

**2.6.1: Teachers and students are aware of the stated Programme and course outcomes of the Programmes offered by the institution.**

**Bachelor of Science in Chemistry, Botany, Zoology:**

**Programme outcomes**

<b>Programme Name &amp; Code</b>	<b>After the completion of the programme a student is able to</b>
<b>B.Sc, CBZ</b>	<ul style="list-style-type: none"> <li>❖ PO-1: Acquire the knowledge of plant diversity, its importance, threats, and conservation methods</li> <li>❖ PO-2: Understand the basics of life, significance of evolution and ecology</li> <li>❖ PO-3: Correlate the understanding of different fields of botany and basic sciences</li> <li>❖ PO-4: Get awareness and development of basic experimental skills, field observation of plants and biological techniques used for scientific research.</li> <li>❖ PO-5: Acquire the knowledge of animal diversity, its importance, threats, and conservation methods.</li> <li>❖ PO-6: Understand the basics of life, significance of evolution and ecology.</li> <li>❖ PO-7: Correlate the understanding of different fields of zoology and basic sciences.</li> <li>❖ PO-8: Get awareness and development of basic experimental skills, field observation of plants and biological techniques used for scientific research.</li> </ul>
<b>Programme specific outcomes</b>	<ul style="list-style-type: none"> <li>❖ PSO-1: Will have the knowledge of various chemicals used in pharmaceutical and pesticide industry</li> <li>❖ PSO-2: Will have the knowledge of water pollution and water purification</li> <li>❖ PSO-3: Will acquire the knowledge of different diseases causing organisms and their control measures</li> <li>❖ PSO-4: Will be apprised about uses and importance of different plant species in economic botany</li> <li>❖ PSO-5: Will acquire the basic foundation for better understanding of zoology specific fields such as genetics, molecular biology, animal physiology, entomology, fish and fisheries.</li> <li>❖ PSO-6: Will get knowledge of different disease causing organisms and their control measures in the fields of parasitology, medicinal entomology and applied zoology</li> </ul>

**Chemistry**

<b>Course Title</b>	<b>After the completion of the programme a student is able to</b>
<b>I Semester Inorganic and organic chemistry</b>	<ul style="list-style-type: none"> <li>➤ CO-1: Student acquire Knowledge to identify characteristics of metals and non-metals.</li> <li>➤ CO-2: Provide knowledge of the synthesis of complex molecules from simple starting materials.</li> <li>➤ CO-3: To understand the stability of aromatic compounds.</li> <li>➤ CO-4: Knowledge to predict the relative rates of substitution versus elimination.</li> </ul>
<b>II Semester Physical and General chemistry</b>	<ul style="list-style-type: none"> <li>➤ CO-1: To understand the application of gas laws to a study of the stoichiometric reactions.</li> <li>➤ Student acquires knowledge on the use of liquid crystals in electrical devices.</li> <li>➤ CO-2: To understand the effects of x-ray radiation on matter</li> <li>➤ CO-3: Knowledge to separate and purify materials and to carry out chemical analysis</li> <li>➤ CO-4: Knowledge on chemical formulae to build visual model</li> <li>➤ CO-5: To understand the role of surface chemistry in various chemical processes.</li> <li>➤ CO-6: Knowledge on optical isomerism.</li> </ul>
<b>III Semester Inorganic and Organic chemistry</b>	<ul style="list-style-type: none"> <li>➤ CO-1: To gain knowledge on catalysts, complexes and construction materials.</li> <li>➤ CO-2: To understand the electrical properties of solids using band theory.</li> <li>➤ CO-3: To understand the use of metal carbonyls in organic synthesis and as catalysts</li> <li>➤ CO-4: To understand the main properties of organic compounds and their uses.</li> <li>➤ CO-5: Knowledge of the synthesis of alcohols and ether.</li> </ul>
<b>IV SEMESTER Spectroscopy and physical chemistry</b>	<ul style="list-style-type: none"> <li>➤ CO-1: Knowledge to analyze and interpret geological systems.</li> <li>➤ CO-2: To acquire knowledge to determine the molecular mass of a solute</li> <li>➤ CO-3: Knowledge on the basic principle used in the formation of cells and batteries.</li> <li>➤ CO-4: Knowledge on the use of electrical energy for initiating chemical reaction.</li> <li>➤ CO-5: Knowledge on detection of concentrations of different substances and detection of impurities.</li> <li>➤ CO-6: Knowledge on structure elucidation of organic compounds.</li> <li>➤ CO-7: Knowledge on IR is useful in forensic analysis.</li> </ul>

V SEMESTER, Organic Chemistry, Physical And General Chemistry	<ul style="list-style-type: none"> <li>➤ CO-1: Knowledge on its applications towards biological system</li> <li>➤ CO-2: Knowledge on the interaction of metal ions with biological ligands.</li> <li>➤ CO-3: Knowledge of synthesis of medicines, dyes, fertilizers, explosive compounds etc.</li> <li>➤ CO-4: Acquire Knowledge to compute Thermodynamic quantities from Thermodynamic tables.</li> <li>➤ CO-5 : Student will able to acquire knowledge on the role of metal ions.</li> <li>➤ CO-6 : To understand the applications of chemical kinetics in studying enzyme mechanisms.</li> <li>➤ CO-7 : To understand photosynthesis vision, and the formation of D vitamin with the sunlight.</li> <li>➤ CO-8:To understand their importance in pharmaceuticals, agrochemicals and veterinary products</li> <li>➤ CO-9:To understand the important functions of carbohydrates in humans, animals and plants.</li> <li>➤ CO-10:Knowledge of biomedical importance of proteins</li> </ul>
VI Semester Internship	<ul style="list-style-type: none"> <li>➤ Six months Long term internship.</li> </ul>

## **BOTANY**

<b>Course Title</b>	<b>After the completion of the programme a student is able to</b>
<b>I SEMESTER</b> Microbial diversity algae & fungi	<ul style="list-style-type: none"> <li>➤ CO-1. Classify the lower group of plants.</li> <li>➤ CO-2. Recognizes various algal members using observation skills.</li> <li>➤ CO-3. Explain economic importance of algae.</li> <li>➤ CO-4. They gain knowledge about various fungal members.</li> <li>➤ CO-5. They become aware of fungus in their daily routine life.</li> <li>➤ CO-6. Draw the life cycles of Rhizopus, Penicillium and Puccinia</li> <li>➤ CO-7. Prepare solid and liquid medium for culturing of microbes.</li> <li>➤ CO-8. Perform techniques in gram staining.</li> <li>➤ CO-9. Identify disease symptoms caused by bacteria.</li> <li>➤ CO-10. Identify different spores..</li> </ul>
<b>II SEMESTER</b> Diversity of archegoniate and anatomy	<ul style="list-style-type: none"> <li>➤ CO-1. They gain detailed knowledge on Pteridophytes.</li> <li>➤ CO-2 Students will enrich themselves with the concepts of heterospory and seed habit.</li> <li>➤ CO-3. Draw the life history of Lycopodium, Selaginella and Pteris.</li> <li>➤ CO-4. Explains stelar evolution in Pteridophytes.</li> <li>➤ CO-5. Identify seed bearing plants.</li> <li>➤ CO-6 Explain significance of wood, essential oils and medicines.</li> <li>➤ CO-7. Draw the life history of gymnosperms.</li> <li>➤ CO-8 Recognizes the tissues.</li> </ul>
<b>III SEMESTER</b> Plant Taxonomy and Embryology.	<ul style="list-style-type: none"> <li>➤ CO-1. Describe the plants by following ICBN rules.</li> <li>➤ CO-2. Recognize taxonomic status of plants.</li> <li>➤ CO-3. Prepare herbarium.</li> <li>➤ CO-4. Compare and analyze various systems of classification.</li> <li>➤ CO-5. Construct a phylogenetic tree.</li> <li>➤ CO-6. Explain economic importance of families.</li> <li>➤ CO-7. Identify the plants using observation skills.</li> </ul>
<b>IV SEMESTER</b> Plant physiology and metabolism	<ul style="list-style-type: none"> <li>➤ CO-1. Design experiment to examine the hypothesis.</li> <li>➤ CO-2. Analyze the role of nutrients in plant life.</li> <li>➤ CO-3. Identify the nutrient deficiency symptoms in plants.</li> <li>➤ CO-4. Describe the phenomenon of biological nitrogen fixation, protein synthesis and enzyme action.</li> <li>➤ CO-5. Explain various pigments present in the plant body.</li> <li>➤ CO-6. Illustrate the relationship light with photosynthesis.</li> <li>➤ CO-7. Distinguish aerobic and anaerobic respiration.</li> <li>➤ CO-8. Outline the steps in glycolysis, TCA cycle and electron transport.</li> <li>➤ CO-9. Describe the phenomenon of lipid metabolism and oxidative phosphorylation.</li> </ul>
<b>V SEM, PAPER -5</b> Cell Biology, Genetics & Plant Breeding	<ul style="list-style-type: none"> <li>➤ CO-1. Distinguish the structure of prokaryotic and eukaryotic cells.</li> <li>➤ CO-2. Draw the structure of cell organelle.</li> <li>➤ CO-3. Explain structure and function of cell membrane.</li> <li>➤ CO-4. Outline the structure of genetic material.</li> <li>➤ CO-5. Distinguish the structure of DNA &amp; RNA.</li> <li>➤ CO-6. Describe replication of DNA.</li> <li>➤ CO-7. Recall the Mendel's law of inheritance.</li> <li>➤ CO-8. Construct the punnet board to explain the Mendal laws.</li> <li>➤ CO-9. Select and apply experimental procedures and skills to solve genetics problems.</li> <li>➤ CO-10. Describe plant breeding.</li> </ul>
<b>VI SEM,</b>	<ul style="list-style-type: none"> <li>➤ Six months Long term internship.</li> </ul>

## **Zoology**

<b>Course Title</b>	<b>After the completion of the programme a student is able to</b>
I Semester Invertebrates (non-Chordates)	<ul style="list-style-type: none"> <li>➤ CO-1. Define scope and objectives of ethno botany.</li> <li>➤ CO-2. Explain various ethnic groups of Tribals.</li> <li>➤ CO-3. Explain significance of medicinal plants.</li> <li>➤ CO-4. Design strategies for conservation of resources and traditional knowledge.</li> <li>➤ CO-5. Illustrate biopiracy.</li> <li>➤ CO-6. Describe ayurveda, siddha and unani.</li> <li>➤ CO-7. Know the Medicinal properties of plants.</li> <li>➤ CO-8. Develop strategies for conservation of endemic, endangered and red listed plants.</li> </ul>
II Semester Vertebrates (Chordates)	<ul style="list-style-type: none"> <li>➤ CO-1· Describe general taxonomic rules on animal classification of chordates</li> <li>➤ CO-2· Classify Protochordata to Mammalia with taxonomic keys</li> <li>➤ CO-3· Understand Mammals with specific structural adaptations</li> <li>➤ CO-4· Understand the significance of dentition and evolutionary significance</li> <li>➤ CO-5· Understand the origin and evolutionary relationship of different phyla from Prochordata to mammalia.</li> </ul>
III Semester Cytology	<ul style="list-style-type: none"> <li>➤ CO-1· To understand the basic unit of the living organisms and to differentiate the organisms by their cell structure.</li> <li>➤ CO-2· Describe fine structure and function of plasma membrane and different cell organelles of eukaryotic cell.</li> </ul>
Genetics	<ul style="list-style-type: none"> <li>➤ CO-1· To understand the history of origin of branch of genetics, gain knowledge on heredity, interaction of genes, various types of inheritance patterns existing in animals</li> </ul>
Evolution	<ul style="list-style-type: none"> <li>➤ CO-1· Acquiring in-depth knowledge on various aspects of genetics involved in sex determination, human karyotyping and mutations of chromosomes resulting in various disorders</li> <li>➤ CO-2· Understand the central dogma of molecular biology and flow of genetic information from DNA to proteins.</li> <li>➤ CO-3· Understand the principles and forces of evolution of life on earth, the process of evolution of new species and apply the same to develop new and advanced varieties of animals for the benefit of the society</li> <li>➤ CO-4· Acquainting and skill enhancement in the usage of laboratory microscope</li> </ul>
IV Semester Embryology Physiology Ecology	<ul style="list-style-type: none"> <li>➤ CO-1· Understand the functions of important animal physiological systems including digestion, cardio-respiratory and renal systems.</li> <li>➤ CO-2· Understand the muscular system and the neuro-endocrine regulation of animal growth, development and metabolism with a special knowledge of hormonal control of human reproduction.</li> <li>➤ CO-3· Describe the structure, classification and chemistry of biomolecules and enzymes responsible for sustenance of life in living organisms</li> <li>➤ CO-4· Develop broad understanding the basic metabolic activities pertaining to the catabolism and anabolism of various biomolecules</li> <li>➤ CO-5· Describe the key events in early embryonic development starting from the formation of gametes upto gastrulation and formation of primary germ layers.</li> </ul>
V Semester Animal Biotechnology Animal husbandry	<ul style="list-style-type: none"> <li>➤ CO-1· Understand the applications of Biotechnology in the fields of industry and agriculture including animal cell/tissue culture, stem cell technology and genetic engineering.</li> <li>➤ CO-2· Get familiar with the tools and techniques of animal biotechnology.</li> </ul>
VI Semester	<ul style="list-style-type: none"> <li>➤ Six months Long term internship.</li> </ul>

## Bachelor of Science in Microbiology, Zoology, Chemistry

Programme name & code	After the completion of the programme a student is able to
B.Sc, MZC	<ul style="list-style-type: none"> <li>➤ PO-1: Understand, demonstrate theory and practical skills in microscopy and their handling techniques.</li> <li>➤ PO-2: Understand the basic ideas and practices from the scientists contribution in the history and applications of microbiology.</li> <li>➤ PO-3: Acquire knowledge of the standard rules of classification systems from two kingdom to Carl Woes domain concept along with Bergey's manual to categories microorganisms.</li> <li>➤ PO-4: Know various Culture media and their applications, understand various physical and chemical means of sterilization and also isolation &amp; preservation of microbes.</li> <li>➤ PO-5: Understand the characteristics, properties and biological significance of the biomolecules of life and enzymes and also different metabolic processes in microorganisms.</li> <li>➤ PO-6: Understand the knowledge to handle pathogenic microbes and basic instrumentation used routinely in microbiological laboratory and various techniques to isolate, physiological and morphological characteristics of microbes.</li> <li>➤ PO-7: Operate and use of various instruments like Microscope, Colorimetry, Chromatography, Spectrophotometry, Centrifugation, Gel electrophoresis for various analysis.</li> <li>➤ PO-8: Understands the principles/concept of Prokaryotic genetics and application in research.</li> <li>➤ PO-9: Will gain basic knowledge and understanding the production of industrially important alcohols like ethanol, organic acids, Vitamins and their applications.</li> <li>➤ PO-10: Will acquire knowledge in microbial food spoilage and various methods in control of microbial deterioration of food.</li> <li>➤ PO-11: Gain knowledge in Mutagenesis, Mutation and mutants and their significance in microbial evolution.</li> <li>➤ PO-12: Have a conceptual knowledge about the structure of DNA &amp; RNA, enzymology, and replication strategies and the molecular mechanisms involved in transcription and translation for protein synthesis, Understanding of tools and techniques involved in molecular cloning in genetic engineering.</li> <li>➤ PO-13: Demonstrate and understand the key concepts in immunology, organization of immune system, understand the salient features of antigen antibody reaction &amp; its uses in diagnostics like ELISA, Immunofluorescence, RIA etc and various other studies.</li> <li>➤ PO-14: Understands the significance of microbial diversity, community structure and role of microorganisms in biogeochemical cycles, role of microorganisms in sustainable development and bioremediation of various pollutants using microorganisms.</li> <li>➤ PO-15: Understands the information about Inter-relationship of soil and microorganisms, different group of beneficial microorganisms in agriculture, microbes as a biofertilizer (<i>Rhizobium</i>, <i>Azospirillum</i>, VAM) plant pathogen and biocontrol agent (<i>Pseudomonas spp</i>).</li> <li>➤ PO-16: Understands the concept of pathogenesis of various pathogens, its underlying mechanisms along with molecular interactions, leading to development of disease in the host. Develops principles of pathogen, host and environment in terms of its varied existence and interactions, leading to epidemiological events in medical microbiology.</li> <li>➤ PO-17: Correlate the understanding of different fields of microbiology and its applications in various fields like pharmaceutical industries etc.</li> <li>➤ PO-18: Acquire knowledge about different disease causing microorganisms in plants &amp; animals and their control measures.</li> <li>➤ PO-19: Understand the concept of Solid and liquid waste management system and their management.</li> <li>➤ PO-20: Understand and demonstrate a knowledge of Intellectual property rights, Biosafety regulations etc.</li> <li>➤ PO-21: Understand the knowledge on the concept of biofertilizers, Biopesticides and their application and also Concept of Composting and biofuels, types and applications.</li> </ul>

Programme name &code	After the completion of the programme a student is able to
B.Sc, MZC	<ul style="list-style-type: none"> <li>➤ PSO-1: Microbes are exceptionally attractive models for studying fundamental life process.</li> <li>➤ PSO-2: Will gain basic knowledge in microbial concepts, pros and cons of microorganisms in various applications in day to day life with special reference to environmental sustainability and industry.</li> <li>➤ PSO-3: Acquire the skill in the safe use and maintenance of basic instrumentation, performing the safe basic laboratory procedures like collection, isolation and processing of various pathogenic microbes etc.</li> <li>➤ PSO-4: Acquire the basic knowledge in isolation, identification, treatment and prevention of various plant and animal diseases caused by pathogenic microorganisms.</li> <li>➤ PSO-5: Will gain ample knowledge in the production and applications of various industrially products important to human wellbeing in day to day life.</li> <li>➤ PSO-6: The various skills enriched in the subject will motivate the learners interest towards further research in their area of microbiology and its related subjects.</li> <li>➤ PSO-7: The Microbial field is very immense due to its involvement in many fields like agriculture, biotechnology, pharmacy, water industry, food industry, industrial, clinical research etc.</li> <li>➤ PSO-8: It will also help the learners to be eligible for higher studies, jobs in various sectors and Entrepreneurship abilities.</li> <li>➤ PSO-9: Will help the learners to acquire basic knowledge in relationship between microbes and food, methods and techniques used in processing of food and also understands the role of microbes in the eco system.</li> <li>➤ PSO-10: It will make learners specialists in a discipline, they will play a key part in future advances and breakthroughs in the subject, allowing the discipline to advance.</li> <li>➤ PSO-11: It will helps the learners to apply their microbiological knowledge and expertise to solve microbiology problems that arise in society from time to time.</li> </ul>

## MICROBIOLOGY

Course Title	After the completion of the programme a student is able to
I Semester Introduction to Microbiology and Microbial diversity	<ul style="list-style-type: none"> <li>➤ CO-1: Learners will be understanding the history and development of the discipline of Microbiology and the contributions made by prominent scientists in this field.</li> <li>➤ CO-2: Students will be acquired knowledge and understanding the characteristics and classification of bacteria, most important in microbiology.</li> <li>➤ CO-3: Students will be acquired knowledge and understanding the Fungi, Viruses, Algae and Protozoa and microbiology concepts as applicable to diverse areas such as medical, industrial, environment, genetics, agriculture, dairy &amp; food industry, water industry and bioprocess industry etc.</li> <li>➤ Learners would work safely in the laboratory with microscope handling to observe various types of microorganisms.</li> <li>➤ CO-4: After completion of this unit students individually expertise in staining.</li> <li>➤ Students get knowledge on different methods of sterilization techniques like incineration, Chlorination, operation theatres etc.</li> <li>➤ CO-5: To get trained in performing routine microbiological practices such as culture media techniques, maintenance of microbial culture, etc., which plays a major role in many industries and research laboratories for identification of microorganisms.</li> <li>➤ CO-6: Learners would work safely in the laboratory with various types of pathogenic microorganisms which will boost their performance during practical sessions and working in an industry or research field.</li> <li>➤ Students will be acquired knowledge and understanding the basic microbiology practical which are applicable to diverse areas such as medical, industrial, environment, genetics, agriculture, dairy &amp; food industry, water industry and bioprocess industry etc.</li> </ul>
SEMESTER-II Microbial Biochemistry and Metabolism	<ul style="list-style-type: none"> <li>➤ CO-1: Students will be skilled of characteristics and classification of biomolecules which are the essential components of living organisms.</li> <li>➤ CO-2: Understanding the various analytical techniques which are applied for the estimation of biomolecules in various complex mixtures.</li> <li>➤ CO-3: Learners will acquire complete knowledge on microbial enzymes and microbial metabolism have played valuable in large scale industrial processes shows their curiosity towards biochemistry has contributed more to the growth of health, agriculture and modern medical.</li> <li>➤ CO-4: Students will be prominent in microbial nutrition, culture media which is crucial for their growth. And studied various methods of growth and the factors influencing and their measurement.</li> <li>➤ CO-5: Understanding the microbial biochemistry and metabolism have played valuable role.</li> <li>➤ Students will be skilled of practicals having applications in clinical diagnosis, understanding pathology of diseases, treatment of diseases, designing of drugs and understanding their metabolism and manufacture of various biological products like amino acids, proteins, antibiotics, hormones, enzymes, nutrients, etc.</li> </ul>
SEMESTER-III Microbial Genetics and Molecular Biology	<ul style="list-style-type: none"> <li>➤ CO-1: Molecular Biology basically deals with study of DNA and other biomolecules essential for life and varied mechanisms involved at molecular level.</li> <li>➤ CO-2: The emergence of mutations and their influence on the survival of organisms and the DNA repair methods and mechanism of recombination.</li> <li>➤ CO-3: Topic includes involvement of RNA types and Genetic code importance in protein synthesis.</li> <li>➤ CO-4: Studied the transcription &amp; translation methods and gene expression methods.</li> <li>➤ CO-5: Students get knowledge basic molecular techniques like PCR and their applications in industry, medicine and agriculture.</li> <li>➤ Students handle and independently work on lab protocols involving molecular techniques which has major job opportunities in the research areas of biotechnology.</li> </ul>

Course Title	After the completion of the programme a student is able to
SEMESTER-IV Immunology and Medical Microbiology	<ul style="list-style-type: none"> <li>➤ CO-1: Understanding the types of cells, organs of the immune system and functioning of T and B lymphocytes which plays major role in resistance.</li> <li>➤ CO-2: The students learn about molecular basis of antigen recognition, hypersensitivity reaction, antigen-antibody reactions. Begin to appreciate the significance of maintaining a state of immune tolerance sufficient to prevent the emergence of autoimmunity.</li> <li>➤ CO-3: The course develops in the student an overview of normal flora of human body, hospital infections and various methods and principles used in laboratory diagnosis.</li> <li>➤ CO-4: The course develops in the student an account of antimicrobial substances, tests for antimicrobial susceptibility toward drugs and about viruses.</li> <li>➤ CO-5: Discussed about the causal organism, pathogenesis, epidemiology, diagnosis, prevention and control of various microbial diseases have applications in diagnostic laboratory mainly.</li> <li>➤ Students will be knowledge about the blood and blood components estimation which have a great future in many clinicals, hospitals, nursing homes and many diagnostic laboratories as a microbial technician.</li> </ul>
SEMESTER-V (A) Environmental and Agricultural Microbiology	<ul style="list-style-type: none"> <li>➤ CO-1: Appreciate the diversity of microorganisms and learn the abundance, distribution and significance of microorganism in the terrestrial, aquatic, atmosphere and extreme environment.</li> <li>➤ CO-2: Expertized to perform established, well-validated tests on water, food, agricultural, environmental samples to detect different types of microbes and about the relationship between microbes and the environment.</li> <li>➤ CO-3: Get expertise in methods of solid waste and liquid waste management and sewage treatment methods employed in waste-water treatment.</li> <li>➤ CO-4: Learn in detail the types and mechanisms of nitrogen fixation and applications of diazotrophs as biofertilizers which are harmless.</li> <li>➤ CO-5: Learn about the various microorganisms causing plant diseases and principles of plant disease control.</li> <li>➤ Considers the biological processes that take place in the soil and their importance to soil fertility, plant growth, and environmental quality. Deals with the biochemical basis for soil processes, including microbial ecology, the carbon and nitrogen cycles, mineral transformation, and ecological interrelationships.</li> <li>➤ Learners will understand the procedures to be followed in treatment &amp; safety of water along with the methods followed in solid waste and liquid waste management which shows a path to get opportunities in water industries.</li> </ul>
SEMESTER-V (B) Food and Industrial Microbiology	<ul style="list-style-type: none"> <li>➤ CO-1: Understand the significance and activities of microorganisms in various food and role of intrinsic and extrinsic factors on microbial growth in foods leading to spoilage, and understand the principles underlying the preservation methods will be used in many food processing industries.</li> <li>➤ CO-2: Used to recognize and describe the characteristics of important food borne pathogens and learn various methods for their isolation, detection and identification which causes food spoilage.</li> <li>➤ Learners will grasp the isolation of microorganisms in spoiled foods and the methods to be followed in milk quality by MBRT methods have great opportunities in milk industries.</li> <li>➤ Get acquainted with fermentation techniques for the production and estimation of ethanol and citric acid has opportunities in beverage industry.</li> </ul>
Semester VI	<ul style="list-style-type: none"> <li>➤ Six months Long term internship.</li> </ul>



### **Bachelor of Science in Biotechnology, Botany, Chemistry**

<b>Programme name &amp;code</b>	<b>After the completion of the programme a student is able to</b>
B.Sc, BBC	<ul style="list-style-type: none"><li>➤ PO 1: Demonstrate knowledge skills of biotechnology concepts.</li><li>➤ PO 2: Acquire technical knowledge and hands-on experience necessary for biotechnology research.</li><li>➤ PO 3: Able to communicate effectively on the technical aspect of the subject.</li><li>➤ PO 4: will provide knowledge of genetic engineering techniques to manipulate living organisms genetically to produce valuable therapeutic products to treat diseases.</li><li>➤ PO 5 : Acquire knowledge about use of genetically modified microbes to clean the environmental toxicants.</li><li>➤ PO 6 : Able to provide knowledge on analysis and interpretation of research data using statistical tools.</li><li>➤ PO 7 : will acquire Knowledge of molecular biology techniques.</li><li>➤ PO 8: Acquire knowledge about the usage of Calorimeters, Spectrophotometer and PCR.</li></ul>
	<ul style="list-style-type: none"><li>➤ PSO 1: will gain basic knowledge of cell and its components.</li><li>➤ PSO 2: Acquire skill to operate various instruments in the laboratory.</li><li>➤ PSO 3: Understand the importance of genetic engineering approaches in Biotechnology.</li><li>➤ PSO 4: understand the basic molecular biology techniques which are useful for research.</li><li>➤ PO 5: Gain knowledge about the production of different fermentative products.</li><li>➤ PO 6: Acquire basic knowledge of isolation of DNA and different cell organelles.</li><li>➤ PO 7: will gain ample of knowledge about the production of valuable plants by tissue culture technology.</li><li>➤ PO 8: can understand operation of microscopes and visualizing the microorganisms in different cultures.</li></ul>

## **BIOTECHNOLOGY**

<b>Course Title</b>	<b>After the completion of the programme a student is able to</b>
<b>I SEMESTER</b>	➤ CO-1: After successful completion of the semester students will able to acquire
Microbiology & Cell biology	knowledge about microscopes, Basic techniques of Microbiology, Structures, classification of Bacteria and viruses. Microbial nutrition, microbial growth, pure cultures, sterilization techniques. Gain knowledge about eukaryotic cell structure.
<b>II SEMESTER</b> Macro Molecules, Enzymology And Bioenergetics:	➤ CO- 1: This course will helps the students to gain knowledge about structure and functions of macromolecules and classification and action mechanism of Enzymes. ➤ CO-2: After successful completion of the semester students will able to acquire knowledge about nucleic acids, chromosomes, Aminoacids, lipids and Enzymes.
<b>III SEMESTER</b> Biophysical techniques	➤ CO-1: Students will able to develop the basic concepts of biophysical techniques, handling and operating of common instruments used in Biotechnology laboratory. ➤ CO-2: After successful completion of the semester students will able to acquire knowledge about spectrophotometry, colorimetry, chromatography, Electrophoresis, applications of radio isotopes and different centrifugation techniques.
<b>IV SEMESTER</b> Immunology	➤ CO-1: students will get basic knowledge about the techniques for identifying antigen antibody interactions, immunological response against tumor, blood transfusion and transplantation. ➤ CO-2: Get knowledge about role of vaccines and vaccine production. Different types of immunity, structure and functions of antibodies, hyper sensitivity reactions, role of vaccines in immunity and different Immunological techniques.
<b>V SEMESTER</b> PAPER-5 Molecular Biology	➤ CO-1: Structure of DNA, Genome, replication, transcription, regulation of replication and features of genetic code. ➤ CO-2: Molecular Biology gives ample knowledge of biological mechanisms in the system. ➤ CO-3: Better understanding of biology prepares them for studying abnormalities and diseases and to explore their solutions. ➤ CO-4: Will provide skill on molecular biology techniques which are useful in research laboratories.
<b>V SEMESTER:</b> PAPER-6 r- DNA Technology	➤ CO-1: This course will provide students to learn the versatile techniques involved in recombinant DNA technology. ➤ CO-2: Also they will have an understanding on application of genetic engineering techniques and proficiency in designing and conducting experiments involving genetic manipulations.
<b>VI SEMESTER</b>	➤ Six months Long term internship.

**Bachelor of Science in Mathematics, Physics, Chemistry**

<b>Programme name &amp;code</b>	<b>After the completion of the Programme a student is able to</b>
<b>B.Sc, MPC</b>	<ul style="list-style-type: none"><li>➤ PO-1: Understand the concept and apply appropriate methods for solving differential equations.</li><li>➤ PO-2: Understand the ring theory concepts with the help of knowledge in group theory and to prove the theorems.</li><li>➤ PO-3: Understand the behavior of permutations and operations.</li><li>➤ PO-4: Understand the homomorphism and isomorphism with applications.</li></ul>
	<ul style="list-style-type: none"><li>➤ PSO-1: Understand the concepts of vector spaces, subspaces, basics, dimension and their properties.</li><li>➤ PS-2: Recognize the different methods of finding Laplace transforms and Fourier transforms of different functions.</li></ul>

## MATHEMATICS

Course Title	After the completion of the programme a student is able to
Semester-I	➤ CO-1:Solve linear differential equations
Differential Equations	➤ CO-2:Convert non exact homogeneous equations to exact differential equations by using integrating factors. ➤ CO-3: Know the methods of finding solutions of differential equations of the first order but not of the first degree. ➤ CO-4:Solve higher-order linear differential equations, both homogeneous and non homogeneous, with constant coefficients. ➤ CO-5: Understand the concept and apply appropriate methods for solving differential equations.
Semester-II Solid Geometry	➤ CO-1: Get the knowledge of planes. ➤ CO-2: Basic idea of lines, sphere and cones. ➤ CO-3: Understand the properties of planes, lines, spheres and cones.. ➤ CO-4: Express the problems geometrically and then to get the solution.
SEMESTER-III Abstract Algebra	➤ CO-1: Acquire the basic knowledge and structure of groups, subgroups and cyclic groups. ➤ CO-2: Get the significance of the notation of normal subgroups. ➤ CO-3: Get the behavior of permutations and operations on them. ➤ CO-4: Study the homomorphism and isomorphism with applications. ➤ CO-5: Understand the ring theory concepts with the help of knowledge in group theory and to prove the theorems. ➤ CO-6: Understand the applications of ring theory in various fields.
SEMESTER-IV Real Analysis	➤ CO-1: Get clear idea about the real numbers and real valued functions. ➤ CO-2: Obtain the skills of analyzing the concepts and applying appropriate methods for testing convergence of a sequence/ series. ➤ CO-3: Test the continuity and differentiability and Riemann integration of a function. ➤ CO-4: Know the geometrical interpretation of mean value theorems.
SEMESTER-V Ring Theory and Vector Calculus	➤ CO-1:Scalar and cross product of vectors in 2 and 3 dimensions represented as differential forms or tensors, ➤ CO-2: The vector-valued functions of a real variable and their curves and in turn the geometry of such curves including curvature, torsion and the Frenet-Serre frame and intrinsic geometry. ➤ CO-3: Scalar and vector valued functions of 2 and 3 variables and surfaces, and in turn the geometry of surfaces. ➤ CO-4: Gradient vector fields and constructing potentials. ➤ CO-5: Integral curves of vector fields and solving differential equations to find such curves. ➤ CO-6: The differential ideas of divergence, curl, and the Laplacian along with their physical interpretations, using differential forms or tensors to represent derivative operations, ➤ CO-7: The integral ideas of the functions defined including line, surface and volume integrals - both derivation and calculation in rectangular, cylindrical and spherical coordinate systems and understand the proofs of each instance of the fundamental theorem of calculus ➤ CO-8: Examples of the fundamental theorem of calculus and see their relation to the fundamental theorems of calculus in calculus 1, leading to the more generalized version of Stokes' theorem in the setting of differential forms.
SEMESTER-VI	➤ Six months Long term internship.

## PHYSICS

Course Title	After the completion of the programme a student is able to
SEMESTER-I Mechanics And Properties Of The Matter	<ul style="list-style-type: none"> <li>➤ CO-1: Understand Newton's laws of motion and motion of variable mass system and its application to rocket motion and the concepts of impact parameter, scattering cross section.</li> <li>➤ CO-2: Apply the rotational kinematic relations, the principle and working of gyroscope and its applications and the precessional motion of a freely rotating symmetric top.</li> <li>➤ CO-3: Comprehend the general characteristics of central forces and the application of Kepler's laws to describe the motion of planets and satellite in circular orbit through the study of law of Gravitation.</li> <li>➤ CO-4: Understand postulates of Special theory of relativity and its consequences such as length contraction, time dilation, relativistic mass and mass-energy equivalence.</li> </ul>
SEMESTER-II Waves And Oscillations	<ul style="list-style-type: none"> <li>➤ CO-1: Examine phenomena of simple harmonic Motion and the distinction between undamped, damped and forced oscillations and the concepts of resonance and quality factor with reference to damped harmonic oscillator.</li> <li>➤ CO-2: Appreciate the formulation of the problem of coupled oscillations and solve them to obtain normal modes of oscillation and their frequencies in simple mechanical systems.</li> <li>➤ CO-3: Figure out the formation of harmonics and overtones in a stretched string and acquire the knowledge on Ultrasonic waves, their production and detection and their applications in different fields.</li> </ul>
SEMESTER-III Optics & Laser Physics	<ul style="list-style-type: none"> <li>➤ CO-1: Understand the phenomenon of interference of light and its formation in (i) Lloyd's single mirror due to division of wave front and (ii) Thin films, Newton's rings and Michelson interferometer due to division of amplitude.</li> <li>➤ CO-2: Distinguish between Fresnel's diffraction and Fraunhofer diffraction and observe the diffraction patterns in the case of single slit and the diffraction grating.</li> <li>➤ CO-3: Describe the construction and working of zone plate and make the comparison of zone plate with convex lens.</li> <li>➤ CO-4: Explain the various methods of production of plane, circularly and polarized light and their detection and the concept of optical activity.</li> <li>➤ CO-5: Comprehend the basic principle of laser, the working of He-Ne laser and Ruby lasers and their applications in different fields.</li> <li>➤ CO-6: Explain about the different aberrations in lenses and discuss the methods of minimizing them.</li> <li>➤ CO-7: Understand the basic principles of fibreoptic communication and explore the field of Holography and Nonlinear optics and their applications.</li> </ul>
SEMESTER-IV Thermodynamics & Radiation Physics	<ul style="list-style-type: none"> <li>➤ CO-1: Understand the basic aspects of kinetic theory of gases, Maxwell-Boltzman distribution law, equipartition of energies, mean free path of molecular collisions and the transport phenomenon in ideal gases.</li> <li>➤ CO-2: Gain knowledge on the basic concepts of thermodynamics, the first and the second law of thermodynamics, the basic principles of refrigeration, the concept of entropy, the thermodynamic potentials and their physical interpretations.</li> <li>➤ CO-3: Understand the working of Carnot's ideal heat engine, Carnot cycle and its efficiency.</li> <li>➤ CO-4: Develop critical understanding of concept of Thermodynamic potentials, the formulation of Maxwell's equations and its applications.</li> <li>➤ CO-5: Differentiate between principles and methods to produce low temperature and liquefy air and also understand the practical applications of substances at low temperatures.</li> <li>➤ CO-6: Examine the nature of black body radiations and the basic theories.</li> </ul>

Course Title	After the completion of the programme a student is able to
SEMESTER-V PAPER-5	➤ CO-1: Understand the Gauss law and its application to obtain electric field in different cases and formulate the relationship between electric displacement vector, electric polarization, Susceptibility, Permittivity and Dielectric constant.
Electricity, Magnetism And Electronics	➤ CO-2: Distinguish between the magnetic effect of electric current and electromagnetic induction and apply the related laws in appropriate circumstances. ➤ CO-3: Understand Biot and Savart's law and Ampere's circuital law to describe and explain the generation of magnetic fields by electrical currents. ➤ CO-4: Develop an understanding on the unification of electric and magnetic fields and Maxwell's equations governing electromagnetic waves
SEMESTER-V PAPER-6 Modern Physics	➤ CO-1: Develop an understanding on the concepts of Atomic and Modern Physics, basic elementary quantum mechanics and nuclear physics. ➤ CO-2: Develop critical understanding of concept of Matter waves and Uncertainty principle. ➤ CO-3: Get familiarized with the principles of quantum mechanics and the formulation of Schrodinger wave equation and its applications. ➤ CO-4: Examine the basic properties of nuclei, characteristics of Nuclear forces, salient features of Nuclear models and different nuclear radiation detectors. ➤ CO-5: Classify Elementary particles based on their mass, charge, spin, half life and interaction.
Semester VI	➤ Six months Long term internship.

Programme name & code	After the completion of the programme a student is able to
B.Sc, MPCs	➤ PO-1. An ability to apply knowledge of Computer Science and Mathematics to a variety of computational problems. ➤ PO-2. An ability to design and conduct experiments and also to analyse and interpret data. ➤ PO-3. An ability to design a system, component or process to meet the desired needs within realistic constraints such as environmental, economic, social, political, ethical and safety, healthy ,manufacturability and sustainability. ➤ PO-4. An ability to gain required programming skills, formulate and solve practical problems. ➤ PO-5. An understanding of professional and ethical responsibility. ➤ PO-6. An ability to communicate effectively. ➤ PO-7. An ability to function on multidisciplinary teams.
	➤ PSO-1. Ability to apply knowledge of computing, mathematics, and basic sciences that may be relevant and appropriate to the domain. ➤ PSO-2. Ability to analyse a problem, identify and define the computing requirements, which may be appropriate to its solution. ➤ PSO-3. Ability to use current techniques, skills, and tools necessary for computing practices. ➤ PSO-4. Ability to apply problem-solving skills and the knowledge of computer science to solve real world problems. ➤ PSO-5. Ability to understand, Analyse and Develop computer programs for efficient design of computer-based systems of varying complexity. ➤ PSO-6. Ability to develop technical project reports and present them orally among the users. ➤ PSO-7. Ability to develop proficiency in the practice of computing. PSO-8. Prepare for continued professional development.

## COMPUTER SCIENCE

Course Title	After the completion of the programme a student is able to
SEMESTER-I Fundamentals of Computer & Programming in C	<ul style="list-style-type: none"> <li>➤ CO-1. Understanding the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming.</li> <li>➤ CO-2. Makes students gain a broad perspective about the uses of computers in various fields.</li> <li>➤ CO-3. Able to gain knowledge in various generations Computers and Programming languages.</li> <li>➤ CO-4. Develops the ability to analyse a problem, develop an algorithm to solve it</li> <li>➤ CO-5. Develops the use of the C programming language to implement various algorithms.</li> <li>➤ CO-6. Write, compile and debug programs in C language and use different data types for writing the programs.</li> <li>➤ CO-7. Design programs connecting decision structures, loops ,arrays and functions.</li> <li>➤ CO-8. Explain the difference between call by value and call by address.</li> <li>➤ CO-9. Understand the dynamic behaviour of memory by the use of pointers.</li> <li>➤ CO-10. Use different data structures and create / manipulate basic data files and developing applications for real world problems.</li> </ul>
SEMESTER-II Object Oriented Programming With C++	<ul style="list-style-type: none"> <li>➤ CO-1. Understand the difference between the top-down and bottom-up approach.</li> <li>➤ CO-2. Understand the fundamentals of C++ programming structure, function overloading and constructors.</li> <li>➤ CO-3. Apply the various concepts in object oriented programming in terms of software reuse and managing complexity to solve real-world problems.</li> <li>➤ CO-4. Able to explain programming fundamentals, including statement and control flow and recursion.</li> <li>➤ CO-5. Illustrate the process of data file manipulations using C++</li> <li>➤ CO-6. Apply virtual and pure virtual function &amp; complex programming situations</li> <li>➤ CO-7. Implement files and command line arguments.</li> </ul>
SEMESTER-III Object Oriented Programming using Java	<ul style="list-style-type: none"> <li>➤ CO-1. Use object oriented programming concepts to solve real world problems.</li> <li>➤ CO-2. Identify classes, objects, members of a class and relationships among them needed for a specific problem.</li> <li>➤ CO-3. Achieve the Knowledge of developing simple java programs.</li> <li>➤ CO-4. Develop computer programs to solve real world problems.</li> <li>➤ CO-5. Demonstrate the behaviour of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.</li> <li>➤ CO-6. Use overloading methodology on methods and constructors to develop application programs.</li> <li>➤ CO-7. Demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords.</li> <li>➤ CO-8. Describe the concept of interface and abstract classes to define generic classes.</li> <li>➤ CO-9. Understand the impact of exception handling to avoid abnormal termination of program using checked and unchecked exceptions.</li> <li>➤ CO-10. Demonstrate the user defined exceptions by exception handling keywords ( try, catch, throw, throws and finally).</li> <li>➤ CO-11. Use multithreading concepts to develop inter process communication.</li> <li>➤ CO-12. Illustrate different techniques on creating and accessing packages.</li> <li>➤ CO-13. Design simple GUI interfaces to interact with users, using Applets.</li> <li>➤ CO-14. Understand and implement concepts on file streams and operations in java programming for a given application programs.</li> </ul>

Course Title	After the completion of the programme a student is able to
SEMESTER-IV Data Structures	<ul style="list-style-type: none"> <li>➤ CO-1. Implement abstract data types using arrays and linked list.</li> <li>➤ CO-2. Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory.</li> <li>➤ CO-3. Ability to describe stack, queue and linked list operation.</li> <li>➤ CO-4. Apply the different linear data structures like stack and queue to various computing problems.</li> <li>➤ CO-5. Implement different types of trees and apply them to problem solutions.</li> <li>➤ CO-6. Demonstrate different methods for traversing trees</li> <li>➤ CO-7. Discuss graph structure and understand various operations on graphs and their applicability.</li> <li>➤ CO-8. Ability to analyse algorithms and algorithm correctness.</li> <li>➤ CO-9. Analyse the various sorting and searching algorithms.</li> </ul>
SEMESTER-V PEPAE-5 MDBMS	<ul style="list-style-type: none"> <li>➤ CO-1. Describe DBMS architecture, physical and logical database designs, database modelling, relational, hierarchical and network models.</li> <li>➤ CO-2. Able to Identify basic database storage structures and access techniques such as file organizations, indexing methods including B-tree, and hashing.</li> <li>➤ CO-3. Learn and apply Structured query language (SQL) for database definition and database manipulation.</li> <li>➤ CO-4. Use ER model for Relational model mapping to perform database design effectively</li> <li>➤ CO-5. Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.</li> <li>➤ CO-6. Understand various transaction processing, concurrency control mechanisms and database protection mechanisms.</li> <li>➤ CO-7. Students can use DML,DDL,DCL commands to manipulate data in the database.</li> <li>➤ CO-8. Analyse and design a real database application.</li> <li>➤ CO-9. Apply normalization concepts for designing a good database with integrity constraints.</li> </ul>
SEMESTER-V PEPAE-6 Software Engineering	<ul style="list-style-type: none"> <li>➤ CO-1. Plan a software engineering process life cycle , including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements.</li> <li>➤ CO-2. Identify the key activities in managing a software project and recognize different process model.</li> <li>➤ CO-3. Able to elicit, analyse and specify software requirements through a productive working relationship with various stakeholders of the project.</li> <li>➤ CO-4. Analyse and translate a specification into a design, and then realize that design practically, using an appropriate software engineering methodology.</li> <li>➤ CO-5. Know how to develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice.</li> <li>➤ CO-6. Able to use modern engineering tools necessary for software project management, time management and software reuse.</li> </ul>
Semester -VI	<ul style="list-style-type: none"> <li>➤ Six months Long term internship.</li> </ul>



## **STATISTICS (WM)**

<b>Course Title</b>	<b>After the completion of the programme a student is able to</b>
<b>SEMESTER-I</b> Descriptive Statistics and Probability	<ul style="list-style-type: none"> <li>➤ CO-1) Knowledge of Statistics and its scope and importance in various areas such as Medical, Engineering, Agricultural and Social Sciences etc.</li> <li>➤ CO-2) Knowledge of various types of data, their organization and evaluation of summary measures such as measures of central tendency and dispersion etc.</li> <li>➤ CO-3) knowledge of other types of data reflecting quality characteristics including concepts of independence and association between two attributes.</li> <li>➤ CO-4) Insights into preliminary exploration of different types of data.</li> <li>➤ CO-5) Knowledge of correlation, regression analysis, regression diagnostics, partial and multiple correlations.</li> <li>➤ CO-6) ability to distinguish between random and non-random experiments,</li> <li>➤ CO-7) Knowledge to conceptualize the probabilities of events including frequent and axiomatic approach. Simultaneously, they will learn the notion of conditional probability including the concept of Bayes' Theorem,</li> <li>➤ CO-8) Knowledge related to concept of discrete and continuous random variables and their probability distributions including expectation and moments.</li> </ul>
<b>SEMESTER-II</b> Probability Distributions and Statistical Methods	<ul style="list-style-type: none"> <li>➤ CO-1) Ability to distinguish between random and non-random experiments.</li> <li>➤ CO-2) Knowledge to conceptualize the probabilities of events including frequent and axiomatic approach. Simultaneously, they will learn the notion of conditional probability including the concept of Bayes' Theorem,</li> <li>➤ CO-3) knowledge related to concept of discrete and continuous random variables and their probability distributions including expectation and moments.</li> <li>➤ CO-4) knowledge of important discrete and continuous distributions such as Binomial, Poisson, Geometric, Negative Binomial and Hyper-geometric, normal, uniform, exponential, beta and gamma distributions,</li> <li>➤ CO-5) to apply standard discrete and continuous probability distributions to different situations.</li> </ul>
<b>SEMESTER-III</b> Statistical Inference	<ul style="list-style-type: none"> <li>➤ Concept of law large numbers and their uses.</li> <li>➤ Concept of central limit theorem and its uses in statistics.</li> <li>➤ Concept of random sample from a distribution, sampling distribution of a statistic, standard error of important estimates such as mean and proportions.</li> <li>➤ Knowledge about important inferential aspects such as point estimation, test of hypotheses and associated concepts.</li> <li>➤ Knowledge about inferences from Binomial, Poisson and Normal distributions as illustrations.</li> <li>➤ Concept about non-parametric method and some important non-parametric tests.</li> </ul>
<b>SEMESTER-IV</b> Sampling Techniques and Design of Experiments	<ul style="list-style-type: none"> <li>➤ CO-1) Introduced to various statistical sampling schemes such as simple, stratified and systematic sampling.</li> <li>➤ CO-2) an idea of conducting the sample surveys and selecting appropriate sampling techniques,</li> <li>➤ CO-3) Knowledge about comparing various sampling techniques.</li> <li>➤ CO-4) carry out one way and two way Analysis of Variance,</li> <li>➤ CO-5) understand the basic terms used in design of experiments,</li> <li>➤ CO-6) Use appropriate experimental designs to analyze the experimental data.</li> </ul>

### **STATISTICS (NM)**

<b>Course Title</b>	<b>➤ After the completion of the programme a student is able to</b>
Paper-I : Elementary Mathematics	<ul style="list-style-type: none"> <li>➤ CO-1) time series data, its applications to various fields and components of time series,</li> <li>➤ CO-2) fitting and plotting of various growth curves such as modified exponential, Gompertz and logistic c curve,</li> <li>➤ CO-3) fitting of trend by Moving Average method,</li> <li>➤ CO-4) measurement of Seasonal Indices by Ratio-to-Trend , Ratio-to-Moving Average and Link Relative methods,</li> <li>➤ CO-5) Applications to real data by means of laboratory assignments.</li> <li>➤ CO-6) Interpret and use a range of index numbers commonly used in the business sector</li> <li>➤ CO-7) Perform calculations involving simple and weighted index numbers</li> <li>➤ CO-8) Understand the basic structure of the consumer price index and perform calculations involving its use.</li> <li>➤ CO-9) Various data collection methods enabling to have a better insight in policy making, planning and systematic implementation,</li> <li>➤ CO-10) Construction and implementation of life tables,</li> <li>➤ CO-11) Population growth curves, population estimates and projections,</li> <li>➤ CO-12) Real data implementation of various demographic concepts as outlined above through practical assignments.</li> </ul>
PAPER - II : Descriptive Statistics	<ul style="list-style-type: none"> <li>➤ CO-1. Have an idea about basic mathematical techniques which are necessary to analyze the Statistical techniques.</li> <li>➤ CO-2. Able to know the concepts of set theory and operations in sets.</li> <li>➤ CO-3. Able to know the concept of matrices and its operations.</li> <li>➤ CO-4. Able to complete the adjoint and determinate of a square matrix , hence its inverse.</li> <li>➤ CO-5. Capable of solving the simultaneous equations using matrix method.</li> <li>➤ CO-6. Understands the concept of finite differences. Set, Subset, Types of Sets, Operations onsets, Demorgan Laws – statements only.</li> </ul>
PAPER-II	<ul style="list-style-type: none"> <li>➤ CO-1) knowledge of Statistics and its scope and importance in various areas such as Medical, Engineering, Agricultural and Social Sciences etc.</li> <li>➤ CO-2) knowledge of various types of data in diagrammatic representation.</li> <li>➤ CO-3) Brief analyzing in different types of data and tabulated.</li> <li>➤ CO-4) knowledge of various types of data, their organization and evaluation of summary measures such as measures of central tendency and dispersion etc.</li> <li>➤ CO-5) insights into preliminary exploration of different types of data.</li> </ul>
PAPER - III : Statistical Methods And Probability	<ul style="list-style-type: none"> <li>➤ CO-1) Knowledge related to concept of attributes.</li> <li>➤ CO-2) Knowledge of other types of data reflecting quality characteristics including concepts of independence and association between two attributes.</li> <li>➤ CO-3) knowledge to conceptualize the probabilities of events including frequent and axiomatic approach. Simultaneously, they will learn the notion of conditional probability.</li> <li>➤ CO-4) knowledge related to concept of discrete and continuous random variables and their probability distributions including expectation and moments,</li> <li>➤ CO-5) knowledge related to concept of random variable, Probability mass function and probability density function.</li> <li>➤ CO-6) knowledge related to concept of Mathematical expectation.</li> </ul>
PAPER – IV : Probability Distributions, Correlation And Regression	<ul style="list-style-type: none"> <li>➤ CO-I. Ability to distinguish between discrete and continuous distributions.</li> <li>➤ CO-2. Knowledge related to concept of curve fitting.</li> <li>➤ CO-3. Knowledge of important discrete and continuous distributions such as Binomial, Poisson, rectangular, normal, distributions.</li> <li>➤ CO-4. Acumen to apply standard discrete and continuous probability distributions to different situations.</li> <li>➤ CO-5. Knowledge related to concept of correlations.</li> </ul>

PAPER – V : Statistical Applications	<ul style="list-style-type: none"> <li>➤ CO-1) Concept of Criteria of a good estimator.</li> <li>➤ CO-2) Knowledge of large sampling.</li> <li>➤ CO-3) Knowledge of small sampling.</li> <li>➤ CO-4) Knowledge of Exact sampling</li> <li>➤ CO-5) Concept of random sample from a distribution, sampling distribution of a statistic, standard error of important estimates such as mean and proportions,</li> <li>➤ CO-6) knowledge about important inferential aspects such as point estimation, test of hypotheses and associated concepts,</li> <li>➤ CO-7) knowledge about inferences from Binomial, Poisson and Normal distributions as illustrations,</li> <li>➤ CO-8) concept about non-parametric method and some important non-parametric tests.</li> </ul>
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### **Catering, Tourism and Hotel Management**

<b>Programme name &amp;code</b>	<b>After the completion of the programme a student is able to</b>
B.Sc,CT&HM	<ul style="list-style-type: none"> <li>➤ PO-1. An ability to apply knowledge of Computer Science and Mathematics to a variety of computational problems.</li> <li>➤ PO-2. An ability to design and conduct experiments and also to analyse and interpret data.</li> <li>➤ PO-3. An ability to design a system, component or process to meet the desired needs within realistic constraints such as environmental, economic, social, political, ethical and safety, healthy ,manufacturability and sustainability.</li> <li>➤ PO-4. An ability to gain required programming skills, formulate and solve practical problems.</li> <li>➤ PO-5. An understanding of professional and ethical responsibility.</li> <li>➤ PO-6. An ability to communicate effectively.</li> <li>➤ PO-7. An ability to function on multidisciplinary teams.</li> </ul>
	<ul style="list-style-type: none"> <li>➤ PSO-1. Ability to apply knowledge of computing, mathematics, and basic sciences that may be relevant and appropriate to the domain.</li> <li>➤ PSO-2. Ability to analyse a problem, identify and define the computing requirements, which may be appropriate to its solution.</li> <li>➤ PSO-3. Ability to use current techniques, skills, and tools necessary for computing practices.</li> <li>➤ PSO-4. Ability to apply problem-solving skills and the knowledge of computer science to solve real world problems.</li> <li>➤ PSO-5. Ability to understand, Analyse and Develop computer programs for efficient design of computer-based systems of varying complexity.</li> <li>➤ PSO-6. Ability to develop technical project reports and present them orally among the users.</li> <li>➤ PSO-7. Ability to develop proficiency in the practice of computing.PSO-8. Prepare for continued professional development.</li> </ul>

Course Title	After the completion of the programme a student is able to
SEMESTER – I Principles Of Tourism	<ul style="list-style-type: none"> <li>➤ CO-1• Defines terms like Tourism, Tourists and identifies Tourism as an industry.</li> <li>➤ CO-2• Explains growth and development of Tourism at state and national level.</li> <li>➤ CO-3• Understands the importance of tourism in Indian context.</li> <li>➤ CO-4• Uses the knowledge of unity in diversity for tourism industry.</li> <li>➤ CO-5• Explains the importance of tourism industry for revenue and foreign exchanges.</li> <li>➤ CO-6• Describes impact of tourism on physical environment and social impact of tourism.</li> <li>➤ CO-7• Visiting and observing tourist places of importance.</li> <li>➤ CO-8• Analyses and appraises the natural resources, wild life sanctuaries, Hill resorts etc.</li> <li>➤ CO-9• Preparing brochures for travel destination.</li> <li>➤ CO-10• Technique of collecting case studies of tourists.</li> </ul>
Food Production	<ul style="list-style-type: none"> <li>➤ Concepts and principles of cooking.</li> <li>➤ Identifies different cooking practices.</li> <li>➤ Understands the criteria for selection of ingredients and raw materials according to menu.</li> <li>➤ Uses principles in planning and preparation of menu in kitchen.</li> <li>➤ The problems faced in kitchen.</li> <li>➤ Analyses the methods involved in different kinds of food preparation and food services.</li> <li>➤ Planning and understanding different types of menus.</li> <li>➤ Visit to different hotel kitchens.</li> <li>➤ Preparation of south Indian menu.</li> <li>➤ Preparation of sauces.</li> <li>➤ Preparation of stocks and soups.</li> <li>➤ Preparation of lunch and brunch.</li> </ul>
Food & Beverage Services	<ul style="list-style-type: none"> <li>➤ CO-1 The concepts of Food Beverage Outlets.</li> <li>➤ CO-2 Explains about different types of Food &amp; Beverage services.</li> <li>➤ CO-3 Understands the concepts of kitchen order tickets.</li> <li>➤ CO-4 Uses knowledge about glass wares and /crockerries.</li> <li>➤ CO-5 Explains different types of services and skills used in Food &amp; Beverages services.</li> <li>➤ CO-6 Solves problems in maintaining hygiene in kitchen.</li> <li>➤ CO-7 Observing the duties of a waiter by visiting hotels.</li> <li>➤ CO-8 Observing the calculation techniques for food costing by visiting hotels.</li> <li>➤ CO-9 Doing different types of services like cafeteria service , counter service, room service, banquet hall etc.,</li> <li>➤ CO-10 Planning different formal and informal banquets.</li> <li>➤ CO-11 Drawing different table plans</li> </ul>
SEMESTER – II Bakery	<ul style="list-style-type: none"> <li>➤ CO-1 The concepts and principles of bakery services.</li> <li>➤ CO-2 Explains the concepts of bakery products.</li> <li>➤ CO-3 Understands the role of flours and ingredients in baking.</li> <li>➤ CO4- Uses techniques for planning and preparation /of bakery products.</li> <li>➤ CO-5 The problem in making dough.</li> <li>➤ CO-6 Applies procedures for standardization of dough for different bakery products.</li> <li>➤ CO-7 Visiting bakeries and observing different dough.</li> <li>➤ CO-8 Visiting nearby bakery and understanding the process of production</li> <li>➤ CO-9 Preparation of biscuits.</li> <li>➤ CO-10 Preparation of cakes.</li> <li>➤ CO11-• Preparation of bread.</li> <li>➤ CO-12• Preparation of Pizza.</li> </ul>

Course Title	After the completion of the programme a student is able to
Front Office	<ul style="list-style-type: none"> <li>➤ CO-1 Advance reservation and Booking system.</li> <li>➤ CO-2 Dealing with walk in guests.</li> <li>➤ CO-3 Dealing with group visitors.</li> <li>➤ CO-4 The front office management system and its functions.</li> <li>➤ CO-5 The role of front office in hospitality industry.</li> <li>➤ CO-6 Understands the organization structure of front office</li> <li>➤ CO-7 Uses knowledge to explain professionalized methodology of front office.</li> <li>➤ CO-8 Explains the different types of guest services.</li> <li>➤ CO-9 Judges the competencies of front office professionals.</li> <li>➤ CO-10 Visiting different types of hotels and observation of front office functioning.</li> <li>➤ CO-11 Understanding personal management by interacting with front office staff of hotels.</li> <li>➤ CO-12 Reservation and registration process.</li> <li>➤ CO-13 Room change process.</li> <li>➤ CO-14 Advance reservation and Booking system.</li> <li>➤ CO-15 Dealing with walk in guests.</li> <li>➤ CO-16 Dealing with group visitors.</li> </ul>
Accommodation Operation-I	<ul style="list-style-type: none"> <li>➤ Identifies the concepts of accommodation operations.</li> <li>➤ Explains the cleaning process in accommodation operation.</li> <li>➤ Uses the knowledge to know about the functions of housekeeping department.</li> <li>➤ Understands the Duties of housekeeping staff.</li> <li>➤ Explains issues in Linen maintenance and dealing with linen used in hotel.</li> <li>➤ Describes about different types of trolleys used in hotel.</li> <li>➤ Visit to a House keeping department and observation of cleaning process.</li> <li>➤ Examining the functions of housekeeping department.</li> <li>➤ Dealing with different types of stains.</li> <li>➤ Performing Cleaning by different methods.</li> <li>➤ Practical experience in bed making like morning and evening bed.</li> </ul>
SEMESTER-III Pilgrimage Tourism and Hospitality Management – II	<ul style="list-style-type: none"> <li>➤ Label the concepts of tourism. • Name different types of tourism.</li> <li>➤ Identifies different travel agencies and tourist guides.</li> <li>➤ Recognizes Tourism as a revenue generator in a country.</li> <li>➤ Reviews tourism destinations in the world.</li> <li>➤ Explains the merits and demerits of tourism as a destination.</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Interprets employment generation in Tourism sector.</li> <li>➤ Learn about globalization of world through tourism.</li> <li>➤ Visit to different Tourist accommodations.</li> <li>➤ Visit to various Tourism destinations.</li> <li>➤ Dealing and analysing the history of tourist destination.</li> </ul>
Food Production - II	<ul style="list-style-type: none"> <li>➤ CO-1 The principles of cooking.</li> <li>➤ CO-2 Concept of International, National and regional cuisines.</li> <li>➤ CO-3 Knowledge related to standardization of quantity cooking.</li> <li>➤ CO-4 Reviews standardization of different cuisines.</li> <li>➤ CO-5 Explains difference between Northern Indian and South Indian cuisine and also cooking methods of different cuisines.</li> <li>➤ CO-6 Judges suitable techniques for purchase and storage of quantity cooking</li> <li>➤ CO-7 Learning about quality cooking by visiting hotels.</li> <li>➤ CO-8 Visiting different cuisines offering North and South Indian styles.</li> <li>➤ CO-9 Preparation of different cuisines.</li> <li>➤ CO-10 Preparation of quality cooking.</li> <li>➤ CO-11 Preparation of food using different types of cooking</li> </ul>

Course Title	After the completion of the programme a student is able to
Food And Beverage Service - II	<ul style="list-style-type: none"> <li>➤ CO-1 Names of different alcoholic and non-alcoholic beverages.</li> <li>➤ CO-2 Identifies different types of beverage/es</li> <li>➤ CO-3 Understands about history of alcoholic and non-alcoholic beverages.</li> <li>➤ CO-4 Uses the knowledge about storage of cocktails and mock tails.</li> <li>➤ CO-5 Apply knowledge in analysing and standardizing the method of making different beverages.</li> <li>➤ CO-6 Explains about quality of different alcoholic and non-alcoholic beverages.</li> <li>➤ CO-7 Observing the preparation of mock tails and cocktails by visiting bars and hotels.</li> <li>➤ CO-8 Knowing about different types of glass wares for the table arrangements.</li> <li>➤ CO-9 Preparation non-alcoholic beverages.</li> <li>➤ CO-10 Services of Tea, Coffee.</li> </ul>
SEMESTER - IV Tourism Marketing-III	<ul style="list-style-type: none"> <li>➤ CO-1 Identifies new trends of tourism marketing..</li> <li>➤ CO-2 List out 5 A's in Tourism marketing.</li> <li>➤ CO-3 Understands challenges in marketing.</li> <li>➤ CO-4 Uses the knowledge to market tourism as a product.</li> <li>➤ CO-5 Explains about the importance of advertising and publicity in tourism.</li> <li>➤ CO-6 Analyzes challenges in promotion of tourism.</li> <li>➤ CO-7 Identifies and solves problems in the market skills in tourism.</li> <li>➤ CO-8 Visit to travel agencies.</li> <li>➤ CO-9 Learn how to sell various tourism products.</li> <li>➤ CO-10 Observing a Tourist guide.</li> <li>➤ CO-11 Preparation of Itinerary for tourists.</li> <li>➤ CO-12 Preparing a product according to guest requirement.</li> </ul>
Front Office-II	<ul style="list-style-type: none"> <li>➤ CO-1 Defines the concepts of reservation and terminology of Reception.</li> <li>➤ CO-2 Identify the concepts that explains E-commerce.</li> <li>➤ CO-3 Understands the concept of concierge.</li> <li>➤ CO-4 Express clearly about different shifts in a hotel.</li> <li>➤ CO-5 Problems encountered in manual reservation</li> <li>➤ CO-6 Apprehend the process of message handling.</li> <li>➤ CO-7 Applies knowledge of foreign exchange.</li> <li>➤ CO-8 Observing and learning about Bell Desk Staff by visiting hotels.</li> <li>➤ CO-9 Learn about the duties of a Guest Relation Executive by visiting hotels.</li> <li>➤ CO-10 Receiving guest and filling forms according to the type of guest.</li> <li>➤ CO-11 Collect different forms used in hotel during a hotel visit.</li> </ul>
Accommodation Operation-II	<ul style="list-style-type: none"> <li>➤ CO-1 Labels housekeeping inventories and textiles terminologies.</li> <li>➤ CO-2 Identifies different surfaces used and methods of cleaning</li> <li>➤ CO-3 Understands the importance of a guest</li> <li>➤ CO-4 Uses knowledge of Science of Cleaning/</li> </ul>
	<ul style="list-style-type: none"> <li>➤ CO-5 Analysis lost and found procedure</li> <li>➤ CO-6 Analysis the concepts of par stock.</li> <li>➤ CO-7 Observing the co-ordination with other departments.</li> <li>➤ CO-8 Concepts of linen and uniform room.</li> <li>➤ CO-9 Practice of different types of cleaning.</li> <li>➤ CO-10 Partial on maid trolley by hotel visit maintenance of records.</li> </ul>

<b>Course Title</b>	<b>After the completion of the programme a student is able to</b>
SEMESTER-V Internship Training Programme	<ul style="list-style-type: none"> <li>➤ Meaning of the terms like larder, Guerdon Service and continental cuisine.</li> <li>➤ Principles and scope of hospitality Industry</li> <li>➤ Concepts of appetizer and garnishes.</li> <li>➤ Understands the importance of training and supervision</li> <li>➤ Uses knowledge about registers used in food production.</li> <li>➤ Explains different servicing techniques.</li> <li>➤ Analyses the concepts of total quality management in food production.</li> <li>➤ Learning about quality cooking by visiting hotel.</li> <li>➤ Standardization of ingredients of continental cuisines.</li> <li>➤ Planning different countries continental cuisines.</li> <li>➤ Hands on experience on techniques used in continental cuisine. Preparation of basic recipes of different countries continental cuisines .</li> </ul>
Semester-VI Food And Beverage Services - III	<ul style="list-style-type: none"> <li>➤ CO-1 Understanding the concepts good restaurant layout.</li> <li>➤ CO-2 Learn about a concepts food and beverage services.</li> <li>➤ CO-3 Knowing about different types of kitchen design.</li> <li>➤ CO-4 Understanding the concepts of table plan and seating arrangements.</li> <li>➤ CO-5 Analyze the concepts of formal and informal banquets.</li> <li>➤ CO-6 Critically evaluate different types of guest services.</li> <li>➤ CO-7 Observing the duties and responsibilities of food and beverage staff by visiting various hotels.</li> <li>➤ CO-8 Planning of buffet.</li> <li>➤ CO-9 Learn about service still room.</li> <li>➤ CO-10 Knowing about guardian service.</li> <li>➤ CO-11 learning the techniques of food preservation.</li> </ul>
Front Office - III	<ul style="list-style-type: none"> <li>➤ CO-1 Learn the term Night Audit, Front Office Cashier.</li> <li>➤ CO-2 Understand of Yield management..</li> <li>➤ CO-3 Understand importance's of HRM in Hotel.</li> <li>➤ CO-4 Learn the process of Recruitment.</li> <li>➤ CO-5 Explain the importance of Night Auditor inHotel.</li> <li>➤ CO-6 Study Hotel Security and Staff.</li> <li>➤ CO-7 Visit Reception and Front Office various Organisation</li> <li>➤ CO-8 Learn to handle different Keys.</li> <li>➤ CO-9 Learn fire safety and First Aid.</li> <li>➤ CO-10 Learn about different types of Accounts.</li> </ul>
Hotel Law	<ul style="list-style-type: none"> <li>➤ CO-1 Define terms like license, permit and Hotel Law.</li> <li>➤ CO-2 Explained important of Hotel Law in Hotel Industry.</li> <li>➤ CO-3 Understand important of Hotel Law in staff life.</li> <li>➤ CO-4 Uses of Knowledge of law in getting Hotel permission</li> <li>➤ CO-5 Explained the importance of Building height soil testing before starting Hotel.</li> <li>➤ CO-6 Described importance of hotel and Tourism learn in the World</li> <li>➤ CO-7 Observing the causes for cancelation of license.</li> <li>➤ CO-8 Analyses and understand the Hotel law for staff and guest.</li> <li>➤ CO-9 Understand apprentices, child and other Terminology .</li> <li>➤ CO-10 Study in keeper lien.</li> <li>➤ CO-11 Study safety and hygiene provision.</li> </ul>



Course Title	After the completion of the programme a student is able to
Accommodation Operation	<ul style="list-style-type: none"> <li>➤ CO-1 Described importance how to deal with pest.</li> <li>➤ CO-2 Visit various Hotels housekeeping department.</li> <li>➤ CO-3 Learn different carpet and covering cleaning.</li> <li>➤ CO-4 Prepare and learn different flower arrangement.</li> <li>➤ CO-5 Learn different types of cleaning.</li> <li>➤ CO-6 Explain the Principles of designs</li> <li>➤ CO-7 Understand important of guest and employee</li> <li>➤ CO-8 Uses of Knowledge of flower arrangement in Hotel</li> <li>➤ CO-9 Explained the importance of Horticulture in Hotel.</li> <li>➤ CO-10 Described importance how to deal with pest</li> <li>➤ CO-11 Visit various Hotels housekeeping department</li> <li>➤ CO-12 Learn different carpet and covering cleaning.</li> <li>➤ CO-13 Prepare and learn different flower arrangement</li> <li>➤ CO-14 Learn different types of cleaning</li> </ul>
Travel and tour management	<ul style="list-style-type: none"> <li>➤ Define and study documents needed for international travel.</li> <li>➤ Explain the Important the honorary .</li> <li>➤ Understand Tour operation.</li> <li>➤ Study CRS.</li> <li>➤ Explained the importance of Warso convention.</li> <li>➤ Described various Tour package.</li> <li>➤ Visit various Travel Agencies.</li> <li>➤ Analysis various Tour packages.</li> <li>➤ Prepare Tour Brochures.</li> <li>➤ Learn automatic and manual ticketing.</li> </ul>

  
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