

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



BACHELOR OF SCIENCE (B.Sc.) PROGRAMME

SEMESTERS 2

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

SEMESTER-II

CC - III Microbial Growth and Nutrition (Theory) (MB11320)

Credits: 2 (Theory)

Contact hours per week: 2 (Theory)

Objectives of the course:

- ☞ This subject provides knowledge about the nutritional requirements of microorganisms and how those nutrients are transported inside the cell.
- ☞ Additionally, it also inculcates the information about the growth pattern and measurement of microorganisms.
- ☞ 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.

Outline of the Course:

No.	Unit	Minimum No. of Contact Hours	Weightage in %
1.	Nutritional Requirement of Microorganisms	08	25
2.	Isolation and Cultivation of microorganisms	07	25
3.	Bacterial Growth	08	25
4.	Factor affecting the microbial growth	07	25
Total		30	100

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

CO-1. To prepare media and grow microbes in the laboratory.

CO-2. Understand nutrients uptake required by different types of microorganism group of bacteria.

CO-3. Measure of microbial population and study them in natural samples

CO-4. Gain knowledge about principles of microbial growth.

B.Sc. Microbiology Semester-II		
CORE COURSE		Hours
CC- III MB11320: Microbial Growth and Nutrition (Theory)		2 Hours /week
		Hours
Unit – I	Nutritional Requirement of Microorganisms	
	1.1 Common Nutritional requirement 1.2 Physical and chemical requirement for the growth 1.3 Nutritional Types of bacteria 1.4 Uptake of Nutrients – mechanisms of Nutrient uptake	08
Unit – II	Isolation and Cultivation of microorganisms	
	2.1 Culture Media – Preparation and Types of culture media 2.2 Cultivation of aerobic and anaerobic bacteria 2.3 Enrichment and isolation of pure cultures 2.4 Maintenance and preservation of pure cultures	07
Unit – III	Bacterial Growth	
	3.1 Bacterial cell cycle 3.2 The Growth Curve 3.3 Measurement of bacterial growth (Methods of enumeration) 3.4 Continuous culture of microorganism	08
Unit – IV	Factor affecting the microbial growth	
	4.1 Temperature 4.2 Oxygen concentration 4.3 pH 4.4 Solute and Water activity 4.5 Pressure 4.6 Radiation	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-II

CC - IV Prokaryotic Cell Structure (Theory) (MB11330)

Credits: 2 (Theory)

Contact hours per week: 2 (Theory)

Objectives of the course:

- ☞ The main objective of this course is to describe the basic structure and function of prokaryotic cells and their cellular contents.
- ☞ It also describes the structure of archaeal cell and difference between eubacteria and archaebacterial.

Outline of the Course:

No.	Unit	Minimum No. of Contact Hours	Weightage in %
1.	Eubacterial cell structure	08	25
2.	Structures External to cell wall	07	25
3.	Structures Internal to cell wall	07	25
4.	Archaeal cell structure	08	25
	Total	30	100

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

CO.1- Understand morphological characteristics of prokaryotes.

CO.2- Describe characteristics of bacterial cells, cell organelles, cell wall composition and various appendages like capsules, flagella or pili.

CO.3- Understand that besides common bacteria there are several other microbes which grow under extreme environments

CO.4- Differentiate between eubacterial and archaebacterial.

B.Sc. Microbiology Semester-II		
CORE COURSE		Hours
CC- IV MB11330: Prokaryotic Cell Structure (Theory Course)		2 Hours /week
		Hours
Unit – I	Eubacterial cell structure	
1.1 Size, Shape and Arrangements 1.2 Bacterial plasma membrane 1.3 Bacterial Cell wall		08
Unit – II	Structures External to cell wall	
2.1 Capsule, slime layers and S layers 2.2 Bacterial Pili and Fimbriae 2.3 Bacterial Flagella 2.4 Type of bacterial movements		07
Unit – III	Structures Internal to cell wall	
3.1 Cytoplasm and cytoskeleton 3.2 Inclusion bodies 3.3 Bacterial ribosomes 3.4 Nucleoid and Plasmid 3.5 Endospores		07
Unit – IV	Archaeal cell structure	
4.1 Shape, Arrangement, and Size 4.2 Archaeal cell membrane and cell wall 4.3 Ribosome and nucleoid 4.4 Archaeal Flagella and Motility		08

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

SEMESTER – II
MICROBIOLOGY PRACTICAL COURSE - II
(MB11340)

Credits: 2 (Practical)

Contact hours per week: 4 (Practical)

Objectives of the course:

- ☞ Students will learn the preparation of different media used in laboratory.
- ☞ Students will learn the different techniques to isolate and cultivate microorganism in laboratory.
- ☞ Students will have the knowledge of environmental factors affecting growth of microbes *in-vivo*.

Course Outcome:

- CO-1.** In the laboratory course, students can learn the techniques to calculate size of Microorganisms.
- CO-2.** Students can handle the microbial isolation and cultivation.
- CO-3.** Students can gain knowledge about factor affecting microbial growth.

Practical Code	MICROBIOLOGY PRACTICAL - II
1	Measurement of dimensions of fungal structures by Ocular and stage Micrometre
2	Preparation and sterilization of culture media (liquid & solid) for bacterial cultivation – Nutrient Broth and Agar

3	Demonstration of preparation of selective and differential media: Mac Conkey Agar, EMB Agar , Blood Agar
4	Isolation of pure cultures of bacteria by streak plate, spread plate and pour plate method
5	Enumeration of bacterial by heterotrophic plate count (HPC) method
6	Study and plot growth curve of <i>Escherichia coli</i> (Demonstration)
7	Effect of pH on bacterial growth
8	Effect of temperature on bacterial growth.
9	Effect of osmotic pressure on bacterial growth
10	Preservation of bacterial cultures by various techniques (Demonstration)

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.