

Program me :	B.Sc Biotechnology,Chemisty,Zoolog y(BTCZ)		
Biotechnology			
PO Code	Programme Outcomes		
PO1	.Contribute towards the industry designing, developing,and providing solutions for product/processess/technology development in either of the fields.		
PO2	Work as entrepreneurs with strong ethics and good communication skills.		
PO3	Students should be able to pursue higher education and research at national and international level.		
PO4	Demonstrate understanding of the societal, health, safety , legal and cultural issues relevant to science field		
PO5	.Exhibit skills of handling microbial processes, biochemical analysis by making use of state of the art instruments.		
CourseCode	CourseName	CO Code	Course Outcomes
BT1BC	Biochemistry and Cell Biology - Paper 1	CO1	Students will be able to understand theoretical concepts of instruments that are commonly used in bio-chemistry field as well as interpret and use the data obtained
		CO2	Students will be able to recognize and apply key principles of biochemistry to interpret and analyze quantitative data
		CO3	Able to appreciate the various biochemical processes occurring within a single cell
		CO4	Realize the importance of buffers and calculations used to prepare various chemical solutions

		CO5	They get the basic concepts of cell structure and function
		CO6	Become aware of the fundamental features of prokaryotic and eukaryotic cells and methods used to examine them
		CO7	Recognize the roles of the major cell organelles
		CO8	Able to name specific processes and proteins involved in membrane transport
		CO9	Develop skills that help them identify the major stages of the cell cycle with confidence
		CO10	Students develop an understanding about cell surface receptors and their uses in cell signalling
BT2GM	Genetics and Microbiology - Paper 2	CO1	Students get familiar with the terminologies used in genetics
		CO2	Strong foundation of genetics is laid in students by using Mendel's laws and suitable examples
		CO3	Students will have a clear understanding of how concepts of genetics affect broad societal issues including health and diseases
		CO4	Have the knowledge required to analyze the results of genetic experimentation in animal and plants
		CO5	Acquire the ability to draw conclusions that validate the genetic data
		CO6	Able to apply their theoretical knowledge to set guidelines regarding infection control methods
		CO7	Able to enhance their laboratory skills like sterilization of media and culturing microbes
		CO8	Maintain pure cultures of microorganisms which will further help them in research work and projects
		CO9	They will be able to appreciate and follow laboratory safety guidelines
		CO10	Learn to handle equipments like microscope with great care and specificity
BT3MBS	Molecular Biology and Biostatistics - Paper 3	CO1	They will be able to compare and contrast the mechanisms of bacterial and eukaryotic DNA replication, DNA repair, transcription, and translation
		CO2	Develop an analytical ability regarding how these processes can be manipulated or modified according to scientific need
		CO3	They will be able to recognize the impact that mutations in DNA can cause and be aware of the repair mechanisms the organism itself has
		CO4	Realize the importance of gene regulation and to differentiate the regulation mechanisms in prokaryotes and eukaryotes

		C05	Students will know the different transposable elements and their importance in different organisms
		C06	A student learns to critically evaluate articles published in journals or papers
		C07	A student understand the basic methods of observation in research
		C08	Gain knowledge on bio- statistical techniques which assures that the results found in research studies are not merely because of chance
		C09	From a Biotechnology point of view, a student can apply that an understanding of carrying out research and testing whether the desired performance is observed or not in the field of genetic manipulation, gene therapy , animal and plant biotechnology
		C010	Analyze and learn that a research requires statistical analysis of results
BT4GEB	Genetic Engineering and Biophysics - Paper 4	C01	Students will be familiar with the different applications of gene cloning and gene technology
		C02	Students will understand the function of restriction endonucleases and how cells can protect its DNA from the enzyme action
		C03	Able to identify the different types of plasmids and vectors important in the field of genetic engineering
		C04	They will be competent enough to distinguish between the techniques of selection and screening of recombinants
		C05	They will be adept in techniques like blotting, DNA sequencing, PCR and value the processes involved
		C06	Students will be able to recognize the role and significance of IPR in Indian context
		C07	Students will be aware of the fundamental concepts in physics that underlie biological processes
		C08	Familiar with the biophysical techniques indispensable for industrial production of economically important biotechnological products
		C09	They will be able to appreciate that laws of physics are valid in biological systems
		C010	Able to appreciate the importance of the different instruments useful in biological experiments
BT5I	Immunology - Paper 5	CO1	Students develop an understanding of core immunology and the immunological basis of some common diseases
		CO2	Students will be able to distinguish between innate and adaptive immunity.
		CO3	Topic on cellular and molecular basis of inflammatory response, innate immunity and

			adaptive immunity will stimulate their reasoning power
		CO4	They will understand the role of NK cells, macrophages, dendritic cells, T cells and B cells along with primary and secondary lymphoid organs
		CO5	Students get familiar with the structure of antibody and antigens and the various classes of antigens and antibodies
		CO6	They will be exposed to diagnostic techniques which are helpful in diagnosing various diseases
		CO7	They will also be able to understand the mechanisms involved in control of immune responses and the problems that arise when not controlled
BT5EIB	Environmental and Industrial Biotechnology - Paper 6	CO 1	The student understands the underlying design of fermenter, fermentation process and downstream processing
		CO 2	Students develop and build a foundation for understanding the key steps involved in production of microbial products.
		CO 3	Students acquire a fundamental insight to exploit enzymes and microbes for manufacturing products.
		CO 4	Learn the types of bioreactor, and operation methods for the same.
		CO 5	Students are made aware of the Dairy Technology, learn the key concepts and technical procedures that underpin industrial biotechnology
		CO 6	Students will develop an understanding about the breadth and interdisciplinary nature of environmental issues
		CO 7	Students can design an action plan for sustainable alternatives to overcome pollution issues
		CO 8	Students will be able to locate, understand and interpret the possible solutions for an environmental issue
		CO 9	Gain basic knowledge about the environment and its allied problems
		CO 10	Students develop an attitude of concern for the environment.
		CO11	Students will be able to assess and analyze the harmful effects of the impact of pollution on environment.
BT6AB	Animal Biotechnology - Paper 7	CO1	Students will understand the principles of animal cell culture and its application
		CO2	They will gain knowledge on the latest developments in cell culture techniques

		CO3	They will learn the concepts required to generate genetically manipulated animals with better yield and improved life quality
		CO4	Students will be able to identify the different cell lines and how they can be used in the field of research
		CO5	They can critically evaluate scientific literature and experimental studies relating to animal biotechnology and be able to effectively communicate the findings
BT6PB	Plant Biotechnology - Paper 8	CO1	Students realize the role of biotechnology for plant improvement
		CO2	Students recognize new knowledge in handling classical and modern plant biotechnological processes – breeding of healthy plants and plants with improved characteristics
		CO3	Students get an insight into the working knowledge of laboratory techniques required in plant biotechnology
		CO4	Students develop the capacity to undertake research in plant biotechnology
		CO5	A student appreciates the needs of industrial enterprises using plant biotechnology techniques to develop new products
CHEMISTRY			
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PO Code	Programme Outcomes		
PO1	Analyze critically and evaluate constructively the concept of science and effectively bring out the knowledge derived from that, organize and apply that knowledge skillfully and ethically to provide constructive solutions to social, economic and environmental problems faced by the society globally.		
PO2	Apply scientific theories and concepts to critically debate, evaluate and create solutions to meet the needs of social, economic and environmental requirements of the society.		

CourseCode	CourseName	CO Code	Course Outcomes
CHEM1E	Chemistry 1	CO1	Explain the basic concepts of mathematics for efficient learning and application in chemistry
		CO2	Apply appropriate techniques of analytical chemistry, conduct experiments, analyze data and interpret results with an understanding of the limitations
		CO3	Recall the basic concepts of atomic structure and identify patterns in molecular bonding and relate to their chemical properties
		CO4	Analyze, interpret and identify crystal systems using X-ray crystallography.
		CO5	Explain HSAB concepts, its applications in different areas and its limitations. Discuss the importance of different non-aqueous solvents, their chemical reactions and applications.
		CO6	Categorize the different binary solutions and deduce their behavior with change in external parameters.
		CO7	Predict the reactivity of an organic compound based on its structure, justify the mechanism based on chemical effects and develop systematic methods for the preparation of different compounds
		CO8	Recall the basic knowledge of organic chemistry to name new compounds and formulate their conformations.
CHEM2E	Chemistry 2	CO1	Apply the law of thermodynamics to thermal cycles, understand the significance of state variables, thermodynamic functions, illustrate their roles in determining equilibrium under different conditions and solve related problems
		CO2	Explain the terms in phase rule and interpret the phase diagrams in uninary and binary systems
		CO3	Explanation of radioactivity, its measurement, major components of a nuclear reactor and applications of tracer techniques
		CO4	Illustrate methods to determine the molecular weight of inorganic polymers and discuss some commercially important polymers
		CO5	Understand the properties of coordination compounds, their structures and stability. Apply Crystal Field Theory to understand the magnetic properties and describe the stability of metal complexes using stepwise formation constant and thermodynamic parameters
		CO6	Create interest in different magnetic properties and functional properties of structural materials and smart materials

		CO7	Apply various rules to understand the stability of alkenes and reactions of dienes and alkynes
		CO8	Elaborate electrophilic substitution reactions of benzene under the influence of activating and deactivating groups. Predict aromaticity based on Huckel's rule and illustrate the molecular orbital picture of benzene.
CHEM3E	Chemistry 3	CO1	Identify the challenges in the conservation of water and design feasible solutions to overcome the limitations . Formulating and implementing green solutions to some of the reactions which are hazardous to the bio-system and sensitizing the younger generation chemists to design, produce and generate greener products.
		CO2	Interpret the basic concepts involved in inorganic analysis. Infer the knowledge of buffers and their biological applications.
		CO3	Explain the use of various industrial materials and their applications. Upgrade the conventional methods to design latest technologies for the economical and smarter production.
		CO4	Explore the dynamic world of nano materials, interpret their unique properties and discover the plethora of possibilities of their applications in various fields for a better and smarter life.
		CO5	Relate and examine the theories and concepts of electrochemistry. Develop deep knowledge of the application of measurements useful in analytical estimations.
		CO6	Enumerate the fundamentals of the kinetics of chemical reactions followed by a detailed study of catalysis.
		CO7	Understand the mechanisms to predict the outcome of various reactions. Relate elimination or substitution reactions to their energy profile diagrams
		CO8	Discuss in detail alcohols, phenols and epoxides. Understand and recall mechanisms of aromatic electrophilic substitution reactions. Describe the synthetic application of Grignard reagents.
CHEM4E	Chemistry 4	CO1	Recall and integrate the characteristic properties of the lanthanoides and monitor their applications in revolutionizing industry and medical field. Identify and summarize the significance of organometallic compounds in the catalytic industry.
		CO2	Utilize the knowledge of the latest technology, skills and tools in the production field to generate smarter and economical products
		CO3	Compose and formulate ideas to create the much required energy harvesting sources like solar cells

			and fuel cells with the fundamental knowledge of the working of the electrochemical cells.
		CO4	Illustrate the effect of absorption of light by matter. Application of the photochemical processes in different fields
		CO5	Explain the principles and working of various instruments and application of these instruments for qualitative and quantitative analysis
		CO6	Classify polymers and explain the mechanism of polymerization. Differentiate thermosetting and thermosoftening polymers with special mention to commercially important polymers
		CO7	Recall the IUPAC nomenclatures. Detailed discussion of aldehydes and ketones
		CO8	Predict the mechanisms and compare the reactivity of different carboxylic acids and their derivatives. Understanding amines in detail and studying the various applications of biologically important amines
CHEM5BP EE	Chemistry 5	CO1	Outline and exemplify the classification, reactions, properties and biological significance of proteins.
		CO2	Explain and understand the chemical structure, reactions, properties, function and use of broad range of food carbohydrates and various components of nucleic acids
		CO3	Contrast the structure of fats, phospholipids, steroids and explain various properties of the above macromolecules. Interpret the biological roles of diverse hormones and to study their mode of action
		CO4	Categorize enzymes based on their action and understand the kinetic parameters of enzymatic reactions. Illustrate the coenzyme function of water soluble vitamins and select appropriate methods to control harmful effects of synthetic vitamins
		CO5	Evaluate the basic theory and instrumentation of microwave, IR and UV/Vis spectroscopy as a qualitative and quantitative method.
		CO6	Understand the symmetry elements and the corresponding symmetry operations that lead to the classification of molecules into point groups
CHEM5OI E	Chemistry 6	CO1	Apply principles of coordination chemistry to explain how nature tailors properties of metal centers for specific applications in biochemical systems.
		CO2	Outline the types of catalysis and applications of certain well known and industrially important reaction-specific catalysts used globally.

		CO3	Imagine the structural formulae of organic compounds in a 3D perspective. Understand the importance of stereochemistry in organic chemistry and apply the knowledge gained in this course to a variety of chemical problems. Apply the knowledge in the synthesis, enantiomeric separation and characterisation of a range of chiral compounds in the laboratory for further research.
		CO4	Examine the enantiomers, diastereomers and epimers of simple sugars. Understand how the ring structures of aldehyde and ketone sugars are formed. Construct the ring structure of any 5 or 6 carbon containing monosaccharide from its corresponding straight chain structure.
		CO5	Outline various reaction mechanisms of heterocyclic compounds. Illustrate different methods for the synthesis of 5- and 6-membered heterocyclic compounds and summarise their properties, and biological importance.
		CO6	Distinguish and characterize various classes of natural products by their structures. Identify pharmaceutically active products of natural origin.
CHEM6B OPCE	Chemistry 7	CO1	Understand complex biochemical pathways within living cells. Elaborate the importance of ATP.
		CO2	Solution to various disorders caused due to impairment of various metabolic pathways in the living system.
		CO3	Discuss the role of active methylene compounds in various organic syntheses, illustrate the mechanisms involved and propose the synthesis. Identify the importance of coupling reaction in dye industry. Apply organometallics in synthetic organic chemistry
		CO4	Understand and compare the principle and theory of various spectroscopic techniques. Determine the effect of conjugation on UV-Visible absorption spectrum. Interpret the spectra of compounds, determine functional groups and propose structures for compounds. Apply the knowledge in the characterisation of organic compounds in research and chemical industry.
		CO5	Explain the principle of Raman and ESR spectroscopy and their application to simple molecules
		CO6	Understand the working principle, experimentation and applications of Fluorescence Spectrometry, GC, HPLC, ion-exchange chromatography, CV, and thermogravimetric analysis

CHEM6EP CE	Chemistry 8	CO1	Understand the basic principles of pharmacology, pharmacodynamics and pharmacokinetics. Outline the various stages and practical application of pharmacokinetics . Describe the various phases of clinical studies. Explain the rationale for the complete development plan (pharmaceutical, pre-clinical and clinical) according to the proposed therapeutic indication
		CO2	Relate the concepts of active principles and lead compounds in drug discovery; Outline and critically appraise the principal steps in drug discovery Describe the technologies available and those in development of new drugs; Explore the therapeutic opportunities that might arise from the technology(gene therapy)
		CO3	Apply the concepts of enzyme inhibition, drug-receptor interaction, working of proton pumps and ion channel pathways in drug action with suitable illustrations. Relate the factors that modify the effect of drug action. Distinguish drug potency and efficacy. Construct dose-response curves to predict the safety margin of the drug
		CO4	Outline the process of drug development and identify the critical factors and decision points in QSAR approach. Evaluate the advantages of combinatorial organic synthesis in scaling up production of drugs to meet increasing demand
		CO5	Categorise the drugs based on pharmacological-application and interpret their mode of action with suitable illustration. Underrstand and compare the mechanism of action of each class of drug; relate drug-drug interaction and its impact in patient safety
		CO6	Apply the basic concepts of buffers, acid-base theories and Henderson’s equations in buffer preparations and evaluating their functions in pharmacy. Develop analytical skills in predicting the buffer concentrations and develop practical skills in preparing buffers required for an assay of drug. Asses the use of antioxidants in pharmacy. Discuss the role of radio pharmaceuticals in drug industry. Create an awareness about the factors involved in quality control of drugs.
ZOOLOGY			
PO Code	Programme Outcomes		

PO1	Analyze critically and evaluate constructively the concept of science and effectively bring out the knowledge derived from that, organize and apply that knowledge skillfully and ethically to provide constructive solutions to social, economic and environmental problems faced by the society globally.		
PO2	Apply scientific theories and concepts to critically debate, evaluate and create solutions to meet the needs of social, economic and environmental requirements of the society		
PO3	To acquire knowledge about diversity of the animal kingdom – their morphology, anatomy, physiology, genetics, evolution and social organization		
PO4	Enable students to apply the acquired knowledge for holistic development of self and society and also to pursue research		
CourseCode	CourseName	CO Code	Course Outcomes
ZOO1NCL D	Non Chordata I	CO1	To become familiar with the invertebrate phyla and their diversity
		CO2	To understand the concept of evolution starting from the most simple unicellular forms – Protozoans to multicellular Annelida
		CO3	To gain knowledge about animals that are successful parasites and their modifications for a parasitic life
		CO4	To understand the concept of evolution starting from the most simple unicellular forms – Protozoans to multicellular Annelida
ZOO2NCL CD	Non Chordata - II and Lower Chordata	CO1	To become familiar with the rest of the invertebrate phyla and their diversity.
		CO2	To understand the concept of evolution of protochordates and chordates
		CO3	To gain knowledge about the lower chordates and the diversity in Super class Pisces
		CO4	To get to know the economic importance of fishes and Pisciculture

ZOO3CAD	Higher Chordata, Human Anatomy and Comparative Anatomy	CO1	To introduce the students to the diversity among higher chordates, their origin, and adaptation to their environment
		CO2	To educate the students about human anatomy and functioning of various systems
		CO3	To create an awareness about the similarities and differences and evolutionary trends in various organ systems in the vertebrates
ZOO4CBI HD	Cell Biology, Immunology & Histology	CO1	To make the students aware about the cell organelles cytoskeleton and their dynamic functions
		CO2	To make them appreciate the interaction between the cells and cell division.
		CO3	To educate them about complex activities like cell signaling and cell death
		CO4	To create an awareness about the importance of our immune system, cancer and organ transplantation
ZOO5GM BED	Paper - 5: Genetics, Molecular Biology and Evolution	CO1	To become familiar with the process of inheritance and variation from the normal Mendelian laws
		CO2	To update the students about the latest molecular biology techniques and genetic engineering
		CO3	To impart knowledge about inherited disorders, inborn errors and the possibilities of improving the human race
		CO4	To become familiar with different schools of thought explaining the concept of origin of life on Earth by studying classical theories
		CO5	To gain knowledge about the modern concepts of evolution
		CO6	To follow the path of evolution from primitive forms to the present day complex forms and outline of major transitions in evolution – from origin of life on earth to hominid evolution
ZOO5GPD	Paper - 6: General Physiology	CO1	To create awareness of the various physiological processes occurring in our body
		CO2	To appreciate the body's ability to maintain homeostasis, the control of digestion by the nervous, endocrine systems and micro fauna
		CO3	Understand the physiological mechanism of circulation, clotting of blood and respiration
		CO4	The complex mechanism of excretion coupled with osmoregulation and formation of Urine is understood by the students
		CO5	Learns about excitable tissue, the mechanism of muscle contraction, nerve conduction and transmission
		CO6	Understands the mechanism and similarities in sensory perceptions and the concept of thermoregulation

ZOO6EER MD	Paper 7: Elect - Ecology & Research Methodology	CO1	To enlighten students about the intricate relationship between the environment and all forms of life
		CO2	To make them understand the abiotic factors and their influence as limiting factors and the laws of thermodynamics
		CO3	To make them appreciate the various interactions between organisms and the concepts of population ecology
		CO4	To create awareness regarding environment pollution, the effects of human interference and conservation of wild life
		CO5	To enlighten the students about the basic requirements and methodology required for research
		CO6	To teach the students about the importance of statistics in research and learn to write a project report.
ZOO6EAP LTD	Paper 7: Elect - Applied Physiology & Lab Techniques	CO1	Students get knowledge about pathophysiology of disorders of digestive system and precautionary measures to be taken
		CO2	Create awareness about the ill effects of cigarette smoking, silicosis, pulmonary hypertension, common cold ,how to reduce asthma attacks and cope with the same
		CO3	Study complex mechanism of excretion coupled with osmoregulation and formation of urine
		CO4	Learns about excitable tissue, the mechanism of muscle contraction, nerve conduction and transmission
		CO5	Understands the mechanism and similarities in sensory perceptions and the concept of thermoregulation.
ZOO6ENB D	Paper 7: Elect - Neurobiology	CO1	To understand the relationship between Zoology and Psychology
		CO2	To learn the functions of the nervous system and how it influences behavior
		CO3	Understand the neuronal basis of emotions, stress, addiction and psychological disorders
		CO4	Observe that learning, memory, speech and pain are controlled by neurons
ZOO6DBE D	Paper 8: Development Biology and Ethology	CO1	To understand the process of fertilization and development in formation of an embryo in different animals
		CO2	To learn the concept of organizers and the role of genes in development
		CO3	To create awareness about the reproductive cycle, causes of infertility and use of contraception
		CO4	To enlighten students about animal behaviour and understand various means of communication

			among animals. Social organization and instinctive behaviour such as migration and parental care
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