Mahatma Phule Shikshan Sanstha's

Karmaveer Bhaurao Patil College, Urun- Islampur

Department of Biotechnology (Entire)

B.Sc. I

SEM I

Course I: DSC BT-I : Basics in Biotechnology

Students should be able to understand

- Basic concepts in biotechnology
- About the biotechnology institute in India.
- Different areas in biotechnology .
- Role of Biotechnology in Human welfare

Course I: DSC BT-II: Basics in Microbiology

After completing the credits students should gain knowledge about:

- Milestones in Microbiology,
- Cytology of Prokaryotic and Eukaryotic Cell structure and function, and the differences between these cells
- Characteristics of viruses and lytic cycle
- Class of microorganisms according to Microbial nutrition
- Nutritional requirement of micro organism
- Basic components of Nutrient medium and their role
- Principles of sterilization
- The Principles and procedures of staining microorganisms

Course I: DSC BT Practical I: Techniques in Microbiology (2 Cr)

- Student is expected to use independently various instruments with proper care.

- Student should get the knowledge of basic spectroscopic and chromatography techniques.
- Students know the various staining procedures and their applications.
- Students get the knowledge of culture media preparation, microbial cultivation and enumeration.
- Students know how to isolate bacteria and study their cultural and morphological characteristics

Course II: DSC BT-III: Biomolecules

Student should understand:

- Basic concepts and experiments about origin of life,
- Concept of buffer and its importance in biological system,
- Fundamentals of biochemistry i.e. Nucleic acid, carbohydrates and lipids,
- Structure, function, properties and types of nucleic acids,
- Classification, structure and function of carbohydrates
- Classification, structure and function of lipids
- Basics of chemical science in relevance to biological systems

Course II: DSC BT-IV: Chemical Science I

Student should understand:

- Basic concepts and experiments about chemistry.
- Concept of electrochemistry and thermodynamics.
- Structure and bonding.
- Basics of coordination complex and organic reaction.

Course II: DSC BT Practical II: Techniques in Chemistry (2 Cr)

- At the end of this module, student is expected to know simple chemistry techniques .
- Models should bring clarity in concepts of titration.
- Organic and inorganic preparations.
- Process of estimations.

Course III: DSC BT-V Plant Developmental Biology

Students should be able to understand

- Plant and animal development.
- Embryology of plants and animals.
- Differentiation and regeneration.

Course III: DSC BT-VI Bio techniques and Instrumentation

- Student should be able to understand basic concepts of Instruments and its Application
- To be able to apply this knowledge in the laboratory
- Student should able to handle instruments during project.
- Student should understand principle behind the instruments.
- Student should understand different staining methods in biological world.

Course III: DSC BT Practical III: Laboratory Exercises in Instrumentation (2 Cr)

- Student is expected to use independently various instruments with proper care.
- Student should get the knowledge of basic spectroscopic and chromatography techniques.

SEM II

Course I: DSC BT-VII: Basics in Cell Biology

- After completing the credits students should gain knowledge about:
- Basic concepts of Cell and sub cellular structures
- Basic Concept of Cytoskeletal assembly.
- Basic Concept of Cell membrane and membrane transport

Course I: DSC BT-VIII: Advances in Microbiology

- After completing the credits students should gain knowledge about:
- Basic concepts of microbial nutrition, growth and control

- Basic techniques of pure culture isolation and preservation of microbes.
- Bacteriological analysis of water
- Types of microorganisms in soil and their application.
- Basic terms in medical microbiology

Course I: DSC BT Practical-IV: Techniques in Biological Sciences (2 Cr)

Students should be able to acquaint:-

- The basic and advanced knowledge of plant and animal embryo.
- Basic knowledge of pollen germination.
- Develop the skill isolation of organelles

Course II: DSC BT-IX- Proteomics

Student should be able to

- Understand fundamentals of biochemistry.
- Understand basics of chemical science in relevance to biological systems. ϖ
- Learn basic concepts of amino acids, proteins.
- Understand the basic methods to determine structure of protein and protein purification.
- Should be able to relate it to day today life

Course II: DSC BT-X: Chemical Science II

Student should understand:

- Basic concepts and experiments about chemistry.
- Concept of electrochemistry and thermodynamics.
- Structure and bonding.
- Basics of coordination complex and organic reaction.

Course II: DSC BT Practical-V : Techniques in Biochemistry (2 Cr)

- At the end of this module, student is expected to know simple applied chemistry and Biochemistry techniques for detection of common yet important analytes.
- Models should bring clarity in concepts of conformations of biomolecules.

- Standardization and calibration of pH meter.
- Models should bring clarity in concepts of conformations of biomolecules.
- Standardization and calibration of conductivity meter.
- Qualitative analysis of various biomolecules.

Course III: DSC BT-XI Animal Developmental Biology

- Students should be able to understand
- Plant and animal development.
- Embryology of plants and animals.
- Differentiation and regeneration.

Course III: DSC BT -XII Basics in Computer Science and Biostatistics

- Student should be able to understand basics of computer & Operating System.
- Student should get Knowledge of Data processing and presentation.
- Student should be able to understand database management.

Course III: DSC BT Practical-VI: Laboratory Exercise in Computer Science and Biostatistics (2 Cr)

- At the end of this module, student is expected to know simple applied statistics
- It should give basic knowledge about Frequency distribution.
- They should be able to test hypothesis.
- Students get the basic knowledge about the handling of various computer tools and software.
- Students get knowledge to handle Microsoft Word and Microsoft Excel.
- Students use and prepare presentation by using Microsoft power poit presentation tool.

B. Sc. II

SEM III

Genetics

- To study Mendel's law of Inheritance, Dominance and recessiveness and interaction of gene.
- To know linkage, linkage groups, crossing-over, structural and numerical changes in chromosomes.
- To study maternal effect and extra chromosomal inheritance.
- To study transposable elements, plasmid, genetic recombination in bacteria and mechanism of recombination.

Immunology

- To study immune system of humans.
- To get the knowledge of types of immunity, types of defense systems.
- Introduction to cells and organs of immune systems

Enzyme Biotechnology

- Upon successful completion of this course, students should be able to:
- explain relationship between the structure and function of enzymes;
- explain how enzymes are able to increase speed of an biochemical reaction in sense of thermodynamics, kinetics and molecular interactions;
- use catalytic strategies in interpreting mechanisms of enzymatic action;
- interpret and explain significant mechanisms of regulation of enzymatic action and specifies importance of enzymes in regulation of metabolism; apply appropriate methods for determination of catalytic parameters and activity of enzymes and resolve problems considering kinetics and thermodynamics of enzymatic reactions;
- Analyze options for applying enzymes and their inhibitors in medicine and various industries; apply theoretical, practical, IT and statistical knowledge during processing experimental results and their correct interpretation.

Molecular Biotechnology I

- To study concepts of molecular biology such as DNA as genetic material, properties and functions of DNA and organization of genome.
- To study molecular events such as replication, mutation and DNA repair.

Practical SEM III

Techniques in Molecular Biology

- It deals with understanding the molecular aspects of the biology.
- It majorly emphasizes the concepts of central dogma of molecular biology spanning from
  DNA Replication till Protein Synthesis and Reverse transcription.
- It also helps in understanding the concepts of cellular function

Techniques in Genetics & Immunology

- It also helps students to learn the molecular aspects of genetic disorders and mutations.
- It helps the students to appreciate the concepts of gene and relationship between genotype and phenotype
- This course provides you with knowledge and understanding of immunology and the way
- it is applied in diagnostic and therapeutic techniques and research.
- It trains the students with essentiality of molecules, cells, tissues, and organs involved in the defense mechanism

VSC I Environmental Biotechnology

- Awareness of environmental problems and solution.
- To study water pollution, air pollution and soil pollution.
- To study environmental toxicology, environmental quality assessment and monitoring.
- To get the knowledge of bioremediation techniques.

SEM IV

Advances in Cell Biology

- To study concepts of secretary pathway, protein trafficking and cell signaling.
- To get the knowledge of cell division cycle, cell division types –amitosis, mitosis, and meiosis.

Physiology and Metabolism

- To study fundamentals of Plant Biochemistry like plant water relation, photosynthesis.
- To study role of nitrogen in plants and nitrogen metabolism.
- To get the knowledge of plant hormones such as auxin, cytokinin, and gibberlin.
- To study plant growth, phases of growth curve.

Molecular Biotechnology II

- To study molecular events such as transcription and translation in prokaryotes and eukaryotes.
- To study genetic code and regulation of gene expression in prokaryote and eukaryote.

Industrial Biotechnology

- To get the introduction of industrial biotechnology.
- To study basic design of fermenter and its types.

To get the knowledge of downstream process and product recovery

Practical SEM IV

Techniques in Industrial Biotechnology

- The course aims to provide fundamental insights to exploit microbes for manufacturing of products which have huge industrial significance.

- The course blends science and engineering with various biochemical processes to obtain products such as food, chemicals, vaccines, medicine
- At the end of the course, the student will have a better appreciation for the role of microbes in industry using technology

Techniques in Metabolism and Enzymology

- The paper provides the structural and functional role of cell organelles and cell membrane at the biological level.
- Students will be exposed classification, biochemical and required quantities of nutrients in diet.
- It helps students to understand the nutritive roles of macro and micro nutrients.

B.Sc. III

SEM V

DSC BT E 1 Basics in Genetic Engineering

- To study fundamentals of r-DNA technology and various tools used in r-DNA technology.
- To get the basic knowledge of cloning vectors and their types.
- To study DNA sequencing and blotting techniques.

DSC BT E 2 Industrial Biotechnology

- To get the introduction of industrial biotechnology.
- To study basic design of fermenter and its types.
- To get the knowledge of downstream process and product recovery.

DSC BT E 3 Application of Biotechnology in Agriculture

- To study fundamentals of Agriculture Biotechnology such as crop improvement, somatic hybridization, artificial seed and germplasm preservation.
- Awareness of GM crops, GM foods and molecular farming and ethical and social aspects.
- To study Biofertilizers and Biopesticides.

DSC BT E 4 Nano biotechnology

- This is an interdisciplinary and emerging area
- The students are taught the basics of nanotechnology and their applications
- The course introduces the students to the new and novel applications to solve biomedical problems through nanotechnology

DSC BT F 1 Advances in Genetic Engineering

- To study advanced techniques in r-DNA technology like c-DNA, genomic library, isolation of desired gene.
- To study PCR and its applications.
- To study gene cloning and applications of r-DNA technology.

DSC BT F 2 Food and Microbial Biotechnology

- To get the knowledge of fermented foods and beverages.
- To study food spoilage and preservation techniques.
- Awareness of impact of food on human health.

DSC BT F 3 Application of Biotechnology in Health

- To study Biotechnology applications in health like application of animal cell culture in transgenic technology.
- To study practices for vaccine production.
- To get the knowledge of monoclonal antibodies and hybridoma technology.
- Awareness of forensic medicines and public health.

DSC BT F 4 Bioinformatics

- To study basics of Bioinformatics.

- To study tools for protein function analysis, homology and similarity, structure analysis.
- To get the knowledge of sequence analysis, BLASTA, FASTA, Clustal W, EMBOSS.
- To study applications of Bioinformatics.

Practical

DSC BT P 11 Techniques in Genetic Engineering and Bioinformatics

- This allied paper introduces the students to concepts in bioinformatics
- The student will be able to apply basic principles of biology, computer science and mathematics to address complex biological problems

DSC BT P 12 Techniques in Industrial Biotechnology

- The course aims to provide fundamental insights to exploit microbes for manufacturing of products which have huge industrial significance.
- The course blends science and engineering with various biochemical processes to obtain products such as food, chemicals, vaccines, medicine
- At the end of the course, the student will have a better appreciation for the role of microbes in industry using technology

DSC BT P 13 Techniques in Agricultural and Health Biotechnology

- The student at the end of the course would have gained knowledge about microbial associations with soil and plants, plant diseases and their management, water treatment techniques and solid waste recycling

DSC BT P 14 Project

- Use research-based knowledge and research methods in the field of Biotechnology engineering to conduct experiments, analyze and interpret the data, design the equipments and processes as per the specifications and needs of biotech industries.

HEAD
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