



# B.Sc. BIOTECHNOLOGY

## PROGRAMME SPECIFIC OUTCOME

- PSO1**      **Understand the types of cells, cell structure and function at biochemical, molecular and genetic level**
- PSO2**      **Illustrate the cellular molecular and biochemical process that provide the platform for basic research in Biosciences**
- PSO3**      **Perform procedures in Cell biology, Microbiology, Genetics, Biochemistry, Environmental Biotechnology, Molecular Biology, Bioprocess technology, Plant tissue culture and Immunology as per laboratory standards**
- PSO4**      **Understand the applications of Biotechnology in Environment Protection, Medical field, Agriculture and Industry**

# COURSE OUTCOME

## SJBTY1B01: CELLBIOLOGY

- SJBTY1B01.1: Deduce the structure and functions of plasma membrane, cyto skeleton and cell organelles
- SJBTY1B01.2: Describe the structural organization and functions of chromosomes
- SJBTY1B01.3: Examine cell cycle and apoptosis
- SJBTY1B01.4: Understand cell communication and signaling
- SJBTY1B01.5: Determine the transport system in the cell
- SJBTY1B01.6: Distinguish between prokaryotes and eukaryotes

## SJBTY1C01: Environmental Biotechnology

- SJBTY1C01.1: Understanding the fundamentals of ecology for sustenance
- SJBTY1C01.2: Analyzing the interactions and biogeochemical interactions for optimal ecosystem function
- SJBTY1C01.3: Evaluating the impact of anthropogenic activities in the environment
- SJBTY1C01.4: Assessing the possible pollution control strategies for a sustainable environment

## SJBTY2B02: General Microbiology

- SJBTY2B02.1: Understand the history and basic principles of microbiology
- SJBTY2B02.2: Analyze various culture media and their applications
- SJBTY2B02.3: Evaluate various physical and chemical means of sterilization
- SJBTY2B02.4: Inspect microbial cell structure, growth and reproduction

## SJBTY2C02: Environmental Biotechnology

- SJBTY2C02.1: Assessing the extend of water pollution for a healthy environment
- SJBTY2C02.2: Devising wastewater treatment plans to control pollution
- SJBTY2C02.3: Evaluate different biological wastewater treatment methods for municipal and industrial waste treatment
- SJBTY2C02.4: Understanding water purification methods

## SJA11: Biodiversity-Scope and Relevance

- SJA11.1: Assess the importance and value of biodiversity for ecological functions
- SJA11.2: Understand the components and magnitude of earth's biodiversity
- SJA11.3: Evaluate the cause and effects of biodiversity loss
- SJA11.4: Apply inventorying and monitoring tools to study dynamics in biodiversity
- SJA11.5: Apprise in situ and ex situ methods for biodiversity conservation

## SJA12: Research Methodology

- SJA12.1: Illustrate the methodology for scientific research
- SJA12.2: Explain the methodology for proper collection of literature for research
- SJA12.3: Evaluate and decide the apt procedures and data analysis tools for research
- SJA12.4: Develop a suitable outline for thesis based on the topic
- SJA12.5: Identifying the opportunities for publishing research work

## **SJBTY3B03: Biochemistry**

- SJBTY3B03.1: Appraise the buffers and buffering action in biological system
- SJBTY3B03.2: Analyze the basic biochemical aspects such as structure and functions of biological molecules
- SJBTY3B03.3: Summarize the major energy production pathways
- SJBTY3B03.4: Deduce the classes of enzymes and mechanism of enzyme action
- SJBTY3B03.5: Examine the principle and types of important separation techniques such as chromatography and electrophoresis

## **SJBTY3C03: Environmental Biotechnology**

- SJBTY3C03.1: Determining the significance of different solid waste treatment methodologies
- SJBTY3C03.2: Understanding the process and advantages of bioremediation for waste management
- SJBTY3C03.3: Outline the xenobiotic degradation for cleaning up the environment
- SJBTY3C03.4: Design methods for air pollution management to control industrial emissions

## **SJBTY4B04(P): Biochemistry Practical**

- SJBTY4B04(P).1: Perform the basic calculations in laboratory techniques in preparing buffers and reagents
- SJBTY4B04(P).2: Perform quantitative analysis of various biological molecules
- SJBTY4B04(P).3: Demonstrate the separation techniques for biological molecules

## **SJA13: Natural Resource Management**

- SJA13.1: Evaluate the economics, ecological and socio-cultural approaches for sustainable utilization of natural resources
- SJA13.2: Develop methods for the sustainable utilization of soil, water and energy resource
- SJA13.3: Analyze National Biodiversity Action Plan for conservation
- SJA13.4: Design strategies for conservation of forest and its resources
- SJA13.5: Evaluate the applicability of national and international efforts for natural resource management and conservation

## **SJA14: Intellectual Property Rights**

- SJA14.1: Understand the concept of intellectual property right
- SJA14.2: Explain patent system and documentation procedure
- SJA14.3: Analyze the usability of copyright, trademark and industrial design laws for the mutual benefit of user and manufacturer
- SJA14.4: Evaluate geographical indication protection system for identifying a particular type of product
- SJA14.5: Apprise the role of IPR in biotechnology industry

## **SJBTY4B05: Genetics**

- SJBTY4B05.1: Identify the inheritance patterns of characteristics for Genetic Counseling

SJBTY4B05.2: Understand the molecular basis of inheritance

SJBTY4B05.3: Examine the microbial genetic system for biomedical and industrial applications

SJBTY4B05.4: Apply the genetic principles in a population for predicting genetic dynamics

### **SJBTY4B06(P): Practicals in Genetics**

SJBTY4B06(P).1: Demonstrate the division patterns observed in different types of eukaryotic cells

SJBTY4B06(P).2: Understand the chromosomal modifications to cope up with gene expression

SJBTY4B06(P).3: Examine the genetic abnormalities based on karyotyping

SJBTY4B06(P).4: Perform bacterial recombination methods

### **SJBTY4C04: Environmental Biotechnology**

SJBTY4C04.1: Design environment friendly methods for waste treatment

SJBTY4C04.2: Devise methods for green energy from waste

SJBTY4C04.3: Apply bioprocess technology for developing ecofriendly products

SJBTY4C04.4: Evaluating environmentally sustainable methods for leaching

### **SJBTY4C05(P): Environmental Biotechnology Practicals**

SJBYT4C05(P).1: Develop methods for aseptic maintenance, isolation and enumeration of different types of microorganisms.

SJBYT4C05(P).2: Perform different methods of water quality analysis

SJBYT4C05(P).3: Understand basic procedures for microbial identification and characterization

SJBYT4C05(P).4: Analyze the growth pattern of bacteria and develop different methods to assess the growth

SJBYT4C05(P).5: Devise methods for green energy from waste

SJBYT4C05(P).6: Design bioremediation methods for removal of toxic chemicals

### **SJBTY5B07: Molecular Biology**

SJBTY5B07.1: Understanding the structure and organization of DNA

SJBTY5B07.2: Examine the composition of prokaryotic and eukaryotic genome

SJBTY5B07.3: Analyze the mechanisms for genome maintenance relevant for biomedical research

SJBTY5B07.4: Appraise the stages of prokaryotic and eukaryotic gene expression

SJBTY5B07.5: Illustrate the gene expression regulatory mechanism involved in protein synthesis

### **SJBTY5B08: Immunology and Immunotechnology**

SJBTY5B08.1: Understand the history and basic concepts of immunity

SJBTY5B08.2: Examine immune system – types, cells and organs

SJBTY5B08.3: Illustrate properties of Antigens and structure of antibodies

SJBTY5B08.4: Outline the mechanisms of Ag-Ab interactions

SJBTY5B08.5: Compare and contrast hypersensitivity and autoimmune diseases

SJBTY5B08.6: Explain vaccines, monoclonal antibody and tumour immunology

## **SJBTY5B09: Bioprocess technology**

SJBTY5B09.1: Evaluate different methods available for the isolation of microbial stains for bioprocess industry

SJBTY5B09.2: Develop strategies for strain improvement to improve the yield of industrial fermentation

SJBTY5B09.3: Formulate optimum growth medium for fermentation industry

SJBTY5B09.4: Select appropriate fermenter and operational conditions for bioprocess industry

SJBTY5B09.5: Apprise the applicability of enzyme technology in bioprocess

## **SJBTY5D01: Introduction to Biotechnology**

SJBTY5D01.1: Understanding the basic tools in biotechnology

SJBTY5D01.2: Apply biotechnology principles in food industry

SJBTY5D01.3: Examine the role of biotechnology in modernizing agriculture

SJBTY5D01.4: Apprise the applications of biotechnology in healthcare industry

## **SJBTY6B10(P): Practicals in Molecular Biology**

SJBTY6B10(P).1: Understand the different methods of isolation of DNA from plant and microbial cells

SJBTY6B10(P).2: Perform the quantification and separation procedures for DNA

SJBTY6B10(P).3: Analyze the gene expression and recombination in bacteria

## **SJBTY6B11(P): Immunology and Immunotechnology Practicals**

SJBTY6B11(P).1: Identify blood group

SJBTY6B11(P).2: Demonstrate blood film preparation and identification of blood cells

SJBTY6B11(P).3: Analyse various methods to estimate unknown amount of Antigen

SJBTY6B11(P).4: Understand different methods of antigen-antibody interaction

## **SJBTY6B12(P): Practicals in Bioprocess technology**

SJBTY6B12(P).1: Apply the methods of bioprocess technology for demonstrating fermentation process in laboratory

SJBTY6B12(P).2: Perform procedures for identification and isolation of antibiotic producing microbes

SJBTY6B12(P).3: Formulate optimum growth conditions for fermentation industry

SJBTY6B12(P).4: Understand the applications of enzyme immobilization

## **SJBTY6B13: Plant Biotechnology**

SJBTY6B13.1 : Understand basic techniques of tissue culture, types of cultures and in vitro morphogenesis

SJBTY6B13.2 : Analyze plant hormones and secondary metabolites

SJBTY6B13.3 : Examine genetic manipulation with special focus on agrobacterium mediated gene delivery

SJBTY6B13.4 : Evaluate transgenic plants and applications of genetically modified plants.

SJBTY6B13.5 : Illustrate tissue culture applications in horticulture, agriculture, pharmacology industry

## **SJBTY6B14: Animal Biotechnology**

SJBTY6B14.1: Understand the principles of animal cell culture

SJBTY6B14.2: Outline laboratory design and equipment used in laboratory

SJBTY6B14.3: Summarise media preparations and sterilization techniques

SJBTY6B14.4: Evaluate primary cell culture and cell lines

SJBTY6B14.5: Analyse various cytotoxicity assays and cell proliferation assays

SJBTY6B14.6: Understand the protocol for cryopreservation of cells

## **SJBTY6B15: Recombinant DNA Technology and Bioinformatics**

SJBTY6B15.1: Apply tools and techniques in recombinant DNA technology for genetic manipulation

SJBTY6B15.2: Evaluate the features and applications of different cloning vectors

SJBTY6B15.3: Plan transformation strategies based on the vector and host

SJBTY6B15.4: Discuss the applications of rDNA technology in medicine and agriculture

SJBTY6B15.5: Evaluate the applications of bioinformatics and proteomics in rDNA technology

## **SJBTY6B17: Medical Biotechnology**

SJBTY617.1: Assess the use of microbiological and biochemical techniques to identify pathogen

SJBTY617.2: Identify the pathogenesis in bacterial infection

SJBTY617.3: Illustrate the pathogenesis in viral infection

SJBTY617.4: Integrate infection and immunity for devising treatment procedures

## **SJBTY6B16(P): Plant Biotechnology Practical**

SJBTY6B16(P).1: Understand preparation and sterilization of plant tissue culture media

SJBTY6B16(P).2: Develop the method of callus induction

SJBTY6B16(P).3: Describe production of artificial seeds

SJBTY6B16(P).4: Analyze the protocol for isolating protoplasts

## **SJBTY6B18: Project**

SJBTY6B18.1- Build strong practical skills in Basic Science research

SJBTY6B18.2- Develop the aptitude to work on scientific problem and look for alternative solutions.

SJBTY6B18.3- Create proficiency in literature writing and research methodology

SJBTY6B18.4 Develop team spirit and collaboration skills