

VALLABH GOVERNMENT COLLEGE MANDI (H.P.)

Programme outcomes: Bachelor of Science (B. Sc.)

Vallabh Government college Mandi provides three years degree programme in Science from Himachal Pradesh University, Shimla. After successful completion of the B.Sc. programme, the student will be able:

1. To know the fundamental concepts of chemistry and applied chemistry. These fundamental concepts would reflect the latest understanding of the field, and therefore, are dynamic in nature and require frequent and time-bound revisions.
2. To possess minimum standards of communication skills expected of a science graduate in the country. They are expected to read and understand documents with in-depth analyses and logical arguments. Graduates are expected to be well-versed in speaking and communicating their idea/finding/concepts to wider audience
3. To know basics of cognitive biases, mental models, logical fallacies, scientific methodology and constructing cogent scientific arguments.
4. To possess basic psychological skills required to face the world at large, as well as the skills to deal with individuals and students of various sociocultural, economic and educational levels. Psychological skills may include feedback loops, self-compassion, self-reflection, goal-setting, interpersonal relationships, and emotional management.
5. To be equipped themselves with problem-solving philosophical approaches that are pertinent across the disciplines;
6. To acquire formulate cogent arguments and spot logical flaws, inconsistencies, circular reasoning etc.
7. To be keenly observant about what is going on in the natural surroundings to awake their curiosity. Graduates are expected to design a scientific experiment through statistical hypothesis testing and other a priori reasoning including logical deduction.

Programme Specific outcomes: B.Sc. Chemistry

The programme has been developed with the motive of ensuring the integrated personality of the science students in terms of providing opportunity for exposure towards various courses, discipline specific courses, generic elective courses, ability enhancement courses and skill enhancement courses with special focus on technical, communication and subject specific skills through practical and other innovative transactional modes to develop their employability skills. A graduate student is expected to be capable of demonstrating comprehensive knowledge and understanding of both theoretical and experimental/applied chemistry knowledge in various fields of interest like Analytical Chemistry, Physical Chemistry, Inorganic Chemistry, Organic Chemistry, Material Chemistry, etc. After studying the B.Sc. with Chemistry Programme:

- (i) Systematic and coherent understanding of the fundamental concepts in Physical chemistry, Organic Chemistry, Inorganic Chemistry, Analytical Chemistry and all other related allied chemistry subjects.
- (ii) Students will be able to use the evidence based comparative chemistry approach to explain the chemical synthesis and analysis.
- (iii) The students will be able to understand the characterization of materials.
- (iv) Students will be able to understand the basic principle of equipments, instruments used in the chemistry laboratory.
- (v) Students will be able to demonstrate the experimental techniques and methods of their area of specialization in Chemistry.

COURSE OUTCOMES: CHEMISTRY

CLASS: B.Sc. I, II, III

Course	Course outcomes
CHEM101TH: ATOMIC STRUCTURE, BONDING, GENERAL ORGANIC CHEMISTRY & ALIPHATIC HYDROCARBONS	<p><i>After studying the course, students will able to:</i></p> <ol style="list-style-type: none"> 1. Learn atomic theory and its evolution. 2. Learn scientific theory of atoms, concept of wave function. 3. To predict the atomic structure, chemical bonding, and molecular geometry based on accepted models. 4. Characterize bonding between atoms, molecules, interaction and energetics 5. Explain hybridization and shapes of atomic, molecular orbitals, bond parameters, bond- distances and energies. 6. Explain stereochemistry of organic molecules – conformation and configuration, asymmetric molecules and nomenclature. 7. Understand concept of aromaticity, mechanism of aromatic reactions. 8. Understanding hybridization and geometry of atoms, 3-D structure of organic molecules, identifying chiral centers. 9. Define electrophile, nucleophiles, free radicals, electronegativity, resonance, and intermediates along the reaction pathways.
CHEM102TH: STATES OF MATTER, CHEMICAL KINETICS & FUNCTIONAL ORGANIC CHEMISTRY	<p><i>After studying the course, students will familiarization with:</i></p> <ol style="list-style-type: none"> 1. Various states of matter and physical properties of each state of matter and laws related to describe the states. 2. Kinetic model of gas and its properties. 3. Maxwell distribution, mean-free path, kinetic energies. 4. Behavior of real gases, its deviation from ideal behavior, equation of state, isotherm, and law of corresponding states. 5. Liquid state and its physical properties related to temperature and pressure variation. 6. Familiarization about classes of organic compounds and their methods of preparation. 7. Basic uses of reaction mechanisms 8. Preparation and uses of various classes of organic compounds. 9. Organic chemistry reactions and reaction mechanisms.
CHEM201TH: SOLUTIONS, PHASE EQUILIBRIUM, CONDUCTANCE, ELECTROCHEMISTRY & ORGANIC CHEMISTRY	<p><i>After studying the course, students will familiarization with:</i></p> <ol style="list-style-type: none"> 1. Understanding phases, components, Gibb's phase rule and its applications. 2. Construction of phase diagram of different systems and the application of phase diagram. 3. Electrolytes and electrolytic dissociation, salt hydrolysis and acid-base equilibria 4. Ionic equilibria – electrolyte, ionization, dissociation. 5. Salt hydrolysis (acid-base hydrolysis) and its application in chemistry.
CHEM202TH: CHEMISTRY OF MAIN GROUP ELEMENTS, CHEMICAL ENERGETICS AND EQUILIBRIA	<p><i>The student will able to understand and apply:</i></p> <ol style="list-style-type: none"> 1. Chemistry of s and p-block elements. 2. Chemistry of noble gases. 3. Inorganic polymers and their use. 4. Understanding redox reactions in hydrometallurgy processes. 5. Structure, bonding of s and p block materials and their oxides/compounds. 6. Understanding chemistry of boron compounds and their structures. 7. Chemistry of noble gases and their compounds; application of VSEPR theory in explaining structure and bonding.
CHEM203TH: BASIC ANALYTICAL CHEMISTRY	<p><i>After studying this skill enhancement course, student will be able to:</i></p> <ol style="list-style-type: none"> 1. Understand the basics of analytical chemistry

	<ol style="list-style-type: none"> Undertake Soil analysis, water analysis and various aspects food analysis Undertake analysis using chromatographic techniques Undertake the analysis of cosmetics like deodorants and antiperspirant, talcum powder etc
CHEM204TH: FUEL CHEMISTRY & CHEMISTRY OF COSMETICS & PERFUMES	<p><i>After studying the course, students will familiarization with:</i></p> <ol style="list-style-type: none"> Energy sources (renewable and non-renewable) Coal in various industries, composition and processing Petroleum and Petrochemical Industry Classification of lubricants, lubricating oils, Properties of lubricants preparation and uses of the following: Hair dye, hair spray, shampoo, suntan lotions etc. Essential oils and their importance in cosmetic industries
CHEM301TH: POLYNUCLEAR HYDROCARBONS, DYES, HETEROCYCLIC COMPOUNDS AND SPECTROSCOPY	<p><i>After studying the course, students will familiarization with:</i></p> <ol style="list-style-type: none"> Polynuclear hydrocarbons and their reactions. Heterocyclic compounds and their reactions. Understanding the structure and their mechanism of reactions of selected polynuclear hydrocarbons. Understanding the structure, mechanism of reactions of selected heterocyclic compounds To study UV, IR and NMR spectroscopy. Determine structure of compound by spectroscopic methods
CHEM302TH: INDUSTRIAL CHEMICALS AND ENVIRONMENT	<p><i>After completion of the course, the learner can be able to understand:</i></p> <ol style="list-style-type: none"> Industrial Gases: Large scale production, uses, storage and hazards in handling of General Principles of Metallurgy. Air Pollution Water quality parameters Atmospheric chemical phenomena and environmental pollution Water pollution, parameters of water pollution, treatment of polluted wate Nuclear Pollution
CHEM303TH: QUANTUM CHEMISTRY, SPECTROSCOPY & PHOTOCHEMISTRY	<p><i>The students will able to understand:</i></p> <ol style="list-style-type: none"> De-Broglie hypothesis and Uncertainty principle To derive Schrodinger time dependent and independent equations, know the Eigen function, Eigen value, operator and postulates of quantum mechanics. Learn two- and three-dimensional box, mechanics of particle. Study of photochemistry Role of photochemical reactions in biochemical processes
CHEM304TH: CHEMISTRY OF TRANSITION AND INNER TRANSITION ELEMENTS, COORDINATION CHEMISTRY, ORGANOMETTALICS, ACIDS & BASES	<p><i>The students will able to understand the:</i></p> <ol style="list-style-type: none"> Coordination compounds – its nomenclature, theories, d-orbital splitting in complexes, chelate. Transition metals, its stability, colour, oxidation states and complexes. Lanthanides, Actinides – separation, colour, spectra and magnetic behaviour Understanding the nomenclature of coordination compounds/complexes, Molecular orbital theory, d-orbital splitting in tetrahedral, octahedral, square planar complexes, chelate effects. Understanding the transition metals stability in reactions, origin of colour and magnetic properties. Know the shapes of d-orbital and degeneracy of d-orbital
CHEM305TH: POLYMER CHEMISTRY	<p><i>After completion of the course, the learner can be able to understand:</i></p> <ol style="list-style-type: none"> Introduction and history of polymeric materials. Molecular weight and structure property relationship Kinetics of Polymerization Characterization of polymers: Crystallization and crystallinity Physical, thermal, Flow & Mechanical Properties of polymers.

CHEM306TH: MOLECULES OF LIFE	<i>After completion of the course, the learner can be able to understand:</i> <ol style="list-style-type: none"> 1. Bioinorganic chemistry – metal ions in biological system, 2. Amino Acids, Peptides and Proteins, lipids 3. Enzymes and correlation with drug action 4. Components and functions of Nucleic acids 5. Concept of Energy in Biosystems
CHEM307TH: CHEMICAL TECHNOLOGY & SOCIETY AND BUSINESS SKILLS FOR CHEMISTRY	<i>On completion of this course, the students will be able to:</i> <ol style="list-style-type: none"> 1. Various processes and instruments used in chemical technology such as distillation, solvent extraction, extruders, pumps, mills, emulgators. 2. Scaling up operations in chemical industry. 3. Introduction to clean technology. 4. Exploration of societal and technological issues from a chemical perspective 5. Key business concepts: Business plans, market need 6. Current challenges and opportunities for the chemistry-using industries 7. Concept of intellectual property rights and patents.
CHEM308TH: PESTICIDE CHEMISTRY & PHARMACEUTICAL CHEMISTRY	<i>The students will have the knowledge of:</i> <ol style="list-style-type: none"> 1. Various pesticides, insecticides, fungicides and herbicides. 2. Synthesis of DDT, Malathion, Parathion, Carbofuran. 3. Drugs & Pharmaceuticals Drug discovery 4. Synthesis of the drugs like analgesics agents, antipyretic agents, anti-inflammatory agents. 5. Production of Ethyl alcohol and citric acid, Penicillin, Cephalosporin, Chloromycetin and Streptomycin, Lysine, Glutamic acid, Vitamin B2, Vitamin B12 and Vitamin C.

Department of Physics

Course outcomes of B.Sc. Physics

Course Name	Outcomes
	After completion of these courses students should be able to;
Mechanics (PHYS101TH)	<ol style="list-style-type: none"> 1. Know the Cartesian, spherical polar and cylindrical co-ordinate systems. 2. To understand the Special Theory of Relativity. 3. Discuss the Michelson- Morley Experiment. 4. To obtain the series solution by Frobenius method . 5. Understand Newton’s Laws of motion and their applications such as projectile and rocket motion 6. Gain the knowledge of motion in central force field
Electricity and Magnetism (PHYS102 TH)	<ol style="list-style-type: none"> 1. Understand Charge, Electric Fields. 2. Know the Electric Potential And Basic Circuit Elements. 3. Magnetic Fields and Magnetic Forces. . 4. Learn about magnetic flux, Coulomb’s Law Point charge etc.
Statistical and Thermal Physics (PHYS201 TH)	<ol style="list-style-type: none"> 1. To study kinetic theory of Gases. 2. To study Maxwell Relations and Application. 3. Know the elementary concept of statistics. 4. Understand statistical distribution of system of particles. 5. To study statistical ensembles.
Waves and Optics (PHYS202 TH)	<ol style="list-style-type: none"> 1. To study the Coherent and Incoherent addition of Waves. 2. Discuss the type Diffraction. 3. Know the Interference of light and Young’s experiment. 4. Understanding Polarisation and Huygens Principle. 5. Study the Refraction and Reflection of plane Waves.
Physics Workshop Skill (PHYS203 TH)	<ol style="list-style-type: none"> 1. To study Vernier calliper, Screw gauge and their utility. 2. To study volume of cylindrical glass, diameter of thin wire . 3. Know the types of welding joints and welding defects. 4. Understand gear system, wheel, lifting of heavy weights and pulleys.

Electrical Circuits and Network Skills (PHYS205 TH)	<ol style="list-style-type: none"> 1. To understand the Electricity Principles and power supply. 2. To study the Resistance, AC and DC Electricity and Ohm's law 3. To know the Generators and Transformers. 4. To study the single phase and three phase and DC motors.
Solid State Physics and Electronics (PHYS302 TH)	<ol style="list-style-type: none"> 1. Know the principles of structures determination by diffraction 2. To understand the principles and techniques of X-rays diffraction 3. Know the fundamental principles of semiconductors and be able to estimate the charge carrier mobility and density 4. To give an extended knowledge about magnetic properties like diamagnetic, paramagnetic, ferromagnetic, ferrites and Superconductors. 5. Know the special purpose Diode. 6. To study the Transistor Amplifier. 7. To understand the FET, JFET, MOSFET. 8. To study the Operational Amplifier and their types.
Quantum Mechanics (PHYS305TH)	<ol style="list-style-type: none"> 1. Understand De-Broglie hypothesis and Uncertainty principle 2. Derive Schrodinger's time dependent and independent equations 3. Solve the problems using Schrödinger's steady state equation 4. Get knowledge of rigid rotator 5. Understand different operators in Quantum Mechanics
Radiation Safety (PHYS307 TH)	<ol style="list-style-type: none"> 1. To know the uses of X-rays. 2. To understand the photons and charged particles. 3. To study the solid states Detectors and Neutron Detectors. 4. To study the applications of medical science. 5. To understand the biological effects of ionizing radiation.
Renewable Energy and Energy Harvesting (PHYS310 TH)	<ol style="list-style-type: none"> 1. To understand the Fossil fuels and alternate sources of energy. 2. To study solar energy and its importance and solar pond. 3. To know the Ocean, Geothermal and Hydro energy. 4. To study Piezoelectric energy harvesting and electromagnetic energy harvesting.

DEPARTMENT OF MATHEMATICS

Course outcomes

Programme Specific Outcomes

- Understanding of the fundamental axioms of mathematics and capability of developing ideas based on them.
- Nurture problem solving skills, thinking, and creativity through assignments.
- Empowering the students to pursue higher degree at reputed academic institutions.
- Motivate the students to prepare for competitive examination.

Title of Course	Courses Outcomes
DIFFERENTIAL EQUATIONS MATH102TH	<ul style="list-style-type: none"> ● Understand the concept of differential equations, classification of differential equations. ● Recognize and solve homogeneous and non homogeneous differential equations by using different methods. ● Learn the methods of variation of parameters and reduction of order. ● Learn to determine linear dependence and independence of function. ● Learn the concepts of total differential equations. ● Learn the formation of partial differential equation and solve partial differential equation using Lagrange's and Charpit's method. ● Will able to classify second order partial differential equations.

<p>REAL ANALYSIS MATH301TH</p>	<ul style="list-style-type: none"> ● Construct mathematical proofs of basic results in real analysis. ● Learn sequence and series of real numbers and their convergence and uniform convergence. ● Use comparison test, condensation test, D'Alembert ratio test ,Cauchy's root and Leibnitz's test for convergence of series. ● Comprehend bounded sets, Archimedes properties and Bolzano-Weierstrass theorem. ● Produce proofs of results of real analysis.
<p>INTEGRAL CALCULUS MATH304TH</p>	<ul style="list-style-type: none"> ● Establish various Reduction formulae. ● Learn to find area and length of curves. ● Integration by partial fractions and properties of definite integrals. ● Evaluation of double and triple integrals
<p>ALGEBRA MATH401TH</p>	<ul style="list-style-type: none"> ● Learn the concept of group, subgroup, and normal subgroup and Quotient groups. ● Use the concept of homomorphism, isomorphism and endomorphism of groups . ● Cyclic group, permutation group, polynomial ring, polynomial rings and quotient rings.
<p>VECTOR CALCULUS MATH402TH</p>	<ul style="list-style-type: none"> ● Learn the concept of scalar and vector product. ● Study differentiation and partial differentiation of vectors. ● Learn the concept of divergence, curl and gradient of vectors.
<p>LINEAR ALGEBRA MATH503TH</p>	<ul style="list-style-type: none"> ● Learn the concept of linear independence and dependence, linear span, basis and dimensions. ● Study vector spaces and subspaces. ● Linear transformations ● Inner product spaces and Cauchy Schwarz's inequality.
<p>PROBABILITY AND STATIATICS MATH504TH</p>	<ul style="list-style-type: none"> ● Learn the concept of sample space, random variables, cumulative distribution function, probability mass and probability density function. ● Concept of mathematics expectation, moments, moment generating function, characteristic function. ● Different kind of distribution i.e. binomial, continuous, Poisson, uniform, exponential and normal distribution. ● Learn about function of two random variables, conditional expectation and independent random variables.

<p>NUMERICAL METHODS MATH601TH</p>	<ul style="list-style-type: none"> ● Study to find the appropriate rules of solving non linear equations by different methods such as bisection, Secant and Newton Raphson's method. ● Concept of interpolation and extrapolation. ● To find the value of a definite integral from the set of tabulated values of the integrand by using trapezoidal and Simpsons rule.
<p>TRANSPORTATION AND GAME THEORY MATH605TH</p>	<ul style="list-style-type: none"> ● Learn mathematical formulation of transportation problem and solution using Northwest-corner method, least cost method and Vogel method. ● Assignment method its mathematical formulation and Hungarian method for solving assignment. ● Learn the concept of Game theory, formulation and solution of two people zero sum games, mixed strategies games and graphical solution procedure.
<p>Department of Botany</p>	
<p>PROGRAMME OUTCOMES (POs)</p> <ul style="list-style-type: none"> ▪ To inculcate scientific temper among the students ▪ To equip students with knowledge and technical skills pertaining to plants. ▪ It aims to train the students in all the areas of plant sciences with a unique combination of core and elective papers with significant interdisciplinary components as per CBCS. ▪ To enable them to apply the knowledge of Botany wherever needed. ▪ To prepare students for obtaining employment in the government or private sector. ▪ To equip students with Logical and Analytical Thinking Ability so that they are ready to take up a career in research. ▪ Students acquire relevant knowledge and skills appropriate to professional activities. ▪ To inculcate Social responsibility and Effective citizenship. Graduates will understand the environmental issues and sustainability development. 	
<p>PROGRAMME SPECIFIC OUTCOMES (PSOs)</p> <ul style="list-style-type: none"> ▪ Nurture problem solving skills, thinking, and creativity through assignments. ▪ Empowering the students to pursue higher degrees at reputed academic institutions. ▪ Motivate the students to prepare for competitive examinations. 	
<p>Paper Title/ Course Code</p>	<p>Course outcome</p>

<p>Biodiversity (Microbes,Algae, Fungi and Archegoniate) BOTA101</p>	<p>The knowledge of:</p> <ul style="list-style-type: none"> ● Classification of algae and fungi and their Economic & ecological importance.Morphology and life cycle of algae like Nostoc, Oedogonium, Vaucheria, Diatoms, Ectocarpus and Polysiphonia and fungi like Rhizopus, Saccharomyces, Neurospora, Agaricus and Colletotrichum ● Symbiotic relationships between fungi and algae: Lichens: Classification, Morphology, anatomy, Special vegetative structures associated with lichen thallus; Reproduction; Ecological and Economic importance. ● Definitions, symptoms, classification and etiology of major plant diseases ● Able to perform laboratory techniques (Whole mounts, Maceration, Smearing, Section cutting, Squash, Light microscopy, Digital image projection and Micrometry and also prepare temporary mounts of type specimen of algae and fungi ● General characters, classification up to orders Morphology, anatomy, reproduction and life history of Bryophytes, Pteridophytes and gymnosperms.
<p>Plant Ecologyand Taxonomy BOTA102</p>	<p>Students are familiar with:</p> <ul style="list-style-type: none"> ● The various biotic and abiotic factors of ecosystem ● Various plant communities ● Knowledge of food chain, food web, ecological pyramids and biochemicalcycles ● Succession & its mechanism. ● Flow of energy in various trophic levels. ● How various components of ecosystem ● How energy flows from one trophic level to other ● Biogeochemical Cycles ● They are able to understand the complex interaction between abiotic andbiotic components and know the importance of environment conservation ● Binomial nomenclature, principles and rules; Principle of priority ● Type concept and keys to identification of plants; ● Herbarium and Botanical Garden’s functions, important herbaria andbotanical gardens of world and India ● Taxonomic evidence from palynology, cytology, photochemistry andmolecular data.

<p>Plant anatomy and embryology BOTA 201</p>	<ul style="list-style-type: none"> ● Students learn the Meristematic and permanent tissues ● They understand the Shoot System Shoot, leaf and root system of plants. ● They know the histological organization of the Shoot, leaf and root. ● They know the morphology and modifications of these structures students learn about: ● Microsporangium, Microsporogenesis, pollen grains and detailed account of its structure ; Pollen aperture type and NPC system; Pollination; Pollen-pistil interaction; Self incompatibility; Pollen germination and development of male gametophyte ● Megasporangium (Ovule); Megasporogenesis and Examples of female gametophyte, Double fertilization; Endosperm types and its biological importance; Embryogenesis in dicot (Capsella) and monocot (Sagittaria); Polyembryony; Apomixis (Vegetative reproduction and Agamospermy. Structure of dicot and monocot seed; Fruit types; Dispersal mechanism in fruits and seeds.
<p>Plant Physiology and metabolism BOTA204</p>	<p>Students will enable to understand the following topics:</p> <ul style="list-style-type: none"> ● Plant water relations, transpiration, guttation and stomatal movement. ● Mineral nutrition and their absorption and transport mechanisms. ● Photosynthesis: pigments, photosystems, photophosphorylation, photorespiration ● Respiration: glucose breakdown pathways and energy synthesis. ● Enzyme: structure, function and properties. ● Plant hormones and their role
<p>Economic Botany & Biotechnology BOTA301</p>	<ul style="list-style-type: none"> ● The students will understand the concept of the centre of origin of major economic crops. Name of research centres and institute of Rice, Wheat, Maize, Potato. ● Students know the Distribution, botanical description and brief idea of cultivation and uses of major Cereals, Vegetables, Fibres, Oils, Medicinal plants, Beverages, Spices. ● To understand the techniques of Plant tissue culture techniques, Genetic Engineering, Gene sequencing and ELISA. ● to understand the effect of Biotechnology on agriculture and horticulture .

<p>Cell and Molecular Biology BOTA 303</p>	<p>The students will understand-</p> <ul style="list-style-type: none"> ● Chemistry of the Cell ● Brief account of Basic Techniques used in Cell Biology ● Viruses and Bacteria ● Eukaryotic Cell Structure ● Chromosomes and Cell Division ● Discovery, Properties, Chemistry and functioning of DNA, RNA etc. ● Processes like replication and translation.
<p>Biofertilizer BOTA203</p>	<ul style="list-style-type: none"> ● The students will understand about the types of fertilizers, various microorganisms used as biofertilizers, organic farming, Green manuring etc.
<p>Gardening and Floriculture BOTA 204</p>	<ul style="list-style-type: none"> ● The students will have an idea about Landscape Gardening and Floriculture, history of gardening, importance, status and scope of Floriculture and Landscaping along with gardening operations, designs and types of flora and propagation of the plants used in gardening
<p>Medicinal botany and ethnobotany BOTA306</p>	<ul style="list-style-type: none"> ● The students will understand Brief history of use of medicinal herbs; Introduction, concept, scope and objectives of Ethnobotany; Major and minor ethnic groups or Tribes of India, and their lifestyles along with the plants used by them. habitat and morphology of some ethnobotanically important plants.
<p>Mushroom cultivation techniques BOTA307</p>	<ul style="list-style-type: none"> ● The students will know about the requirement and scope of mushroom cultivation. The techniques of cultivation of some edible mushrooms by different types including low cost growing techniques, their nutritive values, different types of mushroom dishes and pest management etc.

Programme Outcomes: B. Sc. Zoology

<p>Programme outcomes</p>	<p>After successful completion of three-year degree program in Zoology a student should be able to:</p>
	<p>PO1. Able to know the various animals from different taxa</p>
	<p>PO2. General characters and classification up to classes of different animals</p>
	<p>PO3. To inculcate good laboratory practices in students and to train them about proper</p>

	handling of lab instruments.
	PO4. Distinguish between various animals in accordance with their morphological characteristics.
	PO5. Know the connecting links, different larval forms, parasites.
	PO6. Analyse complex interactions among the various animals of different phyla, their distribution and their relationship with the environment.
	PO7. Understands the complex evolutionary processes and behaviour of animals.
	PO8. Correlates the physiological processes of animals and relationship of organ systems.
	PO9. Understands about various concepts of genetics and its importance in human health.
	PO10. Apply the knowledge and understanding of Zoology to one's own life and work.
	PO11. Develops empathy and love towards the animals .
Program Specific Outcomes	PSO1. Understand the nature and basic concepts of non chordates and chordates, comparative anatomy of vertebrates and developmental biology, physiology and biochemistry, genetics and evolutionary biology, applied zoology and immunology.
	PSO2. Analyse the relationships among different animals.
	PSO3. Perform procedures as per laboratory standards in the areas of animal diversity, comparative anatomy of vertebrates and developmental biology, physiology and biochemistry, genetics and evolutionary biology, applied zoology and immunology.
	PSO4. Understand the applications Apiculture, Aquaculture, Sericulture and Medical Diagnostics.
B.Sc 1st Year	
Animal Diversity (Zool-101)	CO1-Familiar with the non-chordate world that surrounds us. Describe the life histories of some protozoan and helminth.
	CO2-Able to identify the invertebrates and classify them up to the class level with the basis of systematic.
	CO3-Understand the basis of life processes in the non-chordates and recognize the economically important invertebrate fauna.
	CO4-Describe the diversity in form, structure and habits of vertebrates.
	CO5-Explain general characteristics and classification of different classes of vertebrates.

	Classify and characterize Phylum-Protozoa and Phylum Porifera to Mammals.
Comparative Anatomy and Developmental Biology of Vertebrates (Zool-102)	CO1-Describe the anatomy of Integumentary System, Skeletal System, Respiratory System, Circulatory System, Urinogenital System, Nervous System and Sense Organs.
	CO2-Develop the basic concepts of Developmental Biology.
	CO3-Explain the fundamental concept of embryogenesis, organogenesis, placentation and programmed cell death
B.Sc. 2nd Year	
Physiology and Biochemistry (Zool-201)	CO1-Understand the function of various systems (Nervous system, Digestion, Respiration, Excretion, Cardiovascular system, etc.).
	CO2-Fundamental understanding of metabolism of carbohydrates, proteins and lipids.
	CO3-Familiar with various biochemical pathways.
	CO4-Explain Enzyme catalysis and kinetics.
	CO5-Apply the knowledge to lead a healthy life.
Genetics and Evolutionary Biology (Zool-202)	CO1-Appreciate the contribution of Mendel's work on transmission of traits.
	CO2-Explain Mendelian Genetics and its Extension (Principles of Inheritance, Chromosome theory of inheritance, Incomplete dominance and co-dominance, Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, sex linked inheritance, extra-chromosomal inheritance).
	CO3-Describe Linkage, Crossing Over and Chromosomal Mapping.
	CO4- Different types of Mutations and Sex Determination.
	CO5- Understand Evolutionary Theories and Direct Evidences of Evolution.
	CO6- To correlate the theories with the evidence.
Medical Diagnostics (Zool-203) Apiculture (Zool-204)	CO1- Familiarize with different Diagnostics Methods Used for Analysis of Blood (i.e. DLC, ESR, PCV, etc.).
	CO2- Know various Diagnostic Methods used for Urine Analysis; Physical characteristics and Abnormal constituents of Urine.
	CO3- To distinguish infectious (Tuberculosis and Hepatitis) and non-infectious diseases (Diabetes, Hypertension).
	CO4-Familiar with the tools and techniques eg. Medical imaging: X-Ray of Bone

	fracture, PET, MRI and CT Scan (using photographs).
	CO1-Understand Biology of Bees.
	CO2- Familiarize with Beehives – Newton and Langstroth; Bee Pasturage; Beekeeping Equipment; Methods of Extraction of Honey (Indigenous and Modern); Entrepreneurship in Apiculture.
	CO3- Acquainted with Various Diseases of Honey Bees; Products of Apiculture Industry and its Uses (Honey, Beeswax, Propolis), Pollen, etc.
	CO4- Apply the knowledge and understanding.
B.Sc. 3rd Year	
Applied Zoology (ZOOL-301 A)	CO1- Identify various parasites and pests.
	CO 2- Explain various terms eg. Host, Definitive host, Intermediate host, Parasitism, Symbiosis, Commensalism, Reservoir, Zoonosis.
	CO3-Describe the life histories of Rickettsia prowazekii, Borrelia recurrentis and Treponema pallidum; Entamoeba histolytica, Plasmodium vivax and Trypanosoma gambiense; Ancylostoma duodenale and Wuchereria bancrofti.
	CO4- Explain the economic importance of some insects (Helicoverpa armigera, Pyrrilla perpusilla and Papilio demoleus, Callosobruchus chinensis, Sitophilus oryzae and Tribolium castaneum).
	CO5- Aware of Medical importance and control of Pediculus humanus corporis, Anopheles, Culex, Aedes, Xenopsylla cheopis.
	CO6- Understand techniques and management of Animal Husbandry, Fish Farming and Poultry Farming.
Immunology (ZOOL-302 B)	CO1- Appreciate the contribution of great immunologists
	CO2- Distinguish Innate immunity and Acquired Immunity
	CO3- Understand the importance of Immune system
	CO4-Describe various types of antibodies and their interaction with antigens
	CO5-Describe the molecular structure and function of major histocompatibility complexes and various types of hypersensitivity reactions.
Sericulture (ZOOL-303) Aquarium Fish Keeping(ZOOL-304 A)	CO1-Provide knowledge about different types of silkworms, Distribution and Races Exotic and indigenous races Mulberry and non-mulberry Sericulture.
	CO2- Explain life history of Bombyx mori (Mulberry silk moth).

	CO3- Understand various pests, predators and diseases of silkworms.
	CO4- Acquainted with techniques of Rearing of Silkworms and their benefits.
	CO1- Familiarize with scope of Aquarium Fish Industry as a Cottage Industry, Exotic and Endemic species of Aquarium Fishes; General characters and sexual dimorphism of Freshwater and Marine Aquarium Fishes such as Guppy, Molly, Sword tail, Gold fish, Angel fish, Blue morph, Anemone fish and Butterfly fish.
	CO2- Describe how to maintain Aquarium and Fish handling, packing and forwarding techniques.
	CO3- Apply the knowledge for employment.
ZOOL 101 & 102,	CO1- To identify various invertebrates and vertebrate specimens.
	CO2- Demonstrate various permanent slides with the aid of a microscope.
	CO3- To identify poisonous and non-poisonous snakes with the help of a key.
	CO4- Study disarticulated skeleton of frog and rabbit.
	CO5- Acquainted with different types of placenta- histological sections through permanent slides or photomicrographs.
	CO6- Students are able to handle microscopes.
	CO7- Recognize the live forms of vertebrates and invertebrates.
ZOOL-201 & 202	CO1-Gain skill about histological slide preparation, staining and mounting.
	CO2- Students gain skill about estimation of total protein in given solutions by Lowry's method.
	CO3- Study of permanent slides/histological sections of spinal cord, duodenum, liver, lung, kidney, bone, cartilage, mammalian pituitary, thyroid, pancreas, adrenal gland, etc.
	CO4- Understand various human karyotypes.
	CO5- Describe homology and analogy from suitable specimens/ pictures.
	CO6- Tell about the Phylogeny of horses with diagrams/ cut outs of limbs and teeth of horse ancestors.
ZOOL-301 & 302	CO1- Study of arthropod vectors associated with human diseases: Pediculus, Culex, Anopheles, Aedes and Xenopsylla.
	CO2- Visit to poultry farms or animal breeding centres. Submission of visit report.

	CO3- Acquainted with the knowledge of maintenance of freshwater aquariums.
	CO4- Learn various immunological techniques (ELISA, Immunoelectrophoresis ABO blood group determination, etc).
	CO5- Demonstrate various lymphoid organs.