Vivekanand Education Society's

College of Arts, Science and Commerce

(Autonomous)

NAAC Re-Accredited A grade (3rd cycle)
Best College Award- Urban Area, University of Mumbai (2012-15)
Recipient of FIST Grant (DST) and STAR college Grant (DBT)

Affiliated to University of Mumbai

NATIONAL EDUCATION POLICY
HOLISTIC DEVELOPMENT BASED CURRICULUM FRAMEWORK

For

Undergraduate Program
Bachelor of Science (Microbiology)

MICROBIOLOGY - MINOR

SEMESTER V

PROGRAM CODE: UMB

with effect from Academic Year 2025 - 2026

Program Outcomes (PO)

Upon completion of **B.Sc. Programme**, the graduates will have:

PO1. The required analytical skills to apply appropriate scientific principles and methodologies to solve real world problems.

PO2. The ability to design, carry out experiments and analyse results while accounting for uncertainties in different quantities measured using various scientific instruments.

PO3. The ability to communicate scientific concepts, experimental results and analytical arguments clearly and concisely, both verbally and in writing.

PO4. Understand the need for scientific solutions to problems of the environment and society, keeping in mind their sustainable development.

PO5. Imbibed ethical, moral and social values in personal and social life leading to a cultured and civilized personality.

Program Specific Outcomes (PSO)

Upon completion of **B.Sc. Microbiology (Minor) Programme**, the graduates will:

PSO1. Be well-versed with the fundamentals of Microbiology, which in turn will enable them to comprehend the latest developments in Life Sciences.

PSO2. Be able to apply the acquired conceptual knowledge in real life situations to solve problems.

PSO3. Have a basic understanding of the applications of Microbiology in the Healthcare, Food and Beverage industries, as well as in protecting the environment.

PSO4. Have acquired the basic skills and knowledge required for performing microbiological techniques.

PSO5. Gain foundational expertise in Microbiology to propagate microorganisms for a range of applications.

SEMESTER - V (MINOR COURSE-I)

COURSE TITLE: INTRODUCTION TO BIOMOLECULES

COURSE CODE: UMNMBS5-316

[CREDITS - 02: LECTURES - 30 hours: LEC/WEEK - 02

Course Learning Objective		
The objective of this course is: - *To discuss Biomolecular Composition* - *To elaborate on Structural and Chemical Bonding in Biomolecules* - *To illustrate structures of Carbohydrates, Lipids, Proteins and Nucleic acid* - *To explain the role of biomolecules in functioning of a cell*		
Course Learning Outcomes		
After completion of this course learner will be able to: - *Explain the Molecular Basis of Biomolecules* - *Describe Protein Structure and Function* - *Elucidate Enzyme Catalysis and Mechanism* - *Elaborate on the Structure and Function of Nucleic Acids* - *Explain carbohydrate Structure and Function* - *Discuss the Role of Lipids in Biological Systems*		
Unit I	**Carbohydrates and Lipids**	**[15 L]**
I.1	Chemical foundations: - Biomolecules are compounds of carbon with a variety of functional groups. - Macromolecules as the major constituents of cells (Structure-function relationship of biomolecules) - Configuration and Conformation with definition and suitable examples only. - Types of Stereoisomers and importance of stereoisomerism in biology. - Types of bonds and their importance: Electrovalence, covalent, ester, phosphodiester, thioester, peptide, glycosidic	**03**
I.2	Carbohydrates - Structure and classification (monosaccharides, disaccharides, polysaccharides) - Functions of carbohydrates in biological systems - Glycosidic bonds and their role in polysaccharide formation - Structural polysaccharides (cellulose, Peptidoglycan) - Energy storage polysaccharides (starch, glycogen)	**08**

I.3	Lipids - Classification and structure of lipids (fatty acids, triglycerides, phospholipids, glycolipids, and steroids) - Functions of lipids (energy storage, membrane structure, signaling molecules)	**04**
Unit II	**Proteins, Nucleic acids & Vitamins**	**[15 L]**

II.1	Proteins
	- Amino acids: structure, classification, and properties
	- Peptide bond formation and primary structure of proteins
	- Levels of protein structure: primary, secondary, tertiary, and quaternary
	- Functions of proteins (enzymes, structural proteins, receptors, etc.)
	- Enzymes
	  - as catalytic agent
	  - enzyme Structure
	  - types of enzymes (Tabulation)
		07

II.2	Nucleic acids - Structure and function of DNA and RNA - Nucleotide structure and base-pairing rules - Central Dogma: DNA replication, transcription, and translation processes - Types of RNA (mRNA, rRNA, tRNA,etc.)	**05**
II.3	Vitamins and Coenzymes - Classification of vitamins (water-soluble vs fat-soluble) - Role of vitamins as coenzymes in enzymatic reactions - Deficiency diseases related to vitamin lack (tabulation only) - Coenzymes and cofactors in biochemical reactions	**03**

References

1. Elsevier India Biochemistry Test Book by Satyanarayana.
2. MN Chatterjea and Rana Shinde. Textbook of Medical Biochemistry: 8th Edition, Jaypee Brothers Medical Publishers (P) Ltd
3. Lehninger. Principles of Biochemistry. 4th Edition. D. Nelson and M. Cox. W.H. Freeman and Company. New York 2005
4. Prescott, Hurley Klein-Microbiology, 7th edition, International edition, McGraw Hill

SEMESTER - V (MINOR COURSE-II)

COURSE TITLE:PRACTICALS BASED ON UMNMBS5-316

COURSE CODE: UMNMBS5-317

[CREDITS - 02: LECTURES - 60 hours: LEC/WEEK - 04]

1. Qualitative Detection of:
    a. Carbohydrates - Molisch Test
    b. Reducing sugars - Benedict's Test, DNSA Test
    c. Amino acids - Ninhydrin Test
    d. Proteins - Biuret Method, Lowry Method
    e. DNA - DPA Method
    f. RNA - Orcinol Method
2. Quantitative Estimations
    a. Reducing Sugar - DNSA
    b. Proteins - Biuret method
3. Testing of lipid solubility in different solvents
4. Identification of bacteria producing enzymes:
    a. Amylase
    b. Protease
    c. Lipase
5. Immobilization of yeast
6. Invertase assay with immobilized yeast
7. Enrichment of cellulose degraders
8. Isolation of DNA
9. UV-Visible spectrophotometric analysis of DNA

Modality of Assessment

Students appearing for the NEP BSc Microbiology (Minor) will be evaluated as per the 60:40 scheme wherein the term end exam will be of 30 marks while 20 marks will be through internal evaluation.

I. Theory -

A. Internal assessment 40%

Sr No	Evaluation type	Marks
1.	Evaluation modalities: 1. Assignments that can include a. Essay Writing b. Solving Subjective Questions c. Problem Solving d. Report on lab/industry visit e. Any other subject/content specific assignments 2. Project based learning activities a. Group Discussion b. Research/Case studies c. Seminar Presentations d. Skits e. Poster Presentation f. Debate 3. Self-study/Class test	15
2	a. Active participation in routine class instructional deliveries b. Overall conduct as a responsible student, wrt manners, skill in articulation, leadership qualities demonstrated through organizing co-curricular activities, etc.	05

B. External examination - 60%

Semester End Theory Assessment 30 marks

- The duration of this exam will be of 1.15 Hrs (75 minutes)
- The theory question paper will have 2 questions each of 15 marks.
- For each unit there will be one question
- All questions shall be compulsory with internal choice within the questions such that each question will be set of 25-30 marks with options.

II. Practical Examination pattern

Practical Course	Major Technique - I	Minor Technique - I	Quiz	Viva	Journal	Total
UMNMBS5-317	20	15	05	05	05	50 Marks