

	Program me :	B.Sc Biotechnology,Chemisty,B otany(BTCB)		
	Biotechnology			
	PO Code	Programme Outcomes		
	PO1	Contribute towards the industry designing, developing,and providing solutions for product/processess/techn ology 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.		
Semes ter	CourseC ode	CourseName	CO Code	Course Outcomes
I	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
II	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
III	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

			C04	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
IV	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

V	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	Sudents acquire an 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.

			CO 11	Students will be able to assess and analyze the harmful effects of the impact of pollution on environment.
VI	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			
	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.		
Semester	CourseCode	CourseName	CO Code	Course Outcomes
I	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.

II	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.
III	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.
IV	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

V	CHEM5B PEE	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
	CHEM50 IE	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	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
		CHEM6E PCE	Chemistry 8	CO1
			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. Understand 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. Assess 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	Programme 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	Course Code	Course Name	CO Code	Course Outcomes
I	BOT1DN P1D	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	BOT2DN VPD	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	BOT3DV PEA	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	BOT4CM B	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	BOT5TEB LD	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
	BOT5PP D	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	BOT6BT AB	Paper 7: Biotechnology and Applied Botany	CO 1	Exposure to industrial biotechnology and Students can come out with entrepreneurship based techniques
			CO 2	Exposed to environmental awareness

			CO3	Able to learn the plant tissue culture techniques
			CO 4	Awareness about the medicinal plants
			CO 5	Knowledge about agricultural and horticultural crops
	BOT6EAP D	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