



Department of Biotechnology

M.Sc. Biotechnology

S.No	Course Code	Course Name	Course Outcomes
SEMESTER - I			
1.	23PBTC11	Core Course - I: Biochemistry	CO1[K2]: illustrate the basic principles of carbohydrate metabolism. CO2[K3]: manipulate basic knowledge about lipid metabolism and related significance. CO3[K4]: analyze the importance of bio-energetics and Biological oxidation pathways. CO4[K5]: evaluate the structure, physical and chemical properties of biomolecules. CO5[K6]: compile overall metabolism of biomolecules through biological pathways.
2.	23PBTC12	Core Course - II: Molecular Genetics	CO1[K2]: elaborate the molecular mechanisms of gene expression, organization and functions of genetic material in the living world. CO2[K3]: identify genetic regulatory mechanisms at different levels, the processes behind mutations and various chromosomal abnormalities. CO3[K4]: analyze different types of DNA damage and tools for their detection. CO4[K5]: appraise the concepts of the transposons and their



			applications. CO5[K6]: hypothesize the allele frequencies and genotype frequencies in populations and concepts behind the theory of evolution.
3.	23PBTC13	Core Course - III: Molecular Cell Biology	CO1[K2]: illustrate the molecular machinery of living cells and the principles that govern the structures of macromolecules and their participation in molecular recognition. CO2[K3]: identify the structures and purposes of basic components in prokaryotic and eukaryotic cells and their molecular mechanism. CO3[K4]: analyze the principles and basic mechanisms of nuclear envelope and its functions. CO4[K5]: interpret the metabolic pathway and the process of transmission of extracellular signals. CO5[K6]: compose various stages of cancer development.
4.	23PBTC1P	Core Course - IV: Practical : Biochemistry, Molecular Genetics and Molecular Cell Biology	CO1[K2]: illustrate basic calculations and procedures in biochemistry CO2[K3]: estimate biomolecules by various methods CO3[K4]: isolate and analyze DNA, RNA and protein CO4[K5]: evaluate the quality and purity of DNA, RNA and protein CO5[K6]: prepare single cell suspension and perform histochemical staining
5.	23PBTO11	Elective Courses Generic/Discipline specific - I: Bioinstrumentation	CO1[K2]: demonstrate the working mechanism of bioinstruments CO2[K3]: determine the principle and application of centrifugation and chromatographic techniques CO3[K4]: analyze the applications of electrophoresis, blotting and PCR techniques



			CO4[K5]: appraise the principles and applications of spectrophotometry CO5[K6]: propose the biological applications of radioisotopic techniques
6.	23PBT012	Elective Courses Generic/Discipline specific - I: Biostatistics	CO1[K2]: illustrate the major methods of collection and presentation of data CO2[K3]: compute different methods of analysis of variance CO3[K4]: analyze the application of test of significance to interpret large and small samples CO4[K5]: assess role of computational software and databases for statistical functions CO5[K6]: hypothesize by testing large scale data and calculate errors
7.	23PBT013	Elective Courses Generic/Discipline specific - II: Enzymology	CO1[K2]: illustrate the nomenclature of enzymes and its types CO2[K3]: determine the mechanism of enzyme inhibition CO3[K4]: analyze the significance of active sites and its orientation effects CO4[K5]: appraise the competitive and non-competitive inhibition of enzymes CO5[K6]: propose and prove Michaelis - Menton equation
8.	23PBT014	Elective Courses Generic/Discipline specific - II: Inheritance and Evolutionary Biology	CO1[K2]: illustrate the concepts of inheritance with Mendelian principles CO2[K3]: apply the principles of inheritance at the molecular, cellular and organism levels CO3[K4]: analyse the major events in the evolutionary time scale CO4[K5]: examine the approaches and methods in human behavior CO5[K6]: assess historical and current knowledge regarding human heredity



SEMESTER - II

9.	23PBTC21	Core Course - V: Microbiology	<p>CO1[K2]: illustrate the major discoveries in microbiology, microbial diversity, microbial growth and metabolism.</p> <p>CO2[K3]: determine the role of microbial pathogens in human diseases</p> <p>CO3[K4]: analyze host microbe interaction and epidemiology of microbial disease</p> <p>CO4[K5]: assess the role of novel microbes in environment and integrate them in specific innovative approaches</p> <p>CO5[K6]: develop diagnosis and control measures of epidemic and pandemic diseases</p>
10.	23PBTC22	Core Course - VI: Plant and Animal Biotechnology	<p>CO1[K2]: illustrate theoretical knowledge on various techniques of plant biotechnology like tissue culture and plant genetic transformation</p> <p>CO2[K3]: use gene transfer techniques for developing disease and Pest resistance plants</p> <p>CO3[K4]: analyze the role of reporters and marker genes in gene transfer</p> <p>CO4[K5]: appraise the concepts of disaggregation of tissues, scaling up of cell culture and cloning mechanism</p> <p>CO5[K6]: propose the application of animal cell culture to improve sustainability, productivity, suitability for pharmaceutical and industrial applications</p>
11.	23PBTC23	Core Course - VII: Genetic Engineering	<p>CO1[K2]: explain the strategies of genetic engineering.</p> <p>CO2[K3]: apply suitable bioanalytical tools in gene expression studies.</p> <p>CO3[K4]: compare the central dogma of cell in prokaryotes and eukaryotes.</p> <p>CO4[K5]: choose the appropriate gene transfer method for prokaryotes</p>



			and eukaryotes CO5[K6]: appraise the applications of genetic engineering in the generation of recombinant molecules
12.	23PBTC2P	Core Course - VIII: Practical: Microbiology, Plant and Animal Biotechnology and Genetic Engineering	CO1[K2]: illustrate the methods to isolate and identify microbes from various sources CO2[K3]: determine the cell viability and toxicity CO3[K4]: separate nucleic acids and proteins from biological sources CO4[K5]: perform the micropropagation in plant tissue culture CO5[K6]: elaborate the microbial gene transfer techniques
13.	23PBTO21	Elective Courses Generic/Discipline specific - III: Regulatory affairs and Industrial Standards	CO1[K2]: outline the basic requirements of establish laboratory for testing samples as per the regulatory body's requirements CO2[K3]: determine the Scientific, technical knowledge about various food preservation techniques CO3[K4]: analyze the basic concepts of packing of food materials, various parameters observed during packaging CO4[K5]: evaluate the methods for testing of food materials and identifying microbial food contaminant CO5[K6]: elaborate the importance of food safety management system, good manufacturing practice and good hygienic practices
14.	23PBTO22	Elective Courses Generic/Discipline specific - III: Pharmaceutical Biotechnology	CO1[K2]: explain the basic components of pharmaceutical and biotechnology industry and methods and applications of biosensor CO2[K3]: describe the scientific, technical and economic aspects of vaccine & rDNA technology CO3[K4]: analyze the concepts of protein Engineering, therapeutic proteins



			and enzyme immobilization techniques CO4[K5]: determine the importance of hybridoma technology, microbial biotransformation and microbial biotransformed products CO5[K6]: elaborate the concepts of somatic gene therapy, Xeno-transplantation, fermentor and bio safety methods
15.	23PBT023	Elective Courses Generic/Discipline specific - IV: Environmental Biotechnology	CO1[K2]: illustrate various waste management methods CO2[K3]: determine potential biotechnological approaches to degrade xenobiotic compounds CO3[K4]: examine the techniques involved in waste water management CO4[K5]: assess the methods of monitoring pollution and its control CO5[K6]: elaborate the methods of bioremediation to control the polluted environment
16.	23PBT024	Elective Courses Generic/Discipline specific - IV: Agricultural Biotechnology	CO1[K2]: explain the importance of agriculture and need for biotechnology in agriculture CO2[K3]: discover the basics concepts of plant system and their genetics CO3[K4]: differentiate the importance of genome, plasmids and vectors CO4[K5]: measure different ways of gene transfer methods and transgenesis CO5[K6]: build a suitable methods of biotechnology in the identification of plant hybridization
17.	23PBTN21	Non-Major Elective Course - I: Gene Manipulation Technology	CO1[K2]: illustrate various gene cloning methods and enzymes CO2[K3]: determine applications of gene cloning, gene libraries CO3[K4]: analyze the techniques involved in sequencing the DNA CO4[K5]: appraise the methods of protein engineering techniques



			CO5[K6]: construct the methods of gene cloning and its ethics
SEMESTER -III			
18.	23PBTC31	Core Course - IX: Bioinformatics	CO1[K2]: demonstrate the basic concepts of bioinformatics and its significance in biological data analysis CO2[K3]: find the role of internet in bioinformatics CO3[K4]: analyze the regulatory sequences in both prokaryotes and eukaryotes CO4[K5]: evaluate different types of biological databases CO5[K6]: construct the methods involved in computer aided drug designing
19.	23PBTC32	Core Course - X: Immunology	CO1[K2]: illustrate the various mechanisms that regulate the immune responses CO2[K3]: find the key events and cellular players in antigen presentation CO3[K4]: analyze the concepts of cellular and molecular processes that represents the human immune system. CO4[K5]: evaluate the process of immunological regulation and tolerance at a Cellular and molecular level CO5[K6]: Compile the concepts of immunological principles and diagnosis
20.	23PBTC33	Core Course - XI: Bioprocess Technology	CO1[K2]: illustrate the general requirement for fermentation process CO2[K3]: discuss the production process of insulin CO3[K4]: identify the principle behind the aqueous two phase extraction CO4[K5]: assess the role of different dryers in down stream processing CO5[K6]: compile the methods involved the effluent treatment
21.	23PBTC3P	Core Course - XII:	CO1[K2]: demonstrate the methods involved in the preparation of serum



		Practical : Bioinformatics, Immunology and Bioprocess Technology	and plasma CO2[K3]: determination of lymphocyte viability by trypan blue method CO3[K4]: distinguish the methods involved in the isolation of plasma and serum CO4[K5]: assess the function of different parts of a bioreactor CO5[K6]: construct the method for the production of penicillin
22.	23PBT031	Elective Courses Generic/Discipline specific - V: Nano Biotechnology	CO1[K2]: classify the different types of nanomaterials CO2[K3]: find the role of nanomaterial in drug delivery process CO3[K4]: analyze the function of nanomaterial in bone tissue grafting CO4[K5]: evaluate the role of nanomaterial in cancer treatment CO5[K6]: compile the impact of nanomaterial in the mammalian system
23.	23PBT032	Elective Courses Generic/Discipline specific - V: Molecular Developmental Biology	CO1[K2]: illustrate gametogenesis process CO2[K3]: write about the fertilization process in animals CO3[K4]: analyze the morphogenetic movements in mammals CO4[K5]: evaluate the mechanism of vertebrate eye development CO5[K6]: predict the symptoms of the developmental disorders of Spina bifida
24.	23PBTN31	Non-Major Elective Course - II: Tissue Engineering	CO1[K2]: illustrate about morphogenesis CO2[K3]: write about the tissue assembly in microgravity CO3[K4]: analyze the methods involved in the transplantation of engineered cells CO4[K5]: evaluate the substitutes of red blood cell CO5[K6]: assemble the steps of skin tissue engineering



25.	23PBTJ31	Internship/Industrial Training	<p>CO1[K2]: identify different career paths within the industry and gain insights into potential future roles.</p> <p>CO2[K3]: apply theoretical concepts and academic knowledge to real-world situations and challenges encountered during the internship.</p> <p>CO3[K4]: analyze problems, generate innovative solutions, and make informed decisions.</p> <p>CO4[K5]: evaluate how to manage time effectively and prioritize tasks to meet deadlines and deliver quality work.</p> <p>CO5[K6]: create a portfolio of the work, projects, and achievements during the internship.</p>
SEMESTER - IV			
26.	23PBTC41	Core Course - XIII: Research Methodology	<p>CO1[K2]: classify the types of research</p> <p>CO2[K3]: identify the components of research report</p> <p>CO3[K4]: analyze the statistical tools used in research</p> <p>CO4[K5]: assess the application, features and functions MS EXCEL in research</p> <p>CO5[K6]: compile the applications of google search engine</p>
27.	23PBTC42	Core Course - XIV: Biostatistics	<p>CO1[K2]: explain the different types of sampling methods</p> <p>CO2[K3]: find the relation between correlation and regression</p> <p>CO3[K4]: analyze the characteristics of frequency curve</p> <p>CO4[K5]: evaluate the application of chi-square test</p> <p>CO5[K6]: construct the steps involved in the ANOVA</p>



28.	23PBTJ41	Core Course - XV: Project with Viva Voce	C01[K1]: identify the unexplored areas of research C02[K2]: outline the objectives in formulating a research paper C03[K3]: apply the latest rules of documentation to cite Print, Non-print and Web Publications in a research paper C04[K4]: analyze the stages in writing a thesis – collecting and evaluating Sources and drafting documentation C05[K6]: prepare a rightly documented research project with adequate discussion, interpretation and evaluation
29.	23PBTO41	Elective Courses Generic/Discipline specific - VI: Stem cell Biology	C01[K2]: classify the types of stem cells C02[K3]: Identify the characters of drosophila germ line stem cells C03[K4]: illustrate the stem cell culture techniques C04[K5]: evaluate the role of LIF pathway in cell cycle control C05[K6]: compile the applications of bone marrow and stem cells
30.	23PBTO42	Elective Courses Generic/Discipline specific - VI: Bioethics, Biosafety, Clinical Trials, IPR and Entrepreneurship	C01[K2]: explain the GMO issues C02[K3]: find the applications of Human Genome Project C03[K4]: analyze the regulation of national and international guidelines of biosafety C04[K5]: evaluate the benefits of GM technology C05[K6]: construct the procedure for the registration of geographical indications
31.	23PBTS41	Skill Enhancement Course: Professional Competency Course: Preparatory course for	C01[K2]: outline structure of atoms, molecules, and chemical C02[K3]: find the structure and functions of cell membrane C03[K4]: analyze the process of post-translational modification of proteins C04[K5]: evaluate the role of B and T cells in immune system



		SET/NET in Life Sciences	C05[K6]: compile the process of root and shoot development
32.		Extension Activity	C01[K1]: recognize the importance of community service through training and education C02[K2]: interpret ecological concerns, consumer rights, gender issues & legal protection C03[K3]: develop team spirit, verbal/nonverbal communication and organizational ethics by participating in community service C04[K4]: examine the necessity of professional skills & community-oriented services for a holistic development C05[K6]: create awareness on human rights, legal rights, First Aid, Physical fitness and wellbeing