

B.Sc Biotechnology	
1st SEMESTER	
Course Name: Inorganic Chemistry(BSBT101-18)	
CO1	State with clarity the periodic properties of various inorganic molecules and terminology related to the subject
CO2	Describe in detail various kinds of intermolecular and intramolecular interactions and theories.
CO3	Explain the principles of Werner's coordination theory and all aspects of stereochemistry in different compounds
CO4	Illustrate bonding in metal complexes and properties like paramagnetism, diamagnetism, ferromagnetism and antiferromagnetism in them.
Course Name: Introduction to Biotechnology(BSBT 102-18)	
CO1	Define Biotechnology and different branches of biotechnology and its scope
CO2	To explain the role of Biotechnology in Agriculture sector
CO3	To illustrate different application of biotechnology in food quality enhancement
CO4	To explain about role of Biotechnology in Industrial Biotechnology
Course Name: Biochemistry and Metabolism(BSBT103-18)	
CO1	To introduce fundamental concepts of carbohydrates and proteins by explaining their structural organization, functions and biological importance.
CO2	To develop the understanding of lipids, its structure, functions and important health aspects
CO3	To introduce fundamental concepts of nucleic acids by explaining its structure & functions along with energy carrier molecules and also applied concepts of various enzymes and their kinetics.
CO4	To develop the understanding of carbohydrate metabolism, significance of glycolysis, gluconeogenesis and ETC.
Course Name: Basic of Biosciences (BSBT 107-18)	
CO1	Understanding the concept of the living world and its diversity in the biosphere.
CO2	Demonstrating the anatomy of plants, including the structure and functions of different plant tissues and organs.
CO3	Understanding the relationship between the structural organization and the physiological processes in animals.
CO4	Illustrating the fundamental properties and functions of cells as the basic building blocks of life.
Course Name: English (BTHU 104-18)	
CO1	To introduce students to the theory, fundamentals and tools of communication.
CO2	To develop vital communication skills which are integral to their personal, social and professional interactions.
CO3	To understand the issues related to the Language of Communication.
CO4	To become proficient in professional communication such as interviews, group discussions, office environments.

Course Name: Human Values, DE addiction and Traffic rules

CO1	Understanding the need, basic guidelines, content and process for Value Education
CO2	Knowledge of Harmony in the Human Being - Harmony in Myself, characteristics and activities of Harmony.
CO3	To understand the harmony in the Family- the basic unit of human interaction
CO4	Illustrate relationship harmony in Nature and Existence - Whole existence as Coexistence.

2nd SEMESTER	
Course Name: Physical Chemistry (BSBT 201-18)	
CO1	Understanding the basic concepts of thermodynamics and types of processes.
CO2	Demonstrate fundamental knowledge of the types of solutions and factor influencing rate of a solution.
CO3	Understanding about phase equilibria and rate of a reaction.
CO4	To illustrate the role of buffer solution and pH scale of a solution.
Course Name: Introduction to Microbiology (BSBT 202-18)	
CO1	Understanding the basic concepts of microscopy and history of Microbiology.
CO2	Demonstrate fundamental knowledge of the microbial world and structure of microorganisms.
CO3	Understanding about bacterial genetics and the role of microbes in extreme environments.
CO4	To illustrate the role of microbes in human welfare and agriculture.
Course Name: Biostatistics (BSBT 202-18)	
CO1	Understanding the basic concepts of biostatistics and graphical and tabular representation of data, mean and standard deviation of grouped and ungrouped data
CO2	Demonstrate fundamental knowledge of design of experiments, evaluation and manipulations of matrices and determinants.
CO3	Understanding about the test of deviations, methods of average and least squares, correlations and regression and analysis of variance.
CO4	To illustrate the role of curve smoothening, numerical integration and fourier transformation.
Course Name: Environmental Science (EVS 102-18)	
CO1	To identify, formulate and solve environmental problems by utilizing the concept of environmental studies.
CO2	Conservation of natural resources, ecological balance and biodiversity to achieve sustainable development.
CO3	To understand environmental policies and regulations.
CO4	To understand human activities which are causing environmental degradation and the measures to be taken to avoid this problem

3rd SEMESTER	
Course Name: Organic Chemistry (BSBT301-18)	
CO1	Understanding the basic knowledge of organic chemistry, types of organic reactions.
CO2	Demonstrating fundamental knowledge of alcohol and phenol, its nomenclature, methods of formation, physical and chemical properties.
CO3	Understanding about the key events of formation of Alkenes, its nomenclature, physical and chemical properties.
CO4	Illustrating the role of Arenes and Aromaticity: Nomenclature of benzene derivatives, aryl group, aromatic nucleus and side chain.
Course Name: Immunology (BSBT302-18)	
Course Name: Molecular Biology (BSBT303-18)	
CO1	Acquire better understanding and comprehensive knowledge regarding most of the essential aspects of Molecular Biology.
CO2	Explain in a simple way the structure and function of various types of macromolecules (DNA, RNA and proteins).
CO3	Gain an understanding of molecular mechanisms of DNA Replication, Transcription and Translation in Prokaryotes and Eukaryotes.
CO4	Describe how gene expression is regulated in cells
Course Name: Introduction to Computers (BSBT307-18)	
CO1	Have a general overview of computer systems, which includes the fundamental components of computer systems: hardware and software.
CO2	Gain knowledge of various data and mass storage devices in computers, their types, capacity and utility.
CO3	Get acquainted with knowledge and understanding of various input/output devices of a computer system
CO4	Use a wide variety of internet applications, explore biological databases and will be able to apply these methods to research problems related to biotechnology and bioinformatics.

4TH SEMESTER	
Course Name: Genetic Engineering (BSBT401-18)	
CO1	Understanding the concept behind gene recombination and gene transfer in the field of genetic engineering.
CO2	Demonstrating the composition of Site-directed mutagenesis and Protein engineering.
CO3	Understanding the composition of Site-directed mutagenesis and Protein engineering
CO4	Illustrating the importance of monoclonal antibodies and production.
Course Name: Plant Tissue Culture (BSBT 402-18)	
CO1	Understanding the history of plant tissue culture, types of cell culture, cellular totipotency and somatic embryogenesis.
CO2	Demonstrating the unique approaches and methodologies used in preparation of tissue culture, different sterilization method for explant.
CO3	Understanding the concept behind genetic engineering in animals, its applications and limitations.
CO4	Illustrating the importance of genetic engineering in plants, its applications and ethical issues.
Course Name: Industrial Biotechnology (BSBT403-18)	
CO1	Understanding the importance of microbes in industrial biotechnology.
CO2	Demonstrating the unique approaches and methodologies of fermentation, large scale fermentation its applications and limitations
CO3	Understanding the production of microbial products:antibiotics, vitamins, organic acids; I its applications in the field of industrial biotechnology.
CO4	Illustrating the importance of fuel biotechnology, biofertilizers, biocontrol agents, immobilization and its applications.
Course Name: Analytical Techniques in Biotechnology (BSBT407-18)	
CO1	Understanding the importance of general Biophysical methods and various techniques.
CO2	Demonstrating the unique approaches and methodologies of Centrifugation, various types of centrifuge its ons.applications
CO3	Understanding the concept behind microscopy and its various types and its various applications and limitations
CO4	Illustrating the importance of spectroscopy, its principle and working,applications and limitations.

5TH SEMESTER	
Course Name: Organic Farming (BSBT501-18)	
CO1	Understanding the basic concepts of organic farming, its significance and practices for sustainable agriculture.
CO2	Demonstrate fundamental knowledge of the specifications and quality parameters for organic manures, sewage, sludge & green manures.
CO3	Understanding about bacterial genetics and the role of microbes in extreme environments.
CO4	To illustrate the role of soil enzymes in soil health.
Course Name: Open Elective-I (Human Behaviour and Psychology BS BT137-18)	
CO1	Understanding the nature and scope of psychology as a scientific study of human behavior and mental processes.
CO2	Demonstrate the functions and processes of memory, and assess the various theoretical perspectives on memory formation and retrieval.
CO3	Understanding the physiological and cognitive factors that underlie motivation and its influence on behavior.
CO4	To illustrate the nature of personality and its role in shaping human behavior, emotions, and cognition.
Course Name: Open Elective –I (Renewable Energy Resources BSBT138-18)	
CO1	Understanding Solar Radiation, Measurements of Solar Radiation, Flat Plate and Concentrating Collectors, Solar Direct Thermal Applications.
CO2	Demonstrate fundamental knowledge of Wind Energy and Ocean Energy.
CO3	Understanding about Biomass and Geothermal Energy, principles of Bioconversion and thermal energy.
CO4	To illustrate the principles of energy conservation, the different energy conservation appliances.
Course Name: Elective –I (Animal BiotechnologyBSBT139-18)	
CO1	Understanding the principles and techniques of gene transfer in animals, including microinjection and embryonic stem cell gene transfer.
CO2	Demonstrating the importance of biotechnological interventions in disease management and prevention in animals.
CO3	Understanding the techniques and applications of artificial insemination in animals for improved breeding and genetic traits.
CO4	Illustrating the concept of gene therapy and its different types in the context of human medicine.
Course Name: Open Elective-I (Fermentation Technology BSBT140-18)	
CO1	Understanding production of industrial chemicals, biochemicals and chemotherapeutic products.
CO2	Demonstrate fundamental microbial products of pharmacological interest, steroid fermentations and transformations.
CO3	Understanding methods of purification & characterization of proteins, Upstream and downstream processing, solids, and liquid
CO4	To illustrate the principles of enzyme kinetics, simple and complex reactions and inhibition kinetics.

Course Name: Elective-II (IPR Entrepreneurship Bioethics & Biosafety BSBT141-18)	
CO1	Understanding the Indian Patent Law and WTO Provisions and their significance in protecting intellectual property rights.
CO2	Demonstrating the unique challenges and considerations involved in patenting biotechnological inventions.
CO3	Understanding the excise regulations and the export potential of the chosen product and developing strategies to capitalize on international markets.
CO4	Illustrating the importance of bioethics in guiding research and development practices in biotechnology.
Course Name: Elective-II (Biotechnology in Forensic Sciences BSBT 142-18)	
CO1	Understanding principles of forensic science, forensic science laboratory and its organization and service.
CO2	Demonstrating the unique properties of internal, external and terminal ballistics.
CO3	Understanding role of the toxicologist, significance of toxicological findings, fundamental principles of fingerprinting.

6TH SEMESTER	
Course Name: Technical Writing (BSBT 601-18)	
CO1	Understanding of technical writing, types of audience analysis, and persuasion, definition writing and analysis of material in the field of research.
CO2	Knowledge of collecting notes, writing outlines, and writing rough drafts, elements of the formal research report, grammar, technical writing style, and paper revision.
Course Name: Developmental Biology (BSBT1 47-18) –OPEN ELECTIVE-II	
CO1	Understanding the scope and historical perspective of Developmental Biology as a field of study.
CO2	Demonstrating the morphogenetic movements during gastrulation, including epiboly, emboly, extension, invagination, convergence, and delamination.
CO3	Understanding the epigenetic landscape model of determination and differentiation and its regulatory mechanisms at the genome, transcription, and post-translational levels.
CO4	Illustrating the fate of different primary germ layers and their contributions to the development of various organs and tissues.
Course Name: Biotechnology and Human Welfare(BSBT 148-18) –OPEN ELECTIVE-II	
CO1	Understanding the role of biotechnological advancements in disease diagnosis, therapeutic development, and personalized medicine.
CO2	Demonstrating the potential of biotechnology in developing climate-resilient crops and sustainable agricultural practices.
CO3	Understanding the process of drug development, including preclinical studies and clinical trials.
CO4	Illustrating the potential of biotechnological approaches in waste management and resource recovery.
Course Name: Bioinformatics (BSBT 149-18)-ELECTIVE III	
CO1	Understanding the goals, applications, and limitations of Bioinformatics in biological research.
CO2	Demonstrating the evolutionary basis of sequence alignment and the concept of homologous sequences.
CO3	Understanding the concept of molecular evolution and phylogenetics, and constructing phylogenetic trees.
CO4	Illustrating the ability to use molecular visualization tools for analyzing and understanding protein structures.
Course Name: Environmental Biotechnology (BSBT 150-18)-ELECTIVE III	
CO1	Understanding the concept of bioremediation and its applications in the cleanup of soil and water contaminated with oil spills, heavy metals, and detergents.
CO2	Demonstrating the methods and processes involved in the treatment of municipal waste and industrial effluents using biotechnological approaches.
CO3	Understanding the potential of methanogenic bacteria in biogas production and the environmental implications of this renewable energy source.
CO4	Illustrating the environmental implications of using genetically modified microbes, plants, and animals in biotechnological applications.

Course Name: Plant Biotechnology (BSBT 151-18)-ELECTIVE IV

CO1	Understanding the history of plant tissue culture, types of cell culture, cellular totipotency and micropropagation
CO2	Demonstrating the unique approaches and methodologies used in preparation of tissue culture, different types of cell culture and in vitro propagation.
CO3	Understanding the selection of hybrid cells, cybrids and hybridization techniques, somaclonal variations
CO4	Illustrating the importance of plant growth promoting bacteria and growth promotion by free living bacteria,

Course Name: Medical Microbiology (BSBT 152-18)-ELECTIVE IV

CO1	Understanding the concept of normal microflora in the human body and its significance in health and disease.
CO2	Demonstrating the morphology, pathogenesis, and symptoms associated with infections caused by gram-negative bacteria.
CO3	Understanding the morphology and replication strategies of different virus types and available antiviral therapies.
CO4	Illustrating the major fungal pathogens and protozoan parasites and their clinical significance.