

VANITA VISHRAM WOMEN'S UNIVERSITY

SCHOOL OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF BIOTECHNOLOGY



**VANITA VISHRAM
WOMEN'S UNIVERSITY**

SURAT

**BACHELOR OF SCIENCE (B.Sc.) HONOURS IN
BIOTECHNOLOGY**

**Under Learning Outcomes Based Curriculum Framework
(LOCF)**

For Undergraduate (UG) Education

SEMESTER - 1

Core Courses (CC)

**Syllabus applicable to the students seeking admission in the
following Program**

B.Sc. Biotechnology under LOCF w.e.f. the Academic Year

2021-2022

BACHELOR OF SCIENCE (B.SC.) BIOTECHNOLOGY HONOURS
SEMESTER 1
CORE COURSE PAPER 1

INTRODUCTION TO BIOTECHNOLOGY

Course Objectives:

- To give idea about the Biotechnology and a detailed understanding of the field.
- To explore the interdisciplinary nature of the biotechnology.
- To identify the ways by which biotechnology can help the humans.
- To spread awareness among the learners about the development of biotechnology in India.

Course Outcome:

- Students will be able to define the term Biotechnology and its scope.
- Students will have an awareness of the significance of biotechnology and its related industry.
- Students will have an understanding on how biotechnology is related to us and where we are using biotechnology in daily life.
- Students will be able to understand the relation of biotechnology with other sciences i.e., genetics, microbiology, immunology, bioinformatics, environment, animal and plant science etc.
- Have an awareness of some of the current and future issues surrounding the relationship between biotechnology and government, investors, the environment and consumers and the impact of these on the development of future biotechnology industry.

BT11010 - THEORY COURSE CONTENT**(4 Credits)**

UNIT1	UNDERSTANDING BIOTECHNOLOGY (10 Lectures) What is Biotechnology? Biotechnology-an interdisciplinary pursuit Biotechnology- a three-component central core Product safety Public perception of Biotechnology Biotechnology and developing world	10 lectures
UNIT2	SCOPE OF BIOTECHNOLOGY-I (20 Lectures) Recombinant DNA technology and genetic engineering Genetically modified organisms Bioinformatics Mammalian cell culture Plant cell culture Forensic science Food and dairy Biotechnology Waste Water and Sewage treatment Aquatic biotechnology	20 lectures
UNIT3	SCOPE OF BIOTECHNOLOGY-II (20 Lectures) Industrial Biotechnology Fermentation Bio-fertilizer & Bio-pesticides Environment & Biotechnology Bioremediation Bio-fuels Bio-catalysis Human health & Biotechnology	20 lectures

	Vaccines Monoclonal antibodies Diagnostics in developing countries	
UNIT4	BIOTECHNOLOGY IN INDIA (15 Lectures) Introduction to DBT Autonomous institutions of DBT Public sectors undertaking of DBT BTIS-NET Introduction to ABLE Biotechnology- Current status of industrial growth in India	10 lectures

BT11020 - LAB COURSE CONTENT

(2 Credits)

1. Lab safety and lab rules.
2. Introduction to various Laboratory Apparatus viz. pH meter, Colorimeter, Spectrophotometer, Centrifuge, Laminar air flow, Electrophoresis unit, Gel documentation unit, Thermocycler, ELISA reader, Incubator, Hot air oven, Autoclave, Anaerobic jar.
3. Preparation of laboratory reagents and solutions.
4. Bread making.
5. Case study on some Ethical issues of Biotechnology.

SUGGESTED READING

1. John Smith (2005) *Biotechnology*, 5th Edition.
2. Ratledge, C. & Kristiansen, B. (2006) *Basic Biotechnology*, Cambridge University Press.
3. Gupta, P. K. (2005) *Elements of Biotechnology*, Rastogi Publications.
4. William Thieman and Michael Palladino (2012). *Introduction to Biotechnology* (3rd Edition), Benjamin Cummings Publishing Company. ISBN: 9780321766113
5. Purohit, S. S. (2005). *Biotechnology: Fundamentals and Applications* (4th Edition). Agrobios India.
6. DBT website: <http://dbtindia.gov.in/>

BACHELOR OF SCIENCE (B.SC.) BIOTECHNOLOGY HONOURS
SEMESTER 1
CORE COURSE PAPER 2

BASICS OF BIOCHEMISTRY

Course Objectives:

- To make the students aware about foundations of biochemistry and role of water in biochemistry.
- Students will be given knowledge of biomolecules, their structure and role in cell functioning.
- Through this course the students are exposed to importance of biological macromolecules.
- This course presents the chemical reactions or metabolic functions in the living system and their regulations.
- To make the student to understand the concept of biochemical regulations, synthesis and degradation of biomolecules in the cell.

Course Outcome:

After the successful completion of the course, students will be able to,

- Explain the definition, classification, biological function, structure and interactions of Biomolecules.
- Discuss and differentiate the basic structure and function of cellular macromolecules in the cells.
- Analyze the functioning of life at molecular level.
- Gain knowledge about structure and different forms of various biomolecules in the biological systems.
- Apply the knowledge to control and regulate the various metabolic pathways and reactions of cell.

BT11030 - THEORY COURSE CONTENT**(4 Credits)**

UNIT1	Basics of Biochemistry Evolutionary foundation Chemical foundation Physical foundation	10 lectures
UNIT2	Water Weak Interactions in Aqueous Systems Ionization of Water, Weak Acids, and Weak Bases Buffering against pH Changes in Biological Systems Water as a Reactant The Fitness of the Aqueous Environment for Living Organisms	15 lectures
UNIT3	Proteins and Carbohydrates Amino acids & Proteins: Structure & Function Structure and properties of Amino acids Types of proteins and their classification Forces stabilizing protein structure and shape Different Level of structural organization of proteins Protein Purification Denaturation and renaturation of Proteins Fibrous and globular proteins Carbohydrates: Structure, Function Properties of Monosaccharides, Disaccharides and Polysaccharides Homo & Hetero Polysaccharides, Mucopolysaccharides Bacterial cell wall polysaccharides Glycoproteins and their biological functions	18 lectures

UNIT4	<p>Lipids and Nucleic acids</p> <p>Lipids: Structure and functions</p> <p>Classification, nomenclature and properties of fatty acids, essential fatty acids</p> <p>Phospholipids, sphingolipids, glycolipids, cerebrosides, gangliosides, Prostaglandins, Cholesterol</p> <p>Nucleic acids: Structure and functions</p> <p>Physical & chemical properties of Nucleic acids, Nucleosides & Nucleotides, purines & pyrimidines</p> <p>Biologically important nucleotides</p> <p>Double helical model of DNA structure and forces responsible for A, B & Z – DNA denaturation and renaturation of DNA</p>	<p>17</p> <p>lectures</p>
--------------	---	---

BT11040 - LAB COURSE CONTENT

(2 Credits)

1. To study activity of any enzyme under optimum conditions.
2. To study the effect of pH, temperature on the activity of salivary amylase enzyme.
3. Determination of – pH optima, temperature optima, Km value, Vmax value, Vkat
4. Effect of inhibitor (Inorganic phosphate) on the enzyme activity.
5. Estimation of blood glucose by glucose oxidase method.
6. Principles of Colorimetry: (i) Verification of Beer's law, estimation of protein. (ii) To study relation between absorbance and % transmission.
7. Preparation of buffers.
8. Separation of Amino acids by paper chromatography.
9. Qualitative tests for Carbohydrates, lipids and proteins.
10. Purification of an enzyme from any natural resource.
11. Quantitative estimation of proteins by Bradford/Lowry's method.
12. Perform assay for the purified enzyme.

SUGGESTED READING

1. Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). Biochemistry. VI Edition. W.H Freeman and Co.
2. Buchanan, B., Gruissem, W. and Jones, R. (2000) Biochemistry and Molecular Biology of Plants. American Society of Plant Biologists.
3. Nelson, D.L., Cox, M.M. (2004) Lehninger Principles of Biochemistry, 4th Edition, WH Freeman and Company, New York, USA.
4. Hopkins, W.G. and Huner, P.A. (2008) Introduction to Plant Physiology. John Wiley and Sons.
5. Salisbury, F.B. and Ross, C.W. (1991) Plant Physiology, Wadsworth Publishing Co. Ltd.

VANITA VISHRAM WOMEN'S UNIVERSITY

SCHOOL OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF BIOTECHNOLOGY



**Under Learning Outcomes Based Curriculum Framework
(LOCF)**

For Undergraduate (UG) Education

SEMESTER - 1

Ability Enhancement Compulsory Courses (AECC)

**Syllabus applicable to the students seeking admission in the
following Program**

**B.Sc./B.A./B.Com./B.B.A./ B.C.A. under LOCF w.e.f. the
Academic Year 2021-2022**

BACHELOR OF SCIENCE (B.SC.) BIOTECHNOLOGY HONOURS

SEMESTER 1

ABILITY ENHANCEMENT COMPULSORY COURSE PAPER 1

ENVIRONMENTAL STUDIES-I

Course Objectives:

- To impart basic knowledge about the environment and its allied issues
- Natural resources and their management and biodiversity and its conservation.
- Developing an attitude of concern for the environment.
- Awareness, Knowledge, Attitudes, Skills, Capacity Building and participation for the sustainable and better environment.

Course Outcome:

The expected Student Learning Outcomes would be:

- About Earth structure and its environment and ecology
- Biodiversity and its role in human welfare and its conservation
- Various natural resources and their management
- They would be able to critically examine all sides of environmental issues and apply understanding from various disciplines such as psychology, law, literature, politics, sociology, philosophy, and religion to create opinions about how to interact with the environment on both a personal and a social level.
- Understand the global character of environmental problems and ways of addressing them, including interactions across local to global scales.

BT12010 - THEORY COURSE CONTENT**(2 Credits)**

UNIT1	<p>Introduction of Environment and ecology</p> <p>Scope and multidisciplinary nature of environmental studies</p> <p>Concept and Components of environment (Atmosphere, Lithosphere and Hydrosphere)</p> <p>Concept, structure and function of an ecosystem.</p> <p>Energy flow in an ecosystem: food chains, food webs and ecological pyramids.</p> <p>Case studies of the following ecosystems:</p> <ul style="list-style-type: none">a) Forest ecosystemb) Grassland ecosystemc) Desert ecosystemd) Aquatic ecosystems (ponds, rivers, oceans)	15 lectures
UNIT2	<p>Natural Resources: Renewable and Non-renewable Resources</p> <p>Land as a resource, land degradation, landslides, soil erosion and desertification</p> <p>Forests & forest resources: Use and over-exploitation, deforestation, Impacts of deforestation on biodiversity and tribal populations.</p> <p>Water resources: Use and over-exploitation of surface and ground water, floods, drought, conflicts over water (international & inter-state).</p> <p>Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.</p> <p>Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs.</p>	15 lectures
UNIT3	<p>Biodiversity and Conservation</p> <p>Introduction — Definition, ecosystem diversity, Value of biodiversity, Biodiversity at global, national and local levels.</p>	15 lectures

	<p>India as a mega-biodiversity nation;</p> <p>Threats to biodiversity: Habitat loss, poaching of wildlife, man- wildlife conflicts.</p> <p>Endangered and endemic species of India. Common plant and animal species.</p> <p>Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity</p>	
--	---	--

Field/Practical Work (Assignment/Report Submission)

Students are required to carry out the following practical work

1. To identify the natural resources of your area/any visited area
2. To identify the sources of energy used in your area/any visited area

SUGGESTED READING

Text Books:

- Bharucha, E. (2013). Textbook of Environmental Studies for Undergraduate Courses. Universities Press.
- Asthana, D. K. (2006).Text Book of Environmental Studies. S. Chand Publishing.
- Basu, M., Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India

Reference books:

- Singh, J.S., Singh, S.P. & Gupta, S.R. 2006. Ecology, Environment and Resource Conservation. Anamaya Publications.
- Sodhi, N.S. & Ehrlich, P.R. (Eds). 2010. Conservation Biology for All. Oxford University Press.
- □ Tiwari, G.N. & Ghosal. M. K. 2005. Renewable Energy Resources: Basic Principles and Application. Narosa Publishing House.