

Department of Biotechnology

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B.SC. BIOTECHNOLOGY	
<p><u>Programme</u> <u>Outcome</u></p>	<p>The B.Sc. Biotechnology program is a three-year degree. It has an advantage of the newest teaching protocols and advances in the field of Biotechnology.</p> <p>Biotechnology teaches about biological sciences with engineering technologies that manipulate living organisms and biological systems to produce products that advance healthcare, medicine, agriculture, food, pharmaceuticals and environment control.</p> <p>It applies the knowledge of molecular biology, genetics, microbiology and biochemistry to derive a solution to complex biological problems.</p> <p>The programme helps students to demonstrate their practical learning skills to work effectively in team.</p> <p>In the first two years students will study core subjects like cell biology, genetics, microbiology, biochemistry molecular biology to ensure that they receive a solid grounding in fundamentals.</p> <p>Students will then study specialize subjects like genetic engineering animal biotechnology, plant biotechnology and industrial biotechnology in the final year, making their choice for a wide range of options and research.</p> <p>It is Design such that it helps to develop solution for major environmental problems by applying modern biotechnological tools while keeping in mind the safety factors for environment and society.</p> <p>Biotechnology course contain topics covering all aspects of the biotechnology industry, such as biophysics, biostatistics, immunology environmental biotechnology intellectual property and patents etc.</p> <p>Gain knowledge of Transgenic plants, vermiculture, bio fertilizer, industrially important microbes and their applications in food, Dairy and Pharmacy industries. This will enhance the scope of self-employability.</p>
<p>PROGRAMME SPECIFIC OUTCOMES</p>	<p>Empower the students to acquire technological know-how by connecting disciplinary and interdisciplinary aspects of biotechnology.</p> <p>Students are able to learn the modern molecular biological techniques viz, isolation of DNA, isolation of proteins, chromatography, SDS-PAGE, Agarose Gel Electrophoresis, fermentation, downstream processing and PCR which are very much required for the large-scale production of biotechnology derived products.</p> <p>Students acquire knowledge required for the production of Antibiotics, Vitamins, vaccines, Hormones, enzymes, proteins and</p>

	<p>manufacturing industrially important secondary metabolites through fermentation process.</p> <p>Recognize the importance of IPR, TRIPS, GATT, PATENT, and Bioethics, so as to prepare the next generation of Indian Industrialist.</p> <p>Exhibit their knowledge on Industrial regulations and Environmental safety principles in Biotechnology Industries.</p> <p>Graduates will be able to justify health safety and legal issues and understand the biotechnological principles behind.</p> <p>Students will be able to demonstrate their ability to apply biotechnological research strategies to solve the global environmental problems like climate change, Acid rain, ozone depletion, industrial waste treatment and bioremediation.</p>
COURSE OUTCOME	
SEMESTER I : : Paper1 CELL BIOLOGY AND GENETICS	
Theory	<p>Upon successful completion of this course student will be able to learn</p> <p>The cells as structural and functional unit of life.</p> <p>The basic difference between prokaryotic cell and eukaryotic cell.</p> <p>Studying the various cellular components of cells.</p> <p>The primary structure and ultra-structure of cellular organelles, its composition and functions.</p> <p>The ultra-structure of chromosomes its composition and functions models to know the structure of chromosomes. Special type of chromosomes</p> <p>The glimpses of control of cell cycle, the mechanism of cell death, different types of cell divisions.</p> <p>History and scope of Genetics</p> <p>To study the laws and concepts of mendelian inheritance.</p> <p>Concepts of multiple alleles with examples.</p> <p>Understanding the mechanism of sex determination in different organisms.</p>
practical	<p>Aim of this practical is</p> <p>Micrometry and haemocytometry helps to understand the size of the cell and the no of cells in the given sample</p> <p>Mitotic and meiotic slide preparation of onion root tips and onion flower buds to observe cell divisions.</p> <p>Staining techniques- staining of a cell or organelle to observe their characteristics under light microscope</p> <p>Studying the karyotype analysis of man</p>
SEMESTER II : Paper2: GENERAL MICRO BIOLOGY AND BIO STATISTICS	
Theory	<p>Upon successful completion of this course student will be able to learn about the contribution of microbiologists, types of microbes, and branches of microbiology & anatomy of microbes.</p> <p>To understand about Micro organisms and their participation in day to day activities.</p> <p>To understand the Role of microorganisms in the diversity.</p> <p>Solving the problems related to- measures of central tendency, and measures of dispersion. Studying analysing and solving the hypothetical tests like t test, chi</p>

	<p>square test probability.</p> <p>Application of statistical concepts used in health medical science, plants and animal system</p> <p>Interpretation of results commonly used in statistical analysis.</p>
practical	<p>Aim of this practical is</p> <p>To take the methodological review of cultivation of microbes, pure culture, staining, sterilization & disinfection.</p> <p>Handling of microscope- studying the different parts of microscope, its construction.</p> <p>Laboratory safety measures</p> <p>construction and working of different instruments</p> <p>Staining techniques- staining of a micro organisms to observe its specific characteristics under light microscope</p> <p>Studying the diversity of micro organisms in air, water, soil.</p> <p>Solving the problems related to- measures of central tendency, and measures of dispersion.</p>
SEMESTER III : Paper3: BIOCHEMISTRY AND BIO BIOPHYSICS	
Theory	<p>Upon successful completion of this course student will be able to learn</p> <p>The chemical reactions or metabolic functions in the living system and their regulations.</p> <p>understood the concept of biochemical regulations</p> <p>Basic Structure and metabolism of Biomolecules</p> <p>To familiarize the Metabolic pathways.</p> <p>To Understand the Mechanisms of the actions of different hormones.</p> <p>To gain an insight into the Metabolic Processes associated with Carbohydrates, Amino Acids, Lipids and Nucleotides.</p> <p>To have a firm foundation of the fundamentals and applications of current biophysical theories.</p> <p>Develop an understanding of the different aspects of classical Physics.</p> <p>To relate principles of Physics to applications and techniques in the field of Biology such as chromatography, Spectroscopy and Electrophoresis.</p> <p>It develops ability to comprehend the core concepts of biophysics and concepts of classical & modern physics.</p>
practical	<p>Aim of this practical is</p> <p>Study of buffers.</p> <p>Study of calorimetric and chromatographic techniques.</p> <p>To quantify the amount of biomolecules in the given sample</p> <p>To analyse the enzyme activity of a given sample.</p>
SEMESTER IV : Paper4: MOLECULAR BIOLOGY	
Theory	<p>Upon successful completion of this course student will be able to gain the knowledge of</p> <p>Structure of DNA, RNA and gene.</p> <p>Central dogma of molecular biology and principles of biological processes such as, DNA replication, transcription, translation and gene regulation etc.</p> <p>Understanding of operon concepts.</p> <p>By the end of the course the student will be able to understand:</p> <p>The mechanisms associated with Gene Expression at the level of Transcription,</p>

	<p>Translation and protein synthesis.</p> <p>Discuss the mechanisms associated with Regulation of Gene Expression in Prokaryotes and Eukaryotes</p>
practical	<p>Aim of this practical is</p> <p>Experimentation of quantification of DNA/ RNA</p> <p>Isolation and estimation of cellular protein present in plant and animal sources</p> <p>Chromatographic techniques like column chromatography</p> <p>Learning about SDS PAGE</p>
SEMESTER V : Paper5: GENETIC ENGINEERING AND ENVIRONMENTAL BIOTECHNOLOGY	
Theory	<p>Upon successful completion of this course student will be able to gain the knowledge of</p> <p>Recombinant DNA Techniques.</p> <p>Mechanism of gene manipulation and its goals.</p> <p>The concept of gene manipulation and gene transfer technologies.</p> <p>Expression systems and methods of selection of recombinant DNA in research.</p> <p>Existing and emerging technologies that are important in the area of environment protection.</p> <p>The principles and techniques which underline the application of biosciences, Addressing environmental issues including pollution, mineral resource, renewable energy and water recycling.</p> <p>On bioremediation and treatment of polluted effluent.</p> <p>Significance of genetically modified microbes.</p>
practical	<p>Aim of this practical is</p> <p>To learn the techniques of DNA isolation from plants, animal tissues and bacteria.</p> <p>To learn the techniques of plasmid preparation, Agarose gel electrophoresis, restriction digestion, SDS PAGE, etc.</p> <p>To learn MPN methods for water analysis , BOD analysis of water , VAM Staining.</p>
SEMESTER V : Paper6: IMMUNOLOGY AND ANIMAL BIOTECHNOLOGY	
Theory	<p>Upon successful completion of this course student will be able to gain the knowledge of</p> <p>The basic defence mechanism of animals</p> <p>The concept immunology, Immunity, Antigen, Antibody, Cells of immune system and their function and regulations</p> <p>The role of different types of Cells, Effector Molecules and Effector Mechanisms in Immunology.</p> <p>The principles underlying various Immunotechniques.</p> <p>The application of animal Biotechnology</p> <p>The usage of Animal products and exploitation of them in Biotechnology.</p> <p>In-vitro culture methods, Animal tissue culture, Animal products, production & improvement of them.</p> <p>Transgenic animals :techniques and applications</p>
practical	<p>Aim of this practical is</p> <p>To learn the techniques of blood typing , WBC counting</p> <p>To learn the techniques of the tests for typhoid and tuberculosis through WIDAL and RPR method.</p> <p>Immuno techniques like ODD. SRID .RIEP Dot ELISA etc</p>

	To learn the techniques of animal cell isolation by different methods and its quantifications
SEMESTER VI : Paper7: PLANT BIOTECHNOLOGY	
Theory	<p>Upon successful completion of this course student will be able to gain the knowledge of</p> <p>Plant biotechnology which is one of the emerging most successful branch of biotechnology.</p> <p>The different techniques of plant biotechnology utilized for conservation and mass propagation of rare and endangered plant species.</p> <p>The principles of plant tissue culture including <i>in vitro</i> culture of different plant parts.</p> <p>☐ The tools and processes involved in generation of transgenic plants.</p> <p>This course presents the application of Plants in Biotechnology.</p> <p>Crop development, Callus culture, Biotechnological applications of plants, Transgenic plants resistance to biotic and abiotic stress.</p> <p>Gain knowledge about IPR</p>
practical	<p>Aim of this practical is</p> <p>Learn the aseptic techniques of plant biotechnology.</p> <p>Learn the techniques of media preparation.</p> <p>Learn the techniques of plant propagation tissue culture.</p>
SEMESTER VI : Paper8: INDUSTRIAL BIOTECHNOLOGY	
Theory	<p>Upon successful completion of this course student will be able to gain the knowledge of</p> <p>Fermentation technology, media components as applied to lab scale, pilot scale and industrial scale, upstream and downstream processing.</p> <p>Acquire requisite knowledge about processes of bioreactors and production of vitamins, amino acids, alcohols, enzymes, solvents by biotech industry.</p> <p>Develop skills associated with isolation and screening of Industrially Important microbial strains.</p>
practical	<p>Aim of this practical is</p> <p>To learn the techniques of strain development and mass culture of spirulina, yeast, aspergillus, agaricus, etc. and production of enzymes and acids by them and their estimation.</p> <p>Wine production and quantification of its alcohol percentage.</p>