

	<b>Program :</b>	<b>B.Sc. -Chemistry, Zoology, Microbiology (CZM)</b>		
	<b>Chemistry</b>			
	<b>PO Code</b>	<b>Programme Outcomes:</b>		
	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.		
<b>Semester</b>	<b>CourseCode</b>	<b>CourseName</b>	<b>CO Code</b>	<b>Course Outcomes</b>
I	CHEM1B	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	Recall the basic knowledge of organic chemistry to name new compounds and formulate their conformations.
			CO8	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

II	CHEM2B	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 unary 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.
III	CHEM3B	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

				<p>reactions which are hazardous to the bio-system and sensitizing the younger generation chemists to design, produce and generate greener products.</p>
			CO2	<p>Interpret the basic concepts involved in inorganic analysis. Infer the knowledge of buffers and their biological applications.</p>
			CO3	<p>Explain the use of various industrial materials and their applications. Upgrade the conventional methods to design latest technologies for the economical and smarter production.</p>
			CO4	<p>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.</p>
			CO5	<p>Relate and examine the theories and concepts of electrochemistry. Develop deep knowledge of the application of measurements</p>

				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.
IV	CHEM4B	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
V	CHEM5BPB	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
	CHEM50IB	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.
VI	CHEM6BOPCB	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

			<p>syntheses, illustrate the mechanisms involved and propose the synthesis. Identify the importance of coupling reaction in dye industry. Apply organometallics in synthetic organic chemistry</p>
			<p>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</p>
			<p>CO5 Explain the principle of Raman and ESR spectroscopy and their application to simple molecules</p>
			<p>CO6 Understand the working principle, experimentation and applications</p>

				of Fluorescence Spectrometry, GC, HPLC, ion-exchange chromatography, CV, and thermogravimetric analysis
	CHEM6EPCB	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.
	CHEM6EECB	Chemistry 8	CO1	Understand the concept and importance of entrepreneurship and entrepreneur in relation to the characteristics, functions, challenges and types of entrepreneurs.

			CO2	Outline the functioning of the cosmetic industry in terms of raw materials used, Indian standard specifications for production, formulation of cosmetics and quality assurance.
			CO3	Evaluate the nutritional requirements for different age groups, sex, and health conditions through understanding the concept of nutritional value. Explain food production in terms of processing, preservation, additives, qualitative analysis and adulteration.
			CO4	Evaluate the importance of the given soil / water / plant through analysis of the physical and chemical properties of the given soil / water and plants.
			CO5	Understand the drugs in terms of WHO definition, nomenclature, dosage forms, formulations, quality analysis, adulteration and toxicology.
			CO6	Describe the importance of

				nanomaterials for various applications in daily life, based their properties of various nanomaterials
			CO7	Mention the salient features of various rules and acts related to food, cosmetics and drug
	<b>ZOOLOGY</b>			
	<b>PO Code</b>	<b>Programme Outcomes:</b>		
	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 understand and appreciate the diversity of Flora and fauna; to foster interaction of students regarding conservation of endemic plants and animals		
	PO4	To gain knowledge of simplest to most complex plant forms; to provide baseline information on applied aspects of botany		
	PO5	To acquire knowledge about diversity of the animal kingdom – their morphology, anatomy, physiology, genetics, evolution and social organization		
	PO6	Enable students to apply the acquired knowledge for holistic development of self and society and also to pursue research		
<b>Semester</b>	<b>CourseCode</b>	<b>CourseName</b>	<b>CO Code</b>	<b>Course Outcomes</b>

I	ZOO1NCIB	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
II	ZOO2NLCB	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.

III	ZOO3CAB	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
IV	ZOO4CBIHB	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
V	ZOO5GMBEB	Paper 5 : Genetics, Molecular Biology & 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
	ZOO5GPB	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	3. 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
VI	ZOO6DBEB	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.
	ZOO6EAPLTB	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	Students get knowledge of anemia, blood cancer, types, changes occur in body during severe blood loss, ill effects and causes and remedies of hypertension, cardiovascular diseases.
			CO4	Study complex mechanism of excretion coupled

				with osmoregulation and formation of urine
			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
	ZOO6EERMB	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
	ZOO6ENBB	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
	<b>MICROBIOLOGY</b>			
	<b>PO Code</b>	<b>Programme Outcomes:</b>		
	PO1	Students will be able to acquire, articulate, retain and apply specialized skills and knowledge relevant to microbiology.		
	PO2	Students will be able to appreciate the diversity of microorganism and microbial communities inhabiting a multitude of habitats, understand their pathogenic as well beneficial significance to man and nature.		

Semester	CourseCode	CourseName	CO Code	Course Outcomes
I	MIC1FMB	Microbiology 1 - Fundamentals of Microbiology	CO1	To understand history, relevance of microbiology and classification of bacteria
			CO2	To understand the working of various microscopes and their application
			CO3	To gain knowledge of various (physical and chemical) methods of control of microorganisms and safety measures to be followed while handling microbes
			CO4	To understand the structure of bacterial cells, its organelles, physiology and behavior
			CO5	To learn different methods of staining bacteria
			CO6	To demonstrate proficiency in handling aseptic bacteriological specimens
II	MIC2MDGCA	Microbiology 2- Microbial Diversity, Growth and Culturing	CO1	To demonstrate an understanding of bacterial, fungal, cyanobacterial, viral and rickettsial classifications, culturing, reproduction and significance.
			CO2	The student will learn the techniques of studying bacterial

				growth curve and factors effecting growth curve.
			CO3	The students will gain knowledge about role of macronutrients and micronutrients in growth of microbes.
			CO4	The student will gain competence to understand anaerobic cultivation of microorganisms.
			CO5	The students will be able to realize the importance of national and international microbial culture collection centres.
			CO6	The student will know general bacteriology and microbial techniques for isolation of pure cultures of bacteria, fungi and algae.
			CO7	The student will master aseptic techniques and be able to perform routine culture handling tasks safely and effectively.
III	MIC3BBMB	Microbiology 3-Biophysics, Biochemistry and Microbial Physiology	CO1	To understand the scope of biophysics, principle, construction working of spectrophotometers, centrifuges, column chromatography.

			CO2	The student is able to describe the concept of, pH and its biological significance, buffers, Henderson-Hasselbalch equation, biological buffer systems and their importance.
			CO3	The student develops understanding of the laws of thermodynamics, concepts of entropy, enthalpy and free energy changes and their application to biological systems and various biochemical studies and reactions.
			CO4	Conceptual knowledge of aerobic and anaerobic respiration and various intermediary mechanisms involved, oxidative phosphorylation.
			CO5	Overview of major biomolecules: Classification, structure, function of carbohydrates, lipids, proteins, amino acids, nucleic acids.
			CO6	Discuss the biosynthesis and the degradation pathways

				involved in the physiology of microbes.
			CO7	Conceptual knowledge of properties, structure, function of enzymes, enzyme kinetics and their regulation, enzyme engineering, application of enzymes in large scale industrial processes.
IV	MIC4MMRA	Microbiology 4 - Microbial Genetics, Molecular Biology, Recombinant DNA Technology	CO1	To understand how DNA replication and recombination occurs in bacteria
			CO2	To understand the concept of gene expression, gene regulation, mutations and DNA repair in prokaryotes
			CO3	To know the importance E. coli and Pichia pastoris as model organisms
			CO4	To analyze the role of various enzymes, vectors and other tools used in genetic engineering
			CO5	To apply the knowledge of recombinant DNA technology to create novel products
			CO6	To discuss various methods of introducing DNA into cells and how to screen and

				select the recombinants
V	MIC5IMB	Microbiology 5- Immunology and Medical Microbiology	CO1	The students will be able to identify the cellular and molecular basis of immune responsiveness
			CO2	The students will be able to describe the roles of the immune system in both maintaining health and contributing to disease
			CO3	The students will be able to describe immunological response and how it is triggered and regulated.
			CO4	The students will be able to explain interventions employed to prevent infectious diseases including infection control measure and vaccines
			CO5	The students will be able to identify common infectious agents and the diseases that they cause and their relevance to healthcare and the pharmaceutical industry
			CO6	The students will be able to assess treatment strategies including the appropriate use of

				antimicrobial agents and common mechanisms of antimicrobial action and resistance
			CO7	It also provides opportunities to develop diagnostic skills, including the use and interpretation of laboratory tests in the diagnosis of infectious diseases
			CO8	The student will be able to describe the epidemiology of infectious agents including how infectious diseases are transmitted
	MIC5BFDMB	Microbiology 6-Biostatistics, Food and Dairy Microbiology	CO1	To understand the significance and activities of microorganisms in food and role of intrinsic and extrinsic factors on growth and survival of microorganisms in food and dairy.
			CO2	To know the spoilage mechanisms in foods and dairy and thus identify methods to control deterioration and spoilage
			CO3	To recognize and describe the characteristics of important pathogens and

				spoilage microorganisms in foods and dairy.
			CO4	To learn various methods for their isolation, detection and identification of microorganisms in food and dairy and employ in industries
			CO5	To identify ways to control microorganisms in food and dairy and thus know the principles involving various methods of food preservation
			CO6	To understand of the basis of food safety regulations and discuss the rationale for the use of standard methods and procedures for the microbiological analysis of food and dairy.
			CO7	To acquire, discover, and apply the theories and principles of food microbiology in practical, real-world situations and problems.
			CO8	To demonstrate skills in interpreting and communicating the results of statistical analysis in writing
			CO9	To learn to participate in a research team

				setting in study design, data coordination and management, and statistical analysis of study results.
VI	MIC6IMBA	Microbiology 7 - Industrial Microbiology and Bioinformatics	CO1	To get acquainted with the industrial aspect of the field of Microbiology, and also learn about growth pattern of microbes in different industrial systems.
			CO2	To learn the techniques of discovering (new) useful microorganisms by various isolation, screening and strain improvement methods and store them reliably for later use.
			CO3	To develop understanding of various upstream processes like media formulation, sterilization, process control and selection of the appropriate fermentation process.
			CO4	To develop understanding of functional and fabrication aspects of various bioreactor designs.

			CO5	To gain knowledge about microbial production of various industrial products such as alcohols, Vitamines, enzymes, organic acids, Antibiotics, biofertilizers, biopesticides, vaccines and biofuel etc.
			CO6	Develop an understanding of downstream processes like detection and assay of the product, methods of recovery of the product and purification of the production.
			CO7	The students will be able to describe the contents and properties of the most important bioinformatics databases, perform text- and sequence-based searches, and analyze and discuss the results in light of molecular biological knowledge
	MIC6ECMA	Microbiology 8: Elective 2 - Clinical Microbiology	CO1	To identify Infections caused by pathogenic bacteria and select the best methods for their diagnosis in the clinical laboratory

			CO2	Able to critically analyze the results of clinical investigations
			CO3	To explain interventions employed to prevent infectious diseases including infection control measure and vaccines
			CO4	To assess treatment strategies including the appropriate use of antimicrobial agents and common mechanisms of antimicrobial action and resistance
			CO5	It also provides opportunities to develop diagnostic skills, including the use and interpretation of laboratory tests in the diagnosis of infectious diseases
			CO6	The student will be able to communicate using the proper scientific language of the field including clinical laboratory reports written with a professional approach
			CO7	To Apply theory, microbiology knowledge and technical skills to identify bacteria, fungi and

				parasites in the laboratory, appreciating the hazards associated with handling microorganisms in the laboratory and the subsequent safety
VI	MIC6EMEB	Microbiology 8 : Elective 1 - Microbial Ecology	CO1	The students will be able to elaborate on the positive and negative interactions of microorganisms in the soil
			CO2	The students will be able to value the role of microbes in: biogeochemical cycles, bioleaching, biodegradation, as biopesticides and biofertilizers
			CO3	The students will be able to understand how microorganisms can cause diseases in plants, and to formulate different measures to prevent and treat these diseases
			CO4	The students will be able to understand how to isolate and identify microorganisms from the various water sources to check the potability of water
			CO5	The students will be able to explain

				the different treatment methods for sewage water
			CO6	The students will be able to isolate and identify air-borne microorganisms and deduce their role in respiratory disorders
			CO7	The students will be able to analyze the importance of biosafety cabinets for aseptic procedures