

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



BACHELOR OF SCIENCE (B.Sc.) PROGRAMME

SEMESTERS 4

w.e.f. the Academic Year 2023-2024

SEMESTER-4

(MB11390) Virology

Credits: 2 (Theory)

Contact hours per week: 2 (Theory)

Objectives of the course:

- ☞ understanding basics of virus, Virus- structure, nomenclature and classification. Isolation, purification and cultivation of viruses, Viral transmission, replication cycle. study of important human and plant viruses and role of viruses in causation of cancer. Concept of viroids and Prions. Virus-Host Interactions, diagnosis and Treatment.

Outline of the Course:

No.	Unit	Minimum No. of Contact Hours	Weightage in %
1.	General Characteristics of Viruses	07	25
2.	Cultivation and Replication of Viruses	08	25
3.	Classification and Nomenclature of Viruses	08	25
4.	Virus-Host Interactions	07	25
Total		30	100

Course outcome: on completion of this course, students will learn,

- CO-1.** Describe characteristics of bacterial cells, cell organelles, cell wall composition and various appendages. Differentiate a large number of common bacteria by their salient characteristics
- CO-2.** Describe the nutritional requirements of bacteria for growth;
- CO-3.** Explore microbial taxonomy and evolution—how and why microorganisms are classified using an evolutionary framework. Contrast and compare the structural differences between archaeal and eukaryotic microbes.
- CO-4.** Review archaea, which were once considered almost exclusively extremophiles and also know that they are physiologically and ecologically diverse

B.Sc. Microbiology (Honours) Semester-4	
CORE COURSE	Hours
(MB11390) Virology	2 Hours /week
Topic	Hours
Unit-I General Characteristics of Viruses	

1.1	Introduction and history of virology	07
1.2	Morphology and properties of viruses	
1.3	Host range and specificity of viruses	
1.4	Virus Taxonomy and phylogeny (Baltimore System)	
1.5	Origin of Viruses	
Unit-II Cultivation and Replication of Viruses		
2.1	Isolation, cultivation & enumeration of animal and plant viruses, One step growth curve.	08
2.2	Viral assay, Assay of infectivity and Viral Genetics.	
2.3	Viral Hemagglutination and Viral Multiplication	
2.4	Types of Viral Infection in Bacteria (Lytic and Lysogenic)	
Unit – III Classification and Nomenclature of Viruses		
3.1	RNA Viruses: Structure and General properties	08
3.2	DNA Viruses: Structure and General properties	
3.3	Plant viruses, Fungi and Protists Viruses, Insect viruses	
3.4	Emerging viruses, Satellites viruses, Viroids and Prions, Oncogenic Viruses.	
Unit – IV Virus-Host Interactions		
4.1	Pathogenesis of viral infection	07
4.2	Host response to virus infections	
4.3	Laboratory diagnosis and Immunoprophylaxis of viral disease.	
4.4	Chemoprophylaxis and Chemotherapy of virus disease.	

Reference books:

1. Arti Kapil, (2020). Ananthanarayan and Paniker's Textbook of Microbiology, Eleventh Edition, Universities Press.
2. Wiley, J., Sandman, K. and Wood, D. (2019). Prescott's Microbiology, Eleventh Edition, McGraw-Hill Professional.
3. Michael T. Madigan, John M. Martinko, Kelly S. Bender, Daniel H. Buckley, and David A. Stahl, (2017). Brock Biology of Microorganisms, Fourteenth Edition, Pearson Education, Inc.
4. Jacquelyn G. Black and Laura J. Black, (2017). Microbiology: Principles and Explorations, Microbiology, Tenth Edition, Wiley, John Wiley and Sons., Inc.
5. Pelczar M. J., Chan E. C. S and Krieg N. R., (2001). Microbiology, Fifth Edition, McGraw-Hill Education.

(MB11400) Mycology, Phycology, Protozoology and Parasitology

Credits: 2 (Theory)

Contact hours per week: 2 (Theory)

Objectives of the course:

Course is designed with an objective to study basic concepts of fungi, algae, protozoa and vectors. Students shall learn the diversity of eukaryotic organisms in terms of morphology, reproduction, Classification and Cultivation. Also study of some of the important genera, useful and harmful activity and their uses

Outline of the Course:

No.	Unit	Minimum No. of Contact Hours	Weightage in %
1.	Mycology	08	25
2.	Phycology	08	25
3.	Protozoology	07	25
4.	Parasitology	07	25
Total		30	100

Course outcome: on completion of this course, students will learn,

CO-1. Importance of fungi, and their classification based on morphology

CO-2. Types and life cycle of algae and their importance.

CO-3. Morphology of protozoas and their classifications.

CO-4. Some important parasites and their morphology

B.Sc. Microbiology (Honours) Semester-4	
CORE COURSE	
(MB11400): Mycology, Phycology, Protozoology and Parasitology	
Topic	Hours
Unit-I Mycology	
1.1 Fungal importance, Distribution, Physiology, Structure and Symbiosis.	08
1.2 Fungal Classification and Reproduction.	
1.3 Division: Zygomycota	
1.4 Division: Ascomycota	
1.5 Division: Basidiomycota	
Unit-II Phycology	
2.1 Characteristics of Algae	08
2.2 Classification of Algae	
2.3 Biological and Economical Importance of algae	
2.4 Lichens, Blue Green Algae	
Unit – III Protozoology	

3.1	Introduction, Morphology, Encystment and excystment and Reproductive cells and structure	07
3.2	Supergroup: Excavata (Fornicata and Euglenozoa)	
3.3	Supergroup: Amoebozoa	
3.4	Supergroup: Archaeplastida	
Unit – IV Parasitology		
4.1	Multicellular Parasites: Helminths	07
4.2	Roundworms, Tapeworms, Flukes	
4.3	Arthropods: Mosquitoes and life cycle	
4.4	Fleas, Lice, Ticks, Mites	

Reference books:

1. Arti Kapil. (2020). Ananthanarayan and Paniker's Textbook of Microbiology, Eleventh Edition, Universities Press.
2. Wiley, J., Sandman, K. and Wood, D. (2019). Prescott's Microbiology, Eleventh Edition, McGraw-Hill Professional.
3. Michael T. Madigan, John M. Martinko, Kelly S. Bender, Daniel H. Buckley, and David A. Stahl. (2017). Brock Biology of Microorganisms, Fourteenth Edition, Pearson Education, Inc.
4. Eugene W. Nester, Denise G. Anderson, C. Evans Roberts and Martha T. Nester. (2022). Nester's Microbiology: A Human Perspective, Tenth Edition, McGraw-Hill Professional.
5. Pelczar M. J., Chan E. C. S and Krieg N. R. (2001). Microbiology, Fifth Edition, McGraw-Hill Education.

(MB11410): Microbial Physiology

Credits: 2 (Theory)

Contact hours per week: 2 (Theory)

Objectives of the course:

- ☞ To understand fundamentals principles of microbial growth and methods to measure growth
- ☞ To understand the effect of surrounding environment of microbial growth
- ☞ To understand the cell division process and retention of particular shape during the division process
- ☞ To understand transport mechanisms, prevail in the microorganisms

Outline of the Course:

No.	Unit	Minimum No. of Contact Hours	Weightage in %
1.	Bacterial Growth	8	25
2.	Microbial Growth in Response to environment	7	25
3.	Bacterial Cell Division	7	25
4.	Bacterial Transport	8	25
	Total	30	100

Course outcome: on completion of this course, students will learn,

CO-1. Measurement of growth and growth cycle of the organisms

CO-2. Effect of surrounding environment on the growth and microbial adaptations.

CO-3. Cell division cycle and how cells shape is maintained after division.

CO-4. Different mode of transport of metabolites adopted by cell

B.Sc. Microbiology (Honours) Semester-4	
CORE COURSE	Hours
(MB11410): Microbial Physiology	2 Hours /week
Topic	Hours
Unit-I Bacterial Growth	
Definitions of growth, measurement of microbial growth, Batch culture, Continuous culture, generation time and specific growth rate, synchronous growth, diauxic growth curve. growth kinetics Factors Affecting Growth: Nutrition, Oxygen, Carbon Dioxide	08
Unit-II Microbial Growth in response to environment	
Microbial growth in response to environment -Temperature (psychrophiles, mesophiles, thermophiles, extremophiles, thermodurics, psychrotrophs), pH	07

(acidophiles, alkaliphiles), solute and water activity (halophiles, xerophiles, osmophilic), Oxygen (aerobic, anaerobic, microaerophilic, Facultative aerobe, facultative anaerobe), barophilic. Microbial response to nutritional stress: Stringent response Bacterial Sporulation cycle	
Unit – III Bacterial Cell Division	
Most Bacteria and Archaea Reproduce by Binary Fission, Phases of cycle: Chromosome Replication and Partitioning, Cytokinesis, Cellular Growth and Determination of Cell Shape Some Archaeal Cell Cycles Resemble the Eukaryotic Cell Cycle	07
Unit – IV Bacterial Transport	
Metabolite Transport: Passive and active transport mechanisms Diffusion, Facilitated Diffusion, Mechanosensitive Channels, ATP-Binding Cassette Transporter Family, Chemiosmotic-Driven Transport, establishing Ion Gradients, Specific Transport Systems: ATP-Linked Ion Motive Pumps, The Histidine Permease, Iron, Phosphotransferase System	08

Reference books:

1. Prescott, M.J., Harley, J.P. and Klein, D.A. Microbiology. 10th Edition WCB Mcgraw Hill, New York, (2014).
2. Tortora, G.J., Funke, B.R. and Case, C.L. Microbiology: An Introduction. Pearson Education, Singapore, (2004).
3. Alcomo, I.E. Fundamentals of Microbiology. VI Edition, Jones and Bartlett Publishers. Sudbury. Massachusetts, (2001)
4. Moat A. G, Foster J. W. and Spector M P. (2002). Microbial Physiology, 4th Edition, Wiley, John Wiley and Sons.
5. Black, J. G., (2014). Microbiology, 9th edition, Wiley, John Wiley and Sons., Inc

(MB11420) Microbiology Practical IV

Credits: 3 (Practical)

Contact hours per week: 6 (Practical)

Objectives of the course:

- ☞ Learn to isolate viruses, fungi, algae and protozoa from natural sources
- ☞ To prepare growth curve of bacteria.

Course Outcome: on successful completion of this course,

- CO-1.** Students will understand source and structure of various organisms.
- CO-2.** Learn to prepare growth curve of bacterial culture.
- CO-3.** Student will be able to isolate microorganisms from various habitats
- CO-4.** Able to identify fungi based on morphological properties

Practical Code	Practical
MB-1	Preparation and study of mycological cultural media.
MB-2	Isolation and study of economically important fungi from various natural sources. (Example: Aspergillus, Penicillium, Mucor, Rhizopus, Curvularia, Helminthosporium, Fusarium, Alternaria)
MB-3	Isolation of protozoa from garden soil.
MB-4	Study of permanent slides of algae (Ex. Volvox, Spirogyra, Diatoms, Nostoc, Anabaena)
MB-5	Study of permanent slides of arthropod vectors (Ex. Mosquitoes, Flea, Mite, Ticks)
MB-6	Study of various stages of malarial parasites in RBC using permanent mounts.
MB-7	Isolation and enumeration of bacteriophage from sewage sample.
MB-8	Study of the structure of animal viruses (Any Three) by using electron microscope micrographs. (HIV, Corona, Ebola, Influenza, Monkeypox, Dengue virus)
MB-9	Study of the structure of plant viruses by using electron microscope micrographs. (TMV, Leaf curl Viruses, Yellow Mosaic Viruses)
MB-10	One-step growth curve (Demonstration).
MB-11	Growth curve of bacterial culture
MB-12	Endospore induction by different factors
MB-13	Isolation of Halophiles

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 edition., New Age International Publishers.