

Name of the Department: Biotechnology

Programme: UG

S.No	Course Code	Course Name	Course Outcome
SEMESTER I			
1.	15UBTC11	Cell Biology	<ul style="list-style-type: none"> • Thorough knowledge about structure and function of Cells, bio molecules and cellular development. • Knowledge about the role of the major cell organelles. • Fundamental features of prokaryotic and eukaryotic cells and methods used to examine them. • Knowledge on the specific processes and proteins involved in membrane transport. • Understand the major stages of the cell cycle. • Awareness on the latest advances in cell biology.
2.	15UBTC1P	Lab in Cell Biology & Genetics	<ul style="list-style-type: none"> • Practical skills on Cell Biology. • Basic techniques of cell biology. • Knowledge about the organelles of cells and function. • Different stages in mitosis and meiosis cell division. • Understand the difference between monohybrids and dihybrids of plants. • Knowledge on starch utilization in plants.
3.	15UBTN11	Human Diseases- Communicable Diseases	<ul style="list-style-type: none"> • Understand the ubiquitous nature of pathogens and host - pathogen relationships • Awareness on diseases caused by the microorganisms and the prevention methods and vaccination • Understand about the diagnosis and treatment of various diseases. • Awareness on diseases and ensure the sanitation and hygiene
4.	15UBTE11	Fundamentals of Genetics	<ul style="list-style-type: none"> • Knowledge in genetics and science • Understand about monohybrid and dihybrid plants • Structure and function of genes, chromosomes and genomes • Understand how traits get passed down through

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			generations • Fundamentals of molecular biology
SEMESTER II			
1.	15UBTC21	Biochemistry	<ul style="list-style-type: none"> • Knowledge about structure and function of Cells, bio molecules and cellular development. • Awareness on the latest advances in cell biology. • Concepts of molecular and functional organization of a cell and its sub cellular components. • Understand structure and interrelationship of various biomolecules and consequences of deviation from normal. • Awareness about digestion and assimilation of nutrients and consequences of malnutrition. • Understand the various aspects of metabolism and their regulatory pathways.
2.	15UBTC2P	Lab in Biochemistry	<ul style="list-style-type: none"> • Familiar in basic biochemistry laboratory techniques. • Understand the basic Biochemical estimations. • Analyze the methods including graphing and statistical analysis. • Problem solving skills and analytical thinking skills • Familiar with laboratory skills.
3.	15UBTN21	Human Diseases - Non Communicable Diseases	<ul style="list-style-type: none"> • Knowledge about the Health and Diseases • Understand about various metabolic related disorders • Awareness on in borne metabolic disorders • Understand about diagnosis, treatment and prevention method.
4.	15UBTE21	Basic Concepts of Biotechnology	<ul style="list-style-type: none"> • Understand the structure, composition and function of various biomolecules. • Understand the fundamentals of biotechnology. • Role of biotechnology in Spirullina cultivation and its applications • Novel methods for production of antibiotic. • Importance of mushroom and its cultivation technique. • Application of biotechnology in pollution control.

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SEMESTER III			
1.	15UBTC31	Microbiology	<ul style="list-style-type: none"> • Apply appropriate terminology relating to the structure, metabolism, genetics, and ecology of prokaryotic microorganisms, eukaryotic microorganisms, and viruses. • Understand the nutritional requirement of microorganisms. • Knowledge about the interactions between pathogenic microorganisms and susceptible hosts that results in infection and disease. • Knowledge on methods of sterilization used in the control of microorganisms and apply this understanding to the prevention and control of infectious diseases. • Understand the life cycle of algae bacteria and fungi and viruses. • Understand the interaction between the microorganisms and plants, animals.
2.	15UBTC3P	Lab in Microbiology	<ul style="list-style-type: none"> • Perform safe practices in a microbiology laboratory. • Understand the use of culture media. • Identify unknown bacteria using biochemical testing. • Perform proper streaking for isolation using the quadrant method • Perform appropriate staining technique. • Interpret biochemical test results properly to determine species identification
3.	15UBTA31	Biological Sciences	<ul style="list-style-type: none"> • Knowledge about the modern system of classification of plants. • Analyze the Economic importance and Life history of Algae, Fungi and Bryophytes. • Understand the Classification and Life history of Pteridophytes, Gymnosperms. • Salient features of Monocot and Dicot plants. <p>Characteristic features of invertebrates and their suitable examples</p>
4.	15UBTA3P	Lab in Biological	<ul style="list-style-type: none"> • Handling and identification of plants, animals and

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		Sciences	<p>lower plants.</p> <ul style="list-style-type: none"> • Practical knowledge on ecological techniques. • Basic techniques of cell biology
5.	15UBTS31	Human Physiology	<ul style="list-style-type: none"> • Understand about nutrition and their values • In depth analysis of the internal organs and their working mechanisms. • Understand about important of hormones and their role in health • Importance of health and exercise. • Knowledge about physiology of digestion and absorption of nutrition. • Awareness on the ultra structure and • activities of bones and muscles.
6.	15UBTV31	Medicinal Plants	<ul style="list-style-type: none"> • Identify medicinal plant taxa and habitats threatened by non-sustainable harvest. • Understand the present and future prospectus of the medicinal plants. • High levels of trade, environmental degradation, and other factors contributing to loss of species and genetic diversity. • Work with local, regional, national, and global partners to design and implement conservation action plans for priority medicinal plant taxa and habitats. • Opportunities for consumers, industry, and other beneficiaries to understand and participate more directly in conservation. • Marketing of Medicinal plants in India and World level.
SEMESTER IV			
1.	15UBTC41	Molecular Biology & Molecular Genetics	<ul style="list-style-type: none"> • Knowledge about the bacterial and eukaryotic DNA replication, transcription, translation and post translational modification, • Regulation of gene expression in prokaryotes. • Knowledge about genetic diseases and causes of genetic diseases. • Knowledge on mutation and various aspects of DNA repair mechanism.

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			<ul style="list-style-type: none"> • Knowledge about the types of mutation and it's causing agents. • Ensure the students understand about transposable elements and transposition mechanism
2.	15UBTC4P	Lab in Molecular Biology Molecular Genetics	<ul style="list-style-type: none"> • Understand the principle of bacterial conjugation. • Isolation of bacteriophage and their titration. • Understanding the mechanism of mutation. • Knowledge about the differentiation auxotrophic and prototrophic mutants. • Isolate the DNA from plants, animals, plasmids
3.	15UBTA41	Food Biotechnology	<ul style="list-style-type: none"> • Awareness about the food contamination by microorganisms. • Understand the production of cheese, bread, wine. • Production of single cell protein and their economic importance. • Understanding of food preservation techniques. • Awareness on food hazardous and food analysis
4.	15UBTA4P	Lab in Food Biotechnology	<ul style="list-style-type: none"> • Knowledge about the basic food biotechnology techniques. • Knowledge about the isolation and identification of food contaminants. • Identify the quality of milk. • Identify the water quality analysis. • Awareness on microbiological examination of soft drinks.
5.	15UBTO41	Biostatistics	<ul style="list-style-type: none"> • Understand about basic knowledge on biostatistics and their important in applied biology • Understand about history of biostatistics and their role • Knowledge in mean, median and mode and the difference in tabulation • Understand about diagrams and tabulations and their role in experimental studies • Knowledge about ANNOVA and their application in research studies.
6.	15UBTO42	Fundamentals of Drug Designing	<ul style="list-style-type: none"> • Understand about basic knowledge on biostatistics and their important in applied biology • Understand about history of biostatistics and their

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			<p>role</p> <ul style="list-style-type: none"> • Knowledge in mean, median and mode and the difference in tabulation • Understand about diagrams and tabulations and their role in experimental studies • Knowledge about ANNOVA and their application in research studies.
SEMESTER V			
1.	15UBTC51	Immunology & Immunotechnology	<ul style="list-style-type: none"> • Understand the cells and organs involved in the immune system of the body • Familiar with the body's natural defense (immunity), its mechanism and active immunity by vaccination • Understand the mechanisms of humoral and cell mediated immune response • Handling skills of different immunotechniques for disease diagnosis and identification • Theoretical understanding of transplantation immunology and immunosuppressive agents • Understand how to combat the disease and immunotherapies available • Highlight the current applications of immunological research in practice
2.	15UBTC52	Industrial Biotechnology	<ul style="list-style-type: none"> • Understand the scope and applications of Industrial Biotechnology. • Basic knowledge about fermentors and its types for the production of recombinant proteins. • Knowledge about the innovative microbial food products. • Explore the methods of potential improvement of efficient strains to increase the yield of microbial products • Knowledge on immobilization of enzymes and cells and downstream processing of biologicals • Understand the mechanism for the production of secondary metabolites. • Understand the importance of single cell protein and single cell oils

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3.	15UBTC53	Animal Biotechnology	<ul style="list-style-type: none"> • Explore diagnostic method and therapy for mortal diseases. • Expose to genetic engineering for the production of regulatory proteins, vaccines and hormones. • Understand the basic principles of animal tissue culture and handling procedures • Knowledge on the concept of transgenesis and methods of transferring genes using various vectors into the host. • Understand the fundamentals of animal genomics. • Basic understanding about genetically modified organisms. • Understand the ethical issues related to animal biotechnology and to introduce the concepts and importance of intellectual property rights- patents, copyright, tradeseecrets, trademark. • Understand human genome project and gene therapy.
4.	15UBTC5P	Lab in Immunology & Immunotechnology	<ul style="list-style-type: none"> • Identify the blood groups using antibody specific to each blood group antigens and to study the principle of transfusion • Knowledge on different types of antigen, hapten, adjuvants and immunization methods to elicit polyclonal antibody production in animals • Expose to the different immunotechniques for disease diagnosis and identification • Isolate and separate B and T lymphocytes from total human blood using nylon wool column • Enumerate WBCs and RBCs from human blood using haemocytometer • Detect the specific protein (antigen) present in the unknown protein sample using western blotting • Detect the presence or absence of antigen/antibody present in the unknown sample using ELISA
5.	15UBTO51	Bioinformatics	<ul style="list-style-type: none"> • 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

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			<p>research.</p> <ul style="list-style-type: none"> • Understand the vast quantities of data generated in the fields of Molecular and Biological Sciences (databases available for different organisms). • Problem-solving skills and gain experience in understanding, handling and developing important software used in pharmaceutical, chemical and biotechnology industries. • Understand the basic algorithms of bioinformatics and to learn with the fundamentals of sequence retrieval and alignment and to study the phylogenetic relationship between the different organisms • Understand with application of structural biology and molecular docking and to impart knowledge on drug designing.
6.	15UBTO52	Marine Biotechnology	<ul style="list-style-type: none"> • Awareness on the physical and chemical elements present in Sea. • Understand the bioactive compounds of the sea. • Knowledge on the biodiversity of different organisms in marine environment. • Application of marine organisms for production of antibiotics.
7.	15UBTS51	IPR, Bioethics & Biosafety	<ul style="list-style-type: none"> • Importance of Intellectual property rights and productions • Awareness on patenting, Bioethics, Biopiracy and its importance • Operation of Biosafety and hazards of environmental management • Understand about the ethics of cloning and stem cell research • Knowledge on guidelines of ICMR and DBT
8.	15UBTS52	Cancer Biology	<ul style="list-style-type: none"> • Mechanisms of transformation of normal cell into cancerous cell • Understand the physical, chemical and biological agents that causes cancer • Understand the genes (oncogenes and tumor suppressor genes) involved in cancer progression

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			<p>and termination</p> <ul style="list-style-type: none"> • Knowledge on the classical and advance methods of diagnosis of cancer • Explore the current trends of cancer research such as nanomedicine and therapies available • Understand the gene silencing process using RNAi technology of cancerous cells
SEMESTER VI			
1.	15UBTC52	Recombinant DNA Technology	<ul style="list-style-type: none"> • Basic principles of recombinant DNA technology and its pros and cons • Knowledge on the bacterial vectors, viral vectors for the construction of recombinant molecule • Knowledge on the construction of recombinant molecule and how to transform the recombinant molecule into the desire host • Knowledge on methods of gene transfer into bacteria, plant, animal • Knowledge on molecular techniques such as PCR, RFLP, genomic library, DNA fingerprinting and RAPD and to highlight the methods of gene sequencing • Detect DNA, RNA, Protein by blotting techniques • Understand the application of rDNA in industrial enzyme production
2.	12UBTC53	Plant Biotechnology	<ul style="list-style-type: none"> • Knowledge of Plant Genome Organization organelles organization. • Perception of Plant Tissue Culture and the techniques involved. • Knowledge on the regulation of gene expression in plant development • Basic concepts of plant genetic engineering and its application such as edible vaccines, plantibodies, improved nutritional content resistance to bacterial, fungal and viral infections • Influence of plant hormones in plant tissue culture • Understand the molecular mechanism of agrobacterium mediated gene transfer and to study the plant-pathogen interaction

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			<ul style="list-style-type: none"> • Basic knowledge on gene silencing using RNAi technology
3.	15UBTC6P	Lab In Recombinant DNA Technology	<ul style="list-style-type: none"> • To perform DNA isolation from different organisms such as plant, bacteria and human blood. • To study the transformation of recombinant DNA into bacteria • To amplify the gene of interest by polymerase chain reaction (PCR) • To perform the cloning of the gene of interest in vector and screening of the recombinants and non recombinants • To identify the gene of interest by southern hybridization • To identify the protein of interest by western blotting • To provide hands on experience on molecular techniques to every students
4.	15UBTC6Q	Lab in Plant Tissue Culture	<ul style="list-style-type: none"> • Basic knowledge of plant tissue culture such as surface sterilization, media preparation, contamination and other handling procedures • Understand the techniques involved in plant tissue culture & to generate <i>in vitro</i> propagated plants • Knowledge on hardening techniques • Handling skills for agrobacterium mediated gene transfer and host–plant pathogen interactions • Isolation and purification of protoplasts • Hands on experience to all students • Importance of marketing the plants from plant tissue culture
5.	15UBTO61	Stem Cell Biology	<ul style="list-style-type: none"> • Understand the properties and types of stem cell. • Knowledge about the techniques used for studying stem cell. • Application of stem cell biology in medicine. • Justify the ethical consideration of stem cell research.
6.	15UBTO62	Biochemical	<ul style="list-style-type: none"> • Basic principles of biological instruments such as

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		Techniques	<p>microscopy, flow cytometry</p> <ul style="list-style-type: none"> • Knowledge on chromatographic, electrophoretic, spectroscopic and radioisotopic techniques for analysis of biological compounds • Application of instruments for the biological research • Techniques of two dimensional gel electrophoresis and MALDI-TOF. • Information on immunotechniques for disease diagnosis and identification.
7.	15UBTS61	Functional Genomics	<ul style="list-style-type: none"> • Theoretical knowledge of Proteome and genomes • Understand the various proteomic and genomic analysis techniques • Understand the principle of DNA sequencing and mapping of the genome • Acquire problem-solving skills and gain experience used in biotechnology, pharmaceutical, chemical and industries • Applications of DNA array and protein array • Basic concepts of pharmacogenomics in the identification of drug targets
8.	15UBTV61	Nanobiotechnology	<ul style="list-style-type: none"> • Understand the basic concepts and historical aspects of nanotechnology • Understand the different physical, chemical and biological methods of synthesis of nanoparticles • Analyse of nanoparticles using UV spectrometry, microscopic techniques such as SEM, TEM and X-ray diffraction • Applications of nanoparticles in anticancer, antiangiogenic, drug delivery and imaging • Understand the scope of nanomedicine in near future
9.	12UESR61	Environmental Studies	<ul style="list-style-type: none"> • Understand that living and non living things are interlinked from micro to macro level as an unbroken chain from sun to soil • Gain Knowledge about the general aspects of eco system and their structure • Identify the diversity of animals and plants and

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			<p>their conservation</p> <ul style="list-style-type: none"> • Learn the Core concepts and methods from ecological and physical sciences and their application in environmental problem solving. • Understand the transnational character of environmental problems and ways of addressing them, including interactions across local to global scales. • Address the lethal impact of global warming and control measures