Bhavan's Vivekananda College
of Science, Humanities and Commerce
(Sainikpuri, Secunderbad, Telangana – 500094)
Autonomous College – Affiliated to Osmania University
Accredited with 'A' Grade by NAAC

B.Sc (MbGC)

Program Outcomes:

PO1 Knowledge: Understand the basic concepts, fundamental principles and scientific theories and processes related to the fields of Chemistry, Biochemistry, Biotechnology, Genetics and Microbiology with their relevance in day-to-day life.

PO2 Skills and analysis: Apply the scientific skills in terms of designing experiments, execution of protocols and data analysis in scientific research, industry, and entrepreneurship.

P03 Creativity and Critical thinking: Think creatively and apply the core concept of Biology and Chemistry to a chosen scientific discipline and generate and interpret scientific data using quantitative, qualitative, and analytical methodologies and techniques.

P04 Science and Society: Implement the acquired knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to the professional scientific practice.

P05 Communication: Communicate effectively on problems, issues, and solutions with community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

P06 Ethics &Environment: Apply ethical principles and commit to professional ethics and responsibilities and norms in research and the functional areas, understand the issues of environmental context and sustainable development.

P07 Individual and Teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

P08 Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context of socio, economic and technological changes.

Program Specific Outcomes

PS01: Capacity building to apply knowledge of biological concepts in various thrust areas of Molecular biology, Computational biology, Medical, Environmental, Agricultural, Food and Dairy microbiology considering the demand of academia, research, and industry.

PSO2: Interpret and apply the principles and concepts of Genetics, Genetic engineering, Genomics, Genetic Counselling and Evolutionary biology in reasoning, problem solving, mathematical analysis to understand the process of inheritance and genetic disorders.

PSO3: Utilise the concepts of Organic, Inorganic, General and Physical Chemistry to evaluate and develop analytical skills required for drug designing and green lab practices to safe guard the environment.

Course Outcomes

Name of the Course	**INTRODUCTORY MICROBIOLOGY**
Course Code	**MB 131 Paper I**
CO1	Summarize various discoveries and contributions in the history of Microbiology
CO2	Apply microscopy and staining techniques
C03	Experiment different procedures of sterilization
CO4	Compare various types of viruses and viral replication strategies.
CO5	Summarize various discoveries and contributions in the history of Microbiology

Name of the Course	**Transmission Genetics**
Course Code	**GT132**
CO1	Apply Mendelian laws and genetic notation for problem-solving
CO2	Solve problems using gene mapping and recombination
C03	Examine the molecular mechanisms in cell cycle and chromosomal
CO4	Identify chromosome structure and chromosomal aberrations.
CO5	Apply Mendelian laws and genetic notation for problem-solving

Name of the Course	**Transmission Genetics**
Course Code	**GT132P**
CO1	Students learn genetic annotations and develop analytical skills for problem solving.

Name of the Course	**Inorganic And General Chemistry-I**
Course Code	**CT135**
CO1	Use the knowledge of Ionization energy and Electronegativity to predict types of compounds(Ionic /Covalent) & their reactivity.
CO2	Compare the properties of s-& p-block elements & organometallic compounds.
C03	Familiarize the concept of VBT & MOT to differentiate physical parameters of various diatomic molecules, .Use the knowledge of quantum mechanics to explain atomic structure.
CO4	Interpret organic reaction mechanisms, reactivity of a few organic compounds & examine the ions in soil, water by the semi micro analysis method.

Name of the Course	**Inorganic Chemistry-I**
Course Code	**CT135P**
CO1	Learn to identify the presence of anions and cations in salt mixtures using systematic semi-micro analytical method

Name of the Course	**General Microbiology**

Course Code	**MB 231 Paper II**
CO1	Distinguish bacteria based on taxonomy.
CO2	Compare general characters of different microorganisms.
C03	Prepare pure cultures of microorganisms.
CO4	Analyze biomolecules by qualitative analysis and biochemical techniques

Name of the Course	**Genetic Analysis**
Course Code	**GT232**
CO1	To distinguish structures of DNA and RNA.
CO2	Learn the fundamental aspects of gene expression such as transcription, translation andmRNA splicing.
C03	Identify different mechanisms of gene regulation
CO4	Recognize the significance of rDNA technology in agriculture and medicine.

Name of the Course	**Genetic Analysis**
Course Code	**GT232P**
CO1	Students understand the underlying principle involved in extraction of DNA, estimation ofDNA/RNA, basic techniques used in Microbial Genetics.

Name of the Course	**Physical And General Chemistry-I**
Course Code	**CT235**
CO1	The student will know non-ideal behaviour of gases, PV isotherms, van der Waal's equation and critical phenomenon. They should be familiar with methods used to liquefy gases.
CO2	Implement Nernst Distribution law to relate the solubility of solute in immiscible solvents, to interpret the change in physical parameters to liquefy gases & use of Liquid crystals in LCDs.
C03	At the end of this course, the student will be able to identify whether a molecule is chiral or not by symmetry criteria; the number of stereo isomers possible for a chiral molecule; and the absolute configuration at the chiral centre(s); and the theory of optical activity and internal compensation. The students are expected to know the methods of C – C, C=C formation, reagents and respective name reactions; the difference in reactivity of single, double and triple bonds; the meaning and use of reaction mechanisms with examples.
CO4	The students interpret the theory of aromaticity, aromatic compounds and their reactivity; difference from acyclic conjugated alkenes.

Name of the Course		Inorganic Chemistry-II
Course Code		CT235P
CO1	By the end of this course, students will be able to 1.Prepare inorganic complexes & test the presence of ions in the salt mixtures. 2. Students will be able to utilize green solvents for analyses	

Name of the Course		Microbial Physiology
Course Code		MB 331 Paper III
CO1	List growth media ingredients based on nutritional requirement of microbes.	
CO2	Apply enzyme assay methods to determine the enzyme activity.	
C03	Sketch and summarize metabolic pathways in microbes.	
CO4	Analyse fermentative abilities of various microbes.	

Name of the Course		Food Adulteration
Course Code		SEC-1: MB 301
CO1	Differentiate adulterated and unadulterated food products.	
CO2	Apply simple methods to detect food adulterants.	

Name of the Course		Gene Structure, Organization and Expression
Course Code		GT332
CO1	To distinguish nucleic acid structures and types.	
CO2	To differentiate types of sequences in the genome.	
C03	To recognize fine structure of the gene.	
CO4	To contrast gene expression in prokaryotes and eukaryotes.	

Name of the Course		Gene Structure, Organization and Expression
Course Code		GT332P
CO1	They learn the basics of sterilization, microbial culture and biochemical methods of estimation.	

Name of the Course	Genetically Modified Organisms
Course Code	**SE332**
CO1	Students learn the basic concepts of gene transfer protocols.
CO2	They learn to appreciate the role of Agrobacterium as a natural genetic engineer.
C03	They are acquainted with the significant role of transgenic plants inagriculture.
CO4	Students learn from their field study the usage of GMOs in the local area.

Name of the Course	Organic And General Chemistry-II
Course Code	**CT335**
CO1	Differentiate between SN^1 and SN^2 reactions and identify different alcohols. Apply these reactions in organic synthesi
CO2	Write mechanisms of organic reactions involving reactive intermediates.
C03	Solve problems based on various analytical tools. Design experiments with improved sample preparation and new measurement procedures.
CO4	Appreciate the application of nuclear reactions in the field of Agriculture, medicine etc. Determine the symmetry operations of simple molecules. Apply Woodward Hoffman's rules for different molecular systems

Name of the Course	Inorganic Chemistry-III
Course Code	**CT335P**
CO1	Acquire quantitative skills in volumetric analysis and gain knowledge about the neutralisation, redox and complexometric titrations. 1. Able to prepare standard solutions. 2. Find the concentrations of unknown solutions

Name of the Course	Safety Rules In Chemistry Laboratory & Preparing Lab Reagent
Course Code	**SE335**
CO1	To improve the skills of students in the application of theory and practical knowledge.
CO2	To fill the gap between theory and experimental procedures.
C03	To train the students in understanding laboratory safety rules and to improve the skills in preparation of laboratory regents.
CO4	To make students aware about best lab practices

Name of the Course	**Molecular Biology**
Course Code	**MB 431 Paper IV**
CO1	Solve problems related to DNA basing on Chargaff's rule and Determine the concentration of DNA and RNA.
CO2	Prepare a mind map of types of Mutagens and their mechanism of action.
C03	Extract DNA from bacteria and estimate the molecular weight of isolated DNA.
CO4	Prepare a pictorial representation of various steps involved in Recombinant DNA. technology and present applications of Recombinant DNA technology in various fields.

Name of the Course	**Fundamentals Of Bioinformatics**
Course Code	**SEC-2: MB 401**
CO1	Sketch phylogenetic tree using NCBI.
CO2	Perform pairwise alignment and multiple sequence alignment.

Name of the Course	**Molecular Genetics**
Course Code	**GT432**
CO1	Differentiate types of gene regulation mechanisms in Prokaryotes and Eukaryotes.
CO2	Value rDNA technology as a tool for genetic engineering.
C03	Identify the molecular mechanisms of gene mutation.
CO4	Recognize mechanisms of replication and transposable elements with examples.

Name of the Course	**Molecular Genetics**
Course Code	**GT432P**
CO1	The students improve their analytical skills by working out problems based on replica plating, SLRL and restriction mapping. They understand the effect of UV on bacterial growth They understand the principle of DNA extraction from different sources

Name of the Course	**Genetic Counselling**
Course Code	**SE432**
CO1	The students learn the concepts of Human genetic disorders.
CO2	Students learn the different steps involved in genetic counselling.
C03	They also learn various methods involved in carrier detection.
CO4	They learn to appreciate the prenatal diagnostic techniques.

Name of the Course	**Inorganic And Physical Chemistry-II**
Course Code	**CT435**
CO1	Identify the basic principles related to structure and properties of lanthanides and Actinides. Apply the concept of lanthanide contraction for separation techniques.
CO2	Identify the structure and bonding in simple metals .Apply the 18- electron rule to simple and bridged metal carbonyls.
C03	Use the phase rule to determine the number of components, phases and degrees of freedom of different systems. Calculate the molecular weights of solutes using colligative properties
CO4	Write equations representing electrochemical cell and calculate electrochemical parameters

Name of the Course	**Inorganic Chemistry-IV**
Course Code	**CT435P**
CO1	Acquire quantitative skills in volumetric analysis and gain knowledge about the neutralisation, redox and complexometric titrations. 1. Able to prepare standard solutions. 2. Find the concentrations of unknown solutions

Name of the Course	**Green Methods In Chemistry**
Course Code	**SE435**
CO1	Know about green lab practices. Improving reaction efficiency by changing certain parameters and making it more environment friendly.
CO2	Learning about green reagents and their mode of action in making chemistry less hazardous.
C03	Atom economy and its usefulness i.e. utilizing 100% of the reactants
CO4	Acquaint with different green reactions.

Name of the Course	**Agricultural and Environmental Microbiology**
Course Code	**MB 531 Paper V**
CO1	Summarize the role of plant growth promoting rhizobacteria.
CO2	Compare different plant diseases and measures to prevent them.
C03	List the environment friendly methods in agriculture using microorganisms.
CO4	Review on methods of solid and liquid waste disposal using microorganisms.

Name of the Course	**Immunology**
Course Code	**MB 532/A Paper VI**
CO1	Classify the different types of immunity and correlate the role of vaccines in conferring immunity in an individual.
CO2	Review on functions of cells and organs in immune responses.
C03	Illustrate the structure of antibody and antigen highlighting their specific properties and functions.
CO4	Differentiate between Hypersensitivity and Autoimmunity and will also be able to practically demonstrate the principlesinvolved in antigen antibody reactions.

Name of the Course	**Clinical Microbiology**
Course Code	**SEC-3: MB 501**
CO1	Comprehend about various microbial diseases caused to human beings
CO2	Acquaint knowledge on methods of clinical specimen collection, processing and culturing
C03	Understand various serological and molecular techniques to detect pathogenic infections
CO4	Learn about antibiotic sensitivity

Name of the Course	**Microbes For Human Welfare**
Course Code	**GE-1: MB 502**
CO1	Basic Knowledge about microbiology and role of microbes in daily life
CO2	Conceptual understanding of role of microbiology in production of industrially important products.
C03	Acquaint with prevention and control strategies of microbial diseases
CO4	Acquire basic knowledge on Cosmetic microbiology

Name of the Course	**Population Genetics**
Course Code	**GT532**
CO1	Demonstrate the concept of Genetic Equilibrium.
CO2	Recognize HWE and relate it to mutation.
C03	Differentiate types of selection with examples.
CO4	Distinguish the mechanisms for maintenance of balanced polymorphism.

Name of the Course	**Population Genetics**
Course Code	**GT532P**
CO1	Students learn to use Mathematics and Statistics in problem solving. They understand the dynamics of Genetic Equilibrium and how it can be altered by the evolutionary processes.

Name of the Course	**Advanced Techniques in genome analysis and Genetic Engineering**
Course Code	**GT532A**
CO1	To value biophysical techniques such as electrophoresis, Hybridization techniques, PCR
CO2	To appreciate advanced genome analysis techniques like NGS and DNA Microarray.
C03	To differentiate gene transfer strategies for the development of Genetically Modified Organisms
CO4	To appraise the uses of transgenic plants and animals

Name of the Course	**Advanced Techniques in genome analysis and Genetic Engineering**
Course Code	**GT532AP**
CO1	The students learn cytogenetic techniques like Karyotyping and biophysical techniques like Agarose and Polyacrylamide gel electrophoresis.

Name of the Course	**Vermicomposting**
Course Code	**SE532**
CO1	The students learn to identify the different species if Earthworm.
CO2	They learn to make their own vermi-compost.
C03	They can also start a start-up programme on vermicomposting.
CO4	This skill enhancement course encourages entrepreneurship.

Name of the Course	**Organic, General And Physical Chemistry-III**
Course Code	**CT535**
CO1	Analyse different nitrogen compounds by conducting simple experiments.
CO2	Identify the principles, structure and reactivity of selected coordination complexes. Utilise the principles of coordination complexes in understanding the functions of biological systems.
C03	Identify the heterocyclic structure in metalloproteins or enzymes. synthesise them through green chemistry approach. Interpret electronic spectra and magnetic properties
CO4	Calculate change in thermodynamic properties. Calculate the absolute value of thermodynamic quantities (U, H, S, A, G).

Name of the Course	**Organic Chemistry- V**
Course Code	**CT535P**
CO1	Develops a skill in organic synthesis and re-crystallisation

Name of the Course		Physico-Chemical Methods Of Analysis,Spectroscopy And Analysis
Course Code		CT535A
CO1	Acquires a basic knowledge in solvent extraction and all chromatographic techniques	
CO2	Acquaint withspectroscopic techniques and colorimetic estimations .Students identify organic compounds using mass spectroscopy.	
C03	Identify organic molecules using spectroscopic tools such as UV, IR, Raman and H^1NMR spectroscopy.	
CO4	Apply the knowledge of catalysis to carry out atom economy organic synthesis. Acquires the knowledge of how alcohol dehydrogenase catalysis is different in Asians and Europeans	

Name of the Course		Physical Chemistry- VI
Course Code		CT535AP
CO1	Develops a skill to use conductometers, potentiometers, PH meters and colorimeters that are required for the industry	

Name of the Course		Basic Analytical Chemistry
Course Code		SE535
CO1	It enhances the knowledge and skills required for attaining analytical and critical abilities, logical thinking, and ability to apply knowledge learnt to solve issues and problems related to chemical analysis.	
CO2	Improve the use of statistical tools.	
C03	Used in determining the water quality refers to the chemical, physical, biological, and radiological characteristics of water. It is a measure of the condition of water relative to the requirements of one or more biotic species and or to any human need or purpose.	

Name of the Course		Organic Farming
Course Code		GE535
CO1	Upon successful completion of this course, students will: Have a better understanding of the basic principles of organic farming. Recognize that organic farming systems, if practiced in a an environmentally sound manner, can constitute a larger philosophy of sustainable agriculture.	
CO2	Be able to devise an organic farm management plan.	
C03	Have improved their ability to think critically about the opportunities and challenges faced by organic growers.	

Name of the Course	**Medical Microbiology**
Course Code	**MB 631 Paper VII**
CO1	Summarize the role and distribution of normal flora and describe the host pathogen interactions.
CO2	Compute on causal organisms and pathogenesis of food borne air, water and sexually transmitted diseases.
C03	Differentiate various viral borne diseases, causal organisms, modes of transmission and pathogenesis.
CO4	Practically demonstrate the antibiotic sensitivity tests.

Name of the Course	**Food And Industrial Microbiology**
Course Code	**MB 632/A Paper VIII**
CO1	Classify various microbes involved in the food spoilage and properties of spoiled foods.
CO2	Summarize food borne diseases, food poisoning and their detection.
C03	Restate the general methods food preservation.
CO4	Illustrate the steps of various microbial fermentation procedures involved in production of yoghurt, bread, cheese, ethyl alcohol, glutamic acid, Beer, penicillin, citric acid, Vitamin B12, Biogas and insulin.

Name of the Course	**Mushroom Cultivation**
Course Code	**SEC-4: MB 601**
CO1	Summarize mushroom cultivation in methods
CO2	Tabulate the nutritional value of mushrooms
C03	List the mushroom preservation procedures.
CO4	Learn about antibiotic sensitivity

Name of the Course	**Contagious Diseases And Immunization**
Course Code	**GE-2: MB 602**
CO1	Awareness on bacterial and viral diseases
CO2	Understand about mode of infections
C03	Acquaint Knowledge on types of immunity
CO4	Knowledge on vaccination schedule

Name of the Course	**Inbreeding, Breeding techniques and Genome Evolution**
Course Code	**GT632**
CO1	Interpret the effects of inbreeding in populations through inbreeding coefficient.
CO2	To discuss conventional and modern breeding methods in the progress of agriculture.
C03	To appreciate the techniques used in livestock improvement
CO4	To judge evolutionary relationships between/among organisms.

Name of the Course		Inbreeding, Breeding techniques and Genome Evolution
Course Code		GT632P
CO1	Students apply the concepts learnt in theory such as: calculation of inbreeding coefficient from pedigrees. They learn to calculate different types of Genetic load. They learn the bio-physical technique of native PAGE. They learn construction of phylogenetic trees using Bioinformatics software	

Name of the Course		Human Genetics & Biostatistics
Course Code		GT632A
CO1	Distinguish the strategies used for the management of human genetic disorders.	
CO2	Value gene therapy for various genetic disorders and the importance of genome projects & Bioinformatics.	
C03	Apply the concepts of genetic engineering for industrial products.	
CO4	Relate to the importance of statistical methods used in Human Genetics.	

Name of the Course		Human Genetics & Biostatistics
Course Code		GT632AP
CO1	The students learn statistical testing of hypothesis by using different tests like Chi-Square test, Z-test and t-test. Students develop their mathematical and analytical skills.	

Name of the Course		Medicinal Plants
Course Code		SE632
CO1	The students learn the importance of medicinal plants.	
CO2	The students are able to identify the medicinally important plants.	
C03	They learn the technique involved in the powder analysis of different crude drugs.	
CO4	They learn to appreciate the significance of medicinal botany with reference to Siddha and Ayurveda.	

Name of the Course		Wine making
Course Code		GE632
CO1	Students learn the basic method of wine preparation.	
CO2	They learn the difference between wine and other alcoholic beverages.	
C03	They learn to identify and taste the different kinds of wine.	
CO4	The present paper encourages them to be entrepreneurs.	

Name of the Course		Organic, General And Physical Chemistry-IV
Course Code		**CT635**
CO1	Identify the carbohydrates and explain its role in living organisms.	
CO2	Apply HSAB principle for stability and occurrence of simple salts in nature.	
C03	Apply various synthetic strategies in the field of synthesis. Use retro synthesis and disconnection approach for synthesis of drugs.	
CO4	Solve problems on rate and rate constants. Calculate the age of rocks, carbon dating etc	

Name of the Course		Organic Chemistry- VII
Course Code		**CT635P**
CO1	Organic Analysis-Apply principles of identification techniques in organic analysis Identify organic compounds Identify the presence of organic compounds in vegetables and fruits	

Name of the Course		Drugs,Pesticides,Macromolecules
Course Code		**CT 635A**
CO1	Apply the knowledge of drugs & formulation chemistry to the pharmaceutical industry.	
CO2	Acquaint with green pesticides and harmful effect of other organic pesticides.	
C03	Acquire knowledge in Material science, super conductance and nanotechnology- the allied subjects in chemistry, which find a great place in modern research.	
CO4	Students can synthesize different polymers based on their tacticity and different mechanisms of polymerization.	

Name of the Course		Physical Chemistry- VI
Course Code		**CT635AP**
CO1	Familiarized with calculation of rate constant for first and second order kinetic reactions. Utilise the technique of solvent extraction to separate different solutes in a compound or extract medicinal components from herbs.	

Name of the Course		Cheminformatics
Course Code		**SE635**
CO1	Learn about drawing chemical structures on PC Using the tools to search the chemicals in the database to help	

	in research.
CO2	Identification of protein targets. Spectral predictions of various drugs. Molecular modelling Hands on experiment on drug development using cheminformatics.
C03	Hands on MOLINSPIRATION

Name of the Course	**Chemistry Of Cosmetics & Perfumes**
Course Code	**GE635**
CO1	Describe fundamentals of chemistry and the scientific basis for cosmetic formulation and the function of the active ingredients.
CO2	Comprehend the efforts of scientists in cosmetic product design and developments.