

DEPARTMENT OF BIOTECHNOLOGY

PROGRAM OUTCOMES

B.Sc.

At the end of the Program, the students will be able to

PO1: Categorize various domains of biotechnology

PO2: Execute the laboratory skills in biotechnology

PO3: Implement the communication skills effectively

PO4: Interpret biological data

PO5: Apply independent thinking ability in industry

PO6: Operate the entrepreneurship skills

Department of Biotechnology

Program Specific Outcomes

B.Sc.

At the end of the program, the students will be able to

PSO1: Interpret various biotechnological concepts and diverse applications

PSO2: Exemplify practical oriented skills to meet the demands of industry, academia and society.

PSO3: Implement the concepts and research approaches in the field of advanced biotechnology

DEPARTMENT OF BIOTECHNOLOGY

B.Sc. BIOTECHNOLOGY

COURSE OUTCOMES

Semester - I

Course Title: Cell Biology

CODE: SAC1A

At the end of the course students will be able to

CO-1

Interpret the Taxonomy and Classification of Organisms and cellular organisation into higher structures.

CO-2

Describe the Molecules of life, Architecture of cells and differentiation

CO-3

Explain the cellular transcription and translation

CO-4

Illustrate the Cell cycle phases in mitosis and meiosis and Cell cycle check points

CO-5

Compare cell to cell connections taking place through Cell junctions, Extra Cellular Matrix and Signal transduction pathways

CO-6

Summarize the world of cell, their communication and their organization

Course Title: Microbiology

CODE: SBANA

At the end of the course, Students will be able to

CO-1

Summarize the concepts and applications of fermentation technology.

CO-2

Infer bacterial growth curve, concepts of bacterial classification.

CO-3

Describe production of various dairy products like cheese, butter, koumiss etc

CO-4

Summarize microbial products such as biosurfactants, biofertilizers, biopesticides in industry

CO-5

Connect the structure and uses of *Streptomyces* and *Penicillium*

CO-6

Summarize the role of microorganisms that aid the industries.

Semester - II

Course Title: Molecular Developmental Biology

CODE: SAC2B

At the end of the course, Students will be able to

CO-1

Describe the mechanism of cell cycle, checkpoints, signalling pathways.

CO-2

Explain the lifecycle and development process of slime mould, *C.elegans*

CO-3

Elaborate the myogenesis in mammals, Mitogens and Oncogenes.

CO-4

Compare Neurogenesis in Drosophila, Mice, Regional specification in Drosophila

CO-5

Define Embryogenesis, Mammalian homologs in Drosophila ANT-C and BC-X.

CO-6

Examine cell differentiation and development in organisms.

Semester - III

COURSE TITLE: Genetics

CODE: SAC3A

At the end of the course, Students will be able to

CO – 1

Summarize basic concepts of gene, DNA and chromosome and transfer of genetic material

CO – 2

Describe Mendel and his experiments and also the significance of allele.

CO – 3

Explain about the mechanism of linkage in Maize and Drosophila and the factors affecting it

CO - 4

Relate the DNA transfer mechanisms and genetic alterations of cell.

CO - 5

Elucidate the Human Genome project, variations and speciation.

CO - 6

Infer various causes of mutation

COURSE TITLE: Biochemistry

CODE: SBC3A

At the end of the course, students will be able to

CO-1

Summarize the basic concepts of carbohydrates and its energy production in cells

CO-2

Categorize the overview of all amino acids structure and structural organisation of proteins.

CO-3

Define the Lipids, fats and lipoproteins & metabolic pathways related to lipids and fatty acids

CO-4

Examine nucleic acids, vitamins and eicosanoids and their function in body.

CO-5

Outline the importance of enzymes in all metabolic pathways, enzymatic action

CO-6

Memorize the various biomolecules, their structure, classification and metabolism.

Semester - IV

COURSE TITLE: Plant Biotechnology

CODE: SAC4A

At the end of the course, Students will be able to

CO-1

Describe the plant genome

CO-2

Infer crown gall tumours and Rhizobia

CO-3

Summarize the plant seed store proteins and development of vaccines using plants

CO-4

Compare different phytohormones & their biological roles

CO-5

Execute plant tissue culture technique

CO-6

Discuss about transgenic plants and applications

COURSE TITLE: Biophysics and Biostatistics

CODE: SAC3A

At the end of the course, Students will be able to

CO – 1

Summarize scope and methods of biophysics, levels of molecular organization, structure of protein molecules

CO – 2

Describe about analysis of protein and their interaction, protein and nucleic acid interaction.

CO – 3

Explain the collection, classification, and tabulation of statistical data, graphs, plots, curve and sampling methods, errors

CO - 4

Relate the measure of central tendency, dispersion, skewness, kurtosis, correlation and regression

CO - 5

Illustrate probability distributions, binomial distributions, tests of significance, ANOVA, spread sheets and word process

CO - 6

Correlate about scope of biophysics and applications of biostatistics.

Semester - V

Course Title: Animal and Medical Biotechnology

CODE: SAC5A

At the end of the course, Students will be able to

CO-1

Summarize the concept of ART in animal breeding and IVF technology

CO-2

Infer human pathogens and diagnose microbial diseases

CO-3

Explain hybridoma technology and its applications

CO-4

Interpret the principle and working of vaccines, their various types and production process

CO-5

Discuss about cloning, r-DNA Technology and animal cell culturing.

CO-6

Summarize the production of transgenic animals and plants and its applications

Course Title: Bioinformatics

CODE: SAC5B

At the end of the course, Students will be able to

CO-1

Summarize the concepts of biomolecular sequences and identification, Gene prediction and human genome project

CO-2

Validate the technologies involved in gene therapy, transgenic animals

CO-3

Discuss about cancer and cancer causing genes, bioinfo tools in expression analysis.

CO-4

Interpret the process, applications, tools involved in microarray.

CO-5

Infer the protein databases and softwares for protein structure prediction.

CO-6

Interpret various biological databases and bio informatics tools.

Course Title: Immunology

CODE: SAC5C

At the end of the course, students will be able to

CO-1

Classify the different antigens, their purification and characterization.

CO-2

Compare the isolation procedure of various immune cells.

CO-3

Describe the hybridoma technology, purification and quantification of antibodies.

CO-4

Explain the hypersensitivity reactions and HLA typing.

CO-5

Illustrate the cytokines, DNA vaccines and infectious diseases

CO-6

Experiment the different immunotechniques and immune cells.

Course Title: Pharmaceutical Biotechnology

CODE: SEC5A

At the end of the course students will be able to

CO-1

Explain the basic concepts of pharmaceutical biotech and microbes involved in formulation of drugs and delivery of protein based drugs.

CO-2

Compare Pharmacokinetics and Pharmacodynamics with examples on Biogeneric drugs and therapeutic proteins

CO-3

Summarize the therapeutic proteins and somatic gene therapy

CO-4

Connect the Pharmaceutical and pharmacodynamics of biotech drugs and an outline of clinical development of drugs

CO-5

Assess the advanced biotechnology products in clinical development and Xenotransplantation

CO-6

Summarize the Applications of biotechnology in pharmaceutical industries

Semester - VI

Course Title: Genetic Engineering

CODE: SAC6A

At the end of the course, students will be able to

CO-1

Explain the fundamentals of gene cloning process

CO-2

Execute the selection and screening of recombinants and information of the RFLP

CO-3

Discuss the ligase chain reaction and their principle

CO-4

Describe the various applications of expression systems

CO-5

Examine the applications of Genetic engineering in Forensics, Agriculture and Medicine.

CO-6

Interpret the various genetic tools useful in gene manipulation and cloning.

Course Title: Bioprocess Technology

CODE: SAC6B

At the end of the course, students will be able to

CO-1

Outline the upstream and downstream process in fermentation.

CO-2

Comment the aerobic and anaerobic fermentation conditions and their products.

CO-3

Describe the kinetics of enzyme-catalyzed reactions and medium requirements in fermentation.

CO-4

Investigate the stoichiometric analysis of cell growth and product fermentation.

CO-5

Relate the kinetic models for growth and non-growth associated product formation.

CO-6

Explain the fermentation conditions and its importance in the industries.

Course Title: Microbial Biotechnology

CODE: SEC6A

At the end of the course, Students will be able to

CO-1

Describe about history and scope of microbial biotechnology, microbial diversity and its uses.

CO-2

Infer knowledge on microbial production of enzymes and organic solvents

CO-3

Analyse wine and beer production from microbes.

CO-4

Discuss about the biofertilizers, biopesticides and biomass production

CO-5

Summarize biodegradation and bioremediation using microbes.

CO-6

Classify the usage of microbes in various industries

Course Title: Environmental Biotechnology

CODE: SEC6B

At the end of the course students will be able to

CO-1

Define environmental biotechnology and various types of reactors

CO-2

Interpret soluble microbial products and inert biomass and linking stoichiometric equations

CO-3

Demonstrate reactors and its types.

CO-4

Outline bioremediation and environmental contaminants and strategies for evaluating bioremediation

CO-5

Examine the remediation of petroleum industry, paper industry, and chemical industry waste

CO-6

Summarize the importance of various processes involved in environmental biotechnology

DEPARTMENT OF BIOTECHNOLOGY

PROGRAM OUTCOMES

M.Sc.

At the end of the program, the students will be able to

PO1: Solve the issues related to Biotechnology Industry, Pharma industry, Medical or hospital related organizations through the experimental techniques

PO2: Interpret the issues related to environmental Biotechnology and sustainable development.

PO3: Execute communication skills in healthcare, industry, academia and research

PO4: Interpret data generated from research work for practical applications

PO5: Evaluate the different IPR and Ethical issues related to practical and research aspects in biotechnology

PO6: Identify research problems independently in specialized area of Biotechnology

Department of Biotechnology

Program Specific Outcomes

M.Sc.

At the end of the program, the students will be able to

PSO1: Operate biotechnology techniques and advances in medical, microbial, environmental, bioremediation, agricultural, plant, animal and forensic sciences.

PSO2: Infer professional ethics in order to address global and societal issues for sustainable development through biotechnology solutions

PSO3: Integrate research aptitude and skills for innovative research in biotechnology sciences.

DEPARTMENT OF BIOTECHNOLOGY

M.Sc. BIOTECHNOLOGY

COURSE OUTCOMES

Semester - I

Course Title: Biochemistry

CODE: MDK1A

At the end of the course, students will be able to

CO-1

Discuss the advance concepts of carbohydrates of energy production in cells.

CO-2

Explain about classification of lipids, fatty acids and its metabolism

CO-3

Classify the bioenergetics and Biological oxidation of macromolecules

CO4

Describe about amino acids and Proteins, its degradation, inborn errors of metabolism

CO-5

Summarize on nucleic acids; salvage pathway, denovo pathway.

CO-6

Illustrate about biomolecules, their characteristics and their metabolisms.

Course Title: Molecular Genetics

CODE: MDK1B

At the end of the course, Students will be able to

CO-1

Relate the structure of genes and chromosomes

CO-2

Infer DNA replication, DNA repair, gene expression and mutation

CO-3

Summarize DNA repair mechanisms, *Xerodermapigmentosum*, chemically induced mutation, chromosomal Abnormalities and recombination - models.

CO-4

Describe about McClintok in maize, complex transposons, its mechanism and controlling sequences

CO-5

Discuss about allele frequencies and genotype frequencies, systems of mating, inbreeding, genetics and evolution, mutation and migration, random genetic drift.

CO-6

Interpret genetic mechanisms, organization and structures.

Course Title: Molecular Cell Biology

CODE: MDK1C

At the end of the course, Students will be able to

CO-1

Recognize the organelles of the eukaryotic cell, its functions and transport.

CO-2

Discuss the principle and applications of different microscopes, histochemistry, hybridization & cytometry techniques

CO-3

Infer the Eukaryotic DNA organization and DNA replication, transcription and post and co-transcriptional modifications.

CO-4

Infer cell signalling, Cancer development and tumour suppressor genes

CO-5

Explain the microfilaments, microtubules

CO-6

Summarize about the world of cell, cellular processes and cellular interactions.

Course Title: Bioinstrumentation

CODE: MDKAA

At the end of the course, Students will be able to

CO-1

Illustrate the principle and applications of Spectroscopic Techniques and different microscopes

CO-2

Execute the Radio-isotopic techniques, Immuno and blotting techniques, different types of centrifugation and chromatographic techniques

CO-3

Analyse the sequencing, electrophoretic and blotting methods

CO-4

Evaluate the types of spectroscopic techniques

CO-5

Classify the different radio-isotopic techniques

CO-6

Elucidate about the various techniques in biotechnology

Semester - II

Course Title: Microbiology

CODE: MDK2A

At the end of the course, students will be able to

CO-1

Illustrate the phenotypic, genotypic and different kingdom of the classification.

CO-2

Experiment the different staining techniques.

CO-3

Describe the nutritional requirements for microbial growth and culture techniques.

CO-4

Differentiate the lifecycle, pathogenesis, diagnosis and treatment of different parasites.

CO-5

Explain the role of microorganisms in primary and secondary metabolites production

CO-6

Summarize the various microbial interactions and practical implications

Course Title: Plant and Animal Biotechnology

CODE: MDK2B

At the end of the course students will be able to

CO-1

Define the various types and products of plant tissue culture method

CO-2

Compare plant transformation techniques.

CO-3

Present about animal health and diagnosis

CO-4

Distinguish the different types of animal cell culturing methods including karyotyping and cell growth

CO-5

Examine nuclear magnetic resonance and its applications.

CO-6

Summarize plant and animal biotechnology advanced techniques.

Course Title: Genetic Engineering

CODE: MDK2C

At the end of the course, Students will be able to

CO-1

Summarize the fundamentals in gene cloning

CO-2

Infer bacterial cloning vectors, the various types of phage cloning in vectors

CO-3

Discuss the cloning with *S. cerevisiae* and its life cycle, SV40 vectors, hybridization, probes and labelling of probes

CO-4

Experiment Molecular Techniques

CO-5

Describe non-viral gene transfer system in somatic gene therapy, Xenotransplantation

CO-6

Execute transformation and selection of recombinants in laboratory

Course Title: Pharmaceutical Biotechnology

CODE: MDKAE

At the end of the course, Students will be able to

CO-1

Explain the basic concepts and technologies in pharmaceutical biotechnology

CO-2

Infer about the DNA vaccines

CO-3

Relate about biogeneric drugs, therapeutic proteins, and Special pharmaceutical aspects

CO-4

Summarize about Pharmaceutical and pharmacodynamics of biotech drugs

CO-5

Describe somatic gene therapy, nonviral gene transfer system in somatic gene therapy

CO-6

Discuss Formulation of biotech products and their clinical development

Course Title: Environmental Biotechnology

CODE: MDKAG

At the end of the course, Students will be able to

CO-1

Analyse reactors, soluble microbial products, and inert biomass- special case biofilm solution

CO-2

Describe about Plug flow reactor with effluent recycles, linking stoichiometry to mass equations

CO-3

Articulate knowledge on both aerobic and anaerobic method of treatment, methanogenesis, microbial processes in reactors.

CO-4

Explain the detoxification mechanism how microbial metabolism in treatment process

CO-5

Infer knowledge on wastewater treatment and bioremediation

CO-6

Outline the pollution monitoring control through microbial processing

Semester - III

Course Title: Bioinformatics

CODE: MDK3A

At the end of the course students will be able to

CO-1

Memorize the various databases and tools of nucleic acids and proteins

CO -2

Compare various types of sequence alignment and alignment tools

CO-3

Relate genome maps and markers, protein structure prediction and classification

CO-4

Illustrate the procedure involved in microarray and its applications

CO-5

Assess the various types of drug designing

CO-6

Summarize the various databases and tools that are used in metabolic construction and application of bioinformatics

Course Title: Immunology

CODE: MDK3B

At the end of the course, students will be able to

CO-1

Compare the types of immunity and immune cells.

CO-2

Categorize the various immune cells involved in immune system and types of immunoglobulins.

CO-3

Explain the monoclonal antibody production, structure and function of MHC molecules

CO-4

Illustrate the hypersensitivity reactions and effector mechanisms in immunity.

CO-5

Experiment the different Immunotechniques.

CO-6

Conclude the functions of immune cells and the mechanism of immunity

Course Title: Bioprocess Technology

CODE: MDK3C

At the end of the course, students will be able to

CO-1

Comment the types of fermentation process and their application in industries.

CO-2

Relate the types of bioreactors and their role in metabolites production.

CO-3

Discuss the various cell disruption methods

CO-4

Determine the filtration and extraction techniques.

CO-5

Explain the types of dryers used in product formation

CO-6

Conclude the importance of bioreactors, upstream and downstream process.

Course Title: Life Style Diseases

CODE: MENBB

At the end of the course, students will be able to

CO-1

Define obesity, its risk, management of the diseases

CO-2

Identify the socio-economic factors, consequences of diabetes mellitus and hypertension

CO-3

Explain the causes and diagnosis of cancer

CO-4

Describe the aging factors and aging related diseases.

CO-5

Discuss Gall stones and ulcers diseases

CO-6

Categorize the major lifestyle disorders and its environmental, social and other factors.

Course Title: Nanotechnology

CODE: MDKAH

At the end of the course, Students will be able to

CO-1

Discuss about nanoparticles and nano quantum dots.

CO-2

Analyze about nanomaterials, drug delivery and cancer therapy

CO-3

Explain the bone grafting using Hydroxyapatite.

CO-4

Classify the biosensors and their application in tissue engineering

CO-5

Discuss about microarray and computational technologies

CO-6

Apply nanophysics in biotechnology and its various practical implications

Semester - IV

Course Title: Research Methodology

CODE: MDK4A

At the end of the course, students will be able to

CO-1

Explain the various types of research, Research Approaches, Importance of research and research process.

CO-2

List the various components of research report.

CO-3

Describe the Analysis of Variance components (ANOVA) for fixed effect model.

CO-4

Define the procedure involved in to spreadsheet application, features and functions, Using formulas and functions, Data storing.

CO-5

Examine the various tools used in Microsoft Excel, Open office or similar tool, Presentation Tool.

CO-6

Assess various databases and tools that are used in implementing proper methods in research.

Course Title: Stem Cell Biology

CODE: MDKAK

At the end of the course students will be able to

CO-1

Identify the various types of Stem cells and their properties

CO -2

Discuss about Stem cell niche, with Drosophila germ line stem cells amniotic fluid & cord blood

CO-3

Demonstrate the various cell signalling pathways involved in differentiation.

CO-4

Investigate the Chromatin modification and transcriptional regulation

CO-5

Relate the therapeutic applications of various types of stem cells

CO-6

Summarize the applications of stem cell biology and Ethics in human stem cell research.

Course Title: Bioethics, Human rights and Social Issues

CODE: MDKAL

At the end of the course, Students will be able to

CO-1

Discuss about the Historical development of Human Rights and Human Relations

CO-2

Describe about European Convention for Human Rights, UDHR, Civil and Political Rights-National Instruments

CO-3

Explain about Human Relations: Political relations, Organization relation

CO-4

Analyse about the procedure involved in human rights via case studies.

CO-5

Summarize about IPR and containment facilities

CO-6

Discuss about Development of Human Rights–Article 21 of Indian Constitution.