Maratha Vidya Prasarak Samaj's

COMMERCE MANAGEMENT & COMPUTER SCIENCE (CMCS) COLLEGE,

Gangapur Road, Nashik-13

Programme Outcome, Programme Specific Outcome and Course Outcome

CBCS 2019 Pattern

B.Sc. (Regular)

B.Sc. (Mathematics)

Sr No	Programme Outcomes
PO1	Scientific temper will be developed in Students.
PO2	Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science stream.
PO3	Students will become employable; they will be eligible for career opportunities in Industry, or will be able to opt for entrepreneurship.
PO4	Students will possess basic subject knowledge required for higher studies, professional and applied courses like Management Studies, Law etc.

Sr No	Programme Specific Outcomes
PSO1	Think in a critical manner.
PSO2	Know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand.
PSO3	Formulate and develop mathematical arguments in a logical manner.

PSO4	Acquire good knowledge and understanding in advanced areas of mathematics and statistics, chosen by the student from the given courses.
PSO5	Understand, formulate and use quantitative models arising in social science, business and other contexts.

Subject	**Course Outcomes (F.Y.B.Sc)**
Algebra	CO1 The mathematical maturity of students in their current and future courses shall develop. CO2 The student develops theoretical, applied and computational skills. CO3 The student gains confidence in proving theorems and solving problems.
Calculus - I	CO1 Give the students a sufficient knowledge of fundamental principles, methods and a clear perception of in numerous power of mathematical ideas. CO2 Students will be able to identify areas in mathematics and other fields where Calculus is useful. CO3 Students will be able to write detailed solutions using appropriate mathematical language.
Analytical Geometry	CO1 Recognize the system of linear equations, identify the existence of solutions and if there are solutions, solve equations. CO2 Define the system of linear equations. Define the system of linear equations by using matrices. CO3 Investigate the existence of solutions using rank of the extended matrix and matrix of coefficients.
Calculus - II	CO1 A student should get a relational understanding of mathematical concepts. CO2 Concerned structures, and should be able to follow the patterns involved, mathematical reasoning.

Mathematics Practical 1 & 2	CO1 To visualise algebraic and analytical results geometrically. CO2 To design practical demonstrations of mathematical results/formulae or the concepts. CO3 To exhibit relatedness of mathematics with day to day life problems. CO4 To explain visually some abstract concepts by using three dimensional models.

Subject	**Course Outcomes (S.Y.B.Sc)**
Calculus of Several Variables	CO1 To enable students to use basic tools of analysis related to functions of several variables. CO2 To explain the concept/theory in multivariate functions, partial differentiation and multiple integration. CO3 To illustrate the basic applications of multivariate calculus.
Numerical Methods and it's Applications	CO1 Apply numerical methods to obtain approximate solutions to mathematical problems. CO2 Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations. CO3 Analyse and evaluate the accuracy of common numerical methods.
Linear Algebra	CO1 To solve systems of linear equations using multiple methods, including Gaussian elimination and matrix inversion CO2 Demonstrate understanding of the concepts of vector space and subspace. CO3 Demonstrate understanding of linear independence, span, and basis Apply principles of matrix algebra to linear transformations.
Dynamical Systems	CO1 To introduce students to the basic mathematical skills for the qualitative solving of low dimensional systems of ordinary differential equations in continuous time, including dimensionless forms, phase portraits, and bifurcations CO3 To provide a brief introduction to the way ordinary differential equations can be used to model, explain and interpret real world problems. CO3 To provide a brief introduction to the theory and

	concepts that underpin the field of dynamical systems
Mathematics Practical Sem 3 & Sem 4	CO1 To visualise algebraic and analytical results geometrically. CO2 To design practical demonstrations of mathematical results/formulae or the concepts. CO3 To exhibit relatedness of mathematics with day to day life problems. CO4 To explain visually some abstract concepts by using three dimensional models. CO5 To Solve the mathematical problems by using maxima software.

B.Sc. (Chemistry)

S.R.	Programme Outcomes
PO1	Demonstrate, solve and an understanding of major concepts in all disciplines of chemistry.
PO2	Solve the problem and also think methodically, independently and draw a logical conclusion.
PO3	Employ critical thinking and the scientific knowledge to design, carry out, record and analyse the results of chemical reactions.
PO4	Create an awareness of the impact of chemistry on the environment, society, and development outside the scientific community.
PO5	Find out the green route for chemical reaction for sustainable development.

S.R.	Programme Specific Outcomes
PSO1	Gain the knowledge of Chemistry through theory and practical's.
PSO2	To explain nomenclature, stereochemistry, structures, reactivity, and mechanism of the chemical reactions.
PSO3	Identify chemical formulae and solve numerical problems.
PSO4	Use modern chemical tools, Models, Chem-draw, Charts and Equipment.
PSO5	Know structure-activity relationship.
PSO6	Understand good laboratory practices and safety.
PSO7	Develop research oriented skills.
PSO8	Make aware and handle the sophisticated instruments/equipment.

Subject	Course Outcomes (F.Y.B.Sc)
Physical Chemistry	CO1 Students will be able to apply thermodynamic principles to physical and chemical process. CO2 Calculations of enthalpy, Bond energy, Bond dissociation energy, resonance energy. CO3 Variation of enthalpy with temperature –Kirchoff's equation. CO4 Third law of thermodynamic and its applications. CO5 Relation between Free energy and equilibrium and factors affecting on equilibrium constant. CO6 Gas equilibrium, equilibrium constant and molecular interpretation of equilibrium constant. CO7 Concept to ionization process occurred in acids, bases and pH scale. CO8 Related concepts such as Common ion effect hydrolysis constant, ionic product, solubility product.
Organic Chemistry	CO1 The students are expected to understand the fundamentals, principles, and recent developments in the subject area. CO2 It is expected to inspire and boost interest of the students towards chemistry as the main subject. CO3 To familiarize with current and recent developments in Chemistry. CO4 To create foundation for research and development in Chemistry.
Inorganic Chemistry	CO1 Various theories and principles applied to revel atomic structure. CO2 Origin of quantum mechanics and its need to understand structure of hydrogen atom. CO3 Application of non-bonded lone pairs in shape of molecule. CO4 Explain rules for filling electrons in various orbitals- Aufbau's principle, Pauli exclusion principle, Hund's rule of maximum multiplicity.
Analytical Chemistry	CO1 Calculations of mole, molar concentrations and various units of concentrations which will be helpful for preparation of solution.

	CO2 Relation between molecular formula and empirical formula. CO3 Basics of chromatography and types of chromatography. CO4 Compare qualitative and quantitative analyses.
Chemistry Practical 1&2	CO1 Determination of physical constant: Melting point, Boiling point. CO2 drawing organic molecule and arrow pushing concepts. CO3 Strength of Acid and Base. CO4 Common names and IUPAC nomenclature system of chemicals. CO5 Name oh Alkane, Alkanes, Alkenes and Alkynes. CO6 Preparation methods of Alkane, Alkanes and Alkynes including Hydrocarbons. CO7 Application of Hackle's rule of organic compounds to find the compounds are aromatic/ non aromatic.

B.Sc. (Botany)

S.R.	Programme Outcomes
PO1	Students know about different types of lower & higher plants their evolution in from algae to angiosperm &also their economic and ecological importance.
PO2	Cell biology gives knowledge about cell organelles & their functions.
PO3	Molecular biology gives knowledge about chemical properties of nucleic acid and their role in living systems.
PO4	They knows economic importance of various plant products & artificial methods of plant propagation.
PO5	Use modern Botanical techniques and decent equipment.
PO6	To inculcates the scientific temperament in the students and outside the scientific community.

S.R.	Programme Specific Outcomes
PSO1	Students acquire fundamental Botanical knowledge through theory and practical's.
PSO2	To explain basis plant of life, reproduction and their survival in nature.
PSO3	Helped to understand role of living and fossil plants in our life.
PSO4	Understand good laboratory practices and safety.
PSO5	To create awareness about cultivation, conservation and sustainable utilization of biodiversity.
PSO6	Students able to start nursery, mushroom cultivation, bio fertilizer production, fruit preservation and horticultural practices.
PSO7	To create awareness about cultivation, conservation and sustainable utilization of biodiversity.

Subject	Course Outcomes (F.Y.B.Sc)
Plant Life And Utilization I	CO1 Basic idea regarding lower and higher cryptogams. CO2 Introduction to higher plants i.e. phanerogams (Gymnosperms and Angiosperms) CO3 To study different classification systems to classify Kingdom Plantae. CO4 Utilization of algae, fungi, lichens and bryophytes in different sectors.
Plant Morphology and Anatomy	CO1 Basic terminology in plant morphology. CO2 Descriptive and interpretative morphology of plants. CO3 Complete study of reproductive parts such as inflorescence, flower and fruit. CO4 Introduction to plant anatomy including types of tissues and their organization in plants.
Plant Life And Utilization II	CO1 Introduction to vascular plants including pteridophytes, gymnosperms and angiosperms. CO2 Study of above groups with their representative member in detail. CO3 Introduction to Angiosperms classification. CO4 Utilization and economic importance of pteridophytes, gymnosperms and angiosperms in different sectors.
Principles of Plant Science	CO1 Introduction to Plant Physiology and Cell Biology. CO2 Study of different physiological processes such as Diffusion, Osmosis, Plasmolysis and Plant growth. CO3 Ultrastructure studies of cell and chloroplast. CO4 Study of cell cycle in plants with detailed study of mitosis and meiosis. CO5 Introduction and scope of molecular biology, central dogma of molecular biology. CO6 Study of DNA and RNA in detail. CO7 DNA Replication with its types.

Botany Practical Based on 1&2	CO1 Study of plant life cycles including Algae, Fungi and Bryophytes. CO2 Exposure to f Mushroom Cultivation. CO3 Introducing basic terms and concepts related to Angiosperms Taxonomy. CO4 Study of plant life cycles including Pteridophytes and gymnosperms. CO5 Introducing basic terms and concepts related cell biology such as mitosis and meiosis. CO6 Practical studies of plant processes in Plant Physiology.

B.Sc. (Physics)

S.R.	Programme Outcomes
PO1	Demonstrate, solve and an understanding of major concepts in all disciplines of physics.
PO2	Solve the problem and also think methodically, independently and draw a logical conclusion.
PO3	Employ critical thinking and the scientific knowledge to design, carry out, record and analyse the results of Physics experiments.
PO4	Create an awareness of the impact of Physics on the society, and development outside the scientific community.
PO5	To inculcate the scientific temperament in the students and outside the scientific community.

S.R.	Programme Specific Outcomes
PSO1	Gain the knowledge of Physics through theory and practical's.
PSO2	Understand good laboratory practices and safety.
PSO3	Develop research oriented skills.
PSO4	Make aware and handle the sophisticated instruments/equipment.

Subject	Course Outcomes (F.Y.B.Sc)
Mechanics and Properties of Matter	CO1 To understand the basic terms related to motion. CO2 Introducing Newton’s laws of motion. CO3 Studying different kinds of energy. CO4 Concept of Fluid Mechanics in physics. CO5 To study various Properties of Matter.
Physics Principles and Applications	CO1 To understand the general structure of atom, spectrum of hydrogen atom. CO2 To understand the atomic excitation and LASER principles. CO3 To understand the bonding mechanism and its different types CO4 To demonstrate an understanding of electromagnetic waves and its spectrum.

	CO5 Understand the types and sources of electromagnetic waves and applications. CO6 To demonstrate quantitative problem solving skills in all the topics covered.
Heat and Thermodynamics	CO1 To study basic concepts related to Fundamentals of Thermodynamics CO2 To understand Applied Thermodynamics. CO3 To study Heat Transfer Mechanisms indetail. CO4 To study different concepts related to Thermometry.
Electricity and Magnetism	CO1 To understand the concept of the electric force, electric field and electric potential for stationary charges. CO2 Able to calculate electrostatic field and potential of charge distributions using Coulomb's law and Gauss's law. CO3 To understand the dielectric phenomenon and effect of electric field on dielectric CO4 To Study magnetic field for steady currents using Biot-Savart and Ampere's Circuital laws CO5 To study magnetic materials and its properties CO6 Demonstrate quantitative problem solving skills in all the topics covered.
Physics Practical 1&2	CO1 Study and use of various measuring Instruments like Vernier calliper, Micrometer Screw Gauge, Travelling Microscope. CO2 Practical studies of different motions. CO3 Study of surface tension by Jaeger’s method. CO4 Study of Spectrometer and determination of angle of prism. CO5 Study of divergence of LASER beam. CO6 Determination of Plank’s constant and its practical uses. CO7 Study of temperature coefficient of Thermistor. CO8 Study of temperature related properties and its application.

	CO9 Study of various circuit types such as f LR circuit, LCR circuit etc. CO10 To understand Diode characteristics. CO11 Comparison of capacitor using DeSauty's method.

B.Sc. (Zoology)

S.R.	Programme Outcomes
PO1	Demonstrate, solve and an understanding of major concepts in all disciplines of Zoology.
PO2	Solve the problem and also think methodically, independently and draw a logical conclusion.
PO3	Understand the evolution, history of phylum.
PO4	Create an awareness of the impact of Zoology on the environment, society, and development outside the scientific community.
PO5	Use modern techniques, decent equipment and Zoology software's.
PO6	To inculcate the scientific temperament in the students and outside the scientific community.

S.R.	Programme Specific Outcomes
PSO1	Gain the knowledge of Zoology through theory and practical's.
PSO2	Study and understand the DNA Recombinant technology.
PSO3	Understand good laboratory practices and safety.
PSO4	Develop research oriented skills.

Subject	Course Outcomes (F.Y.B.Sc)
Animal Diversity I	CO1 To understand the Animal diversity around us. CO2 To understand the underlying principles of classification of animals. CO3 To understand the terminology needed in classification. CO4 To understand the differences and similarities in the various aspects of classification. CO5 To classify invertebrates and to be able to understand the possible group of the invertebrate observed in nature. CO6 To understand our role as a caretaker and promoter of life.

Animal Ecology	CO1 To understand impact on ecosystem and biosphere due to the dynamics in population. CO2 To understand anticipate, analyse and evaluate natural resource issues and act on a lifestyle that conserves nature. CO3 To understand diversity of ecosystems and applies beyond the syllabi to understand the local lifestyle and problems of the community. CO4 To study food chains, food webs and link it with human life for its betterment and for non-exploitation of the biotic and abiotic. CO5 The working in nature to save environment will help development of leadership skills to promote betterment of environment.
Animal Diversity II	CO1 The student will be able to understand classify and identify the diversity of animals. CO2 The student understands the importance of classification of animals and classifies them effectively using the six levels of classification. CO3 To understand role in nature as a protector, preserver and promoter of life which he has achieved by learning, observing and understanding life.
Cell biology	CO1 The learner will understand the importance of cell as a structural and functional unit of life. CO2 The learner understands and compares between the prokaryotic and eukaryotic system and extrapolates the life to the aspect of development. CO3 The dynamism of bio membranes indicates the dynamism of life. Its working mechanism and precision are responsible for our performance in life. CO4 The cellular mechanisms and its functioning depends on endo-membranes and structures. They are best studied with microscopy.

Zoology Practical 1&2	CO1 To study different phylum in kingdom Animalia. CO2 Study of permanent slides in zoology. CO3 . Estimation of Dissolved oxygen from water sample. CO4 Determination of density, frequency and abundance of species by quadrat method. CO5 Study of microscopic fauna of freshwater ecosystem. CO6 . Study of Eutrophication in lake/river. CO7 To study Economic importance of honey bees, Lac insects silk worms, red cotton bug, Anopheles mosquito CO8 .Study of Microscope for microscopic visualization. CO9 Study of animal cell in detail. CO10 Preparation of blood smears to observe the blood cells.

Subject	**Course Outcomes (S.Y.B.Sc)**
Animal Diversity_I II & IV	CO1_ The students will be able to understand, classify and identify the diversity of higher vertebrates. CO2 _ The students will able to understand the complexity of higher vertebrates CO3 _ The students will be able to understand different life functions of higher vertebrates. CO4_ The students will be able to understand the linkage among different groups of higher vertebrates. CO5_ The student will become aware regarding his role and responsibility towards nature as a protector, to understand his role as a trustee and conservator of life which he has achieved by learning, observing and understanding life.
Applied Zoology_I & II	CO1_ The learner understands the basics about beekeeping tools, equipment, and managing beehives. CO2_ The learner understands the basic information about fishery, cultural and harvesting methods of fishes and fish preservation techniques. CO3_ The learner understands the biology, varieties of silkworms and the basic techniques of silk production. CO4_ The learner understands the types of agricultural pests, Major insect pests of agricultural importance and Pest control practices.

Subject	Course Outcomes (T.Y.B.Sc)
Pest Management	CO1_Define pest management. CO2_Describe the economic, ecological, and sociological benefits of IPM. CO3_ Distinguish positive and negative impacts of pesticide use. CO4_ Understand problems resulting from misuse, overuse, and abuse of chemical pesticides. CO5_ Define and describe pesticide resistance and how it develops. CO6_Identify ecological and biological characteristics important in development of pest populations. CO7_ Identify 10 tactics commonly used in IPM and be able to distinguish them. CO8_Understand society's role in IPM decisions. CO9_ Describe different groups of pests and compare them to weeds and plant pathogens. CO10_Analyse and compare management tactics to determine the best approach to reducing pest populations, weeds, and disease presence. CO11_Locate appropriate, scientifically valid sources of information on specific tactics to manage insect pests, weeds, and diseases. CO12_ Know and how to develop an IPM program.
Histology	CO1_The students will be able to understand, classify and identify the different types of tissue. CO2_The students will understand the complexity of various tissues in an organ. CO3_The students will be able to learn structure & functions of various tissues. CO4_ The students will understand the various diseases related to organs. CO4_The student will be able to know the role of glands in mammals.
Biological Chemistry	CO1_Learners shall be able to understand basic concepts and significance of biochemistry CO2_ The students will learn about the pH and Buffers. CO3_The students will learn about the chemical structures of carbohydrate, and their biological and clinical significance. CO4_The students will be able to understand, interpret structure and importance of proteins, carbohydrates and lipids. CO5_Learners will be able to comprehend variations in enzyme activity and kinetics.
Genetics	CO1_Students will be taught Mendelian genetics, their principles

	and gene interaction. CO2_They learn about chromosomal aberrations and structure of chromosomes CO3_The student will gain a basic understanding on human genetics and hereditary.
Developmental Biology	CO1_Identify model organisms used to investigate developmental biology and compare the developmental programmers of different organisms. CO2_Describe genetic, molecular and cellular techniques, including genome editing, used to investigate developmental and cell biology processes in various organisms.
Parasitology	CO1_Identify, describe and contrast unicellular parasites and parasitic worms. CO2_Describe specific human and non-human parasitic diseases. CO3_Parasitology is the study of the interaction between parasites and their hosts. CO4_Prepare and observe live parasitic specimens and test students' own seropositivity for a particular parasitic infection CO5_Report on observations of biological specimens such as parasites

B.Sc. (Statistics)

S.R.	Programme Outcomes
PO1	Recall and explain acquired scientific knowledge in a comprehensive manner and apply the skills acquired in their chosen discipline.
PO2	Interpret scientific ideas and relate its interconnectedness to various fields in science
PO3	Evaluate scientific ideas critically, analyse problems, explore options for practical demonstrations, illustrate work plans, execute & draw inferences.
PO4	Explore and evaluate digital information and use it for knowledge Upgradation.
PO5	Apply relevant information so gathered for analysis and communication using appropriate digital tools.

S.R.	Programme Specific Outcomes
PSO1	Understand, condense, visualize, analyse and interpret the data collected in daily walk of life.
PSO2	Understand the data generated in various scenarios of scientific, industrial, or social problems.
PSO3	Enhance knowledge of Statistical tools
PSO4	Pursue their higher education programs leading to post-graduate or doctoral degrees.

Subject	Course Outcomes (F.Y.B.Sc)
Descriptive Statistics I	CO1 To compute various measures of central tendency, dispersion, skewness and kurtosis. CO2 To analyse data pertaining to attributes and to interpret the results.

Discrete Probability and Probability Distributions I	CO1 To distinguish between random and non-random experiments. CO2 To find the probabilities of events. CO3 To obtain a probability distribution of random variable (one or two dimensional) in the given situation.
Descriptive Statistics II	CO1 To compute the correlation coefficient for bivariate data and interpret it. CO2 To fit linear, quadratic and exponential curves to the bivariate data to investigate relation between two variables CO3 To compute and interpret various index numbers.
Discrete Probability and Probability Distributions II	CO1 To apply standard discrete probability distribution to different situations. CO2 To study properties of these distributions as well as interrelation between them.
Statistics Practical Paper 1 & 2	CO1 To use various graphical and diagrammatic techniques and interpretation. CO2 To analyse data pertaining to discrete and continuous variables and to interpret the results. CO3 To compute various measures of central tendency, dispersion, skewness and kurtosis. CO4 To interpret summary statistics of computer output. CO5 To summarize and analyse the data using computer. CO6 To compute correlation coefficient, regression coefficients. CO7 To compute probabilities of bivariate distributions. CO8 To fit binomial and Poisson distributions. CO9 To compute probabilities of bivariate distributions. CO10 To draw random samples from Poisson and binomial distributions.

B.Sc. (Microbiology)

S.R.	Programme Outcomes
PO1	Acquired knowledge and understanding of the microbiology concepts as applicable to diverse areas such as medical, industrial, environment, genetics, food etc.
PO2	Demonstrate key practical skills in working with microbes.
PO3	Use of good microbiological practices.
PO4	To acquire good lab Discipline to maintain sterile conditions.

S.R.	Programme Specific Outcomes
PSO1	The students are also trained in such a way that they develop critical thinking and problem solving as related to the microbiology.
PSO2	Students should have the appropriate skills of Microbiology so as to perform their duties as microbiologists.
PSO3	Students must be able to analyse the problems related to microbiology and come up with most suitable solutions.
PSO4	To develop good lab skills for culturing contamination free cultures.

Subject	Course Outcomes (F.Y.B.Sc)
Introduction to Microbial World	CO1 To study Amazing world of Microbiology. CO2 To study types of Microorganism and their differentiating characters. CO3 To study Beneficial and Harmful effects of microorganisms.
Basic Techniques in Microbiology	CO1 To study Microscopy related to microbiology and staining techniques. CO2 To study different Sterilization and Disinfection methods in microbiology.

Bacterial Cell and Biochemistry	CO1 To study Bacterial Cytology and its structure and functions. CO2 To study of biochemistry in microbiology.
Microbial cultivation and growth	CO1 To study cultivation and maintenance methods related to microbes. CO2 To study growth kinetics during microbial growth.
Microbiology Practical Paper 1 & 2	CO1 To study Safety measures and Good Laboratory Practices in microbiology laboratory CO2 To study mounting and staining of specimen. CO3 To study detail microscopy. CO4 To study Basic staining techniques: Monochrome staining, Negative staining, Gram staining of bacteria. CO5 To study Preparation of simple laboratory nutrient media. CO6 To study Special staining techniques. CO7 To study different isolation techniques in microbiology.

Subject	**Course Outcomes (S.Y.B.Sc)**
MB-231: Medical Microbiology and Immunology	CO1 To acquire knowledge of principles underlying establishment of pathogens in human body. CO2 Gain Knowledge principles of chemotherapy of microbial diseases and development of drug resistance among pathogens and strategies to mitigate CO3 Understand immune system structure, composition, function and comparison of different types of immunity, cell associated with, antigens and antibodies.
MB-232: Bacterial Physiology and Fermentation Technology	CO1 Understand the importance of enzymes in living cell and distinguish between different classes of enzymes and their function. CO2 Get ability to illustrate and explains the various metabolic pathways of the cell in particular prokaryotic. CO3 Understand the importance of microorganisms in Industry. CO4 To learn basic concepts of fermentations and its different types.

MB-241: Bacterial Genetics	CO1 Get ability to summarize the basics of genetics e.g., DNA, RNA structure. CO2 Get ability to paraphrase the concept of gene. CO3 Understand the concept of central dogma of molecular biology and its mechanism. CO4 Understand the basic molecular processes like DNA replication, transcription and translation. CO5 Understand various types of mutations and their causes.
MB-242: Air, Water and Soil Microbiology	CO1 Understand air, water and soil microflora and disease associated with them. CO2 Master various techniques to measure the air and water microflora. CO3 Understand the important soil microorganisms and their role in agriculture. CO4 Understand how soil microorganisms helps in maintaining with elemental cycles in nature.
MB-233 and MB-243 Practical Course based on theory papers.	CO1 Practical for the second-year students is kept more flexible, designed to evolve project themes on environment, agriculture and pollution aspects e.g., Biochemical characterization of pathogenic bacteria, Bacteriological tests of potability of water and bacterial genetics.

Subject	**Course Outcomes (T.Y.B.Sc)**
MB 351: Medical Microbiology-I and MB 361: Medical Microbiology-II	CO1 Understand the human anatomy, pathogens associated with diseases. CO2 Acquire knowledge of principles underlying establishment of pathogens in human body. CO3 Comprehend of pathogenesis of specific pathogens causing microbial diseases. CO4 Assess epidemiological patterns of microbial disease transmission as various modes, intensity at local and global level. CO5 Gain Knowledge principles of chemotherapy of microbial diseases and development of drug resistance among pathogens and strategies to mitigate. CO6 Develop identification systems for microbial disease diagnosis, disease treatment and prevention measures.
MB-352 Immunology- I	CO1 Understand immune system structure, composition, function and comparison of different types of immunity.

and MB-362 Immunology-II	CO2 Acquire knowledge about antigens, Recognition of pathogens; antigen processing and presentation; Immunity to infection and pathological consequences of immunodeficiencies. CO3 To learn the applications of Immunology in monoclonal antibodies, vaccines production and Immunotherapy. CO4 Understand abnormal working of Immune system in hypersensitivity, auto immune diseases, immune tolerance and transplantation immunology. CO5 To develop strategies for Diagnosis of diseases based on antigen and antibody reactions with emphasis on prevailing communicable diseases
MB 353 Enzymology and MB 363 Metabolism	CO1 To understand methods of active site determination, role of enzymes and its cofactors in microbial physiology. CO2 To learn to perform enzyme assay, purification and quantification of enzymes activity, enzyme kinetics in terms of initial, final velocity, mathematical expression of enzyme kinetic parameters. CO3To correlate regulation of metabolism at enzymatic levels and apply, methodology for commercial applications of enzymes CO4 To learn mechanisms of transport of solutes across the membrane CO5 To get acquainted with mechanism of biosynthesis and degradation of bio molecules CO6 To comprehend basic concept of autotrophic mode of metabolism of prokaryotes
MB 354 Genetics and MB 364 Molecular Biology	CO1 To exhibit a knowledge base in Genetics and Molecular Biology CO2 To understand the central dogma of Molecular Biology CO3To construct genetic map of bacteria and fungi CO4 To get introduced to concept of recombination and bacteriophage Genetics CO5 To understand the concept cloning in bacteria CO6 To demonstrate the knowledge of common and advanced laboratory practices in Molecular Biology.
MB 355 Fermentation Technology- I	CO1 To impart technical understanding of commercial fermentations. CO2 To apply classical, advanced strain improvement and

and MB 365 Fermentation Technology- II	isolation techniques for fermentation processes. CO3 To optimize and sterilize media used in fermentation industry for commercially economical and efficient fermentations. CO4 To recover the product using suitable methods and ensuring quality of the finished product by quality assurance tests. CO5 To acquaint fermentation economics, process patentability, process validation. CO6 To comprehend the large-scale productions of commercially significant fermentation products of classical and recent significance.
MB 356 Agricultural Microbiology	CO1 To understand plant growth improvement with respect to disease resistance, environment tolerance. CO2 To correlate stages of plant disease development, epidemiology, symptom-based classification, control methods. CO3 To understand the importance of microorganisms in sustainable agriculture, biotechnological application of bio films, edible vaccines. CO4 To correlate Soil Micro biome and Role of microorganisms in soil health CO5 To determine the use of Microorganisms as tools in plant genetic engineering.
MB 366: Food Microbiology	CO1 To describe food safety problems and solutions in India and global scale. CO2 Identify and classify types of microorganisms in food processing and compare their Characteristics and behaviour CO3 To learn food classification based on their perishability, intrinsic and extrinsic factors affecting the growth of microbes in foods, role of microorganisms in food fermentation. CO4 To acquire knowledge about food spoilage, food borne diseases, predisposition and preventive and control measures. CO5 To apply principles of sanitation, heat treatment, irradiation, modified atmosphere, antimicrobial preservatives and combination of method (hurdle concept) to control microbial growth with emphasis on HACCP guidelines.
Skilled Base Elective MB	CO1 To impart the awareness of unseen and unexplored niche of marine ecosystem of microbes.

3510 Marine Microbiology	CO2 To acquire advances in the knowledge of marine microbes and marine ecology. CO3 To learn the field research on marine processes and laboratory research on microorganisms. CO4 To comprehend the role of marine microbes in bioremediation and bioprospecting. CO5 To avail career opportunities in marine education, industry and research.
Skilled Base Elective MB 3511 Dairy Microbiology	CO1 To understand prospects of dairying at commercial marketing. CO2 To acquire skills of processing of milk and dairy products. CO3 To assess quality control in dairy industry. CO4 To comprehend production of dairy products of commercial significance with emphasis to local and global market demand.
Skilled Base Elective MB 3610 Waste Management	CO1 To understand waste management and it practicable applicability. CO2 To assess the magnitude and influence of hazardous content of waste, pollution of waters and waste water treatment technologies. CO3 To learn the design and working of treatment plants and methods used for liquid and solid waste treatment. CO4 To impart the understanding of kinetics of biological systems used in waste treatment. CO5 To learn the standards of waste management and competent authorities involved at National and international level.
Skilled Base Elective MB 3611 Nano-biotechnology	CO1 To understand design, development and application of Nanomaterials and their application in Nanodevices. CO2 To learn fundamentals of nanotechnology as to Synthesis and characterization techniques of nanoparticles. CO3 To acquire knowledge of applications of nanomaterials in different disciplines of human life. CO4 To compare the merits of using nanotechnology with existing technologies
Practical Course I: Based on MB 357 and MB 367:	Understand various techniques in clinical Microbiology, Immunohematology, Immunoprecipitation, Agglutination tests etc.

Diagnostic Microbiology and Immunology	
Practical Course II: Based on MB 358 Enzymology and Genetics MB 368 Metabolism and Molecular Biology	Understand various biochemical techniques like chromatography, colorimetric assay, centrifugation, DNA and plasmid isolation, their quantification.
Practical course-III: Based on MB 359 Fermentation Technology- I and Agricultural Microbiology, MB 369 Fermentation Technology- II and Food Microbiology	Understand various techniques carried out in industries like fermentation, food and dairy. To learn about microorganisms that are harmful and beneficial in agriculture.