

## **Program Outcomes**

- PO1: Students acquire insight in to subjects like Microbiology, Molecular Biology and Genetic Engineering.
- PO2: Well versed with biotechnological remedies for human health and environmental problems.
- PO3: Trained in basic and advanced areas in Biotechnology to develop Biotechnological processes and products.
- PO4: Multidisciplinary proficiency will be attained by utilizing MOOCS courses.
- PO5: Awareness will be created regarding intellectual property rights.
- PO6: Development of human capital for advanced scientific research and entrepreneurship.

## **Program Specific Outcomes**

- PSO1: Students acquire knowledge, critical thinking skills and experience in conducting cutting edge research.
- PSO2: Achieve expertise in a chosen specialized area of Biotechnology based on the research experience gained by their project work.
- PSO3: Develop practical skills which will empower to enroll in research institutions and industries.
- PSO4: Students will be well equipped to pursue higher studies.
- PSO5: Able to produce innovative products, meeting the global demands in the field of applied Biotechnology.
- PSO6: Students emerge with confidence by developing knowledge both in their subject and soft skills and will be ready to face the challenges in the society.

### **PAPER BT 1.1 - CELL BIOLOGY & EVOLUTION**

#### Course Outcomes:

- CO1. Gain knowledge on the basic components of bacterial, plant and animal cells.
- CO2. Awareness regarding the general morphology and functions of endoplasmic reticulum, ribosomes, golgi, lysosomes and cytoskeletal elements.
- CO3. Obtain knowledge on how cells generate energy in mitochondria.
- CO4. Know the importance of the mechanism of photosynthesis.
- CO5. Attain an insight in to the biology of cancer cells.
- CO6. Familiarize with the origin of basic biological molecules and evolutionary time scale.

### **PAPER BT 1.2 - BIOMOLECULES**

#### Course Outcomes:

- CO1. Gain knowledge on chemical foundations of biology.
- CO2. Understand in detail about carbohydrates and lipids.
- CO3. Obtain knowledge about amino acids, proteins and heterocyclic compounds.
- CO4. Know the importance of nucleic acids and vitamins.
- CO5. Familiarize with hormones and phytohormones.
- CO6. Attain an insight in to bioenergetics.

### **PAPER BT 1.3 - MICROBIAL PHYSIOLOGY & GENETICS**

#### Course Outcomes:

- CO1. Gain knowledge on classification and growth of bacteria
- CO2. Introduced to methods of sterilization, pasteurization and disinfection.

- CO3. Understand the mechanism of recombination and transposition in prokaryotes.
- CO4. Obtain knowledge on general characteristics of different plant and animal viruses.
- CO5. Attain an insight in to the biology of clinically important bacteria, viruses and protozoans.
- CO6. Familiarize with emerging, re-emerging diseases and biohazards with their safety precautions.

#### PAPER BT 1.4 - ANALYTICAL TOOLS AND TECHNIQUES IN BIOTECHNOLOGY

##### Course Outcomes:

- CO1. Gain knowledge on basic tools and techniques of biotechnology and its principle and applications.
- CO2. Obtain knowledge about microscopy and spectroscopy.
- CO3. Know the importance of chromatography and centrifugation.
- CO4. Familiarize with radioactivity, electrochemical techniques and electrodes.
- CO5. Understand the basics of blotting techniques.
- CO6. Attain an insight in to X ray diffraction and Flow cytometry.

#### PAPER BT 2.1 - ENZYMOLOGY & METABOLISM

##### Course Outcomes:

- CO1. Gain knowledge on basic enzymology.
- CO2. Familiarize with methods of measuring enzyme activity.
- CO3. Understand the different metabolic pathways of glucose.
- CO4. Know the importance of purines, pyrimidines and their metabolism.
- CO5. Knowledge of therapeutic applications of enzymes.
- CO6. Appreciate biological role and importance of minerals and trace elements in the human body.

#### PAPER BT 2.2- MOLECULAR BIOLOGY

##### Course Outcomes:

- CO1. Gain knowledge on basic concepts of organization of genetic material and structure of gene.
- CO2. Understand the mechanism of replication in prokaryotes and eukaryotes.
- CO3. Understand the mechanism of transcription in prokaryotes and eukaryotes and post transcriptional modifications.
- CO4. Attain an insight into the mechanism of protein synthesis in prokaryotes and eukaryotes and the significance of post translational modifications.
- CO5. Understand the ways by which gene expression is regulated in prokaryotes and eukaryotes.
- CO6. Familiarize with the factors responsible for DNA damage and different DNA repair mechanisms.

#### PAPER BT 2.3- GENETIC ENGINEERING

##### Course Outcomes:

- CO1. Understand the overall concept of r-DNA technology.
- CO2. Introduced to different enzymes used in genetic engineering.
- CO3. Obtain knowledge on salient features and types of cloning vectors.

- CO4. Know the different gene transfer techniques.
- CO5. Attain an insight into selection of recombinant cells, PCR and microarray techniques.
- CO6. Familiarize with the applications of genetic engineering in various fields

#### PAPER BT 2.4- BIOLOGY OF IMMUNE SYSTEM

##### Course Outcomes:

- CO1. Gain knowledge on cells and organs of the immune system.
- CO2. Obtain knowledge on cell mediated immunity.
- CO3. Obtain knowledge on antibody mediated immunity.
- CO4. Knowledge of the role of MHC in discrimination of self and non-self.
- CO5. Understand various immunological techniques.
- CO6. Able to understand hypersensitivity reactions and self-reactivity.

#### PAPER BT 3.1 - CELL CULTURE TECHNOLOGY AND TISSUE ENGINEERING

##### Course Outcomes:

- CO1. Gain knowledge on plant tissue culture media and techniques.
- CO2. Familiarize with animal cell culture techniques.
- CO3. Obtain knowledge about artificial tissues and organs.
- CO4. Familiarize with different types of stem cells, their differentiation and propagation.
- CO5. Understanding of applications of stem cells.
- CO6. Attain knowledge on neuromorphology, neurophysiology and neurodegenerative diseases.

#### PAPER BT 3.2- PLANT BIOTECHNOLOGY

##### Course Outcomes:

- CO1. Gain knowledge on basic concepts in different approaches involved in developing transgenic plants for human welfare.
- CO2. Introduced to molecular markers and their applications.
- CO3. Understand technological ideas in plant science to address disease resistant varieties and organic farming.
- CO4. Know the importance of production of transgenic plants for the quality enhancement in crop production.
- CO5. Attain insight in to the laboratory culturing and production of micro algae.
- CO6. Acquire knowledge on different types of biofertilizers and biopesticides.

#### PAPER BT 3.3 - ANIMAL BIOTECHNOLOGY

##### Course Outcomes:

- CO1. Gain knowledge on basic infertility conditions.
- CO2. Familiar with methods of advanced techniques like IVF in biological systems.
- CO3. Obtain knowledge about transgenesis in animals.
- CO4. Know the important ecological sources of aquatic species.
- CO5. Understand different methods for improving aquaculture.
- CO6. Attain an insight on basic features of development in animals and cell culture assays.

#### PAPER BT 3.4- MEDICAL AND ENVIRONMENTAL BIOTECHNOLOGY

##### Course Outcomes:

- CO1.Introduced to techniques involved in development of health care products.
- CO2.Understanding PCR and its applications.
- CO3.Familiar with biotechnological solutions for controlling emerging diseases, genetic diseases and gene therapy.
- CO4.Gain knowledge on environmental pollution sources, adverse effects and biotechnological control.
- CO5.Obtain knowledge on renewable sources of energy and bioleaching of ores.
- CO6.Attain insight in to biotechnological remedies for environmental problems.

#### **PAPER BT 4.1- HETEROLOGOUS EXPRESSION AND DOWNSTREAM PROCESSING**

##### **Course Outcomes:**

- CO1.Gain knowledge on fundamentals of industrial biotechnology.
- CO2.Acquire knowledge on design and types of bioreactors and fermentation process.
- CO3.Insight on production of active recombinant proteins of mammalian origin.
- CO4.Gain knowledge on different methods of downstream processing.
- CO5.Aware of the industrial production of various biotechnological products.
- CO6.Familiarize with immobilization of enzymes and biosensors in the field of biotechnology.

#### **PAPER BT 4.2 - BIOINFORMATICS AND BIOSTATISTICS**

##### **Course Outcomes:**

- CO1.Gain knowledge on basics of computer and its use in biological research.
- CO2.Know the importance of internet and its applications in biotechnology research.
- CO3.Understand types of biological databases and searching of databases.
- CO4.Understand sequence alignment, protein structure prediction and phylogeny studies.
- CO5.Obtain knowledge about biostatistics and its application in biological research.
- CO6.Familiarize with drug development using tools of bioinformatics.