

Swami Ramanand Teerth Marathwada University, Nanded

Syllabus B.Sc. Biotechnology (Revised) (June 2013 pattern)

(With effect from year 2015-16)

B. Sc. Biotechnology Third Year (Fifth Semester)

Code No.	Paper Title	Teaching Periods/ Week	Maximum Marks T/P (A)	Internal Test Marks (B)	Total Marks (A+B)	Duration of Exam (in Hrs)
BTT-5.1	r- DNA Technology	04	80	20	100	03
BTT-5.2	Agriculture Biotechnology	04	80	20	100	03
BTT-5.3	Bioprocess Engineering	04	80	20	100	03
BTT-5.4	Animal and Plant Development	04	80	20	100	03
BTP-5.1	Lab Course -9 Practical Based on (BTT-5.1 + BTT-5.2)	03+03	100	-	100	03
BTP-5.2	Lab Course -10 Practical Based on (BTT-5.3 + BTT-5.4)	03+03	100	-	100	03
				Total	600	

B. Sc. Biotechnology Third Year (Sixth Semester)

Code No.	Paper Title	Teaching Periods/ Week	Maximum Marks T/P (A)	Internal Test Marks (B)	Total Marks (A+B)	Duration of Exam (in Hrs)
BTT-6.1	Pharmaceutical Biotechnology	04	80	20	100	03
BTT-6.2	Industrial Biotechnology	04	80	20	100	03
BTT-6.3	Environment Biotechnology	04	80	20	100	03
BTT-6.4	Introduction to Bioinformatics	04	80	20	100	03
BTP-6.1	Lab Course -11 (Practical based on BTT-6.1+6.2+6.3+6.4)	03+03	100	-	100	03
BTP-6.2	Lab Course -12 (Project Work)	03+03	100	-	100	03
				Total	600	

B.Sc. Biotechnology V Semester
BTT. 5.1 : r DNA technology Marks : 80 Hours : 50

Objective: To improve the knowledge on genomic structure of microbes, techniques useful in recombinant DNA technology and application of genetic engineering

UNIT-I: Principles of Gene cloning

Molecular Tools of Genetic Engineering: Restriction Endonucleases- Types & Properties, DNA Ligases, Alkaline phosphatase. Vectors: Plasmids (pBR322, pUC18/19), Bacteriophages (λ Phage, M 13 Phage), Cosmids, Artificial Chromosomes-BAC. Choice of Vector. Methods of Gene Transfer- vector based and direct transfer of DNA: Gene Cloning Strategies. Markers and reporter genes in gene cloning

UNIT -II: r- DNA Techniques.

Electrophoresis: Agarose Gel Electrophoresis, Blotting techniques: Southern , Northern , Western Blotting and applications. DNA Sequencing: Sanger's and Maxam Gilbert's Method, Automated DNA sequencing.

PCR: Mechanism, Types and Application. DNA chips (Micro array) principle & application.

UNIT-III: DNA Library

Library construction, screening and applications: Genomic library, cDNA library. Nucleic Acid Probe, Chemical Synthesis of DNA, Autoradiography of DNA

Screening of library-Probe based direct and indirect methods.

UNIT - IV: Applications of r-DNA technology

Agricultural applications i) BT-Cotton, ii) Transgenic maize, iii) Golden rice etc.

Protein engineering: to improve properties of proteins and enzymes.

Pharmaceutical Applications : i) Recombinant hormones ii) Vaccines iii) Blood Clotting factors v) Tissue Plasminogen Activator vi) Erythropoietin v) Human growth hormone. Concept of Gene Therapy

Text & References:

1. Principles of Gene Manipulation and Cloning - Old & Primrose-Black well Science
2. From Genes to Clones- Winnacker- Panima
3. Molecular Biotechnology –Glick-ASM
4. ABC of Gene cloing- Wong-Springer
5. Genomes 3 - T.A.Brown-Garland Science
6. Gene cloning and DNA Analysis- T.A. Brown- Wiley- Blackwell
7. Text book of Biotechnology – U Satyanarayan –Book & Allied
8. Jogdand S.N- Gene Biotechnology-Himalaya
9. Joshi P (2002) - Genetic Engineering and its applications, Agrobios Pub
10. Mitra Sandhya (2006) - Genetic Engineering, MacMillan India

Practical:

1. Isolation of Genomic DNA from Plant, Animal, Bacteria
2. Isolation of Plasmid DNA
3. Isolation of Phage DNA
4. Electrophoresis of DNA
5. Restriction digestion of DNA
6. Ligation of DNA
7. Preparation of Competent Cells & Cell Transformation
8. GFP gene cloning
9. Blotting Techniques- Southern, Western
10. Principle and study of PCR based experiments
11. Experiments based on molecular markers RAPD, RFLP and SNP etc
12. Visit to Molecular Biology & Genetic Engineering Research Laboratory/ Company

B.Sc. Biotechnology V-Semester**BTT.5.2: Agricultural Biotechnology****Marks 80****Hours 50**

Objective: To enable students to gain information on the role of biotechnology in the field of Agriculture and related industries

UNIT- I: Nitrogen Fixation and Phytohormones.

Symbiotic N₂ fixation - Legume, Rhizobium symbiosis, Host specificity, Infection, Nodule Development, Mechanism of N₂ Fixation. **Non Symbiotic N₂ Fixation** - Diazotrophy, Sites of N₂ Fixation, Nitrogenase Complex, Cyanobacteria, Azotobacter, Azospirillum.

Phytohormones- Definition, Classification, Physiological Effects, Functions of Auxin, Cytokinin, Gibberellins. Assimilation of Sulphur and Phosphorus in Plants.

UNIT- II :Biofertilizers

Concept and Types of Biofertilizer. Microbial Inoculums - Rhizobium Inoculant, Blue-Green algae, Azotobacter, Sulphur and Phosphate Solubilizing Biofertilizer. Applications of Biofertilizer.

UNIT- III:Plant Pathology.

Concept of Plant Pathology. Host Pathogen Relationship. Pathogenesis mechanism- Enzymes, Toxins, Nutrition etc. Mechanism of Plant defense, resistance to disease.

Classification of Plant Diseases based on Symptoms. Plant Diseases: Causative agent, Symptoms, Mechanism of Action and Control Measures (Chemical and Biological). i) Bacterial Blight of Cotton ii) Whip Smut of Sugar Cane, iii) Powdery Mildew of Wheat. iv) Citrus Canker of Lemon.

UNIT- IV :Agro-Biotechnology.

Bio-pesticides- Definition and Types (Microbial and Botanical) Advantages of Biopesticides over chemical pesticides. **Biomass** : Composition , Types, Biomass as a energy Source, Biomass conversion and Utilization.. Biofuel: - Biodiesel

Single Cell Protein and its Nutritive Value eg. Spirulina. Mushroom production.

Text & References :

1. Bilgrami K.S and Dube H.G.- Textbook of Modern Plant Pathology, Vikas
2. Gupta P.K. - Genetics and Biotechnology in Crop Improvement, Rastogi Publications
3. Pathak V.N, Khatri N.K., Pathak M. - Fundamentals of Plant Pathology, Agrobotanical Publications,
4. R.C. Dubey – Text book of Microbiology-S.Chand publications.
5. Subba Rao- Soil Microbiology- Oxford IBH
6. Melhotra and Agarwal- Plant Pathology- TataMcGraw Hill
7. Vyas S...and Modi H.A.(1998) - Biofertilizer and Organic Farming, Akta Prakashan
8. Experiments in Microbiology, Plant pathology, Tissue culture and Mushroom cultivation, New age
9. Lehninger-Biochemistry- Kalyani
10. Aneja K.R. – Experiments in Microbiology, Plant pathology & Biotechnology- New Age.
12. Schmauder Hans Peter (1997) - Methods in Biotechnology, Taylor and Francis, London.

Practical:

1. Isolation of *Rhizobium* sp. from root nodule of leguminous plant.
2. Isolation & Study of non symbiotic nitrogen fixing organisms
3. Isolation and study of PSBs.
4. Estimation of leg haemoglobin from root nodule of leguminous plant.
5. Determination of IAA Oxidase activity.
6. Cultivation and study of Spirulina algae, Mushrooms
7. Study of plant diseases by field visit /herbarium
8. Isolation & identification of plant pathogen (*Xanthomonas*) from infected citrus fruit /leaf.
9. Study of Bio pesticides: *Trichoderma*
10. Preparation and study of Biodiesel
11. Study of community by quadrat method (Frequency, Density and Abundance of Species)
12. Visit to Cell Culture Facilities /Production /Biofertilizer Industry.

B.Sc. Biotechnology V-Semester**BTT.5.3: Bioprocess Engineering****Marks 80****Hours: 50**

Objective: To improve the students with various designs of fermenters, growth kinetics and process kinetics and related principles in fermentation processes

UNIT-I :Introduction to Concepts of Bioprocess engineering:

Definition of Bioprocesses engineering. Introduction to simple engineering calculations, Mass & Energy Balances

Fermenters, Bioreactors : Construction, Design & Operation, Materials of Constructions, Welding, Surface treatment Components of the fermenters & their specifications

UNIT-II : Air & Media sterilization :

Air Sterilization Principles, Mechanisms of capture of particles in Air, Depth & Screen Filters, Sizing, Testing & validation of filters for air

Principles of Media Sterilization, Decimal reduction, Design of sterilization cycle using kinetics of thermal death of microbes, Equipments used in sterilization.

Design of media: Constituents of media, their estimation & quantification, Media for large-scale processes & their optimization. Costing of media

UNIT-III : Types of Bioprocesses :

Biotransformations (enzyme, whole cell), Microbial Growth Kinetics: Batch, Fed-batch, Cell recycle & continuous. Enzyme & cell immobilization (industrial aspects)

Measurement & Control of Bioprocesses Parameters: Cell growth. pH, temperature, Substrate consumption, product formation, Measurement of O₂/CO₂ uptake, evolution.

Specific rates of consumption substrate & formation of product. Strategies for fermentation control.

UNIT-IV : Scale up in Bioprocesses

Computer controlled fermentations. Formation of heat, Cooling requirements, Foam & its control. Oxygen uptake rate (OUR), K_a, Viscosity & its control. Scale up in Bioprocesses fermentations, Factors used in scale up. Quality Control, Quality assurance, Standard Operating Procedures (SOP) & Good Manufacturing Practices (GMP).

Text & References:

1. Principles of Fermentation Technology - Whittaker & Stanberry- Elsevier
2. Bioprocess Engineering Principles - Pauline Doran- Elsevier
3. Operational Modes of Bioreactors, BIOTOL series - Butter worth, Heinemann
4. Bioreactor Design & Product Yield, BIOTOL series - Elsevier
5. Bioprocess Engineering: Systems, Equipment & Facilities - Ed. B. Lydersen, Delia & Nelson, John Wiley
6. Bioprocess Engineering- Shuller & Kargi -Pearson Education
7. Process Biotechnology Fundamentals-Mukopadhaya- Viva
8. Biochemical Engineering- Bailey & Bhatia- CBS
9. Biochemical Engineering Fundamentals- Bailey, Ollis- McGraHill
10. Fermentation and Biochemical Engineering Hand book-Vogel, Todaro-Strand Publisher

Practical:

1. Isolation and Screening of Industrially important Microbes-Acid, Antibiotics, Enzymes
2. Study of Strain improvement
3. Sterilization Techniques- Media, Air
4. Maintenance of pure Culture
5. Study of Growth Curve of Bacteria, Fungi
6. Growth kinetics: Effect of pH & Temp
7. Media Formulation
8. Sterilizer Design- TDP, TDT
9. Cell and Enzyme immobilization
10. Visit to Fermentation Industry

B.Sc. Biotechnology V – Semester**BTT.5.4: Animal and Plant Development****Marks : 80****Hours : 50**

Objective: To provide an understanding of basics of gametogenesis, fertilization, stem cells, cloning & embryogenesis and developmental biology aspects in plants & animals.

Unit -I: Animal Development

Gametogenesis, Fertilization, Development: Types and patterns of cleavage, Blastulation, Gastrulation, Neurulation, Organogenesis and Growth in frog and chick. Concepts of competence, determination, commitment and differentiation, dedifferentiation, redifferentiation, transdifferentiation.

Unit-II: Animal Development & Stem Cell

Role of gene/s in patterning and development. Concept of Stem cells, Progenitor cells, cell lineages in plants and animals. Ageing and apoptosis, abnormal development and teratogenesis in plants and animals:

Unit -III: Plant Development

Embryogenesis in plants Male and female gametophyte development, Fertilization, Gametogenesis, Seedling development: Photomorphogenesis, Meristem structure and activity, Organ development: shoot and root patterning, floral patterning in Maize and Arabidopsis. Plant hormones role in development.

Unit –IV :Methods in Development Biology

Developmental plasticity in plant and animal development. Embryo culture and preservation, sperm bank, Cloning in mammals: Dolly and other mammals. *in vitro* fertilization, concept of test tube baby. Transgenic technology and applications in plants and animals: Conservation, Hybrids and GMOs.

Text & Reference:

1. An Introduction to Embryology - B.I. Balinsky
2. Development Biology - S.F. Gilbert- Sinauer Associates
3. Developmental Biology-Shastri and Shukla- Rastogi Publication
4. Developmental Genetics- G.S. Miglani- IK International
5. Chordate Embryology- Varma and Agarwar- S.Chand
6. Chordate Zoology- Jordan Varma- S.Chand
7. Plant Anatomy- B.P. Pande- S.Chand
8. Text book of Angiosperms- B.P. Pande- S.Chand
9. Developmental Biology - S.C. Goel
10. Developmental Biology – Wolpert
11. Embryology of Angiosperms – S.S. Bhojwani and S.P. Bhatnagar
12. An Introduction to Plant Cell Development – J. Burgess

Practical:

1. Study of different types of animal eggs
2. Study of staging & staining of Chick embryos
3. Study of frog development, observation of frog embryo different development stages
4. Study of different types of sperms by smear preparation.
5. Frequency of genetic traits in human
6. Study of Sex-linked inheritance, Multiple allelism
7. Study of plant development and role of hormones in plant development
8. Development of male and female gametophytes
9. Developmental stages during plant Embryogenesis
10. Analysis of histochemical changes during transition of vegetative shoot to reproductive apex
11. Histochemical analysis of the activity of cambium
12. Visit to Sperm bank/ IVF centre

B.Sc. Biotechnology VI-Semester**BTT.6.1: Pharmaceutical Biotechnology****Marks 80****Hours: 50**

Objective: To enable students to understand the role of secondary metabolites in pharmaceutical industries and to provide knowledge on drug designing & delivery.

UNIT -I : Secondary Metabolites.

Introduction to Secondary Metabolites. Types and Medicinal Applications of Secondary metabolites. Production of Secondary metabolites in Plants Through hairy Root Culture. Factors affecting Secondary metabolite production (Precursors, Growth Factors and Nutrients)

UNIT-II : Chemotherapy

Types of Antibiotics: Classification of antibiotics with example. General characteristics of an Antimicrobial Drug. Mechanism of action of antimicrobial agent (General account). Microbial Resistance to antibiotics and antimicrobial agents (Types and Mechanism). Application of antibiotics in various fields. Assaying antimicrobial activity: Principle and Methods of microbial assay (MIC and Different types of agar diffusion.)

UNIT-III: Chemotherapeutics Agents

Structure, Mechanism of Action and Applications of Antibacterial drug: Sulfonamides, Quinolones. Antiviral drug: Amantadine, Azidothymidine. Antifungal drug: Nystatin, Griseofulvin. Mechanism of action of Anticancer drugs, Drugs acting on CNS, Insulin, Blood factor VIII.

UNIT IV: Protein Engineering and Drug Discovery

Protein engineering: Principles and Application. Discovery and Development: History, drug targetting, Molecular Biology and Combinatorial drug discovery, Rational Drug designing. Concept of Pharmacokinetics, Pharmacodynamics. Drug delivery systems, Liposomes. Introduction to Indian and International Pharmacopoeia. Chemoinformatics

Text & References :

1. Gupta P.K. - Biotechnology and Genomics, Rastogi Publication.
2. Hugo W. B. and Russell A. D. - Pharmaceutical Microbiology -Wiley India
3. FSK Barar- Pharmaceutical- Essentials of Pharmaceuticals- S.Chand
4. S.P. Vyas, Dixit- Pharmaceutical Biotechnology-CBS
5. B.Razdan-Medicinal Chemistry-CBS
6. Satoskar, Bhandarkar- Pharmacology and Pharmacotherapeutics- Popular
7. Purohit, Saluja- Pharmaceutical Biotechnology-Student Edition
8. M. Doble- Drug Designing-McGraw Hill
9. Ed. R.H. Thomson-Chemistry of Natural Products-Springer
10. Ashutosh Kar-Pharmacology and Pharmacobiotechnology-New Age
11. Jogdand S.N - Biopharmaceuticals, Himalaya Publishing
12. Ramawat K.G; Merillon J.M - Biotechnology: Secondary Metabolites-Oxford

Practical:

1. Estimation of penicillin/streptomycin by chemical assay.
2. Estimation of penicillin/streptomycin by biological assay.
3. Assay of antimicrobial activity of Penicillin, Chloramphenicol, streptomycin
4. Determination of Minimum Inhibitory Concentration (MIC) of Antibiotic
5. Determination of shelf life of antibiotics (Expired drugs)
6. Bioassay of antifungal compounds
7. Testing of antibiotic resistance
8. Sterility testing of commercial pharmaceuticals.
9. Sterility testing of injectable as per IP.
10. Effect of chemical disinfectant on growth of bacteria
11. Study of microbial spoilage of pharmaceuticals.
12. Visit to Pharmaceutical industry

B.Sc. Biotechnology VI Semester
BTT.6.2: Industrial Biotechnology Marks: 80 Hours : 50

Objective:

To provide knowledge of many procedures in industries, role of microorganisms in industries and techniques used to improve product formation in industries.

UNIT- I : Strain Improvement

Selection of Mutants producing improved level of Primary Metabolites with suitable Example.
 Isolation of mutants which do not produce feedback inhibitors or repressors. Mutants that do not recognize presence of inhibitors or repressors. Modification of Permeability.

UNIT - II : Down Stream Processing.

Removal and Recovery of cell mass (Precipitation, Filtration and Centrifugation)
 Cell disruption - Physical and Chemical methods. Purification of Product Liquid-liquid extraction : Solvent Recovery. Chromatography : Adsorption, Ion-exchange, HPLC
 Membrane processes: Ultrafiltration and Reverse Osmosis. Drying and Crystallization.

UNIT -III : Fermentation Processes.

Fermentation processes: Microorganisms involved, Inoculum preparation, Medium used and product Recovery. Enzyme: Protease, pectinase. Organic acid: Citric acid. Antibiotic: Penicillin, erythromycin. Vitamin: Vitamin B12, vitamin B2.

UNIT- IV : Quality Control, Process Economics and GLP.

Sterility testing. Pyrogen testing. Carcinogenicity testing. Toxicity testing.
 Fermentation Economics: Cost Estimates ,Process Design ,Capital Cost Estimates, Operating Cost Estimates. Concept of QC, QA, Good Laboratory Practices, GMP.

Text & References :

1. Casida L.E - Industrial Microbiology- New Age
2. Crueger W and Crueger A - Biotechnology: A Textbook of Industrial Microbiology-Panima Publishing
3. Patel A.H. - Industrial Microbiology, Macmillan India
4. Peppler H.J and Perlman D - Microbial Technology, Vol I and II-Elsevier
5. Stanbury P.F., Whitaker A. and Hall S.J - Principles of Fermentation Technology-Elsevier
6. Prescott and Dunn's - Industrial Microbiology-CBS
7. Ed. G. Subramaniam- Bioseparation & Bioprocessing - Wiley -VCH
8. Product Recovery in Bioprocess Technology, 'BIOTOL series, Butter worth Heinemann 1992
9. Paul A. Belter, Cussler- Bioseparation : Downstream Processing for Biotechnology - Academic Press
10. Larl Schuger-Solvent Extraction in Biotechnology - Spinger
11. Roger Harrison-Bioseparation Science & Engineering-Oxford
12. N.K. Prasad-Downstream Process Technology-PHI

Practical:

1. Isolation and Screening of Industrially important Microbes-Acid, Antibiotics, Enzymes
2. Isolation & identification of bacteria from different milk & water samples.
3. Fermentative production purification and estimation of antibiotics/ vitamins
4. Fermentative production purification and estimation of Citric Acid
5. Fermentative production purification and Estimation of alcohol. using *Sacharomyces cerevisiae*
6. Estimation of fermentative product (Acetic acid from vinegar).
7. Qualitative estimations of fermentation products by analytical instruments
8. Wine production & estimation of alcohol
9. Immobilization of whole cells of yeasts in calcium alginate gel.
10. Production of cheese using different substrate fro microorganism.
11. Study of fermentation economics with any one example
12. Visit to Fermentation Industry

B.Sc. Biotechnology VI- Semester
BTT.6.3: Environmental Biotechnology Marks : 80 Hours : 50

Objective: To understand aspects of environmental science and techniques implemented to solve environmental problems.

UNIT- I : Waste Water Treatment.

Domestic (Municipal) and Industrial Waste Water Treatments: Primary, Secondary and Tertiary. Important microorganisms in waste water treatment, Principles of their growth and Plasmid Borne Metabolic Activities. Aerobic Biological Treatments: Activated sludge process Rotating Biological Contactors. Anaerobic Biological Treatments: Air Lift Membrane Bioreactors Packed Bed (Column Reactor.)

UNIT- II : Biodegradation techniques

Biodegradation: Definition and Concept, Ready Biodegradation, Ultimate Biodegradation and Inherent Biodegradation. Aerobic and Anaerobic degradation pathways in Microbes. Biodegradation of Hydrocarbon with Suitable Example. Concept of Municipal Solid Waste management

UNIT -III : Bioremediation

Introduction, Definition and Concept, Methods of Bioremediation (*in situ* and *ex situ* Methods) Bioremediation of Soil (Saline Soil and Alkaline Soil) Phytoremediation: Concept and Types. Applications of Bioremediation.

UNIT –IV: Xenobiotics

Xenobiotics and Recalcitrancy. Xenobiotics Degradation: Pesticide Degradation (Principle with suitable example) Herbicide Degradation (Principle with suitable example) Metabolism of Xenobiotics: Cytochrome P450 System, Phase I, Phase II, Metabolic reactions

Text & References :

1. Asthana D.K. and Asthana M.,-Environment : Problems and Solutions- S. Chand
2. Chatterji A.K., Introduction to Environmental Biotechnology, Prentice Hall of India Pvt. Ltd
3. Jogdand S.N.- Environmental Biotechnology- Himalaya Publishing House
4. Kalaichelvan P.T., I Arul Pandi- Bioprocess Technology, MJP Publishers
5. Murugesan A. G.and Rajakumari C-Environmental Science and Biotechnology: Theory &Techniques, MJP
6. Rajendran, Gunashekar- Microbial Bioremediation-MJP
7. Hammer & Hammer-Water & Waste water Technology-PHI
8. Metcaf & Eddy-Waste water Engineering-TMH
9. Indushekar Thakur- Environmental Biotechnology-I K International
10. P. Mohapatra-Text book of Environmental Biotechnology-I K International
11. Rittmann B. E. And McCarty P. L.- Environmental Biotechnology Principles & Applications, McGraw Hill

Practical

1. Determination of Dissolved Oxygen and Biological Oxygen Demand of polluted water.
2. Determination of Chemical Oxygen Demand of polluted water.
3. Bacterial Examination of Water by MPN Test: Presumptive and Confirmed Coliform test.
4. Determination of soil pH and Total organic carbon.
5. Determination of Total Carbohydrates and Phosphorus of soil.
6. NPK determination of soil samples
7. Determination of Alkalinity and Hardness of water.
8. Demonstration of Total Nitrogen estimation by Kjeldahl's Method.
9. Biodegradation of polymer compounds
10. Biodegradation of textile dyes
11. Visit to STP, MSW treatment/ Industrial effluent treatment plants.

B.Sc. Biotechnology VI Semester
BTT.6.4: An Introduction to Bioinformatics Marks:80 Hours : 50

Objective: To provide information on understanding of computational biology, Role of information technology and computer techniques for data generation, data mining and to solve problems in biology

Unit –I : Basic of Bioinformatics

Definitions; History of Bioinformatics; Bioinformatics in business; Scope.

Internet and Bioinformatics: Fundamentals of Internet: www; HTML; URL, Browsers, Search engines, Super computers and Bioinformatics, Omics Concepts: Genomics, Proteomics, Transcriptomics, Metabolomics, Pharmacogenomics etc.

Unit-II: Biological Database and data retrieval

Database: Types of Database; biological databases, NCBI; EMBL; DDBJ; PDB; SwissProt; TrEMBL. Information retrieval from biological databases: Entrez; GenBank; PubMed; PLOS, PubChem, SRS.

Unit -III: Sequence visualization & Analysis

The Human Genome Project, Sequence alignment tools, Pair wise and multiple sequence alignment, Bioinformatics and Human diseases, Problem Solving: Genomic analysis of DNA Protein sequence analysis. Similarity searching, Protein structure visualization and prediction

Unit –IV: Applications of Bioinformatics

Drug Discovery and Development: Computer aided drug designing, Molecular medicine, Comparative studies, Evolutionary studies, Microbial genome application, personalized medicines, Gene Therapy Forensic analysis etc.

Text & Reference:

1. S.C Rastogi, Namita Mendirata, Parag Rastogi. -Bioinformatics Concepts Skills and Applications- CBS
2. Arthur M. Lesk -Introduction to Bioinformatics- Oxford University Press.
3. Jin Xiong- Essentials of Bioinformatics- Cambridge
4. David Mound- Bioinformatics Sequence and Genome analysis-CBS
5. Bultinck Winter- Computational Medicinal Chemistry for Drug Discovery- CRC
6. Attwood Parry smith- Introduction to Bioinformatics-Pearson
7. Clavene J.M and Notredame C - Bioinformatics: A Beginner's Guide-Wiley-
8. Rashidi H.H and Buahler L.K - Bioinformatics : Applications in Biological Science and Medicine-CRC
9. Satyanarayana U. (2007), Biotechnology, Books and Allied Pvt.Ltd.
10. Bergeron-Bioinformatics Computing- PHI

Practical:

1. Demonstration of various domains (search engines) for bioinformatics through Internet.
2. Concept of Databases: accessing database.
3. Literature search by Pubmed, PLOS
4. Searching for gene and protein sequences and accessing information from web.
5. BLAST - pair wise seq. alignment
6. Structure visualization Rasmol, J Mol, Rastop, Deep View etc
7. Working with biology workbench- Multiple Seq. alignment using Clustal-W, EMBOSS
8. Finding consensus sequences using - Texshade, Boxshade, Clustal dist
9. Phylogenetic analysis - using Dendrograms
10. Protein structure prediction - Primary, Secondary, Tertiary structure using EXPASY Tools

B.Sc. Biotechnology VI Semester

BTP 6.2 : Lab Course 12 (Project Work)

Marks-100

Guidelines for project work

1. The projects will be allotted during V semester
2. Students will design experiment of project under guidance of supervisor
3. Selection of topic relevant to priority to areas of biotechnology
4. Collection of literature from various sources
5. Planning of research experiments
6. Performing the experiments with scientific and statistical analysis
7. Project writing and compilation of report
8. Presentation of experimental data in schedule of practical examination
9. Project to be carried out individually or in group of three students maximum