

Program: B.Sc- Chemistry, Botany, Environmental Science (CBE)				
	CHEMISTRY			
	PO Code	Program Outcomes		
	PO 1	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.		
	PO 2	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.		
Semester	CourseCode	CourseName	COCODE	CO
I	CHEM1C	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.
II	CHEM2C	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.
III	CHEM3C	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.
IV	CHEM4C	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	CHEM5BPC	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
	CHEM501C	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	CHEM6BOP C	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
	CHEM6EEC	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
			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.

	BOTANY			
	PO Code	Program Outcomes		
	PO1	To understand and appreciate the diversity of Flora.		
	PO2	To gain knowledge of simplest to most complex plant forms		
	PO3	To provide baseline information on applied aspects of botany		
	PO4	To foster interaction of students regarding conservation of endemic plants		
Semester	CourseCode	CourseName	CO Code	Course Outcomes
I	BOT1DNP1D	Diversity of Non Vascular Plants Part1	CO1	To know about the microbial diversity and to understand the fundamental functioning of primitive cells.
			CO2	To understand the bacterial structure and the diseases caused by them in plants.
			CO3	To understand the Immune techniques and their applications in plants.
			CO4	The study of the simplest aquatic plant classifications.
			CO5	Study the primitive algal forms in detail.
II	BOT2DNVPD	Diversity of Non Vascular Plants Part II and Anatomy	CO1	This paper emphasizes on fungi which is a very important group of plants as many of them are economically important.
			CO2	As productivity and control of diseases is a major concern, this paper highlights the importance of VAM, nematophagous fungi, and lichens in the improved growth of plants.
			CO3	Students are made aware of some of the common diseases and their control using biofertilizers.

			CO4	The study of Bryophyta helps the students to understand the process of evolution of these plants from Thallophyta.
			CO5	This paper helps to study tissues and tissue organization in plant kingdom.
III	BOT3DVPE A	Diversity Of Vascular Plants and Ecology	CO1	The students will be able to learn about the general characters of Pteridophytes and the life cycle of different classes of Pteridophyte with specific examples and the role of these plants in evolution to show better advanced characters.
			CO2	The students will be able to learn about the general characters of Gymnosperms and the life cycle of different classes of gymnosperms with specific examples and the role of these plants in evolution.
			CO3	The students will learn about plant fossils, types and the process of their formation, geological time scale to understand the evolutionary process and its application in exploration of fossil fuels.
			CO4	The students will learn about the various ecological factors and the interaction of biotic and abiotic factors. They will also understand the concept of ecosystems and conservation and its application in conserving the ecosystem with insitu and exsitu conservation methods.
			CO5	The students will learn about the phytogeographical diversity of India and also in detailed about Karnataka and the application of remote sensing in mapping the vegetation.
IV	BOT4CMB	Cytogenetics and Molecular Biology	CO 1	To understand the life processes at subcellular and molecular level
			CO 2	To understand principles of inheritance at individual and population level
			CO 3	To understand the significant theories of evolution and its historical progress through ages
			CO 4	To understand and apply the principles and techniques of molecular biology

V	BOT5TEBLD	Paper5: taxonomy, Economic Botany, Embryology of Angiosperms	CO 1	Understand the basic concept of taxonomy
			CO 2	Gain knowledge and information on different types of inflorescence and fruits
			CO 3	Help the students to appreciate the economic value of plants
			CO 4	Understand the characteristic features of families to which the plants belong
			CO 5	Understand the concept of developmental and experimental biology
	BOT5PPD	Paper 6: Plant Physiology	CO1	outcome The student will be able to analyze the mechanism by which plants are taking up water and minerals and using it for their nutrition.
			CO2	The students will gain knowledge about photosynthesis which is the process by which plants prepares food in the presence of light.
			CO3	The student will get to know how the plants translocate the food that is prepared primarily in the leaves to the different parts of the plant.
			CO4	The student will be able to appreciate the different types of respiration happening in plants.
			CO5	The student will understand the importance of the role of different plant growth regulators and their mode of action in plants.
VI	BOT6BTAB	Paper 7: Biotechnology and Applied Botany	CO 1	Exposure to industrail biotechnology and Students can come out with entrepreneurship based techniques
			CO 2	Exposed to environmental awareness
			CO3	Able to learn the plant tissue culture echniques
			CO 4	Awareness about the medicinal plants
			CO 5	Knowledge about agricultural and horticultural crops
	BOT6EAPD	Paper 8- Elective: Advance Physiology	CO1	Gain knowledge on the structure and functions of cell organelle
			CO2	Analyze the bacterial photosynthesis and respiration

			CO3	Understand the working and applications of various modern techniques
			CO4	Will be able to understand the enzyme mechanism and purification of enzymes
			CO5	Understands the concepts of physiological mechanism of plants to different stresses
			CO6	Apply end to end applications and significance of hydroponics and aeroponics
	ENVIRONMENTAL SCIENCE			
	PO Code	Programme Outcomes		
	P01	Ability to recognize the need for learning the topic and develop foundational knowledge on the topics related to environment.		
	P02	Ability to develop critical thinking and problem-solving skills to solve issues related to the Environment.		
	P03	Ability to understand the relationships between natural and man-made systems		
	P04	Ability to apply statistical methods, field visit and laboratory analysis to analyse scientific data		
	P05	Ability to develop lifelong learning outcomes on impact of environmental degradation.		

	P06	Ability to design and execute a scientific project, write scientific reports, develop research and communication skills		
	P07	Ability to spread awareness about the environment around us, sustainable development and conduct outreach activities		
	P08	Ability to gain empirical knowledge on the topic and contribute to decision making process		
	P09	Ability to develop professional skill in tools of environmental monitoring.		
Semester	CourseCode	CourseName	COCode	CO
I	EnS1ESCB	Earth Science and its Chemistry	CO1	1. To obtain Knowledge on the chemistry of the various spheres of the Earth, weather and climate patterns, water chemistry and soil chemistry
			CO2	To develop skill in Predicting weather patterns
			CO3	To analyze the quality of drinking water with respect to acidity, alkalinity, hardness and dissolved solids
			CO4	To develop the skill in evaluating the quality of drinking water in MCC campus and their own residential area
II	EnS2ESEB	Ecological Studies	CO1	To Remember and understand major ecological concepts like ecosystem structure and function, dynamics of energy and food flow, habitats and niches, ecological succession and demographic studies (population studies)

			CO2	To Apply the knowledge to study movements of animal populations in wildlife research, conservation of forests and sanctuaries
			CO3	To develop attitude towards the conservation of forests and wildlife by prevention of illegal logging, poaching of endangered species
			CO4	To Create a culture of preserving forests and biodiversity and thus, maintain the ecological heritage of the country
III	EnS3EMB	Environmental Microbiology and Microbial Biotechnology	CO1	To Understand the factors that affect microbial growth on various habitats including the human body (disease cause and effect, control and preventive measures)
			CO2	To develop the skill by applying the above knowledge to manage soil fertility, prevent food spoilage, preventive measures for diseases in humans (clinical microbiology)
			CO3	To Apply the knowledge of environmental microbiology and skills to clean up environments and remediate it, in addition to developing innovative bio products such as biofertilizers, bio pesticides, etc
			CO4	To Test the microbial quality of water to prevent water borne diseases
IV	EnS4RMBIB	Research Methodology, Biostatistics and Instrumentation	CO1	Be able to formulate Research problems and hypotheses, plan and conduct research .
			CO2	Know how to use the scientific equipment, instruments.
			CO3	Be able to use relevant statistical methods and Describe and infer the data
			CO4	Be able to synthesise their research and compose their thesis.
			CO5	Be able to disseminate research results orally and in writing, in both scientific and popular scientific
V	EnS5NRMB	Natural Resources Management	CO1	To understand the concepts of land, energy, water, forest and biodiversity management

			CO2	To apply the knowledge and study rates of deforestation, wildlife loss and poaching activities using GIS software and other methods
			CO3	To develop innovative measures to prevent forest and wildlife loss, green energy technologies, save water resources and enhance agricultural productivity
	EnS5WEB	Water Pollution and Environmental Toxicology	CO1	To understand the basic concepts of ground and surface water pollution; also oil and thermal pollution of oceans.
			CO2	To be able to apply latest techniques of water and waste water purification / treatment and recycle/ re use.
			CO3	To be able to evaluate the Water quality and compare to standards .
			CO4	To be able to characterizes the impacts of various industrial effluents and suggest their treatment methods.
			CO5	To be able to calculate LD50 and ED50 and comment on toxicological impact of effluents.
VI	EnS6ASNPB	Air, Soil and Noise Pollution	CO1	To understand the basic concepts of air pollution meteorology, plume behavior, effects and control measures of air and automobile pollution.
			CO2	Be able to compare and evaluate Air quality and emission standards for vehicles.
			CO3	To understand and formulate disposal techniques of solid municipal, biomedical, hazardous and radioactive waste.
			CO4	To evaluate Noise levels and control its transmission.
	EnS6EMB	Environmental Management	CO1	To understand concepts and tools of EM such as EIA, EIS, Env. Mgmt System, ISO 14000 and OSHAS 18000 standards
			CO2	To develop skill and attitude to assess the impacts of environmental projects using EIA and EIS.
			CO3	To develop evaluation of applying ISO 14000 standards to an industry for Environment Management.

			CO4	Enable the students to apply the knowledge of applying ISO 18000 standards to an industry for worker safety and safe procedures of work.
			CO5	To Understand the concept of Environmental Sustainability and Ethics