

Saurashtra University, Rajkot
MICROBIOLOGY PROGRAMME - B.Sc. (Honours) / B.Sc. (Honours with Research)
Curriculum Framework & Syllabus for A.Y. 2023-2024 & Onwards

OBJECTIVES OF THE PROGRAMME

The curriculum is designed to attain the following learning goals, which students shall accomplish by the time of their graduation:

1. This program shall enable students to understand the basics of Microbiology and its scope.
2. Students will learn about various microorganisms, their distinguishing features, characteristic properties, and their place in the world.
3. The program will impart a detailed understanding of the allied fields of Microbiology, like Cell Biology, Metabolism, Immunology, Applied microbiology, Bioprocess Technology, and Molecular Biology, to enable them to understand the emerging and advanced concepts in modern biology and help them to take up a career in this field.
4. After completing the program, the students will be able to acquire the necessary knowledge and skill in Microbiology to undertake higher studies in recognized Institutions of advanced learning and engage in gainful self-employment.
5. The program shall facilitate students to be innovative and to develop versatile personalities in the field of Life Science with quality education and can be skilled human resources required in academic research, industrial development, Institutions of Higher Learning, and Industry.

GRADUATE ATTRIBUTES

Graduates should be able to demonstrate the acquisition of the following:

- **Academic excellence:** Comprehensive knowledge and coherent understanding of Microbiology and other interdisciplinary areas of study
- **Practical, professional, and procedural knowledge** required for carrying out professional or highly skilled work/tasks related to Microbiology, including knowledge required for undertaking self-employment initiatives and knowledge and mindset required for entrepreneurship, improved product development, or a new mode of organization
- **Critical and Analytical reasoning/thinking and Effective communications:** Analysis and evaluation of information to form a judgment about a subject or idea and ability to communicate the same in a structured form.
- **Research-related skills:** the ability to understand basic research ethics and skills in practicing/doing ethics in the field/ in personal research work, regardless of the funding authority or field of study.
- **Leadership qualities and Teamwork abilities:** The graduates should be able to demonstrate the capability for mapping out the tasks of a team and setting direction and inspiring vision, and building a team that can help achieve the goals
- **Global Citizenship:** Mutual understanding with others from diverse cultures, perspectives, and backgrounds by embracing and practicing constitutional, humanistic, ethical, and moral values in life, including universal human values of truth, righteous conduct, peace, love, nonviolence, and scientific temper.
- **Life Long Learning:** Ready to imbibe new knowledge, values, and skills with an open mind and willing to adopt change for constructive development.

23-MBTH102	Basics of Microbial Chemistry (Theory)	3hrs/week	3 Credits
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1. Course Outcomes દરેક વિષયની શરૂઆતમાં દર્શાવેલ છે?: હા
2. Employability/Entrepreneurship/Skill Development પર કેન્દ્રિત થયેલ છે કે નહિ?: હા
3. Value added Courses Imparting Transferable and Life Skills ના ગુણો ધરાવે છે?: હા
4. Major Minor Skill Enhancement Courses
Ability Enhancement Courses Value Added Courses Exit/ Vocational Courses
5. Holistic Education Multidisciplinary Interdisciplinary
6. દિવ્યાંગ માટે વિષય અંતર્ગત આનુસાંગિક જોગવાઈ કરાયેલ છે ? : હા
7. New India Literacy Programme (NILP) મુજબનો વિષય છે?: હા
8. Swayam પ્લેટફોર્મ પરના MOOC વિષય પર આધારિત આ વિષય છે ? : હા
9. ઇન્ડિયન નોલેજ સીસ્ટમ (IKS) પર આધારિત વિષય છે ? : હા

Course Description:

Basic Biochemistry is appropriate for students with some background in the fundamentals of biochemistry. This course introduces the basic structure and functions of elements of life and the biomolecules as well. From this subject student will be able identify the basic structure of monosaccharide, amino acids, nitrogenous base, and other polymeric forms of biomolecules like carbohydrates, proteins, lipids and nucleic acids through the lectures, group activities, class test and homework projects. after complications of this paper students can very well understand the basic properties and the importance of biomolecules in the biological system.

Course Objectives:

After completing this course, the student should be able to:

1. Understand the basic structure of cellular matter, various types of reactions, pH scale and the special properties of water
2. Understand the structure of fundamental monosaccharide, its properties and polysaccharides
3. Understand the structures of amino acids, their chemical properties and their organization into polypeptides and proteins.
4. Understand structure and basic function of nucleotides
5. Understand structure of different classes of lipids and their roles in biological systems
6. Outline the chemical and physical properties of enzymes, mechanism of enzyme actions, factors affecting enzyme activity and enzyme synthesis.

Course Content	Hours
UNIT 1: Basic Biochemistry	9hrs
<ul style="list-style-type: none"> • Introduction to Atoms, Elements & Molecules • Major Chemical bonds found in biological system: Ionic Bonds, Covalent Bonds, 	

<p>Hydrogen Bonds, Van der Waals interactions, Hydrophobic interactions</p> <ul style="list-style-type: none"> • Major Chemical reactions: Acid Base, Redox, Condensation-Hydrolysis Reactions • Water and pH - important properties 	
UNIT 2: Carbohydrates	9hrs
<ul style="list-style-type: none"> • Definition and Classification of Carbohydrates • Structure and properties of Monosaccharide • Types and importance of Disaccharides • Types of importance of Polysaccharides 	
UNIT 3: Proteins	9hrs
<ul style="list-style-type: none"> • Definition and Functions of Proteins • Amino acids: Classification • Physical & Chemical Properties of Amino acids • Structure of Proteins: Primary, Secondary, Tertiary & Quaternary Levels 	
UNIT 4: Lipids and Nucleic acids	9hrs
<ul style="list-style-type: none"> • Definition, Functions and Classification of Lipids • Introduction and significance of Fatty acids, Triacylglycerol, Phospholipid and Steroid • Introduction to Nitrogen Base, Nucleosides & Nucleotides, Structure of Deoxyribonucleic acid: A-DNA, B-DNA, Z-DNA • Introduction to RNA & its types 	
UNIT 5: Enzymes	9hrs
<ul style="list-style-type: none"> • Definition of Enzymes, Apoenzyme, Core Enzyme, Holo enzyme, Coenzyme, Cofactors, Prosthetic Groups, and Classification • Mechanism of enzyme action – Active Sites, Activation Energy, Lock & Key Model, Induced Fit model • Factors affecting enzyme activity • Enzyme inhibition 	

Text Books:

- Atlas, R.M., Bartha, R. (1997). Microbial Ecology, 4th Edition: Benjamin Cummings publication (UNIT: 1)
- Pelczar, M.J., Chan, E.C.S. and Kreig, N.R. (2002) Microbiology. 5th Edition, Tata McGraw-Hill, New Delhi. (UNIT: 2 – 5)
- Powar, C.B., Daginawala, J.F. (2010). General Microbiology Vol-I. Mumbai: Himalaya Publishing House. (UNIT: 2 - 5)

Reference Books:

- Conn E.E., Stumpf P.K. (1989). Outlines of Biochemistry. Wiley publication.
- Stanier, R.Y. (1987). General Microbiology, 5th Edition: Macmillan publication.
- Nelson, D.L., Cox, M.M. (2013). Lehninger: Principles of Biochemistry. W.H. Freeman publication.

- Satyanarayan, U. (2008). Biotechnology. Kolkata, West Bengal: Books and allied (P) Ltd

Pedagogic tools:

- Chalk and Board
- PPT and Videos.
- Assignment
- Class Activity: Think-Pair-Share / Class Test

Suggested reading / E-resources

- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7757301/>
- <https://biochemden.com/download-biochemistry-protocols/>
- <https://www.youtube.com/watch?v=1iYAC6KISMk>
- <https://www.youtube.com/watch?v=YO244P1e9QM>

Suggested MOOCs

- <https://www.my-mooc.com/en/mooc/biochemistry-biomolecules-methods-and-mechanisms/>
- <https://www.edx.org/course/biochemistry-biomolecules-methods-and-mechanisms>

23-MBPR102	Basics of Microbial Chemistry (Practical)	2hrs/week	1 Credits
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Course Description:

This course covers the study of basic structures and properties of various biomolecules. It also emphasise on the use of analytical techniques for the qualitative and quantitative estimation of biomolecules.

Course Purpose:

This course aims to provide basic understanding of qualitative and quantitative estimation of various biomolecules.

Sr. No.	Experiment
1	Measurement and adjustment of pH of various solutions
2	Estimation of Protein by Foiln-Lowry's Method.
3	Estimation of Sugar by Cole's Method.
4	Estimation of Reducing sugar by DNSA method
5	Estimation of DNA by DPA Method.
6	Qualitative Analysis of Carbohydrates.
7	Qualitative Analysis of Proteins & Amino acids.
8	Determination of alpha amylase activity by iodometric method.

Reference Books:

1. Jayaraman, J. (2011). Laboratory Manual in Biochemistry: New Age International Private Limited. India
2. Sawhney S.K., Singh, R. (2005). Introductory Practical Biochemistry: Alpha Science International.
3. Cappuccino, J.G., Sherman, N. (2004). International student edition: Microbiology- A laboratory Manual 4th edition: Benjamin Cummings publications

Pedagogic tools:

- Chalk and Board
- Power point presentation
- Video

Suggested reading / E-resources

<https://www.classcentral.com/course/edx-biochemistry-biomolecules-methods-and-mechanisms-12585>

https://onlinecourses.nptel.ac.in/noc20_cy10/preview