



Department of Biotechnology

B.Sc. Biotechnology

S.No	Course Code	Course Name	Course Outcomes
SEMESTER - I			
1.	23UBTC11	Core Course I : Cell and Molecular Developmental Biology	CO1[K1]: explain discovery, diversity of cells and cell theory CO2[K2]: describe structure and function of cell organelles CO3[K3]: determine the events of cell cycle and its regulation CO4[K4]: analyze the molecular mechanisms involved in cellular differentiation, morphogenesis, growth and potency of the cell CO5[K5]: assess the response of cells to the intra and extracellular environment by intracellular signaling pathways
2.	23UBTC1P	Core Course II : Practical : Cell and Molecular Developmental Biology	CO1[K2]: demonstrate the components of microscope CO2[K3]: identify blood cells and its types CO3[K4]: illustrate the structure of plant and animal cells. CO4[K5]: explain the techniques involved in mounting chick embryo CO5[K6]: elaborate the basic principles of cell fractionation and Identification of cell organelles
3.	23UBTS11	Skill Enhancement Course - I: Foundation Course – Basic Concepts of Biotechnology	CO1[K1]: outline the biotechnological tools and their products for commercial purposes CO2[K2]: explain the basic techniques of biotechnology CO3[K3]: determine the steps involved in gene cloning CO4[K4]: analyse the role of biotechnology in pollution control



			CO5[K5]: differentiate the primary and secondary metabolites
4.	23UBTN11	Skill Enhancement Course – II: Non Major Elective Course: Food and Nutrition	CO1[K1]: define food, nutrients and their energy value CO2[K2]: explain the classification of foods and their deficiency diseases CO3[K3]: describe factors affecting BMR CO4[K4]: examine basic food groups and their adulteration CO5[K5]: illustrate the principles and objectives of meal planning
SEMESTER - II			
5.	23UBTC21	Core Course - III: Genetics	CO1[K1]: describe the transmission of genetic characters from one generation to another CO2[K2]: explain the classical genetics and modern genetics CO3[K3]: determine the factors responsible for inherited disorders CO4[K4]: differentiate linkage and crossing over CO5[K5]: categorize the role of eugenics, euphenics and euthenics on population genetics
6.	23UBTC2P	Core Course - IV: Practical: Genetics	CO1[K2]: demonstrate the basic principles of important techniques in Molecular biology and genetics. CO2[K3]: identify Barr bodies from buccal smear CO3[K4]: analyze the Polytene chromosome of the organisms CO4[K5]: evaluate the preparations and maintenance of culture medium. CO5[K6]: predict the steps in Human karyotyping
7.	23UBTA21	Elective Course	CO1[K1]: describe the structure and classifications of bacteria



		Generic/Discipline Specific - II: Fundamentals of Microbiology	<p>CO2[K2]: demonstrate various microbiological techniques in culturing microorganisms</p> <p>CO3[K3]: select the methods of sterilization and identify significance of culture media in the growth of different microbes</p> <p>CO4[K4]: analyze the importance of bioinsecticides and biofertilizers</p> <p>CO5[K5]: assess the role of microbes in food intoxications.</p>
8.	23UBTA2P	Elective Course Generic/Discipline Specific - II: Practical: Fundamentals Of Microbiology	<p>CO1[K2]: describe the sterilization techniques</p> <p>CO2[K3]: develop skills in media preparation, isolation of microorganisms</p> <p>CO3[K4]: analyze the morphological features of bacteria by staining techniques</p> <p>CO4[K5]: evaluate the motility of organisms</p> <p>CO5[K6]: develop biochemical test for characterization and identification of bacteria</p>
9.	23UBTS21	Skill Enhancement Course – III: Plant And Animal Physiology	<p>CO1[K1]: describe the mechanism of digestion of food materials in animals</p> <p>CO2[K2]: illustrate various physiological processes in plants</p> <p>CO3[K3]: determine the mechanism of circulation in animals</p> <p>CO4[K4]: discriminate the metabolic pathways in plants</p> <p>CO5[K5]: elaborate the process of photosynthesis in plants</p>
10.	23UBTN21	Skill Enhancement Course – IV: Non Major Elective Course:	<p>CO1[K1]: outline the Biotechnological tools and their products for commercial purposes</p> <p>CO2[K2]: explain the basic techniques in Biotechnology</p>



		Biotechnology For Society	CO3[K3]: determine the steps involved in gene cloning CO4[K4]: analyse the role of biotechnology in pollution control CO5[K5]: categorize the primary and secondary metabolites
SEMESTER -III			
11.	23UBTC31	Core Course - V: Immunology and Immunotechnology	CO1[K1]: state the organization of the immune system and their functions CO2[K2]: illustrate the types of antigen and immunoglobulin CO3[K3]: choose the appropriate immunotechniques for disease diagnosis CO4[K4]: analyze the factors responsible for immunodeficiency and auto immune disease CO5[K5]: categorize cell mediated and humoral immune response
12.	23UBTC3P	Core Course - Vi: Practical: Immunology and Immunotechnology	CO1[K2]: demonstrate blood grouping and determine blood type CO2[K3]: estimate WBC and RBC Cells CO3[K4]: examine serological diagnostic tests such as ASO, CRP, RA and widal test. CO4[K5]: determine a technical skill required for immunodiffusion and knows the principle behind the techniques. CO5[K6]: predict ELISA technique
13.	23UBTA31	Elective Course Generic/Discipline Specific - III: Bioinstrumentation	CO1[K1]: state the principles and working mechanism of microscopes CO2[K2]: explain the principles and applications of chromatography and spectrometry CO3[K3]: apply the electrophoresis technique in separation of biomolecules CO4[K4]: analyse the role of radioactive isotopes in bioanalytical techniques CO5[K5]: explain the principle of sedimentation of centrifugation



14.	23UBTA3P	Elective Course Generic/Discipline Specific – III: Practical: Bioinstrumentation	CO1[K2]: estimate the lipids and antioxidants in biological samples CO2[K3]: apply the knowledge of chromatographic techniques in identification of amino acids CO3[K4]: examine the nucleic acid and proteins using UV Spectrophotometer CO4[K5]: choose the appropriate technique for the separation of biological material CO5[K6]: prepare buffer using biological samples in pH meter
15.	23UBTS31	Skill Enhancement Course - V: (Entrepreneurial Skill) Biofertilizer	CO1[K1]: state the usefulness of biofertilizer CO2[K2]: explain the importance of biofertilizer in saving the nature CO3[K3]: elucidate the techniques involved in mass production of Biofertilizers CO4[K4]: analyse the quality control measures in biofertilizers CO5[K5]: predict economical and environmental impacts of biofertilizers
16.	23UBTS3P	Skill Enhancement Course - VI: Practical : Biofertilizer Production	CO1[K2]: explain the role of biofertilizers . CO2[K3]: develop the skill in biofertilizer production. CO3[K4]: determine and develop skill related to handling, cultivation and propagatin of quality Microbial inoculants CO4[K5]: analyse the quality control measures and N, P, K levels of biofertilizers CO5[K6]: determine professional competence and upgrade the knowledge of biofertilizer production.



SEMESTER - IV

17.	21UBTC41	Core Course - VII: Genetic Engineering and rDNA Technology	CO1[K1]: explain the strategies of genetic engineering CO2[K2]: select the suitable bio analytical tools in gene expression studies CO3[K3]: compare the central dogma of cell in prokaryotes and eukaryotes CO4[K4]: illustrate the appropriate gene transfer method for prokaryotes and eukaryotes CO5[K5]: explain the applications of genetic engineering
18.	23UBTC4P	Core Course-VIII: Practical: Genetic Engineering and rDNA Technology	CO1[K2]: illustrate r DNA techniques and their application in the field of genetic engineering CO2[K3]: write about plasmids and their construction CO3[K4]: explain gene manipulation methods CO4[K5]: discuss about the principles of recombinant DNA technology and different type of vectors CO5[K6]: elaborate the concept of different cloning strategies and their expression
19.	23UBTA41	Elective Course Generic/Discipline Specific-IV: Bioinformatics and Biostatistics	CO1[K1]: outline the scope and application of bioinformatics CO2[K2]: explain the role of molecular docking and drug design CO3[K3]: apply the bioinformatics tools in sequence alignment CO4[K4]: analyse the role of statistical software CO5[K5]: differentiate parametric and nonparametric statistics
20.	23UBTA4P	Elective Course Generic / Discipline Specific -IV: Practical: Bioinformatics	CO1[K2]: explain the concept of genomics and proteomics CO2[K3]: apply the knowledge to address frontline problems in bioinformatics



		and Biostatistics	<p>CO3[K4]: point out the steps in drug designing</p> <p>CO4[K5]: create bar diagram, line diagram and pie diagram using MS EXCEL</p> <p>CO5[K6]: predict the structure of protein using bioinformatics tools</p>
21.	23UBTS41	Skill Enhancement Course –VII: Clinical Nutrition and Dietary Managemnet	<p>CO1[K1]: list out of the nutritional requirements</p> <p>CO2[K2]: describe the biomolecules classification and deficiency disease</p> <p>CO3[K3]: plan the dietary management</p> <p>CO4[K4]: analyze different forms of nutrients and their requirement</p> <p>CO5[K5]: Evaluate the importance of nutrients for the growth and maintenance of human body</p>
22.	23UBTS42	Skill Enhancement Course –VIII: Clinical Microbiology	<p>CO1[K1]: state the pathogenic mechanism of disease cycle</p> <p>CO2[K2]: explain the association of microorganisms in human host as normal and pathogenic flora</p> <p>CO3[K3]: apply the epidemiology of infectious agents</p> <p>CO4[K4]: analyse the phases of infection, lifecycle and treatment strategies</p> <p>CO5[K5]: predict therapeutic management and contemporary diagnosis of pathogenic microbes</p>
SEMESTER – V			
23.	23UBTC51	Core Course - IX: Plant Biotechnology	<p>CO1[K1]: describe the history of plant biotechnology and state the importance of organization of plant genome</p> <p>CO2[K2]: illustrate the molecular basics of action of hormones and gene expression</p>



			<p>C03[K3]: determine various culture medium preparations, haploid, triploid plant production and its application</p> <p>C04[K4]: analyze the symbiotic organisms as a vector for gene transfers</p> <p>C05[K5]: develop skills for molecular techniques in crop improvement and transgenic plant production</p>
24.	23UBTC52	Core Course - X: Animal Biotechnology	<p>C01[K1]: explain the basic concepts of animal cell culture and cell</p> <p>C02[K2]: describe the media preparation, preservation, and culture of cell lines</p> <p>C03[K3]: list out the strategies for gene transfer and their applications</p> <p>C04[K4]: illustrate the genetic modification and stem cell technology in production of transgenic animals</p> <p>C05[K5]: discuss the assisted reproductive technology and its applications</p>
25.	23UBTC53	Core Course - XI: Environmental and Industrial Biotechnology	<p>C01[K1]: explain about the environment, its issues and management</p> <p>C02[K2]: illustrate the process of water treatment and solid waste management</p> <p>C03[K3]: find out the significance of bioreactors in bioprocess engineering and culture methods</p> <p>C04[K4]: summarize Downstream processing of fermented Products</p> <p>C05[K5]: assess the role and importance of microorganisms behind the ore leaching production of food products and biofertilizers</p>
26.	23UBTC5P	Core Course -XII: Practical: Plant Biotechnology and Animal Biotechnology	<p>C01[K2]: illustrate the protoplast isolation and nucleus localization</p> <p>C02[K3]: prepare plant and animal tissue culture media</p> <p>C03[K4]: evaluate viability and toxicity of cells using assays</p>



			<p>C04[K5]: develop technical skills in isolation of DNA and RNA from plants and animal</p> <p>C05[K6]: discuss the importance of trypsinization and cryopreservation</p>
27.	23UBTC5Q	Core Course -XIII : Practical: Environmental and Industrial Biotechnology	<p>C01[K2]: examine the microorganisms and determine their growth curve, generation time</p> <p>C02[K3]: perform immobilization, compost production and water quality analysis</p> <p>C03[K4]: focus on biofertilizer production techniques and microbial identification.</p> <p>C04[K5]: predict pasteurization efficacy and other quality checks of raw milk</p> <p>C05[K6]: develop skills to perform efficiency tests of biofertilizers biopesticides, and microbial polysaccharide</p>
28.	23UBT051	Elective Course Generic/Discipline Specific - V: Nanobiotechnology	<p>C01[K1]: explain about nanobiotechnology and its research applications</p> <p>C02[K2]: illustrate the characterization methods of nanoparticles using advanced instrumentation</p> <p>C03[K3]: find out the need of designing the nanodevices and materials</p> <p>C04[K4]: summarize the applications of Nanobiotechnology</p> <p>C05[K5]: discuss about the Nano biosensors and their applications</p>
29.	23UBT052	Elective Course Generic/Discipline Specific - V:	<p>C01[K1]: describe fundamentals of enzymology</p> <p>C02[K2]: illustrate characteristic features and classification of enzymes</p> <p>C03[K3]: practice on enzyme kinetics</p>



		Enzymology	C04[K4]: comment on various methods of enzyme extraction C05[K5]: explain the application of enzymology in industries
30.	23UBT053	Elective Course Generic/Discipline Specific - VI: Bioethics & Biosafety	C01[K1]: describe the concepts in bioethics and biosafety C02[K2]: illustrate the bioethics in gene cloning C03[K3]: practice on patent filling C04[K4]: elucidate the ethical clearance and guidelines C05[K5]: assess the biosafety and good laboratory practices
31.	23UBT054	Elective Course Generic/Discipline Specific - VI: Cancer Biology	C01[K1]: outline the basics of cancer biology C02[K2]: describe cancer at the molecular level C03[K3]: list out different types of cancer C04[K4]: point out detection and treatment methods of cancer C05[K5]: explain prevention methods of cancer
32.	23UBTJ51	Internship / Industrial Training	C01[K1]: identify different career paths within the industry and gain insights into potential future roles C02[K3]: apply theoretical concepts and academic knowledge to real - world situations and challenges encountered during the internship C03[K4]: analyse problems, generate innovative solutions, and make informed Decisions C04[K5]: evaluate how to manage time effectively and prioritize tasks to meet deadlines and deliver quality work C05[K6]: create a portfolio of the work, projects, and achievements during the internship



SEMESTER - VI

33.	23UBTC61	Core Course – XIV: Bioentrepreneurship	C01[K1]: explain about bioentrepreneurship and biotech industries C02[K2]: discuss about the Vermicomposting and sericulture C03[K3]: develop plans for start-ups and know about accounting and IPR C04[K4]: illustrate the cultivation of mushrooms and aquaponics C05[K5]: justify the importance of mass production of Single cell protein
34.	23UBTC62	Core Course – XV : Pharmaceutical Biotechnology	C01[K1]: discuss about the drugs, its development and concepts involved in pharmacokinetics & pharmacodynamics C02[K2]: describe the formulation and production of biotechnology products C03[K3]: list out the different biotechnological products of the pharma industry. C04[K4]: evaluate drug toxicity and prevention of drug abuse C05[K5]: determine national and international
35.	23UBTJ61	Core Course –XVI: Project With Viva Voce	C01[K1]: demonstrate the acquired basic knowledge of technological tools and techniques in specific domain C02[K2]: apply the domain specific subject knowledge in project C03[K3]: present the solution orally and in the form of project report C04[K4]: choose alternative solution for the existing problem definition C05[K6]: prepare formal report which describes the work undertaken using ICT tools
36.	23UBTO63	Elective Course Generic/Discipline Specific - VII:	C01[K1]: explain about the marine ecosystem and its functioning C02[K2]: illustrate the marine microbial habitats



		Marine Biotechnology	C03[K3]: find out the bioactive compounds isolated from Marine Ecosystem C04[K4]: examine manipulations done in Marine organisms C05[K5]: evaluate the economic importance of marine seaweeds
37.	23UBTO64	Elective Course Generic/Discipline Specific - VII: Food Technology	C01[K1]: describe the relationship between biotechnology and the food industry C02[K2]: illustrate different food processing methods C03[K3]: articulate classification of fruits and vegetables and their changes during processing C04[K4]: outline the concept of non vegetarian foods and their processing types. C05[K5]: determine the different food adulterants
38.	23UBTO65	Elective Course Generic/Discipline Specific - VIII: Medical Biotechnology	C01[K1]: define antibodies and vaccines C02[K2]: discuss about the molecular diagnosis of diseases C03[K3]: determine the diagnostic method for infectious Diseases C04[K4]: comment on production methodologies of therapeutic agents C05[K5]: evaluate the clinical Trials and ethic codes
39.	23UBTO66	Elective Course Generic/Discipline Specific - VIII: Forensic Biotechnology	C01[K1]: explain the scope of forensic biotechnology C02[K2]: examine the crime scene investigations C03[K3]: outline the role of serology in forensic biotechnology C04[K4]: summarize the techniques used in forensic biotechnology C05[K5]: discuss about the applications of forensic biotechnology



40.	23UBTO67	Elective Course Generic/Discipline Specific - VIII: Good Laboratory Practices	CO1[K1]: describe the types of labs associated with Biotechnology CO2[K2]: explain about the methods and types of documentations CO3[K3]: illustrate the SOP of lab instruments . CO4[K4]: point out the Good Lab Guidelines CO5[K5]: discuss about the Management and Disposal of wastes
41.	23UBTS61	Skill Enhancement Course – IX: Quality Control And Testing	CO1[K1]: find the assessment of microbial quality methods CO2[K2]: describe the quality control of food and pharmaceutical products. CO3[K3]: explain identification methods of pathogenic microorganisms CO4[K4]: point out the test for the pharmaceutical products CO5[K5]: discuss the safety management and regulations of food and pharmaceutical industry