

VANITA VISHRAM WOMEN'S UNIVERSITY
SCHOOL OF SCIENCE & TECHNOLOGY
DEPARTMENT OF MICROBIOLOGY



BACHELOR OF SCIENCE (B.Sc.) PROGRAMME

SEMESTERS 1

w.e.f. the Academic Year 2022-2023

SEMESTER-1

CC-I Introduction to Microbiology (Theory) (MB11290)

Credits: 2 (Theory)

Contact hours per week: 2 (Theory)

Objectives of the course:

- ☞ Students gain knowledge on Landmark discoveries in microbiology, nomenclature and classification of living organisms.
- ☞ Students may have exposure about different scopes and fields of microbiology.

Outline of the Course:

No.	Unit	Minimum No. of Contact Hours	Weightage in %
1.	Evolution of Microbes	08	25
2.	History of microbiology	08	25
3.	Classifying the organisms	07	25
4.	Scope of Microbiology	07	25
	Total	30	100

Course outcome: After completion of this course, Students are able to -

- CO-1.** Develop a good knowledge of the development of microbiology and the contributions made by prominent scientists in this field.
- CO-2.** Understand the characteristics of different microorganisms and methods to organize/classify them.
- CO-3.** Gain knowledge regarding different fields and scope of microbiology.
- CO-4.** Perform basic experiments to study microorganisms in the laboratory.

B.Sc. Microbiology Semester-1		
CORE COURSE		Hours
CC-I Introduction to Microbiology (Theory)		2 Hours /week
		Hours
Unit – I	Evolution of Microbes	
	1.1 Members of microbial world 1.2 Difference between prokaryotes and eukaryotes 1.3 Theories of origin of life 1.3.1 RNA based evolution 1.3.2 Endosymbiotic theory 1.3.3 Evolution of microbial cells and species	08
Unit – II	History of microbiology	
	2.1 Science of Microbiology 2.2 History of Microbiology 2.2.1 Golden Era of Microbiology 2.2.2 Modern Era of Microbiology	08
Unit – III	Classifying the organisms	
	3.1 Nomenclature and Classification systems 3.1.1 Binomial nomenclature 3.1.2 Whittaker’s five kingdom 3.1.3 Three Domain classification system	07
Unit – IV	Scope of Microbiology	
	4.1 Major field of microbiology (Microbial Genetics, Immunology, Epidemiology, Medical and Clinical Microbiology, Microbial Ecology, Agriculture Microbiology, Environment Microbiology, Industrial and Fermentation Microbiology, Space Microbiology) 4.2 The Impact of Microorganisms on Humans	07

Reference books:

1. Tortora, G.J., Funke, B.R. and Case, C.L. Microbiology: An Introduction. Pearson Education, Singapore, (2004).

2. Prescott, M.J., Harley, J.P. and Klein, D.A. Microbiology. 10th Edition WCB McGraw Hill, New York, (2002).
3. Black J.G. Microbiology- Principles and Explorations. John Wiley & Sons Inc. New York, (2002).
4. Pelczar, MJ Chan ECS and Krieg NR, Microbiology McGraw-Hill.
5. Madigan, Martinko, Bender, Buckley, Stahl. Brock Biology of Microorganisms. Pearson
6. Eugene W. Nester, Denise G. Anderson, C. Evans Roberts, Martha T. Nester. Microbiology, a Human Perspective, 6th Edition, Mc GRAW-HILL.

SEMESTER- I
CC-II Fundamentals of Microbial techniques (Theory)
(MB11300)

Credits: 2 (Theory)

Contact hours per week: 2 (Theory)

Objectives of the course:

- ☞ 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.

Outline of the Course:

No.	Unit	Minimum No. of Contact Hours	Weightage in %
1.	Light Microscopy	08	25
2.	Electron Microscopy	07	25
3.	Advanced Microscopy	07	25
4.	Staining techniques	08	25
	Total	30	100

Course outcome: After completion of this course, Students are able to -

- CO-1.** Understand the basic and advanced microscopic techniques for observing microorganisms.
- CO-2.** Differentiate group of bacteria by observing their internal as well as external features.
- CO-3.** Describe methods to preserve bacteria in the laboratory; calculate generation time of growing bacteria.
- CO-4.** Can perform different staining techniques to study microorganisms in the laboratory.

B.Sc. Microbiology Semester-1		
CORE COURSE		Hours
CC-II Introduction to Microbiology (Theory)		2 Hours /week
		Hours
Unit – I	Light Microscopy	
1.1 Specimen Preparation for Light Microscopy 1.2 Principle, Construction & Applications of 1.2.1 Bright field Microscope 1.2.2 Dark field Microscope 1.2.3 Phase contrast Microscope 1.2.4 Fluorescence Microscope		08
Unit – II	Electron Microscopy	
2.1 Specimen Preparation for Electron Microscopy 2.2 Principle, Construction & Applications of 2.2.1 Transmission Electron Microscope 2.2.2 Scanning Electron Microscope 2.2.3 Electron Crytomography		08
Unit – III	Advanced Microscopy	
3.1 Confocal and Differential Interference Microscope 3.2 Scanning probe microscope 3.3 Live cell imaging		07
Unit – IV	Staining techniques	
4.1 Definition & theories of staining 4.2 Types of stain, properties and role of fixatives, Mordants, decolourizers, accentuators 4.3 Monochrome staining (Negative and Positive staining) 4.4 Differential staining (Gram staining & Acid fast staining) 4.5 Special staining (Capsule, endospore, spirochete, cell wall, flagella, metachromatic)		07

Reference books:

1. Tortora, G.J., Funke, B.R. and Case, C.L. Microbiology: An Introduction. Pearson Education, Singapore, (2004).
2. Prescott, M.J., Harley, J.P. and Klein, D.A. Microbiology. 10th Edition WCB McGraw Hill, New York, (2002).
3. Black J.G. Microbiology- Principles and Explorations. John Wiley & Sons Inc. New York, (2002).
4. Pelczar, MJ Chan ECS and Krieg NR, Microbiology McGraw-Hill.
5. Madigan, Martinko, Bender, Buckley, Stahl. Brock Biology of Microorganisms. Pearson

6. Eugene W. Nester, Denise G. Anderson, C. Evans Roberts, Martha T. Nester. Microbiology, a Human Perspective, 6th Edition, Mc GRAW-HILL.
7. H. A. Modi. Handbook of Elementary Microbiology Vol.1. Akta Prakashan
8. https://www.researchgate.net/publication/49801393_Advances_in_Microscopy_Techniques

SEMESTER – I
MICROBIOLOGY PRACTICAL COURSE - I
(MB11310)

Credits: 2 (Practical)

Contact hours per week: 4 (Practical)

Objectives of the course:

- ☞ Students will learn the fundamentals of microbial techniques.
- ☞ Students will learn the different tools in microbiology laboratory.
- ☞ Students will have the hands on training for microbial techniques.

Course Outcome:

- CO-1.** In the laboratory course, students can acquire knowledge of how to handle different instruments in microbiology laboratory.
- CO-2.** Students can learn techniques to preserve bacteria in the laboratory and calculate generation time of growing bacteria.
- CO-3.** Can perform different staining techniques to study microorganisms in the laboratory.

Practical Code	MICROBIOLOGY PRACTICAL - I
1	Microbiology Good Laboratory Practices and Bio-safety.
2	Study of Light Microscope
3	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
4	Study of living microorganisms from Hay Infusion by wet mount technique
5	Study of bacterial motility by Hanging Drop Technique.
6	Monochrome staining using basic stain. (Positive Staining)
7	Monochrome staining using acidic stain.(Negative Staining)
8	Gram Staining by Hucker' s Modification method
9	Acid fast staining – study using permanent slide
10	Capsule staining (Maneval' s method)

11	Endospore staining – Cold method
12	Spirochetes staining (Fontana’s method)
13	Cell wall staining (Dyar’s method)
14	Cytoplasmic membrane staining - Demonstration
15	Metachromatic granules staining-Albert’s method

Reference Books:

1. Patel, R. J., & Patel, R. K., (2015). Experimental Microbiology, Vol. 1, 9th ed., Aditya.
2. Patel, R. J., & Patel, R. K., (2011). Experimental Microbiology, Vol. 2, 8th ed., Aditya.
3. Cappuccino, J.G., (2016). Microbiology: A Laboratory Manual, 11th ed., Pearson Education (Singapore) Pvt. Ltd.
4. Aneja, K.R., (2003). Experiments in Microbiology, Plant Pathology, Tissue Culture and Mushroom Production Technology, 4th ed., New Age International Publishers.