M.Sc. Biotechnology – I,II,III & IV Semesters

Code	Course Name	Course Outcomes
M.Sc. Biotechnology – I Semester		
PMTT11	**Biochemistry**	**COURSE OUTCOMES** Upon completion of this course the students will be able to **CO1**: know the biomolecules and metabolisms of biochemical pathways **K1** **CO2**: understand the lipid molecules, vitamins and hormones **K2** **CO3**: know the structure, classification and properties of amino acids and proteins **K1** **CO4**: know about nucleotide structure, biosynthesis and its regulation & degradation **K1** **CO5**: learn the basic concept of Enzymes – Nomenclature and Classification, factors influencing enzyme activity **K4**
PBTT12	**Microbiology**	**COURSE OUTCOMES** Upon completion of this course the students will be able to **CO1**: know the history, criteria, classification and diversity of Bacteria. **K1** **CO2**: understand the cultural techniques for isolation and molecular identification of any microbes.**K2** **CO3**: become well-versed with the extremophiles organisms, structure and characteristics of fungi and algae. K2 **CO4:** acquire knowledge on classification, cultivation of virus as well as host and microbial interaction.**K4** **CO5**: learn the essential conception of bacteria, fungi and

		virus pathogenicity, transmission, diagnosis and treatment with examples.**K3**
PBTT13	**Molecular Biology**	**COURSE OUTCOMES** Upon completion of this course the students will be able to **CO1**: know the structure, types, replication process and function of nucleic acids in Prokaryotic & Eukaryotic organisms. **K1** **CO2**: understanding the synthesis and processing of RNA and Protein inside the cells.**K2** **CO3**: Know more about the control of gene expression and molecular Recombination event.**K4** **CO4**: learn the methods of DNA repair mechanisms in the cell, Gene mapping techniques and cellular signal transduction pathways**K3** **CO5**: study the basic concept of Quorum sensing, Oncogenes and anti-oncogenes.**K2**
PBTP11	**Practical I: Lab in Analytical Biochemistry & Lab in Microbiology and Molecular biology**	**COURSE OUTCOMES** Upon completion ofthis course the students will be able to **CO1**: gain practical knowledge about biomolecules **K1** **CO2**: develop skill and perform different chromatographic techniques **K4** **CO3**: gain hands on experience in isolation and identification of microbes in the laboratory**K1** **CO4**: gain knowledge about analysis of mutation studies**K2** **CO5**: acquire knowledgeonseparationof biomolecules.**K1**
PBTE11	**ELECTIVE I** **Option I: Cell Biology**	**COURSE OUTCOMES** Upon completion of this course the students will be able

	And Genetics	to **CO1**: know the structure of prokaryotic and Eukaryotic cell and organelles**K1** **CO2**: understand the ultra-structure of plasma membrane, transport process in the cell**K2** **CO3**: understand the Molecular events of cell cycle and its regulation and Cell division**K2** **CO4**: know about the basic Mendelian principles, Pedigree analysis and Chromosome abnormalities**K1** **CO5**: educate the vital perception of Sex determination and Linkage (Drosophila, Hymenoptera, Mammals).**K3**
PBTE11	**<u>ELECTIVE I</u>** **Option II: Developmental Biology**	**COURSE OUTCOMES** Upon completion of this course the students will be able to **CO1**: know about the Fertilization process in the animal kingdom. **K1** **CO2**: understand the development of organs in chick and Hormonal control process in ovulation pregnancy, menstrual cycle, gestation period and abortion.**K2** **CO3**: understand the Embryogenesis, seed formation and germination in plants.**K2** **CO4**: know about the basic Sex determination as well as understand the genetic errors of human development**K3** **CO5**: comprehend the critical model of organization of shoot & root, floral meristems and floral development in Arabidopsis.**K4**

Code	**Course Name**	**Course Outcomes**

M.Sc. Biotechnology – II Semester		
PBTT21	**Immunology**	**COURSE OUTCOMES** Upon completion of this course the students will be able to **CO1**: know the basics of immune system about the cells and immunoglobins**K1** **CO2**: understand the difference between Antigens and Antibody and its mechanisms inside the host **K2** **CO3**: learn communication of immune cells by cytokines, signaling molecules and regulation of immunity.**K2** **CO4**: become aware on current issues and problems of Hypersensivity, Immunotolerence, Transplantation, graft rejection & immunosuppressive therapy**K3** **CO5**: study the tools and techniques in immunotechnology and vaccine development.**K4**
PBTT22	**Recombinant DNA Technology**	**COURSE OUTCOMES** Upon completion of this course the students will be able to **CO1**: study and know the tools and advanced techniques of genetic engineering **K1** **CO2**: understand the difference between hosts and its suitable vectors for gene cloning **K2** **CO3**: learn the procedure of gene transformation techniques in the cell.**K4** **CO4**: know about PCR techniques and primer designing using bioinformatics tools K3 **CO5**: perform identification of organisms using DNA barcoding, DNA based nanostructure and

PBTT23	**Environmental Biotechnology**	Upon completion of this course the students will be able to **CO1**: identify and conserve the diversity of plants and animals and to use the resource in natural way to avoid pollution **K1** **CO2**: understand and identify the environmental issues due to pollution **K2** **CO3**: learn procedure and do research in water treatment, water borne diseases and treatment of effluent from industry**K3** **CO4**: gain knowledge about types of solid wastes generated in house and industry and to solve the problems using natural process and to earn income by recycling the waste **K6** **CO5**: identify the environmental problems and find the solution for chemical usage of pesticides and fertilizer **K4**
PBTP22	**Practical III: Lab In Immunology & Recombinant DNA Technology & Lab In Environmental Biotechnology**	**COURSE OUTCOMES** Upon completion of this course the students will be able to **CO1**: gain practical knowledge about immunological techniques **K1** **CO2**: understand and identify the health issues and report very easily**K2** **CO3**: learn about protein research, gene and gene transformation **K3** **CO4**: gain knowledge about analysis of water quality and solve the problem of the society**K6** **CO5**: identify the environmental problems and to find solution using biotechniques**K6**
PBTE22	**Elective II**	**COURSE OUTCOMES** Upon completion of this course the students will be able

	Option 1: Bioinformatics	to **CO1**: gain practical knowledge about computer **K1** **CO2**: learn MS office, MS power point and software tool SPSS which is useful in research purpose**K2** **CO3**: perform research in protein and genes present in Biological database**K3** **CO4**: gain knowledge about analysis of Phylogenetic trees.**K5** **CO5**: learn aboutthe submission of DNA and protein sequence to the biological database**K6**
PBTE22	**Elective II** **Choice 2: Nanotechnology And Cancer Biology**	**COURSE OUTCOMES** Upon completion of this course the students will be able to **CO1**: know basics about nanomaterials and Nanoparticles **K1** **CO2**: learn the application of nanotechnology in different field **K3** **CO3**: update research in Nanotechnology for cancer research & therapy**K4** **CO4**: gain knowledge about Epidemiology of cancer and its types and characteristics of cancer cells in molecular level**K2** **CO5**: acquire knowledge about chemotherapy and chemoprevention in Tumor immunology**K6**

Code	**Course Name**	**Course Outcomes**
M.Sc.Biotechnology – III Semester		
PBTT31	**Plant Biotechnology**	**COURSE OUTCOMES** Upon completion of this course the students will be able to

		CO1: know basic techniques and setup off plant tissue culture laboratory **K1** **CO2**: understand the Application and techniques of germplasm conservation, hardening and green house technology.**K2** **CO3**: trained and update research in plant transformation techniques **K3** **CO4**: gain knowledge about Terminator seed technology and research advancement and its production of edible vaccines, plantibodies in transgenic plants **K6** **CO5**: acquire knowledge about Biosafety guidelines for research involving GMO's and IPR**K2**
PBTT32	**Animal Biotechnology**	**COURSE OUTCOMES** Upon completion of this course the students will be able to **CO1**: know the requirements to establish the cell culture laboratory**K1** **CO2**: understand the procedure to do Primary cell culture techniques, mass production, storage methods, germplasm conservation and establishment of gene banks.**K2** **CO3**: know the practical difficulties in sources of contamination in cell culture and importance of transgenic animals and Molecular pharming**K3** **CO4**: know about advanced medical treatment methods using gene therapy for human diseases**K4** **CO5**: learn the basic concept of Collection, processing, preservation and banking of stem cells for future generation free from genetic disorders**K6**
PBTT33	**Bioinstrumentation And Biostatistics**	**COURSE OUTCOMES** Upon completion of this course the students will be

		able to **CO1**: know about the types of microscopy and its principles, working procedure and sample preparation techniques **K1** **CO2**: understand the importance of centrifuge and chromatographic techniques in research aspects**K2** **CO3**: know the advanced methods to study biomolecules using XRD,NMR, MADI-TOF, thermocycler, microarray. Principles and handling procedure of Electrophoresis techniques **K2** **CO4**: develop skill in the aspects of collection and presentation of biological data through biostatics **K3** **CO5**: learn the methods in statistics to solve the biological problems with accuracy**K6**
PBTP33	**Practical V- Lab In Plant Biotechnology & Lab In Animal Biotechnology**	**COURSE OUTCOMES** Upon completion of this course the students will be able to **CO1**: able to gain practical knowledge about plant cell culture techniques requirements **K1** **CO2**: know and skill in transformation techniques in plant cells**K2** **CO3**: learn culture media preparation and cell culture procedure**K2** **CO4**: gain knowledge about Virus inoculation methods**K3** **CO5**: check Cell viability test – MTT and storage of cells**K4**
PBTP44	**ELECTIVE III** **Choice 1 : Women Studies**	**COURSE OUTCOMES** Upon completion of this course the students will be able to **CO1**: gain knowledge about Government

		Organization for women and Child Development**K1** **CO2**: know Indian women –Family and Social System and Health status of women in India**K2** **CO3**: learn Women in organized and unorganized sector-Training, skills and income generation.**K3** **CO4**: gain updates knowledge about Women Empowerment and Women Development **K2** **CO5**: become aware of women -Labors Laws, Legal protection, Police and Judiciary and Human rights as women's Rights**K2**
PBTP44	**ELECTIVE III** **Choice 2 : Employability Skill**	**COURSE OUTCOMES** Upon completion of this course the students will be able to **CO1**: able to take Career Decision making**K3** **CO2**: know how to take Career Plan**K1** **CO3**: gain knowledge and aware how to collect relevant materials **K2** **CO4**: think and take Steps taken to achieve the Goal**K4** **CO5**: prepare and qualifying themselves for that carrier with good resumes**K3**

Code	**Course Name**	**Course Outcomes**
M.Sc.Biotechnology – IV Semester		
MBTC415	**Bioethics, Biosafety And IPR**	**COURSE OUTCOMES** Upon completion of this course the students will be able to **CO1**: become aware of bioethics in gene cloning and its application in agriculture**K1** **CO2**: know about Ethical, legal and Socio economic

		aspects in medicines and Human rights**K2** **CO3**: gain knowledge and aware of Biosafety levels in the laboratory**K2** **CO4**: understand the principles of IPR and its types, procedure about patentable and non-patentable **K2** **CO5**: acquire knowledge onpatenting procedure in India and Indian patent act**K3**
MBTC425	**Bioprocess Technology**	**COURSE OUTCOMES** Upon completion of this course the students will be able to **CO1**: identify the industrially important organisms **K1** **CO2**: know about principles and techniques in Designing and types of fermentor**K2** **CO3**: gain knowledge onbioreactor usage and fermentation process**K2** **CO4**: know about the fermentation products, purification and its characterization **K2** **CO5**: know about commercial production of bio products **K3**
MBTC435	**MAJOR PROJECT**	**Learning outcome:** Empowering students to carryout individual research projects. All the candidates of M.Sc (Biotechnology) are required to undergo a Major project and submit the following: Dissertation/Thesis based on the work done by the student. Soft copy of the project on CD/DVD