10. BIOTECHNOLOGY (CODE NO. 045)

An unprecedented growth of human knowledge in the field of Biological Sciences coupled with equally significant developments in the field of technology have brought significant changes into existing social and economic systems. The emerging field of Biotechnology is likely to further enhance the applications of Science and Technology in the service of human welfare. Modern Biotechnology processes encompass a wide range of new products such as antibiotics, vaccines, monoclonal antibodies and many more. Furthermore, developments in recombinant DNA technology have yielded numerous new useful products in the fields of healthcare and agriculture. The present syllabus takes care of all these aspects. Due emphasis has been laid on familiarizing the learners with the fundamental concepts, basic techniques and their applications. It is expected that the knowledge gained through the study of different topics and the skills acquired through the prescribed practical work will make the learners competent to meet the challenges of academic as well as professional courses after studying the subject at senior secondary stage.

Objectives

The broad objectives of teaching Biotechnology at senior secondary level are:

- To help the learners know and understand basic facts and concepts of the subject at elementary stage.
- To expose the students to different basic processes and basic techniques used in Biotechnology.
- To familiarize the learners to understand the relationship of the subject to health, nutrition, environment, agriculture and industry, etc.
- To develop conceptual competence in the learners so as to cope up with professional courses in future career.
- To acquaint students with different applications of Biotechnology in everyday life.
- To develop an interest in students to study biotechnology as a discipline.

COURSE STRUCTURE
CLASS - XI (2013-14)

One Paper **Time: 3 hrs.**
Max. Marks 70+30

Units		No. of Periods	Marks
Unit-I	Biotechnology within your reach	20	5
Unit-II	Biomolecules	50	20
Unit - III	Cell Development	50	20
Unit - IV	Genetics and Molecular Biology	60	25
	Practical	60	30
	Total	**240**	**100**

CLASS XI
(Theory)

One Paper (Three Hours) **70 Marks** **180 Periods**

Unit I: Biotechnology Within Your Reach 20 Periods

Chapter I: Introduction to Biotechnology: Historical perspectives, Production strategies in

Biotechnology, Quality control, Product safety, Good manufacturing practices, Good laboratory practices, intellectual property, Global market, Public perception, Biotechnology in India and global trends.

Unit II: Biomolecules — 20 Marks — 50 Periods

Chapter I : Building Blocks of Biomolecules - Structure and Dynamics (20 Periods)

Building blocks of Carbohydrates - Sugars and their derivatives, Building blocks of Proteins - Amino Acids, building blocks of Lipids - Simple Fatty Acids, Sphingosine, Glycerol and Cholesterol, Building blocks of Nucleic Acids - Nucleotides, Biochemical Transformations

Chapter II : Structure and Function of Macromolecules — 20 Periods

Carbohydrates - The energy givers, Proteins - The performers, Enzymes - The catalysts, Lipids and Biomembranes - The barriers, Nucleic Acids - The managers

Chapter III : Biochemical Techniques — 10 Periods

Techniques based on molecular weight or size, Techniques based on polarity or charge, Techniques based on spectroscopy, Techniques based on solubility

Unit III: Cell Development — 20 Marks — 50 Periods

Chapter I : The Basic Unit of Life — 20 Periods

Cell structure and components, Tissues and Organs, Stem cells, Biodiversity,Organization of life

Chapter II : Cell Growth and Development — 20 Periods

Cell division, Cell cycle, Cell communication, Movement, Nutrition, Gaseous exchanges, Internal transport, Maintaining the internal environment, Reproduction, *In Vitro* fertilization,Animal and plant development, Immune response in animals, Programmed cell death, Defense mechanisms in plants

Chapter III : Cellular Techniques — 10 Periods

Microscopy, Cell sorting, Cell fractionation, Cell growth determination

Unit IV: Genetics and Molecular Biology — 25 Marks — 60 Peiods

Chapter I : Principles of Genetics — 25 Periods

Historical perspective, Multiple alleles, Linkage and crossing over, Genetic mapping, Gene interaction, Sex-linked inheritance, Extranuclear inheritance, Quantitative inheritance, Genes at population level, Discovery of DNA as genetic material , Mutations, DNA repair, Genetic disorders

Chapter II : Genome Function — 25 Periods

Genome organization, DNA replication, Fine structure of genes, From gene to protein, Transcription - the basic process, Genetic code, Translation, Regulation of gene expression

Chapter III : Genetical Techniques — 10 Periods

Chromosomal techniques, Mutagenic techniques, Recombination in bacteria, Breeding methods in plants, Pedigree analysis in humans

PRACTICALS — 60 Periods

Note : Every student is required to do the following experiments during the academic session.

1. Preparation of buffers and pH determination

2. Sterlization techniques
3. Preparation of bacterial growth medium
4. Isolation of bacteria from curd and staining of bacteria
5. Determination of bacterial growth curve
6. Study of various stages of mitosis and calculation of mitotic index
7. Preparation of karyotyping
8. Cell counting
9. Isolation of genomic DNA
10. Detection of DNA by gel electrophoresis
11. Isolation of milk protein (Casein)
12. Estimation of protein by biuret method
13. Assaying the enzyme acid phosphate

Scheme of Evaluation

Time: 3 Hours **Max. Marks 30**

The scheme of evaluation at the end of session will be as under:

Two experiments	:	20 Marks
Viva on experiments	:	5 Marks
Practical record	:	5 Marks

BIO TECHNOLOGY (CODE - 045)
QUESTION PAPER DESIGN
CLASS - XI (2013–14)

Time 3 Hours **Max. Marks: 70**

S. No.	Typology of Questions	Very Short Answer (VSA) (1 mark)	Short Answer-I (SA-I) (2 marks)	Short Answer -II (SA-II) (3 marks)	Long Answer (L.A.) (5 marks)	Total Marks	% Weightage
01	Knowledge Based	2	2	2	--	12	17%
02	Conceptual Understanding	--	1	3	1	16	23%
03	Application Based and Inferential type	1	2	3	--	14	20%
04	Reasoning Based	2	2	1	1	14	20%
05	Skill Based	1	1	2	1	14	20%
	Total	6	8	11	3	70	100%

Total No. of questions = 28

1. *No chapter wise weightage. Care to be taken to cover all the chapters.*
2. *The above template is only a sample. Suitable internal variations may be made for generating similar templates keeping the overall weightage to different form of questions and typology of questions same.*