

VANITA VISHRAM WOMEN'S UNIVERSITY

SCHOOL OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF BIOTECHNOLOGY



**VANITA VISHRAM
WOMEN'S UNIVERSITY**

SURAT

BACHELOR OF SCIENCE (B.Sc.) IN BIOTECHNOLOGY

For Undergraduate (UG) Education

SEMESTER - 1

Core Courses (CC)

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

B.Sc. Biotechnology w.e.f. the Academic Year 2022-23

BACHELOR OF SCIENCE (B.SC.) BIOTECHNOLOGY

SEMESTER 1

CORE COURSE PAPER 1

INTRODUCTION TO BIOTECHNOLOGY

Course Objectives:

- Students gain knowledge on what is Biotechnology and how the biotechnology is inculcated in different aspects of our day-to-day life.
- Students shall have exposure about different scopes and fields of biotechnology.

Course Outcome:

- Understand the concept of Biotechnology, what for Biotechnology is used, which are the disciplines have major roles in Biotechnology and different branches of Biotechnology.
- Understand how GMOs are formed and what are the applications of Biotechnology in Agriculture.
- Understand how Biotechnology plays important role in Health care sector.
- Understand what are the government initiatives and sectors involved in research and development in Biotechnology.

BT11290 - THEORY COURSE CONTENT

(2 Credits)

UNIT1	Introduction to Biotechnology <ul style="list-style-type: none">• Definitions of Biotechnology• History of Biotechnology• Traditional and Modern Biotechnology• Biotechnology-an Interdisciplinary Pursuit• Biotechnology- a three-component central core• Branches of Biotechnology; Plant, Animal Biotechnology, Marine Biotechnology, Agriculture, Healthcare, Industrial Biotechnology, Pharmaceutical Biotechnology, Environmental Biotechnology.• The World of Biotechnology- Red, Green, White and Blue Biotechnology• Biotech Success Stories and Public Perception of Biotechnology	07 lectures
UNIT2	Applications of Biotechnology <ul style="list-style-type: none">• Recombinant DNA technology and genetic engineering	08 lectures

	<ul style="list-style-type: none"> ● Applications of Biotechnology in Agriculture : ● GM Food <ul style="list-style-type: none"> ○ GM Tomato (Fungal and Viral Resistant plant) ○ BT Crops (BT Cotton and BT Brinjal: Insect Resistant Plants: Pros and Cons) ○ Golden Rice ● Molecular Pharming ● Biotechnological applications in enhancement of Food Quality ● Biofertilizers ● Biopesticides ● Biofuels 	
UNIT3	<p>Biotechnology & Health Care</p> <ul style="list-style-type: none"> ● Vaccines, Plant Based Vaccines, ● DNA & RNA probes, ● Monoclonal Antibodies, ● Autoantibodies, ● Identification of gene causing genetic diseases, ● Therapeutic molecules from recombinant and non-recombinant organisms (Insulin, human growth hormone, interferon, growth factors) ● Gene Therapy ● Human Genome Project 	8 lectures
UNIT4	<p>Biotechnology in India</p> <ul style="list-style-type: none"> ● Biotechnology Research in India. ● Biotechnology Institutions in India (Autonomous, Public and Private Sector) ● Biotech Success Stories- Biocon, Sea6 Energy, Bharat Biotech ● Biotech Policy Initiatives ● Introduction to DBT and Other State Agencies (GSBTM) ● BTIS-NET ● ABLE & BIRAC ● Biotechnology- Current status of industrial growth in India ● Role of CSIR and ICAR in biotechnology research 	7 lectures

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.
5. B. D. Singh, Biotechnology (2018), Kalyani publishers
6. R.C. Dubey, A Textbook Of Biotechnology (2016) 6th Edition, S Chand publications
7. U Satyanarayana, Biotechnology (2020), Publishers: Books & Allied Ltd
8. Biotechnology by Keshav Trehan
9. Biotechnology: The biological principles M. D. Trevan, S. Boffey, K. H. Goulding & P. Stanbury, Open University Press, Milton Keynes, 1987
10. Sobti and Pachauri (2009) Essential of Biotechnology, Ane Books Pvt. Ltd. ISBN-81- 8052-160-5
11. DBT website: <http://dbtindia.gov.in>.

BACHELOR OF SCIENCE (B.SC.) BIOTECHNOLOGY

SEMESTER 1

CORE COURSE PAPER 2

CELL BIOLOGY

Course Objectives:

- To convey student basic fundamental knowledge about cell theory and concept, cellular organization, composition and functioning, cell growth, cellular division and cell death.
- To give information and knowledge about basic components of prokaryotic and eukaryotic cells.
- To make students aware about cellular structures and their organelles.
- To demonstrate significant cell biological principles, cell cycle, role of cell and it's working that enable the students to translate the theoretical foundation into practical understanding.

Course Outcome:

- Understand the origin and evolution of cells, difference between prokaryotic and eukaryotic cells, how cells are joined through extra cellular matrix and interact with each other.
- Understand the ultrastructure of functions of cell membrane and various other organelles.
- Understand the functioning of cell organelles for maintaining proper functioning of cells.
- Understand how cell divide and regulated.

BT11300 - THEORY COURSE CONTENT

(2 Credits)

UNIT1	Introduction to cell biology & Cell wall Origin and Evolution of Cells (First Cell, Evolution of Metabolism, Origin of Eukaryotes-Endosymbiont Theory, Development of Multicellular Organisms) Cell theory Ultrastructure of prokaryotic and eukaryotic cell Structure of Eukaryotic cell wall	8 lectures
UNIT2	Structure and Function of Cell Organelles – I Plasma Membrane: Chemical composition of membranes, Structure and functions of membrane proteins Nucleus (Nuclear Envelope, Nuclear Pore Complex, Sub-compartments within Nucleus) Mitochondria (Mitochondrial Membranes, Mitochondrial Matrix) Chloroplast and other Plastids (Chloroplast Structure and Function, Plant Cell Vacuoles) Lysosomes: (Lysosomal Enzymes, Endocytosis and Lysosome Formation)	8 lectures

UNIT3	Structure and Function of Cell Organelles – II Endoplasmic Reticulum (Smooth ER, Functions of Rough ER) Golgi Complex/Apparatus (Organization of Golgi) Peroxisomes (Peroxisome Assembly, Functions of Peroxisomes) Ribosomes Centrioles and basal bodies Cilia and flagella (Ultrastructure Flagella- Prokaryotic and Eukaryotic) Intermediate Filaments- (Types and Functions), Microfilaments (Actin and Myosin)- Structure of Actin Filaments, Myosin: Molecular Motor in Actin Filaments)	7 lectures
UNIT4	Cell cycle The Cell cycle Cell cycle In vivo Control of Cell Cycle M-Phase: Mitosis and Cytokinesis Phases of mitosis Motor proteins required for Mitotic Movements Meiosis The stages of Meiosis Genetic Recombination during Meiosis Role of meiosis in life cycles of organisms	7 lectures

SUGGESTED READING

1. Karp, G. & Harris, D. (2008) Cell and Molecular Biology – Concepts and Experiments, John Wiley & Sons Inc, New York.
2. Alberts, B., Bray, D., Hopkin K., Johnson A., Lewis, L., Raff, M., Roberts, K., & Walters, P. (2014) Essential Cell Biology. 4th Edition, Garland Science, Taylor and francis Group, LLC.
3. Robertis, E.D.P. & Robertis, E.M.F. (1998). Cell Biology and Molecular Biology, 8th edition, Sauder College.
4. Cooper, G.M. and Hausman, R.E. 2009. The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.
5. Verma P.S. and Agarwal V. K. (1998). Cell Biology, Genetics, Molecular Biology, Evolution and ecology.
6. Wasserman, S. A., Minorsky, P. V., Reece, J. B., & Campbell, N. A. (2017). Campbell biology. Eleventh edition. New York, NY: Pearson Education, Inc.
7. The World of the Cell by Wayne M. Becker

BACHELOR OF SCIENCE (B.SC.) BIOTECHNOLOGY

SEMESTER 1

CORE COURSE PAPER 3

BIOTECHNOLOGY PRACTICAL I

Course Objectives:

Students will learn the safety and GLP of Biotechnology laboratories and students will learn the different tools and equipment used in Biotechnology laboratory.

Students will have the hands-on training for numerous cell biology techniques.

Course Outcome:

In the laboratory course, students can acquire knowledge of how to handle different instruments in Biotechnology laboratory.

Students can learn techniques to perform cell biology experiments.

BT11310 - PRACTICAL COURSE CONTENT

(2 Credits)

1	Biotechnology Good Laboratory Practices and Bio-safety.
2	Study of Light Microscope
3	To study the principle, operation, applications and care of important instruments (autoclave, incubator, hot air oven, light microscope, pH meter, laminar airflow, Centrifuge, Colorimeter, bacteriological filter assembly) used in the Biotechnology laboratory
4	Working of Colorimeter.
5	Case study on ethical issues of biotechnology
6	Calibration, working and use of pH meter.
7	Visualization of animal and plant cell using methylene blue
8	Study of cell viability using phenol red / trypan blue
9	Identification of different stages of mitosis in onion root tip
10	Identification of different stages of meiosis using permanent slide.
11	Study the effect of temperature and organic solvents on semi permeable membrane
12	Study of plasmolysis and de-plasmolysis

SUGGESTED READING

1. Patel, R. J., & Patel, R. K., (2015). Experimental Microbiology, Vol. 1, 9th ed., Aditya.
2. Cell and Molecular Biology: A Lab Manual. K.V. Chaitanya, PHI Learning Private Ltd.
3. Introduction to practical Biochemistry, David Plummer, Tata McGraw Hill Publishing Company.

