Department of Biotechnology

M.Sc. Biotechnology

S.No.	Course Code	Course Name	Course Outcomes
		SEMESTER- I	
1.	18PBTC11	Core Course – I: Biochemistry	1. Developed sufficient background for those students who wish to study more advancedbiochemistry. 2. Aware on thermodynamics and biological energy. 3. In depth knowledge in the classification, structure, function and metabolic pathways ofcarbohydrate, lipids and fatty acids. 4. Understand the molecular structure and function of amino acids and proteins. 5. Analyze the structure and function of DNA and biosynthesis of nucleotides. 6. Basic knowledge on bioactive compounds and secondary metabolites. 7. Familiar with various basic biochemistry techniques. 8. Ability of thinking in biochemistry fields.
2.	18PBTC12	Core Course - II: Microbiology	1. Enable students to understand the diversity of microbes and importance of classificationof microorganisms. 2. Knowledge of different types of microorganisms those are invisible to our naked eyes. 3. Understand the host-pathogen relationships. 4. Knowledge on infections caused by bacteria, virus and fungi. 5. Analyze the physiology of the bacteria and control mechanisms to prevent their growth. 6. Understand the students the influence of microorganisms and

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			microbiologicalapplications on everyday life. 7. Role of microorganisms in composting, biogas production, sewage treatment andbiodegradation.
3.	18PBTC13	Core Course – III: Cell and Molecular Biology	1. Understand the basic structure and function of cell and cell organelles in Prokaryotes andEukaryotes. 2. Understand the history of genetic transformation principle of DNA. 3. Analyse the Watson and Crick helical structure of DNA and to understand the differentforms of DNA, mRNA, rRNA and tRNA. 4. Explore the mechanisms of DNA replication, transcription and protein translation in bothProkaryotes and Eukaryotes. 5. Role of Physical, Chemical and Biological agents that causes mutation and DNA damage. 6. Analyse the mechanisms of DNA repair
4.	18PBTC1P	Core Course– IV: Practical I: Lab in Biochemistry and Microbiology	1. Basic information on concepts of biochemistry including pH, buffer preparation and calculations. 2. Hands on training to every student in the laboratory. 3. Knowledge on chromatographic techniques, enzyme assay, electrophoresis techniques. 4. Facts on screening and identification of industrially important enzymes. 5. Extraction and purification of enzymes isolated from different sources. 6. Understand the kinetics of enzyme production. 7. Basic concepts of protein precipitation, purification and detection by SDS-PAGE.
5.	18PBTO11	Major Elective Course-I:	1. Differences between the four different protein levels. 2. Understand the role of macromolecules in biological membranes.

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		Biophysics and Biostatistics	3. Ability to understand the theoretical aspects of biophysical techniques. 4. Understand the role of structural biology in biology. 5. Knowledge in the application of structural biology. 6. Knowledge in mean, median and mode and the difference in tabulation. 7. Understand about diagrams and tabulations and their role in experimental studies. 8. Knowledge about ANOVA and their application in research studies.
6.	18PBTO12	Major Elective Course- I: Bioinformatics	1. Practical and the theoretical knowledge of DNA sequences, genomes, protein sequences and protein structure information that will prepare them for careers in bioinformatics, academia, industry and research. 2. Understand the vast quantities of data generated in the fields of molecular and biological sciences (databases available for different organisms). 3. Understand the basic algorithms of bioinformatics. 4. Fundamentals of sequence retrieval and alignment. 5. Analyse the phylogenetic relationship between the different organisms. 6. Basic applications of structural biology and molecular docking and knowledge on drug designing. 7. Acquiring problem-solving skills and gain experience in understanding, handling and developing important software used in pharmaceutical, chemical and biotechnology industries
SEMESTER - II			
7.	18PBTC21	Core Course – V: Immunology and	1. Understand the cells and organs involved in the immune system of our body. 2. Familiar with the body's natural defense (immunity), its mechanism and active

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		Immunotechnology	immunityby vaccination. 3. Understand the mechanisms of humoral and cell mediated immune response. 4. Practical skills on different immunotechniques for disease diagnosis and identification. 5. Basis of transplantation immunology and immunosuppressive agents. 6. Understand how to combat the disease and immunotherapies available. 7. Awareness on the current applications of immunological research in practice.
8.	18PBTC22	Core Course- VI: Recombinant DNA Technology	1. Basic principles of recombinant DNA technology and its pros and cons. 2. Knowledge on the bacterial vectors, viral vectors for the construction of recombinantmolecule. 3. Understand how to transform the recombinant molecule into the desire host. 4. Acquire knowledge on methods of gene transfer into Bacteria, Plant, Animal cells. 5. Gain knowledge on molecular techniques such as PCR, RFLP and RAPD. 6. Awareness on the important discovery of gene sequencing. 7. Detect DNA, RNA and Protein by Blotting techniques. 8. Understand the application of rDNA in industrial enzyme production.
9.	18PBTC23	Core Course - VII: Microbial Genetics	1. Understand the mechanism of regulation of gene expression. 2. Basic concept of gene transfer methods- conjugation, transformation and transduction. 3. In depth knowledge about the jumping genes and the process of transposition mechanism. 4. Understand the genetics of viral phage, replication and integration in the host genome.

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			5. Awareness on genetic organization of the chromosomes and its abnormalities. 6. Basic concepts in genetics of Drosophila, as a model organism. 7. Understand Gene linkage, Crossing over and Chromosomal mapping.
10.	18PBTC2P	Core Course-VIII: Practical II: Lab in Immunology, Recombinant DNA Technology and Microbial Genetics	1. Methods of transformation of DNA by conjugation. 2. Isolation of Bacteriophage from sewage samples. 3. Perform Nucleic acid isolation from different organisms such as Plant, Bacteria andHuman blood. 4. Practical knowledge on transformation of recombinant DNA into Bacteria. 5. Perform cloning of the gene of interest in suitable vector and screening of the recombinants and non-recombinants. 6. Handling of animals, antigen preparation and bleeding techniques. 7. Practical knowledge on Antigen-Antibody techniques. 8. Skills on performing immunodiagnostic techniques of infectious diseases. 9. Detect the specific protein (antigen) present in the unknown protein sample using ELISA. 10. Isolate and purify the monoclonal antibody from polyclonal antibody using column.
11.	18PBTN21	Non Major Elective Course-I: Concepts in Biotechnology	1. Enable the students to understand about the basic concepts of modern Biotechnology. 2. Knowledge about the Plant tissue culture, gene manipulation and Genetic Engineering. 3. Knowledge on the methods of microbial screening. 4. Production of Microbial Biomass such as *Spirulin*a, yeast, metabolites such as vitamins, amino acids, antibiotics. 5. Understand the concept of transgenesis and artificial insemination.

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			6. Awareness on the process of fermentation and fermentor.
12.	18PBTN22	Non Major Elective Course-I: Cancer Biology	1. Knowledge on basic properties of cell and cell division. 2. Knowledge on classification of cancer. 3. Perception of Oncogenes and its characteristics. 4. Basic knowledge on different types of cancer therapy. 5. Knowledge on the basics of anticancer drugs.
SEMESTER - III			
13.	18PBTC31	Core Course - IX: Plant Biotechnology	1. Knowledge of plant genome organization & organelles organization. 2. Knowledge on the regulation of gene expression in plant development. 3. Perception of Plant Tissue Culture and the techniques involved. 4. Principle of plant genetic engineering and its application such as edible vaccines, plantibodies, resistance to bacterial, fungal and viral infections. 5. Influence of plant hormones in plant tissue culture. 6. Understand the molecular mechanism of Agrobacterium mediated gene transfer. 7. Basic knowledge on gene silencing using RNAi technology. 8. Analyze the plant-pathogen interaction.
14.	18PBTC32	Core Course- X: Animal Biotechnology	1. Understand the basic principles of animal tissue culture. 2. Knowledge on the concept of transgenesis and methods of transferring genes usingvarious vectors into the host. 3. Understand fundamentals of animal genomics. 4. Understand the ethical issues related to animal biotechnology. 5. Understand about the production of recombinant products.

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			6. Knowledge on biotechnological application for HIV diagnosis and gene therapy. 7. Basic concepts and importance of intellectual property rights- patents, copyright,tradesecrets, trademark. 8. Understand the principles of genetically modified organisms.
15.	18PBTC33	Core Course-XI: Genomics and Proteomics	1. Understand the theoretical knowledge of proteome, genomes. 2. Understand the various proteomic and genomic analysis techniques. 3. Understand the principle of DNA sequencing and mapping of the genome. 4. Basic ideas about protein size, pI, identification and analysis by 2D techniques. 5. Acquire problem-solving skills and gain experience used in biotechnology,pharmaceutical, chemical and industries. 6. Applications of DNA array and protein array. 7. Importance of Pharmacogenomics in the identification of drug targets.
16.	18PBTC3P	Core Course -XII: Lab in Plant Biotechnology and Animal Biotechnology	1. Basic knowledge of plant tissue culture such as surface sterilization, media preparation,contamination and other handling procedures. 2. Understand techniques involved in plant tissue culture and to generate *in vitro* propagatedplants. 3. Knowledge on hardening techniques. 4. Handling skills on Agrobacterium mediated gene transfer. 5. Isolation and purification of protoplasts. 6. Importance on marketing of plants from plant tissue culture and horticulture. 7. Understand the basic principles of animal tissue culture and handling procedures.
17.	18PBT	Major Elective	1. Awareness on Enzyme Nomenclature and its types.

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	031	Course-II: Enzymes and Enzyme Technology	2. Understand the mechanism of enzyme inhibition. 3. Role of active site and its orientation effects. 4. Knowledge on commercial applications of enzymes. 5. Technique of immobilizing enzymes
18.	18PBTO32	Major Elective Course-II: Molecular Oncology	1. Understand the basic concepts and types of cancer 2. Understand the molecular biology of tumor invasion and metastasis 3. Ability in differentiating Oncogenes and Proto Oncogenes. 4. Understand the molecular mechanisms of apoptosis and signaling pathways 5. Understand the classical and advance methods of diagnosis of cancer 6. Awareness on the current trends of cancer research and therapies available 7. Understand the cancer markers and its applications.
SEMESTER - IV			
19.	18PBTC41	Core Course-XIII: Marine Biotechnology	1. Awareness on the physical and chemical elements present in marine environment. 2. Knowledge on the biodiversity of different organisms in marine environment. 3. Understand the bioactive compounds of the marine resources. 4. Application of marine organisms for production of antibiotics. 5. Knowledge on Probiotics microbes to enhanced the aquaculture biotechnology

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20.	18PBTC42	Core Course - XIV: Bioprocess Technology	1. Understand the scope and applications of industrial biotechnology. 2. Methods of potential improvement of efficient strains to increase the yield of microbialproducts. 3. Information of basic fermentation process. 4. Knowledge on immobilization of enzymes and cells and downstream processing of biological. 5. Knowledge on the process of production of secondary metabolites. 6. Awareness on innovative fermented food products. 7. To understand the importance of single cell protein and single cell oils.
21.	18PBTJ41	Core Course – XV: Project	1. Inculcate Research interest among students 2. Get familiarized with basic concepts of research. 3. Identify and state the research topic. 4. Design and conduct research study accordance with the identified research need. 5. Develop skill to search online and offline sources to carryout research. 6. Apply academic skills to present the research study findings in a formal academic oral presentations and a written research paper
22.	18HBTC11	Core Course- I: Research Methodology	1. Understand the basics of research 2. Ability to design an experiment 3. Ability to write research manuscript 4. Understand the theoretical aspects of biotechnological techniques.
23.	18HBTC12	Core Course–II: Advanced	1. Understand the recent advances in biotechnology. 2. Understand the gene expression process in prokaryotes and Eukaryotes.

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		Biotechnology	3. Ability to use bioinformatics tools and softwares. 4. Ability to understand the strageties of cloning.
24.	18HBTC13	Core Course- III: Applied Biotechnology	1. Understand the application of biotechnology in various fields 2. Ability to use IPR and its methods. 3. Understand the core features of nanotechnology. Understand the future prospective of biotechnology
25.	18HBTJ21	Project	1. Inculcate Research interest among students 2. Get familiarized with basic concepts of research. 3. Identify and state the research topic. 4. Design and conduct research study accordance with the identified research need. 5. Develop skill to search online and offline sources to carryout research. 6. Assess ways to collect, compile and conduct a data analysis. 7. Apply academic skills to present the research study findings in a formal academic oralpresentations and a written research paper.