



# M.Sc. GENERAL BIOTECHNOLOGY

## PROGRAMME SPECIFIC OUTCOME

- PSO1:** Understand the basic knowledge and concepts of advanced areas in biotechnology, and also define the Interdisciplinary nature of the biological sciences.
- PSO2:** Develop practical skills in the basic and the advanced fields of biotechnology and also to apply their knowledge which can inculcate research aptitude.
- PSO3:** Apply knowledge in areas like Genetic engineering, immunology, bioprocess technology, environmental biotechnology, stem cell biology and plant biotechnology for the betterment and progress of their research and professional career.
- PSO4:** Analyze the cellular molecular and biochemical aspects of life which provide the platform for basic research in Biosciences

# COURSE OUTCOME

## SJGBT1C01: CELLBIOLOGY

SJGBT1C01.1	Understand the basics of the biology of the cell and principle of microscopic techniques
SJGBT1C01.2	Compare the structural organization of prokaryotic and eukaryotic cells
SJGBT1C01.3	Understand the mechanism of cell cycle to regulate cell division, apoptosis and cancer
SJGBT1C01.4	Explain the synthesis of proteins, post translational modifications and folding of protein.
SJGBT1C01.5	Analyze the process of transport of molecules across cell compartments
SJGBT1C01.6	Understand the concept of cell-cell interactions in plants and animals
SJGBT1C01.7	Compare mechanism of different cell signaling pathways.
SJGBT1C01.8	Understand the mechanism of cellular energy transactions in mitochondria and chloroplast

## SJGBT1C03: MICROBIOLOGY

SJGBT1C03.1	Discuss the historical background of microbiology
SJGBT1C03.2	Understand the major concept of identification, cultivation, classification of microorganisms
SJGBT1C03.3	Discuss different microscopic and sterilization methods used in microbiology
SJGBT1C03.4	Explain the major concept of microbial metabolism
SJGBT1C03.5	Describe the microbial interactions and their overall effects to biosphere.
SJGBT1C03.6	Understand the importance of antimicrobial agents, their classification and mechanism of toxicity

## SJGBT1C02: BIOMOLECULES

SJGBT1C02.1	Understand the basic knowledge and concepts about biochemistry and various biomolecules
SJGBT1C02.2	Discuss the classification, structure and functions of various biomolecules in cells
SJGBT1C02.3	Discuss the classification, structure and functions of vitamins and hormones
SJGBT1C02.4	Understand Heterocyclic compounds.
SJGBT1C02.5	Explain the separation techniques such as chromatography techniques, electrophoresis, centrifugation techniques and spectrophotometer to separate products and purification
SJGBT1C02.6	Explain the analytical techniques and advanced bioinstrumentation techniques

## **SJGBT1L01: CELL BIOLOGY, BIOMOLECULES AND BIOPHYSICS AND MICROBIOLOGY**

SJGBT1L01.1	Demonstrate the basic microbiology handling techniques like sterilization and media preparation
SJGBT1L01.2	Describe about staining and slide preparation techniques
SJGBT1L01.3	Demonstrate various separation techniques such as chromatography techniques, electrophoresis, centrifugation techniques and spectrophotometer
SJGBT1L01.4	Understand the reactions of amino acid, sugar and lipids
SJGBT1L01.5	Discuss about different microscope principles and to be well versed with the handling of microscope
SJGBT1L01.6	Understand the cell division principle and its various stages and to determine the presence of Barr body
SJGBT1L01.7	Determine the Anti-Microbial Activity by different methods and to analyse the bacteriological water quality

## **SJGBT2C02: MOLECULAR BIOLOGY**

SJGBT2C02.1	Understand the basic structure and concepts of molecular biology and related concepts.
SJGBT2C02.2	Analyze the concept and mechanism of DNA Damage and Mutation with reference to DNA repair system.
SJGBT2C02.3	Understand about the fine structure and features of gene and to get understand the major mechanisms involved in gene transfer.
SJGBT2C02.4	Discuss the molecular mechanism and machineries involved in replication, transcription and translation.
SJGBT2C02.5	Discuss the significance of operon models, plasmids and Transposons in the living system.
SJGBT2C02.6	Explain the concept of Central Dogma and importance of the universal Genetic code and its features.
SJGBT2C02.7	Understand the concept of chromosomal breakage, structural and numerical abnormalities and genetic disorders.

## **SJGBT2C03: ENVIRONMENTAL BIOTECHNOLOGY**

SJGBT2C03.1	Understand the basic concept and issues of environmental biotechnology and different types of pollutions and their management.
SJGBT2C03.2	Evaluate importance of biodiversity and their measurement
SJGBT2C03.3	Determine biological methods for identification and treatment of different pollution and polluted areas.
SJGBT2C03.4	Explain the microbial involvement in the degradation of toxic products and protection of environment.
SJGBT2C03.5	Explain the microbial involvement in the degradation of toxic products and protection of environment.
SJGBT2C03.6	Significance of global environmental issues and control measures.

## **SJGBT2C04: BIOSTATISTICS AND BIOINFORMATICS**

SJGBT2C04.1	Analyse statistical data using measures of central tendency dispersion, MS Excel, MS Word and location.
SJGBT2C04.2	Calculate and interpret the correlation between two variables and simple linear regression equation for a set of data.
SJGBT2C04.3	Analyse statistical data graphically using frequency distributions and cumulative frequency distributions.
SJGBT2C04.4	Understand data organization and management of data.
SJGBT2C04.5	Understand the basic concept of bio informatics, including Data management, sequencing, protein modelling and phylogeny.

## **SJGBT2C01: METABOLISM AND BASIC ENZYMOLOGY**

SJGBT2C01.1	Understand the basic concept of complexity, key reactions, regulation and evolution of metabolic pathways
SJGBT2C01.2	Understand the concept of standard free energy and evaluate the role of high energy and low energy phosphate compounds in biological oxidation-reduction reactions.
SJGBT2C01.3	Discuss the metabolic pathways involved in the synthesis and degradation of carbohydrates, lipids, amino acids and nucleic acids
SJGBT2C01.4	Illustrate the functional aspects of electron transport systems in mitochondria and chloroplast
SJGBT2C01.5	Understand mechanism and factors affecting of enzyme action, expression of enzyme activity and immobilisation of enzyme
SJGBT2C01.6	Evaluate the methods for determining the kinetic behaviour of enzyme and analyse the regulatory patterns of activation and inhibition

## **SJGBT2L01: LABORATORY (METABOLISM & BASIC ENZYMOLOGY, MOLECULAR BIOLOGY AND ENVIRONMENTAL BIOTECHNOLOGY)**

SJGBT2L01.1	Design an experiment for the extraction and purification of enzyme.
SJGBT2L01.2	Understand the principles of basic molecular and biochemical techniques.
SJGBT2L01.3	Evaluate enzyme activity using assay protocols.
SJGBT2L01.4	Analyse the factors affecting enzyme activity. Discuss about different microscope principles and to be well versed with the handling of microscope.
SJGBT2L01.5	Discuss the techniques for the estimation of water quality, nitrate content, water pollution parameters BOD, COD
SJGBT2L01.6	Understand the concept of buffer preparation, isolation and quantification of nucleic acids and restriction –ligation experiments.

## **SJGBT3C02: BIOPROCESS TECHNOLOGY**

SJGBT3C02.1	Discuss the use of living organisms in bioprocess technology, engineering, medicine and agriculture.
SJGBT3C02.2	Understand the major concept of bioprocess technology, bio reactor designing, media formulation and optimization.

SJGBT3C02.3	Explain the kinetics of microbial growth in different culture systems.
SJGBT3C02.4	Describe various parameters used for the measurement and control of bioprocess techniques.
SJGBT3C02.5	Explain the downstream process for fermentation products.
SJGBT3C02.6	Design a fermentation process for the production of microbial metabolite.

### **SJGBT3C03: PLANT BIOTECHNOLOGY**

SJGBT3C03.1	Define molecular farming, plant tissue culture, embryogenesis and protoplast culture.
SJGBT3C03.2	Explain secondary metabolite production and its applications also describe the role of plant as a bioreactor.
SJGBT3C03.3	Describe the various techniques and vectors involved in plant transformation.
SJGBT3C03.4	Discuss about the GM crops and their products.
SJGBT3C03.5	Understand the strategies for the improvement of crops and yields.
SJGBT3C03.6	Understand the strategies for the improvement of crops and yields.

### **SJGBT3C04: IMMUNOLOGY**

SJGBT3C04.1	Understand the major aspects of immune system.
SJGBT3C04.2	Discuss the properties of antigen and antibodies and mechanism of their interactions.
SJGBT3C04.3	Significance of MHC, T-cell, B-cell receptors and their regulations.
SJGBT3C04.4	Explain hypersensitivity, autoimmunity and their treatment process.
SJGBT3C04.5	Understand basic concept of immunity against infectious agents and transplantation process.
SJGBT3C04.6	Describe the mechanism of tumour development and therapeutic techniques against cancer.

### **SJGBT3C01: GENETIC ENGINEERING**

SJGBT3C01.1	Understand the basic principle, tools, cloning vectors used and transformation strategies followed in genetic engineering experiments
SJGBT3C01.2	Create gene libraries and understand the methods of selection and screening of recombinant clones
SJGBT3C01.3	Discuss different prokaryotic and eukaryotic gene expression systems
SJGBT3C01.4	Understand the application of molecular markers in genome mapping
SJGBT3C01.5	Understand the application of molecular markers in genome mapping
SJGBT3C01.6	Discuss the techniques of gene knockout and transgenic technologies, gene editing, gene correction and regulation
SJGBT3C01.7	Understand the guidelines for genetic engineering experiments and biosafety and analyse general concerns and environmental hazards of genetic engineering

### **SJGBT3E01: STEM CELL BIOLOGY PART A**

SJGBT3E01.1	Define the basic terminology in stem cells
SJGBT3E01.2	Understand the Sources and classification of stem cells

SJGBT3E01.3 Discuss the developmental aspects of embryogenesis, Nuclear Transfer Technology, Stem cell differentiation and Stem cells cryopreservation

### **SJGBT3L01: LABORATORY LLL (GENETIC ENGINEERING, BIOPROCESS TECHNOLOGY, PLANT BIOTECHNOLOGY AND IMMUNOLOGY)**

SJGBT3L01.1 Design transformation experiment.  
SJGBT3L01.2 Understand DNA amplification using PCR and blotting techniques.  
SJGBT3L01.3 Design small scale production unit of ethanol, organic acid, enzymes and antibiotics.  
SJGBT3L01.4 Understand the technique of whole cell immobilization.  
SJGBT3L01.5 Demonstrate callus initiation and organogenesis in different plantlets.  
SJGBT3L01.6 Comprehensive understanding of basic immunological principles.

### **SJGBT4E05: INDUSTRIAL AND FOOD BIOTECHNOLOGY**

SJGBT4E05.1 Analyse the commercial use of different microorganisms and microbial enzymes in fermentation and food processing.  
SJGBT4E05.2 Discuss the strain improvement strategies of microbes for the production of food processing enzymes.  
SJGBT4E05.3 Understand the applications of cell and enzyme immobilization, biosensors and bioprocess monitoring.

### **SJGBT4E03: STEM CELL BIOLOGY PART B**

SJGBT4E03.1 Discuss Neurodegenerative diseases and Application of stem cells in therapy  
SJGBT4E03.2 Analyse the concept of human embryonic stem Cells with reference to ethical and religious consideration  
SJGBT4E03.3 Examine various model organisms in the field of stem cell research  
SJGBT4E03.4 Understand Stem cell isolation & characterization techniques.

### **SJGBT4P01: PROJECT WORK**

SJGBT4P01.1 Understand project characteristics and various stages of a project.  
SJGBT4P01.2 Design the experiments of interest and execute it.  
SJGBT4P01.3 Apply knowledge in handling of the basic and advance instruments.  
SJGBT4P01.4 Develop writing and presentation skills.  
SJGBT4P01.5 Develop research aptitude.

### **SJGBT4V01: COMPREHENSIVE VIVA-VOCE**

SJGBT4V01.1 Demonstrate knowledge in the subject domain.  
SJGBT4V01.2 Communicate ideas clearly and precisely.  
SJGBT4V01.3 Develop deep understanding of basic concepts and application.