

FACULTY OF SCIENCE AND TECHNOLOGY

NAME OF THE PROGRAMME: Bachelor of Science

3 YEARS DEGREE COURSE: SUBJECTS TO BE OFFERED AS PER UNIVERSITY DIRECTIONS

Programme Outcome

The under-graduate programme is aimed at making student capable of comprehending the post-graduate syllabus and be able to analyse simple as well as complex situations involving application of scientific concepts in real life situations. B.Sc. graduates would apply their expansive knowledge of science over a scope of fields, with inside and out learning in at least one field of discipline of their studies, while exhibiting a comprehension of the nearby and worldwide settings in which science is rehearsed.

A science graduate is expected to articulate the methods of science and explain why current scientific knowledge is both contestable and testable by further inquiry. Develop the skill and ability to apply and understand the principles of various disciplines objectively, creatively and through independent thinking. Apply appropriate methods of research, investigation and design, to solve problems in science.

A science graduate would be competent and independent enough for further studies within the field, can work in an autonomous and sorted out way, set objectives for specified work, devise a work routine and tail it.

Physics

Program Specific Outcome (PSO)

1. Develop scientific attitude and temperament and give emphasis on the development of experimental skills, data analysis, calculation, measurements and also on the limitations and precautions about the experimental method data and results obtained.
2. To apply graduate-level knowledge and solve problems in the areas of electrodynamics, quantum mechanics, classical mechanics, statistical mechanics, mathematical physics and Nanoscience and nanotechnology, Electricity and magnetism, Atomic physics, Nuclear – Physics
3. Understand theories of physics and its relevance in present day Technology.
4. Study the strength of equation, format graphs, and mathematical tools to solve the problems.

5. Make models and circuits through the study of digital electronics.

Course outcomes (CO)

On the completion of the course the students are able to:

1. Explain the concept of Gravitation, Astrophysics, planetary motion, rotational motion of rigid body and moment of inertia and concept of linear, angular momentum and Newton's laws of Motion (Mechanics)
2. Understand the concept of properties of matter viz. Elasticity, viscosity, surface tension, thermodynamics and Kinetic theory.
3. Interpret and illustrate concepts of sound waves, acoustics and ultrasonic and oscillations (Free, damped and forced oscillation).
4. Honed the skilled to understand Electrostatic properties, Magnetostatics, magnetism, Electromagnetic nature.
5. Develop the understanding of the optical phenomenon such as interference, diffraction, polarization, reflection, refraction, transmission etc.
6. Acclimatize with the concept of solid state Physics, relativity, Nuclear Physics, Bio-Physics, X-ray, Laser, Raman spectroscopy, Electron spin resonance, Nuclear magnetic Resonance, Atomic and molecular physics.
7. Learn the basics of solid state electronics eg. BJT, FET, JFET, MOSFET, also communication and digital electronics, fibre optical communication.
8. Gain the knowledge of quantum mechanical concepts applicable in understanding behaviour of nanomaterials and applications in nanotechnology.

Chemistry

Programme Specific Outcomes (PSOs):

- ❖ Students will demonstrate an understanding of major concepts in all disciplines of chemistry.
- ❖ Students will employ critical thinking and the scientific method to design, carry out, record and analyze the results of chemical experiments and get an awareness of the impact of chemistry on the environment, society, and other cultures outside the scientific community.
- ❖ To enable students to develop an understanding of the principals of chemical safety and to enable them to apply these concepts when working in a laboratory.

- ❖ The principle, design, observations, procedures and calculations of the experiment results should demonstrate an understanding of practical's and its applications in different chemical industries and R&D laboratories.

Course Outcomes (PSOs) :

(I) Inorganic Chemistry (CH: 101, 301, 401, 601)

- ❖ To enables students to learn the atomic structure, concept of covalent bond, periodic table and its properties, S-block and P-block elements and chemistry of hydrides, oxides and oxyacides.
- ❖ To enables students to know about VSEPR and MO theories, Chemistry of elements of first, second, third transition series, Errors in Chemical Analysis, non-aqueous solutions, Chemistry of lanthanides and actinides.
- ❖ The students will understand some fundamental aspects of coordination compounds and isomerism, concept of oxidation and reduction, Colorimetry and Spectrophotometry, separation techniques, introductions of some inorganic polymers.
- ❖ To have the idea about Metal ligand bonding in Transition Metal Complexes, Electronic spectra of Transition Metal Complexes, Magnetic Properties of Transition Metal Complexes, Thermodynamic and Kinetic aspect of metal complexes, Organometallic Chemistry, Metal carbonyls, Bioinorganic Chemistry, concept of Hard and Soft Acids and Bases.

(II) Organic Chemistry (CH: 201, 302, 501, 602)

- ❖ To predict the outcome, chemical reactions, preparations & mechanism of organic reactions, stereochemistry of organic compounds, geometrical and conformational isomerism, and basics concept of alkanes, alkenes, dienes, alkynes and aromaticity.
- ❖ To impart the students concepts of the fundamentals of orientations in organic molecules, properties and mechanism involved in alkyl halides, polyhalogen compounds, aryl halides, alcohols, phenols, aldehydes, ketones, carboxylic acids and its derivatives.

- ❖ To understand the basic concepts and mechanisms organic compounds of nitrogen, heterocyclic compounds, elemental analysis, organometallic compounds, UV-visible and infrared spectroscopy and its application.
- ❖ To learn the concept of NMR Spectroscopy and its applications, Organic synthesis via enolates, carbohydrates, amino acids, peptides, proteins, nucleic acids, synthetic drugs, dyes and detergents.

(III) Physical Chemistry (CH : 102, 202, 402, 502)

- ❖ To acquaint knowledge on basics of thermodynamics, gaseous states, liquid state, properties of liquids, surface chemistry and catalysis.
- ❖ Students to learn and understand about second law of thermodynamics, free energy functions, chemical equilibrium, phase rule, chemistry of liquid-liquid mixtures, nuclear chemistry, molecular structure, chemical kinetics and theories of chemical kinetics.
- ❖ To provide an insight into the properties of solid state, electrochemistry, rotational and vibrational spectroscopy, basics of quantum chemistry.
- ❖ To get an overview about the concept of electrochemistry, quantum mechanics and MOT, photochemistry, Raman spectroscopy, Colligative properties and Macromolecules.

(IV) Laboratory Courses (CH : 103, 203, 303, 403, 503, 603)

- ❖ To analyse and determine the acid and basic radicals from inorganic mixture using basic knowledge of qualitative analysis, basics experiments based volumetric analysis, preparation of inorganic complexes, chromatographic separation of binary mixtures, gravimetric and colorimetric analysis
- ❖ Students will gain an understanding of method of analysis related to element detection, functional group detection, synthesis of organic compounds, determination of organic compounds by chemical analysis, estimations of acids, glucose, amide, nitro group, saponification of oils, separation of binary mixture and analysis of organic compound.

- ❖ To perform and understand the experimental procedures during physical chemistry experiments, Students will enable the standard procedures and principles of physical chemistry experiments, handling of instruments, instrumental analysis techniques,

Mathematics

Programme Specific Outcome

Mathematics UG student at Dr. Ambedkar College, Deekshabhoomi, Nagpur will be able to apply critical thinking skills to solve problems that can be modeled mathematically, to critically interpret numerical and graphical data, to read and construct mathematical arguments and proofs, to use computer technology appropriately to solve problems and to promote understanding, to apply mathematical knowledge to a career related to mathematical sciences or in post - UG studies.

Course Outcomes

Course/Semester/Paper	Name of Paper	Course outcome
B.Sc. Sem I Paper I	Algebra and Trigonometry	To inculcate knowledge on Algebra, Trigonometry and their properties & proofs.
B.Sc. Sem I Paper II	Calculus	To inculcate knowledge on the ability to find the effects of changing conditions on a system.
B.Sc. Sem II Paper I	Geometry, Differential and Difference Equations	To inculcate knowledge on solve problems in analytic geometry and able to find appropriate solutions for given problems. To inculcate knowledge on solving of first and second order Ordinary Differential equations.
B.Sc. Sem II Paper II	Vector Calculus and Improper Integrals	To inculcate knowledge on Vector Calculus and Improper Integrals and their properties & proofs.

B.Sc. Sem III Paper I	Advanced Calculus ,Sequence and Series	To inculcate knowledge on Advanced Calculus ,Sequence and Series and their properties & proofs.
B.Sc. Sem III Paper II	Differential Equations & Group Homomorphism	To inculcate knowledge on Differential Equations & Group Homomorphism and their properties & proofs.
B.Sc. Sem IV Paper I	PartialDifferential Equations & Calculus of Variation	To inculcate knowledge on Partial Differential Equations & Calculus of Variation and their properties & proofs
B.Sc. Sem IV Paper II	Mechanics	To inculcate knowledge on Classical Mechanics and their properties & proofs.
B.Sc. Sem V Paper I	Analysis	To inculcate knowledge on analysis and their properties & proofs.
B.Sc. Sem V Paper II	Metric Space, Complex integration & Algebra	To inculcate knowledge on Metric space, complex integration, algebra and their properties & proofs.
B.Sc. Sem VI Paper I	Abstract Algebra	To inculcate knowledge on Abstract Algebra and their properties & proofs.
B.Sc. Sem VI Paper II	Special Theory of Relativity(Optional Paper)	To inculcate knowledge on Special theory of relativity and various properties & proofs.

Computer Science

Student learning outcome

- Explain about the basic concepts of program development statements and its syntax.
- Explain the various types of arrays and its structure.
- Explain the top-down and bottom-up programming approach and apply bottom up approach to solve real world problems.
- Discuss the generic data type for the data type independent programming which relate it to reusability.
- Explain about basic Java language syntax and semantics to write Java programs
- Discuss the the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods
- Describe the basic components of an operating system and their role in implementations for general purpose, real-time and embedded applications.
- Explain what multi-tasking is and outline standard scheduling algorithms for Multi-tasking.
- Explain the basic Concepts of Program building block control statements and the basic concepts of function and procedure.
- Describe the functionality and properties of GUI based ActiveX Control with example programs
- Describe the fundamentals of File processing and database processing system.
- Explain the various normal forms and its role in DBMS.

Botany

Programme Specific Outcome

1. Know the characteristics, systematics, morphology, structure and life cycle pattern of Viruses, Mycoplasma, Bacteria, Cyanobacteria, Algae, Fungi, Lichens, Bryophytes and Pteridophytes.
2. Understand the diversity, systematics and biology of seed plants.
3. Understand the nature and basic concepts of cell biology, genetics, anatomy, morphology, Biochemistry, Physiology, Taxonomy and ecology.
4. Analyze the interrelationships among prokaryotic and eukaryotic organisms

5. Study of organization and function of the gene, genome, cell, tissue, organ and organ-system including development, reproduction, ecological and physiological adaptations and behavior of different forms of life.
6. Understand the importance of plants, their diversity and its conservation.
7. Achieve pure and applied botanical knowledge.
8. Perform procedures as per laboratory standards in the areas of Biochemistry, Physiology,
Biotechnology, Taxonomy, Economic Botany and Ecology
9. Demonstrate hands on skill in the experimental techniques and methods of analysis in various field of Botany.
10. Generate test hypotheses, observations, data, analyze and interpret results, derive conclusions, and evaluate their significance within a broad scientific context.
11. Promotes stewardship responsibility, entrepreneurship skill, research and career opportunities.

COURSE OUTCOMES

B.Sc. SEMESTER-I	PAPER-I (Viruses, Prokaryotes & Algae)	<ul style="list-style-type: none"> • To study in depth about Viruses, Prokaryotes & Algae. • To gain knowledge about microbial diversity. • To Know the General characteristics, systematics, morphology, Ultramicroscopic cell structure and life cycle pattern of Viruses, Mycoplasma, Bacteria, Cyanobacteria and Algae. • To Understand the useful and harmful activities of Viruses, Mycoplasma, Bacteria, Cyanobacteria and Algae. • Learn about the General characteristics, Classification (Fritsch 1954) of Algae.
	PAPER-II (Fungi, Lichen, Plant- Pathology & Bryophyta)	<ul style="list-style-type: none"> • To give information about Fungi, Lichen, Plant Pathology & Bryophyta and their life cycle. • Know the General characteristics, Classification of Fungi & Bryophyta. • To make them Understand the Life history of <i>Albugo</i>, <i>Mucor</i>, <i>Puccinia</i>, <i>Cercospora</i>, <i>Riccia</i>, <i>Anthoceros</i>, <i>Funaria</i>. • To explore host, pathogen, symptoms, Causes and Control of Leaf curl of Papaya, Citrus canker and Red rot of Sugarcane • To Understand the types, Reproduction in Lichens. • Know about the Economic importance of Fungi, Lichen and Bryophyta

PRACTICAL PAPER I & II		<p>Students should understand,</p> <ul style="list-style-type: none"> • Study of Bacterial forms, <i>Nostoc</i>, <i>Oedogonium</i>, <i>Chara</i>, <i>Vaucheria</i>, <i>Ectocarpus</i>. • Study of <i>Albugo</i>, <i>Mucor</i>, <i>Puccinia</i>, <i>Cercospora</i>, Lichen, Plant pathology, <i>Riccia</i>, <i>Anthoceros</i> and <i>Funaria</i>. • Botanical Excursions
B.Sc. SEMESTER -II	PAPER-I (Pteridophyta & Gymnosperm)	<ul style="list-style-type: none"> • Know about the Classification system General characters, Economic importance, alternation of generation of Pteridophyta and Gymnosperms. • To make them know the life history of <i>Rhynia</i>, <i>Selaginella</i>, <i>Equisetum</i>, <i>Cycas</i>, <i>Pinus</i>, and <i>Cycadeoidea</i>.
		<ul style="list-style-type: none"> • To study the concepts of Apogamy, Apospory, Stellar system in pteridophytes, heterospory and seed habit.
	PAPER-II (Palaeobotany & Morphology of Angiosperms)	<ul style="list-style-type: none"> • Study of geological time scale, fossilization, types of fossils and fossil plants. • Understand the fossil genera <i>Glossopteris</i> representing fossil groups. • To Understand the Root, Stem and Leaf Morphology of Angiosperms. • To be familiar with types Inflorescence and details of typical flower including various parts. • To provide information about classification and types of fruits.
PRACTICAL PAPER I & II		<ul style="list-style-type: none"> • To learn about the structure and reproduction of certain selected species of Pteridophytes and Gymnosperms. • To Study Fossils, types forms, and modification of Root, Stem, Leaf, Inflorescence, Flowers and Fruits. • Study Tour
B.Sc. SEMESTER -III	PAPER-I (Angiosperm Taxonomy)	<ul style="list-style-type: none"> • To study Origin and Phylogeny of Angiosperm & Fossil Angiosperms • Comprehend the concepts of plant taxonomy and classification of Angiosperms. • To give knowledge about Phytochemistry cytology and evolutionary relationship among taxonomic groups. • To understand the comparative account of selected angiosperms families and its economic value.
	PAPER-II (Cell Biology, Plant Breeding & Evolution)	<ul style="list-style-type: none"> • Cell biology give knowledge about structure of typical plant cell, cell organelles & their structure, chemistry and functions. • To study chromosome organization and cell division in plants and their significance. • To understand the various techniques in plant breeding, biostatistics and theory of evolution.

PRACTICAL PAPER I & II		<ul style="list-style-type: none"> • Study of Angiospermic Families- Malvaceae, Brassicaceae, Fabaceae (Papilionoideae, Caesalpinioideae, Mimosoideae), Asteraceae, Asclepiadaceae, Euphorbiaceae and Poaceae. • Study of fossil Angiosperms micropreparation and specimens: <i>Sahiananthus</i>, <i>Enigmocarpon</i> • To study Cell division- mitosis & meiosis in plant material. • To calculate Mean, Mode, Median, standard error, the student's t-value. • Botanical Excursion
B.Sc. SEMESTER- IV	PAPER-I (Angiosperm Anatomy & Embryology)	<ul style="list-style-type: none"> • To describe Angiosperm Anatomical & Embryological characters related to study of plants. • To study tissues and their functions.
	PAPER-II (Genetics & Molecular Biology)	<ul style="list-style-type: none"> • Understand the various components of root & stem and its primary and secondary growth. • Types of vascular bundles- dicots and monocots in dicot and monocot plants; Secondary growth and anomalous secondary growth in <i>Bignonia</i> and <i>Dracaena</i> stem. • Anatomy of leaf: Dicot (<i>Nerium</i>), monocot (<i>Maize</i>). • Learn about double fertilization and their significance. Be enlightened about the mechanism of pollination and basic structure and development of the embryo.
PRACTICAL PAPER I & II		<ul style="list-style-type: none"> • Knowledge about Mendelism, genes interaction, linkages, crossing over, chromosome variation • To understand the biochemical nature of nucleic acids, their role in living systems. • To understand the process of gene expression synthesis, genetic code and operon concept.
PRACTICAL PAPER I & II		<ul style="list-style-type: none"> • To Study simple tissue, complex tissue and secretory tissue, types of vascular bundles, internal structure of dicot and monocot root - <i>Sunflower</i>, <i>Maize</i>., internal structure of dicot and monocot stem - <i>Sunflower</i>, <i>Maize</i>, internal structure of secondary growth and anomalous secondary growth - <i>Bignonia</i> and <i>Dracaena</i> stem, internal structure of leaves- <i>Nerium</i>, <i>Maize</i>. • To Study of types of ovules, anther structure, pollen grains, adaptations for pollination • To calculate the percent pollen germination in the given anthers. • To prove the Mendel's law of segregation and independent assortment with the help of coloured beads. • To workout the type of gene interaction in the given cross. • Visit to Research Laboratories, Industries, Nurseries, Field visit.
B.Sc. SEMESTER -V	PAPER-I Biochemistry & Plant Physiology-I	<ul style="list-style-type: none"> • To give knowledge about Biochemistry & Plant Physiology-I • Study of Carbohydrates, Lipids and Amino acids and basics of Enzymology. • To study Plant-water relations and mineral nutrition. • Study the process of respiration and photosynthesis in higher plants • Know the nitrogen metabolism and its importance.

	PAPER-II Plant Ecology I	<ul style="list-style-type: none"> • To study of basics of ecology and environmental factors • To provide knowledge about natural resources and their importance in sustainable development. • Know the importance of ecosystem-components, Food chain, Food web, Ecological pyramids. • Understand plant communities, Climatic & Phytogeographic regions of India.
		<ul style="list-style-type: none"> • To understand by performing some physiological and ecological experiments • To study the effect of various chemicals on permeability of
	PRACTICAL PAPER I & II	<p>membranes, the ascent of sap in suitable plant material, to separate chlorophyll pigment by paper chromatography, to determine the RQ of given plant material, to perform microchemical tests for determination of reducing and non-reducing sugars, starch, cellulose, oils and proteins, to study the effect of light intensity and quality, CO₂ concentration and temperature on rate of photosynthesis by suitable method, to determine osmotic potential of the cell sap by plasmolytic method, to study the activity of enzyme amylase, catalase and peroxidase.</p> <ul style="list-style-type: none"> • To determine frequency, density, abundance of the community by quadrat method, to determine the homogeneity of vegetation by Raunkiers frequency diagram, to determine the water holding capacity of the given soil samples, to determine the water rising capacity of the given soil samples, to determine the soil moisture of the given samples. • Botanical Excursion.
B.Sc. SEMESTER- VI	PAPER-I Plant Physiology- II & Biotechnology	<ul style="list-style-type: none"> • Know the scope of plant physiology & biotechnology. • To understand Growth Concept, Phytochromes, biological clock, plant growth regulators and plant movements. • Understand the concept of Photoperiodism and vernalization, • To learn Seed dormancy and plant defence mechanism. • Understand the basics of genetic engineering and tissue culture techniques and its application.
	PAPER-II (Plant Ecology- II, Techniques & Utilization of Plants)	<ul style="list-style-type: none"> • Understand the Plant succession, Morphological, Anatomical & Physiological adaptations. • Learn about Environmental Pollution, management, natural and resources. • Learn skill on working Principles, types and application of: microscopy, centrifugation, electrophoresis, spectroscopy, chromatography, pH meter. • Knowledge about utilization of plants and ethno botany to enable the student about utility in life.

<p style="text-align: center;">PRACTICAL PAPER I & II</p>	<ul style="list-style-type: none"> • Learn about the ecological adaptations and human interference in environment as analysis of water samples provides great concern towards environmental audit. • To determine seed viability, the effect of various plant growth regulators on the growth and development of plants. • To study the morphological and anatomical characteristics hydrophyte and xerophytes, the morphological characteristics of cladode, phylloclade, phyllode and pneumatophores. • To determine the DO, salinity (chlorides), transparency, pH and temperature of water samples different sources. • To study the dust holding capacity of leaves, the percent leaf-area injury of different leaf samples collected around polluted sites.
	<ul style="list-style-type: none"> • Learn about the utilization of Plants: Morphology, Utilization and Important chemical constituents of plants. • To study the plants of Ethnobotanical importance. • Electrophoretic/chromate graphic separation of amino acids carbohydrates. • Botanical Excursions

Zoology

Program Specific Outcome (PSO)

A broad understanding of animal diversity, including scientific classification and evolutionary relationships of major phyla/groups of animals is the prime objective. The structural and functional relationships at different levels of biological organization (e.g., molecular-, cellular-, tissue-, organ-, organismal-, population-, and species-level organizations) with respect to major phyla/groups of animals is conceptualized in order to understand the life and its prevalence.

To study the interactions of biological, chemical, and physical features of environment or the habitat (e.g., terrestrial, freshwater, marine, host) among living organisms is also emphasized upon. To get aware of the animal growth n development, metabolism and propagation of pre-existing life forms is predominantly included.

A latest elementary understanding of **genetics** and inheritance; **molecular** concepts; micro-techniques; **biotechnical** procedures; **immunological** interactions; **bio-statistics** and **bio-informatics** related to the living forms and their progression is not left out.

Further, the students are made aware of the application of zoology in different facets of mankind environment under the banner of economic zoology such as **seri-culture**, **api-culture**, **lac-culture**, **aquaculture**, Industrial **microbiology**, **rDNA technology**, medicines and **vaccines** of different nature/origin and of course a voluntary effort of briefing of the related **career opportunities**.

Course Outcome (CO): Zoology (Semester-wise)

Semester 01

Paper – I : Life and Diversity of Animals-Nonchordates (Protozoa to Annelida)

Paper -II : Environment Biology

Practical - I (Based on Paper I & II)

The prime objective of paper I and Paper II is to provide fundamental knowledge of animal (without cord), diversity and to provide a much needed environmental awareness and conservation instincts among the students.

1. To make students familiar with the non-chordate (without cord) animals that surrounds us starting from protozoans to annelid group of animals;
2. To reach out to their life cycles of key animals and evolutionary aspects including the connecting animals between two phyla/groups;
3. To understand the environment in different spheres like atmos-, litho- and hydro-sphere; and ecology in interaction with animals and of course conservational aspects of both;
4. To technically/scientifically make the students able to identify the non chordate/invertebrates and classify them up to the class level with the basis of systematic and to comment upon them;
5. To make practically aware of evaluating the animal interactions with environmental parameters and their basic assessment procedures such as pH, oxygen demand and plankton counts in waters;
6. To expose students to the various research-labs/-institutions or animal culture centers/museums/social outreach points if any in and around city per two semesters.

Course Outcome (CO): Zoology (Semester-wise)

Semester 02

Paper - III : Life and Diversity of Animals- Non-chordates (Arthropoda to Hemichordata)

Paper - IV : Cell Biology

Practical - II (Based on Paper III & IV)

The prime objective of paper III and Paper IV is to provide fundamental knowledge of remaining animals (without cord), diversity and to provide a basic know-how of the structural & functional unit of life, the cell.

1. To make students familiar with the non-chordate (without cord) animals that surrounds us starting from arthropods to hemichordate group of animals;
2. To reach out to their life cycles of key animals and evolutionary aspects including the connecting animals between two phyla/groups;

3. To understand the structure of living cell and its organelles in relation to structure and function in significant types of cells such as prokaryotic- and eukaryotic-; plant- and animal-cell;
4. To know the cellular cycle of propagation, cell-divisions (mitosis & meiosis), -ageing and -death with an elementary introduction of cancer and its causative agents;
5. To technically/scientifically make the students able to identify the non chordate/invertebrates and classify them up to the class level with the basis of systematic and to comment upon them;
6. To have hands on experience/usage of pH-meter, microscopes and micrometer, weighing balance, solution making, staining and mounting of materials in practical sessions;
7. To expose students to the various research-labs/-institutions or animal culture centers/museums/social outreach points if any in and around city per two semesters.

Course Outcome (CO): Zoology (Semester-wise)

Semester 03

Paper - V : Life and Diversity of Animals-Chordates (Protochordata to Amphibia)

Paper - VI : Genetics

Practical - III (Based on Paper V & VI)

The prime objective of paper V and Paper VI is to provide fundamental knowledge of animal with cord diversity and to provide with a basic set of doctrines of genetics and its components.

1. To make students familiar with the chordate (with cord) animals that surrounds us starting from protochordates to amphibian group of animals;
2. To reach out to their life cycles of key animals and evolutionary aspects including the connecting animals between two phyla/groups;
3. To understand the process of development of animals; gametogenesis; fertilization; embryogenesis specially in frog including blastula, gastrulation and so on;
4. To impart the basic knowledge of genetics and Mendelian-, cellular- and extracellular-inheritance, linkage and crossing over concepts of genetic code and chromosomal-studies, -aberrations, -abnormalities and including applied aspects of genetics such as DNA fingerprinting, karyotyping used for identifying genetic disorders/syndromes and counseling for public awareness is also made aware to students;

5. To technically/scientifically make the students able to identify the chordate/vertebrates and classify them up to the class level with the basis of systematic and to comment upon them;
6. To have known practically about the hybrids and their ratio in genetics, karyotype studies of various syndromes, population genetic equilibrium with additional staining and mounting of materials for slide preparations;

Course Outcome (CO): Zoology (Semester-wise)

Semester 04

Paper - VII : Life and Diversity of Animals-Chordates (Reptilia, Aves and Mammals)

Paper - VIII : Molecular Biology and Immunology

Practical - IV (Based on Paper VII & VIII)

The prime objective of paper VII and Paper VIII is to provide fundamental knowledge of remaining animals (with cord) diversity and to provide with a basic know-how of molecular biology and immunology and techniques involved to inculcate the research interest/inclination.

1. To make students familiar with the chordate (with cord) animals that surrounds us including reptiles, birds and mammals;
2. To reach out to their life cycles of key animals and evolutionary aspects including the connecting animals between two phyla/groups;
3. To understand the process of development of animals; embryonic membrane development; embryogenesis especially in hen/fowl, mammalian placental structure n functions and additionally stem cell concept;
4. To have the elementary knowledge of molecular concept in biology including DNA, RNA and recombination, replications and protein synthesis, the basic natural phenomena occurring inside the cell and immunological aspects of human antigens and antibodies and the immune responses through T cells, B cells, cytokines and immune disorders;
5. To technically/scientifically make students able to identify the chordate/vertebrates and classify them up to the class level with the basis of systematic and to comment upon them including the bones and the embryo developmental stages of frog and fowl and the knowhow of the immune organs and interactions of antigen and antibody *in vitro* in practical sessions.

Course Outcome (CO): Zoology (Semester-wise)

Semester 05

Paper - IX :General Mammalian Physiology I

Paper - X : Applied Zoology I (Aquaculture and Economic Entomology)

Practical - V (Based on Paper IX & X)

The prime objective of paper IX and Paper X is to provide fundamental knowledge of comparative physiology of different systems in the living body and to provide an idea of applied aspects of zoology.

1. To make them explore the general human physiology such as digestion, respiration, circulation and the enzyme and hormones involved in these processes;
2. To make students know about the applied aspects of zoology by studying the various culture practices such as seri-, api-, lac-, pisci-, prawn-, pearl-culture and equipment n processes involved in them;
3. To make them understand the economic significance, maintenance and the obstacles and diseases related to these practices and their management and control through chemicals or biological indicators;
4. To make them practically know how the practices are carried out, students are taken to the practice sites nearby; experimentally estimating vitamins, foodstuffs in tha samples, the enzyme activities, blood cells counting for identifying diseases, identifying various pests and their control;
5. To expose students to the various research-labs/-institutions or animal culture centers/museums/social outreach points if any in and around city per two semesters.

Course Outcome (CO): Zoology (Semester-wise)

Semester 06

Paper - XI : General Mammalian Physiology II

Paper - XII : Applied Zoology II (Biotechniques, Microtechnique, Biotechnology, Bioinformatics and Biostatistics)

Practical - VI (Based on Paper XI & XII)

The prime objective of paper XI and Paper XII is to provide fundamental knowledge of comparative physiology of remaining systems in the living body and to provide an idea of applied techniques used to elevate enthusiasm towards higher education and research in zoology.

1. To make them explore the general human physiology such as neuron coordination, ecretion, endocrinology and reproduction to understand a human body in a better way;
2. To make students know about the another advanced applied aspects of zoology by studying the micro technique for section cutting, double staining and preparation of permanent slides for study and research purposes, different separation processes such as chromatography and electrophoresis, estimating different molecules of need through colorimeter or spectrophotometer and regular or basic bio-statistical, bio-technical and

bio-informational tools for advance studies and research methodologies, conclusively this paper pops up a research temperament in the students;

3. To create further interest into research, students are practically exposed to the different basic bio-statistical, bio-technical and bio-informational tools used in today's research scenario such as data handling, analysis, database searches with the help of various advanced protocols and tools available on wordl wide web.
4. To expose students to the various research-labs/-institutions or animal culture centers/museums/social outreach points if any in and around city per two semesters.

B.Sc. Microbiology

PROGRAM OUTCOMES (PO)

Students who have opted B.Sc. with microbiology as one of the subjects need to acquire following competencies after completion of Program.

PO 1	Develop the basic knowledge and concept of the various subjects in sciences.
PO 2	Understand the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevancies in the day-to-day life.
PO 3	Develop the skills of observations and drawing logical inferences from the scientific experiments.
PO 4	Develop scientific outlook not only with respect to science subjects but also in all aspects related to life.
PO 5	Acquire various communication skills such as reading, listening, speaking, etc., which we will help in expressing ideas and views clearly and effectively.
PO 6	Acquire ethical, moral and social values in personal and social life leading to highly cultured and civilized personality.
PO 7	Understand broader perspective of the various disciplines of Science to enable him to identify challenging societal problems and plan his professional career after graduation.

PROGRAM SPECIFIC OUTCOMES (PSO)

Students who have opted B.Sc. with microbiology as one of the subjects need to acquire following competencies after completion of Program.

PSO 1	Acquire basic knowledge and concept of the microbiology.
PSO 2	Understand the concepts and applications of diverse fields in microbiology such as medical microbiology, industrial microbiology, environmental microbiology, food microbiology, biotechnology etc.
PSO 3	Understand the detail knowledge of various types of microorganisms such as bacteria, viruses, fungi etc.
PSO 4	Learn key practical skills/competencies in working with microbes for study including the use of good microbiological practices.
PSO 5	Acquire the skills in handling scientific instruments, planning and performing laboratory experiments.
PSO 6	Develop an understanding of broader perspective of the discipline of Microbiology to enable him to identify challenging societal problems and plan his professional career after graduation.
PSO 7	Attain eligibility for choosing options pertaining to courses of higher studies.