Course Outcome

MSc Biotechnology

Core Course Biotechnology

Masters in Science Programme Outcome:

- Students will be able to take up successful programme specific jobs in research and industry.
- Students will have in-depth knowledge in respective scientific area and be able to analyze, design and solve biology related problems

Biotechnology Programme Outcome (specific outcome)

On completion of the course,

- Students will be able to demonstrate skills needed for academic and industrial biotechnological research
- Students will have broad understanding in core concepts of basic bio-molecular sciences, bioanalytical methods, omics, recombinant DNA technology and gene manipulation, research methodology and application of these concepts.
- Students will be able to carry out bio-molecular bench work protocols in vitro, in vivo and *in silico*, and will also have experience in handling biological projects individually.

SL. No.	Paper Name	Course outcome
1.	Cell Biology	● The students will have a detailed and comprehensive knowledge on the various aspects of cell- biology ● The students shall be able to, develop an understanding of the Cellular components, Cytoskeleton and Cell Membrane and their functions. ● Understand cell cycle of bacteria and viruses. ● They will be able to assess and relate information in the context of cell biology.

2.	BIOMOLECULES	• The students will have a detailed understanding on the biomolecules of life, their structure and function • Students will be aware of basic biosynthetic pathways and clinical disorders associated with it. • Students will be aware of the separation and analytical techniques in biochemistry
3.	MICROBIOLOGY	• The students will be able to identify and classify microorganisms • They will be aware of the importance of microbes in clinical field, agricultural field and industrial field • They will be aware of how microbes can be used for research and biotechnology.
4.	CELL BIOLOGY, BIOMOLECULES AND MICROBIOLOGY (LAB I)	• The students will be able to perform basic cell biological techniques like histochemical techniques, identification of cell-cyle stages, basic cellular components and also subcellular fractionation techniques • The students will be to biochemically analyse biological samples, including preparation biochemically important buffers, determine the biomolecules in a given sample and perform bioanalytical techniques like Chromatography and electrophoresis • The students will be to perform basic microbiological techniques including microbial microscopy, staining techniques, microbial isolation and characterization techniques and determination of MIC and antimicrobial activity

5.	Metabolism and Basic Enzymology	• The students will have in-depth knowledge in various metabolic pathways and reactions • The student will be able to describe structure, functions and the mechanisms of action of enzymes. The student will learn kinetics of enzyme catalyzed reactions and enzyme inhibitory and regulatory process. The student will get exposure of wide applications of enzymes and their future potential
6.	Molecular biology	• Students will have an insight into the molecular aspects of life – such as Structure of gene, the central dogma, replication, protein synthesis, DNA repair mechanisms and biology of Cancer. • It will also make students capable of understanding modern molecular research and associated tools and their applications
7.	Environmental biotechnology	• At the end of the course the students will, obtain knowledge on application of biotechnology in environment related matters. • They will be aware of basic principles and technologies of solid and liquid waste management and the effect of biofertilizers and pesticides • They will have awareness of global environmental problems
8.	Biostatistics and Bioinformatics	• At the end of the course the students will, acquire the knowledge for statistically interpreting the results obtained in various research experiments • They will capable of utilizing different computer based tools applicable in biotechnology.

9.	Metabolism And Basic Enzymology, Molecular Biology And Environmental Biotechnology Lab 2	● At the end of the course the students will, acquire practical knowledge in extraction , purification and assay of enzymes from plants and animals ● Students will be capable of performing basic molecular biology techniques such as isolation of DNA RNA plasmid, their quantitative assay, Restriction digestion and electrophoresis of nucleic acid. ● Students will be able to analyse the purity of portable water by different techniques like BOD, COD, and nitrate content, and also equipped to perform experiments related to xenobiotics.
10.	Genetic Engineering	● Students will be capable of applying recombinant DNA technology in biotechnological research and the significance of genetically modified organisms. ● They will be aware of different principles, tools and scope of genetic engineering ● They will be capable of strategizing research methodologies employing genetic engineering techniques like DNA sequencing, mapping and recombinant DNA techniques ● They will also be aware of clinically important applications like production of clinically important proteins, gene editing and gene therapy.
11.	Bioprocess technology	● Students will have good knowledge on isolation and enrichment of economically important strains ● Students will be capable working in a bio-processing unit with knowledge on bioreactor design and factors influencing products produced by the bioprocess.

		● It also deals with the various important products produced by the bioprocess techniques.
12.	Plant Biotechnology	● At the end of the course, the students will gain an insight into different plant tissue culture and propagation methods ● They will also be aware of different transformation and plant biotechnology techniques for producing genetically modified plants ● They will be aware of the concepts and techniques of plant biotechnology and its application in crop production and secondary metabolite production
13.	Immunology	● At the end of the course, the students will gain an insight into antigen-antibody reactions different immunological pathways and the molecules involved in our immune system ● It also explains the various antigen-antibody reactions involved in auto immune- diseases, transplantation immunology and vaccine development.
14.	GENETIC ENGINEERING, BIOPROCESS TECHNOLOGY, PLANT BIOTECHNOLOGY AND IMMUNOLOGY (LAB III)	● At the end of the course, the students will gain hands on experience on basic practical skills in genetic engineering techniques including bacterial transformation, cloning, blotting, and reporter expression assays ● They will be confidently able to carry out basic bio-processing techniques including isolation of microorganisms, production of economically important metabolites, basic fermentation and immobilization techniques ● Students will be capable of carrying out plant biotechnological research work involving techniques like organogenesis, somatic embryogenesis and quantitation of tissue culture procedures. ● Students can implement the basic immunological techniques like immunization, antibody titration, Immuno-

		blotting, ELISA and diffusion and electrophoretic methods in immunology.
15.	Classical benchmark papers- Presentation and critical analysis(AEC- ability enhancement course)	● They develop Scientific aptitude o9n carrying out research projects ● Students get an intense awareness on classical scientific methods of research ● They get an overall contemporary knowledge on their field of interest in research
16.	Application of statistical software like SPSS-(PCC- professional competency course)	● Students will learn to analyse research data with the help of statistical softwares like SPSS ● they will learn to choose data, enter data, choose statistical tests for analysis, interpret results and analyse data outputs.