

BIOTECHNOLOGY

SYLLABUS FOR HIGHER SECONDARY 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.

BIOTECHNOLOGY

SYLLABUS FOR HIGHER SECONDARY FINAL YEAR COURSE

One Paper

Time : Three Hours

Total Marks-70

Pass Marks-21

Unitwise Distribution of Marks and Periods :

Unit No.	Title	Marks	Periods
Unit-1	Protein Engineering and Bioinformatics	15	23
Unit-2	Genetic Engineering and genomics	15	32
Unit-3	Environmental Biotechnology & Bioethics	10	20
Unit-4	Microbial Technology	10	25
Unit-5	Plant Cell Culture Technology	10	25
Unit-6	Animal Cell Culture Technology	10	25
Total		70	150

Unitwise Distribution of Course contents :

Marks

Unit-1 : Protein Engineering and Bioinformatics :

15

Protein based products and designing

Proteins

Proteomics : an introduction

Introduction to Bioinformatics

Sequences and Nomenclature

Information Sources

Analysis using Bioinformatics tools

Unit-2 : Genetic Engineering and Genomics :

15

Recombinant DNA technology-definition and tools

Making recombinant DNA

Construction of DNA library :

Genomic and cDNA

Cloning vectors

Polymerase Chain Reaction (PCR)

DNA probes

Hybridization techniques : Southern, Northern and Western

DNA sequencing

Genomics : an introduction

Unit-3 : Environmental Biotechnology & Bioethics :

10

Bioremediation of oil pollution reducing environmental impact of chemical herbicides & fertilizers; biosensors to detect environmental pollution.

Biofertilizers-definition and uses.
 Biofuels : definition and application
 Genetically Modified Organisms and
 Ethical Issue
 Intellectual Property Rights-Patenting Life forms

Unit-IV : Microbial Technology **10**

Classification of microorganism
 Microbial culture techniques
 Measurement and kinetics of microbial growth
 Strain Isolation and Isolation of microbial products
 Application of microbial culture

Unit-V : Plant cell culture Technology **10**

Introduction; Cellular Totipotency
 Plant cell and tissue culture techniques and media
 Application of plant tissue culture
 Gene transfer methods in plants
 Transgenic plants for crop improvement

Unit-VI : Animal Cell Culture Technology **10**

Introduction
 Animal Cell Culture Technology and media
 Characterization of cell lines
 Scale up of animal cell culture process
 Application of animal cell culture
 Stem cell technology

SYLLABUS FOR BIOTECHNOLOGY PRACTICAL

Total **Marks-30**

Scheme of Evolution : **Marks**

1. Two Experiments **8 + 8 = 16**

(One computer based Practical)

- ❖ Data retrieval and data search using Internet site of NCBI
- ❖ Download a DNA protein sequence from Internet, analyze and comment over it
- ❖ Ion-exchange chromatography for protein
- ❖ Estimation of DNA
- ❖ Isolation of microbes from a given biological sample
- ❖ Sterilization techniques : Dry heat and moist heat sterilization,
Chemical sterilization and ultra filtration
- ❖ Determination of bacterial growth curve

- ❖ Determination of blood groups
 - ❖ Estimation of blood glucose by enzymatic method
 - ❖ Demonstration of plant tissue culture technique
 - ❖ Isolation of bacterial plasmid DNA and its detection by gel electrophoresis
 - ❖ Minor project work/Seminar
2. **Viva on practical** 4
3. **Practical Record** 4
4. **Seminar/Minor project** 6

Recommended Books

1. CBSE publication for class XI and XII

ANNEXURE**Laboratory Requirements :****A. Must include the following components for Laboratory:**

- (a) One small lab with Laminar Air flow cabinet and Single working desk
- (b) Working Laboratory with working table & Chairs, Washing facilities, light arrangement.
- (c) Essential equipments : Autoclave, oven, Refrigerators, Incubator, Water distillation, Centrifuge.
- (d) Glassware's, measuring equipment etc.
- (e) Small Culture room (air conditioned) and culture racks.
