

BIOTECHNOLOGY

SYLLABUS FOR HIGHER SECONDARY FIRST YEAR COURSE

Biotechnology, in its broadest sense, is the technology that provides goods and services by industrial processes using biological organisms, systems and processes. It comprises a number of technologies based upon increasing understanding of biology at the cellular and molecular level. The techniques of biotechnology includes recombinant DNA technology (genetic engineering), hybridoma technology and monoclonal antibody preparation, cell and tissue culture, DNA fingerprinting, protoplast fusion, protein engineering, immobilized enzyme technology, cell catalysis, biosensor and several others. Biotechnology has emerged as one of the frontline technologies in recent times. Biotechnology with its most recent offshoot Bioinformatics is being projected as the technology that would have the greatest impact in the coming years worldwide.

With the exponential growth of human population, it becomes urgent to improve the production process and capabilities for the increased production of food, fuel, medicine, enzymes, fermented items, fibers, vaccines and biofertilizers. It also becomes important to ensure protection, conservation and sustainable utilization of our natural resources. Biotechnology has the answer for these problems. Application of biotechnology has been proved to be fruitful for meeting the need of the modern human society.

Inclusion of Biotechnology in higher secondary level courses is considered as important to create a base and interest among the students for higher education, training and research in Biotechnology. In view of this the present syllabus is designed to cater needs of the Biotechnology education for the higher secondary students of Assam. The theoretical topics and experiments are selected and organized such a way so that the students can earn basic concept and interlink the various topics and techniques. It is expected that the student will gain appropriate knowledge and acquire practical skill on the subject. It is also anticipated that the course will make the students competent to meet up the challenges of both academic and professional courses beyond the secondary level.

Objectives :

The objectives of teaching Biotechnology at Higher Secondary level are :

1. To create an interest among the students of H.S. Classes to study Biotechnology courses.
2. To help the students to know and acquire basic information and concept in the subject.
3. To expose the students to understand the basic techniques and their utilization in various production and service industries.
4. To familiarize the learners to understand the importance and applications of Biotechnology in everyday life.
5. To develop conceptual competence of the students so as to cope-up with technical and professional in future carrier.

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One Paper

Time : Three hours

Marks : 70

Unitwise Distribution of Marks & Periods :

| Unit No. | Title | Marks | Periods |
|--------------|-----------------------------------|-----------|------------|
| Unit-1 | Introduction to Biotechnology | 10 | 22 |
| Unit-2 | Basic Chemistry of Biomolecules | 10 | 22 |
| Unit-3 | Basics of Bio-Chemical Technology | 10 | 16 |
| Unit-4 | Cell Biology | 15 | 34 |
| Unit-5 | Genetics | 10 | 22 |
| Unit-6 | Molecular Biology | 15 | 34 |
| Total | | 70 | 150 |

Unitwise Distribution of Course contents :

| | Marks |
|---|--------------|
| Unit-I : Introduction to Biotechnology | 10 |
| History and definition | |
| Scope & Importance of Biotechnology | |
| Branches of Biotechnology | |
| Biotechnology and Society | |
| Unit-2 : Basic Chemistry of Biomolecules | 10 |
| Building Blocks of Biomolecules : Structure and Dynamics | |
| Structure and function of Molecules | |
| Lipids, Proteins and Nucleic acids | |
| Biochemical Techniques | |
| Unit-3 : Basics of Biochemical Technology | 10 |
| Unit-4 : Cell Biology | 15 |
| Structural Organization of Prokaryotic and Eukaryotic-cells | |
| Cell, divisions and cell cycle | |
| Plasma membrane : Structural organization and function | |
| Cellular techniques | |
| Unit-5 : Genetics | 10 |
| Mendel's law of Inheritance | |
| Chromosome theory of Inheritance | |
| Linkage and crossing over, sex-linked Inheritance | |
| Mutation and mutagenesis | |
| Gene and Genome | |

Unit-6 : Molecular Biology

15

Nucleic acids as genetic material

Replication of DNA

Gene action : Transcription and Translation

Genetic Code

Molecular Techniques : Electrophoresis, DNA fingerprinting

SYLLABUS FOR BIOTECHNOLOGY PRACTICAL

Total Marks- 30

| Scheme of Evaluation: | Marks |
|---|--------------|
| 1. Two Experiments | 20 |
| ❖ Preparation of buffers and PH determination | |
| ❖ Estimation of total Carbohydrate by Anthrone method | |
| ❖ Determination of reducing sugar by Nelson-Somogy Method | |
| ❖ Determination of total lipids by Bligh and Dyer Method | |
| ❖ Estimation of Protein by Biuret Method | |
| ❖ Gram staining of bacteria | |
| ❖ Isolation of milk protein (Casein) | |
| ❖ Study of various stages of mitosis | |
| ❖ Preparation of Karyotypes | |
| ❖ Cell counting by haemocytometer | |
| ❖ Isolation of genomic DNA | |
| ❖ Detection of DNA by gel electrophoresis | |
| 2. Viva on practical | 05 |
| 3. Practical Records | 05 |