokaryotic and archaeal cell structure</b> - Size, shape and arrangement; Structure external to cell wall – capsule and slime layer (glycocalyx), flagella, axial filaments, fimbriae; Cell wall; Structures internal to cell wall – cell membrane, cytoplasm, nucleoid, ribosomes, inclusions and endospores;</p>	44 %	20
<b>3</b>	<p><b>Techniques in Microbiology I</b> – Bright field microscope, Dark field microscopy, Electron microscopy</p> <p>Dyes, stains and staining techniques</p>	18 %	08
<b>4</b>	<p><b>Techniques in Microbiology II</b> - Bacterial cultivation techniques - methods for isolation of pure culture, preservation and maintenance of pure culture, cultivation and maintenance of anaerobic organisms, nutritional requirements and types of bacteria, culture media and its</p>	22 %	10



	types		
<b>MBE201-1C: Introduction to Microbiology (P)</b>			
<b>Practical</b>			
<ol style="list-style-type: none"><li>1. Study of Light Microscope</li><li>2. To study the principle, operation, applications and care of important instruments (autoclave, incubator, hot air oven, pH meter, laminar airflow, Centrifuge,) used in the microbiology laboratory</li><li>3. Study of bacterial motility by Hanging Drop Technique.</li><li>4. Staining methods: simple staining (acidic &amp; basic), gram staining, acid fast staining, capsule, flagella and endospore staining.</li><li>5. Preparation of media (broth, plate, slant and stab).</li><li>6. Cultivation of microorganism on liquid (Nutrient broth) and solid culture media (Nutrient agar, Mac Conkey Agar, EMB Agar, Sabourds agar)</li><li>7. Isolation of bacteria by streak plate, pour plate and spread plate method.</li><li>8. Demonstration on different sterilization techniques e.g. dry heat, moist heat, filtration etc.</li></ol>			
<b>REFERENCE</b>			
<b>References books:</b>			
<ol style="list-style-type: none"><li>11. Tortora, G.J., Funke, B.R. and Case, C.L. Microbiology: An Introduction. Pearson Education, Singapore, (2004).</li><li>12. Prescott, M.J., Harley, J.P. and Klein, D.A. Microbiology. 10th Edition WCB McGraw Hill, New York, (2002).</li><li>13. Black J.G. Microbiology- Principles and Explorations. John Wiley &amp; Sons Inc. New York, (2002).</li><li>14. Pelczar, MJ Chan ECS and Krieg NR, Microbiology McGraw-Hill.</li><li>15. Madigan, Martinko, Bender, Buckley, Stahl. Brock Biology of Microorganisms. Pearson</li><li>16. Eugene W. Nester, Denise G. Anderson, C. Evans Roberts, Martha T. Nester. Microbiology, a Human Perspective, 6th Edition, Mc GRAW-HILL.</li><li>17. H. A. Modi. Handbook of Elementary Microbiology Vol.1. Akta Prakashan</li></ol>			
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**COURSE OUTCOMES:**

CO1	Student will understand the history and members of prokaryotes
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CO2	Student can identify the features of prokaryotes and archea
CO3	Students will have skilled to understand and handle instruments in laboratory like microscopes and perform different staining techniques
CO4	Students can perform microbial culturing methods in aseptic conditions

**COURSE OUTCOMES MAPPING**

Unit No	Title of the Unit	Course Outcome			
		CO1	CO2	CO3	CO4
1	History and Development of Microbiology				
2	Prokaryotic and archaeal cell structure				
3	Techniques in Microbiology I				
4	Techniques in Microbiology II				

**COURSE ARTICULATE MATRIX**

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1						
CO2						
CO3						
CO4						