

Course Outcomes (Science)

Department of Botany

Bachelor of Science:

SEM-I Paper -1

After completion of this course, the students will be able to:

1. Describe the basic concept of bacteria, virus and mycoplasma.
2. Explain types of bacteria, viruses and mycoplasma.
3. Describe Classification and general characteristic of Algae.
4. Analyse economic importance of bacteria, virus and algae.
5. Describe life-cycle of micro-organism and Algae.
6. Differentiate between bacteria and Algae.

SEM-I Paper -2

After completion of this course, the students will be able to:

1. Compare lower group of plants with higher.
2. Explain Fungi, Lichen, Plant diseases and Bryophytes.
3. Identify the different plant diseases.
4. Explain the Economic importance fungi, lichens and bryophytes.
5. Describe the classification of fungi and Bryophytes.

SEM-II Paper -1

After completion of this course, the students will be able to:

1. Explain the classification pteridophyte and gymnosperm.
2. Describe the economic importance of pteridophyte and gymnosperm.
3. Describe the alternation of generation pteridophyte and gymnosperm.
4. Explain the concept of heterospory and seed habit.
5. Describe morphology and anatomy of Cicadidae.

SEM-II Paper -2

After completion of this course, the students will be able to:

1. Compare the palaeobotany and geological time scale.
2. Identify the different type of fossils.
3. Explain the morphology and modification of plants.
4. Compare the types inflorescence and fruits.
5. Describe the parts of flower.
6. Explain the process of fossilization.
7. Describe fossil types in the field.

SEM-III Paper -1

After completion of this course, the students will be able to:

1. Describe general taxonomic rule of plant classification.
3. Explain the characteristics of local flora.
4. Describe the principal of botanical nomenclature.
5. Explain the classification of angiosperms.
6. Describe the merits and demerits of systems of classification.

SEM-III Paper -2

After completion of this course, the students will be able to:

1. Describe the structure of plant cell and its organelles.
2. Analyze the morphology of chromosome organization.
3. Explain the plant cell-division and its significance.
4. Evaluate the biostatic formulas.
5. Explain the method of plants breeding.
6. Describe the structure of typical plant cell and plant membrane.

SEM-IV Paper -1

After completion of this course, the students will be able to:

1. Classify the meristematic and permanent tissue based on origin and position.
2. Compare the different theories of tissue.
3. Explain primary, secondary and anomalous, anatomical structure of plant parts.
4. Explain the various types of pollination mechanism.
5. Explain the types of ovules. 6. Students will understand double staining technique.

SEM-IV Paper -2

After completion of this course, the students will be able to:

1. Describe the laws of Mendelism.
2. Describe the theories of linkage.
3. Design and construct the variation in chromosome structure and number.
4. Explain the concept of gene.
5. Explain the types of mutations and its application in crop –improvement

SEM-V Paper -1

After completion of this course, the students will be able to:

1. Classify and describe about biomolecules.
2. Describe about the basic of enzymes.
3. Describe plant water relation and mineral nutrients.
4. Explain the cycle of respiration and photosynthesis.

SEM-V Paper -2

After completion of this course, the students will be able to:

1. Define and explain about ecology branches and its significance.
2. Explain the environmental factors.
3. Explain the nitrogen cycle and its function.
4. Compare the various Phytogeographic regions of India.
5. Describe the types of ecosystem.
6. Explain the effect of climatic factors on vegetation.

SEM-VI Paper -1

After completion of this course, the students will be able to:

1. Describe the plant growth and its growth regulators.
2. Describe the seed –dormancy.
3. Describe the plant-defence and role of secondary metabolites.
4. Explain plant tissue culture technique and its application.
5. Compare the advantages and disadvantages of genetic-engineering.

SEM-VI Paper -2

After completion of this course, the students will be able to:

1. Compare the various ecological successions.
2. Explain different types of environmental pollution and its management.
3. Explain the renewable and non-renewable natural sources.
4. Analyze the principal, types and application of instruments.
5. Explain morphology utilization and chemical-constituents of different plants

Master of Science (Botany)

M.Sc. Sem.-I

Contents: Microbiology, Algae & Fungi

After completion of this course –

CO1: Explain/describe the structure, type and identification of Bacteria and cyan bacteria.

CO2: Describe Thallus structure, reproduction and economic importance algae.

CO3: Describe classification and structure of mycelium reproduction of fungal species.

CO4: Describe the cause of the plant diseases, causal organism, host and their relationship and control measure for plant diseases, understanding of fungicide and use of chemical physical and biological controlling of diseases mentioned in the unit.

Contents: Bryophytes and Pteridophytes

After completion of this course students will gain knowledge of –

CO1: Explain the characters, distribution, classification and regeneration in Bryophytes.

CO2: Describe the characters of different orders of Bryophytes.

CO3: Describe the process of stele evolution occurring in Pteridophytes.

CO4: Explain the classification of Pteridophytic classes and the morphological and anatomical characters of genus included in the different Pteridophytic order.

Laboratory exercise Contents: Microbiology, Algae & Fungi Bryophytes and Pteridophytes

CO1: Identify different types of forms of cyanobacteria.

CO2: Classify and identify the Algal and fungal genus and specimen included.

CO3: Prepare micro preparation of the material of Pteridophyta and bryophytes and identify anatomically.

CO4: Collect species from locality and identify morphologically during collection of material in the local visit.

Contents: Gymnosperm and Palaeobotany

After completion of this course –

CO1: Explain the function of fossil in the determination of age of plant materials,

CO2: Describe the application of Palaeobotany.

Contents: Cytology and Genetics

After completion of this course students will gain –

CO1: Describe gene from ‘something’, ‘factor’; and gene and one gene one enzyme one characters hypothesis.

CO1.1: Explain the interaction of gene, genetic recombination producing the characters differently.

- CO2: Describe the structure of chromosome and packaging of DNA occurs.
- CO2.1: Differentiate Euchromatin and heterochromatin region of chromosome on the basis of staining properties.
- CO2.2: Draw a karyotype and Ideograms of Karyotype, with a description on the evolution of Karyotype.
- CO3: Describe the different structural and numerical changes occurs in the chromosome.
- CO3.1: Use the trisomic and monosomic for the chromosome mapping.
- CO4: Describe the role and process of mutation and different mutagenic agent which brings about mutation in the organism inclusive of crop improvement and permutation.

Laboratory exercise Contents: Gymnosperm and Pale botany & Cytology and Genetics

- CO1: Demonstrate the skill to prepare double stained micro preparation of the given material and identify on the basis of observation.
- CO2: Demonstrate the skill of identifying the fossil specimen.
- CO3: Describe the action of low treatment of colchicine and para-dichlorobenzene to plant tissue creating polyploidy in the organism
- CO4: Draw figure of chromosome directly from microscope with the help of Camera Lucida and prepared an ideogram of chromosome on graph paper.

M.Sc. Sem.-II

Contents: Plant physiology and Biochemistry

After completion of this course –

- CO1: Describe the function and process of photosynthesis in plants.
- CO2: Describe the function of energy produced by respiration for normal functioning of body.
- CO3: Describe the role of metabolism to maintain living state of cells.
- CO3.1: Explain the role of nitrogen cycle in environment.
- CO4: Describe the function of enzymes in the function in body.
- CO5: Explain the pathways of water through xylem and phloem.

Contents: Plant development and Reproduction

After completion of this course –

- CO1: Explain the role of hormones in plant development.
- CO1.1: Describe the growth of shoot apical meristem.
- CO2: Describe photoperiodism and arrangement of leaf in plants.
- CO3: Describe the structure of anther and role of gene expression during pollen development.
- CO4: Explain the fertilization and pollen stigma interaction.
- CO4: Describe the action/process of endosperm provides nutrition to embryo development.
- CO4.1: Explain the process of germination of seed in plants.

Laboratory exercise experiments Contents: Plant Physiology and Biochemistry & Plant Development and Reproduction

- CO1: Extract chloroplast pigment from leaves.
- CO2: Identify structure of stomata while peeling epidermis leaves of Tradescantia.

Contents: Cell and Molecular Biology-I

After completion of this course –

- CO1: Explain the function of cell wall and plasmodesmata.
- CO2: Describe the role of cell organelles and different phases of cell division.
- CO3: Describe nucleus and its ultrastructure and identify various forms of DNA.
- CO4: Describe the importance of stresses in plants.

Contents: Angiosperm-I

After completion of this course –

- CO1: Describe the floral structure of Angiospermic plants and evolution of stamens and carpels
- CO1.2: Explain the adaptive feature of pollinators.
- CO2: Explain the scope, aim, principles of taxonomy.
- CO2.1: Explain the concepts of taxa, genus etc.
- CO3: Explain different taxonomic evidences.
- CO3.1: Describe the preparation of herbarium sheets and reading floras.
- CO4: Explain biosystematics and adaptive features of ICBN.

Experiment for exercise Contents: Cell and Molecular biology-I & Angiosperm-I

- CO1: Demonstrate skill to prepare staining of salivary gland chromosomes of chironomus larva.
- CO2: Perform the isolation of chloroplast.
- CO3: Explain floral symmetry and anatomical features of various taxa.
- CO4: Draw diagrams of pollen types, stamens, and carpels.

M.Sc. Sem.-III

Contents: Plant Ecology

After completion of this course –

- CO1: Describe the vegetative organization in community.
- CO1.1: Explain the changes take place during ecological succession.
- CO2: Describe the structure, role, and function of ecosystem and biogeochemical cycle in environment.
- CO3: Explain the effect of air, water and soil pollution in environment.
- CO3.1: Explain sources and role of greenhouse gases.
- CO4: Explain the invasive species of plant.
- CO4.1: Describe the procedure/process of ecological management.

Contents: Cell and Molecular biology-II

After completion of this course –

- CO1: Describe the structure and functions of ribosomes.
- CO1.1: Explain the process of transcription and translation in Prokaryotes and Eukaryotes.
- CO2: Describe the fine structure of gene.
- CO2.1: Explain the types of machinery involved in protein sorting.
- CO3: Explain the structure of phage genome and the process of genetic recombination.
- CO4: Explain the cell cycle and apoptosis and the process of signal transduction.

Experiment for exercise Contents: Plant Ecology & Cell and molecular biology-I

- CO1: Demonstrate/Describe the distribution of various plant species by quadrat Method.
- CO2: Explain the presence of specific by Elisa method.

Contents: Reproductive Biology of Angiosperms-I

After completion of this course –

- CO1: Describe the structure of Anther and pollen wall protein.
- CO2: Explain the development of male gametophyte and biochemical aspects of pollen.
- CO3: Describe the method for carpel determination of pistil.
- CO3.1: Explain megasporogenesis.
- CO4: Describe pollination mechanism and the concept of Incompatibility.

Experiment for exercise Contents: Reproductive biology of Angiosperms-I

- CO1: Describe the pollen production in given flower.
- CO2: Explain the structure and various types of ovules.

Contents: Basic Botany-I

After completion of this course –

- CO1: Describe the diversity Cryptogams.
- CO1.1: Describe plant pathology for various diseases in plant.
- CO2: Explain diversity of phanerogams.
- CO2.2: Differentiate between monocotyledons and dicotyledons
- CO3: Name and describe different part species in technical terms.
- CO3.1: Explain different angiosperm families.
- CO4: Describe tissue system in Angiosperms and anatomical feature of Angio-spermic plant.

M.Sc. Sem.-IV

Contents: Plant Biotechnology

After completion of this course –

- CO1: Explain the function of recombinant DNA technology for the production of vaccines.
- CO1.1: Explain crop developed by genetic engineering used to enhance yields & nutritional quality.
- CO2: Explain creative genetically modified bacteria.
- CO2.1: Explain the application of advance proteomic technologies to develop better drugs.
- CO3: Demonstrate tissue culturing/ Grow disease free plant by tissue culture technique.
- CO3.1: Describe the role of gene technology in improving various qualities in Crops.
- CO4: Demonstrate use of computational approach to analyse, manage & store biological data.

Contents: Angiosperm-II

After completion of this course –

- CO1: Identify floral variation.
- CO2: Explain the features & systematic position of Cucurbitaceae, cactaceae, orchidaceae, etc.
- CO3: Explain the probable ancestors of angiosperms, extinct species.
- CO4: Describe the role of biodiversity in Ecosystem functions.

Experiment based on Angiosperm-II for exercise Contents: Plant Biotechnology & Angiosperm-II

- CO1: Isolate protoplast and determine its viability
- CO2: Conduct experiment on preparation of media for plant tissue culture.
- CO3: Students are able to comments on specimen from locally available families.
- CO4: Prepare herbaria

Contents: Reproductive biology of Angiosperms-II

After completion of this course –

CO1: Describe the reproduction in plants.

CO1.1: Differentiate the types of endosperms.

CO2: Explain the relation between embryo and endosperm.

CO2.1: Explain the practical importance of polyembryony.

CO3: Describe the development of endosperms and formation of embryo from somatic cell

CO4: Explain protoplast culture and production of useful compounds through cell culture.

Experiment based on theory Contents: Reproductive biology of Angiosperms-II

CO1: Perform experiment on embryo culture.

CO2: Prepare culture medium for plant tissue culture.

Contents: Basic Botany-II

After completion of this course students will gain knowledge of –

CO1: Describe the movement of water in plants and physiological process in plants.

CO2: Describe the effect of environmental pollution on life and earth.

CO2.1: Explain the evolution of plants.

CO3: List the name and characteristics of the economically important plants.

CO4: Explain the process of fossilization.

Department of Zoology

B. SC. Statement of Course Outcomes (COs)

B.SC. SEMESTER - I

Paper –I

Life and Diversity of Animals - Nonchordates (Protozoa to Annelida)

By the end of this program, the students will understand the:

- 1) Explain the general characters and classification of Protozoa, Porifera, Helminthes, Annelida.
- 2) Describe the Structure and reproduction of Paramecium, Plasmodium, Sycon, Obelia, Ascaris, Leech
- 3) Explain the life cycle of Plasmodium, Obelia, Ascaris, Taenia sodium.
- 4) Explain the Parasitic Protozoans of Man.
- 5) Explain the mode of infection, its control and parasitic adaptations in helminths.
- 5) Explain the function of Trochophore larva.

Paper – II

Environmental Biology

By the end of this program, the students will understand the:

- 1) Describe the Atmosphere (Hydrosphere, Lithosphere), Major zones, energy sources, and Energy flow in an ecosystem.
- 2) Describe pond ecosystem, Food chain, food
- 3) Explain web and ecological pyramids.
- 4) Describe the Biodiversity and its conservation
- 5) Explain the causes of reduction in biodiversity.
- 6) Explain Wildlife Conservation acts (1972 and 1984), national parks and sanctuaries.
- 5) Describe Sources, effect and control measures for air pollution, water pollution, noise pollution.

B.Sc. Semester – II
Paper – III
Life and Diversity of Animals – Nonchordates
(Arthropoda to Hemichordata)

By the end of this programme, the students will be able to understand

- 1) Explain general characters and classification of Arthropoda , Mollusca, Echinodermata, Hemichordata
- 2) Explain the Morphology and anatomy of Cockroach , Pila, Asterias, Balanoglossus.
- 3) Explain the process/concepts of Insects as Vectors , Social behavior in honey bees and Pearl formation in Mollusca

Paper – IV
Cell Biology

By the end of this programme, the students will get knowledge and they will understand the:

- 1) Describe Ultra structure of prokaryotic and eukaryotic cell ,
- 2) Explain the structure and function of Cell organelles.
- 3) Describe the Oxidative phosphorylation, Glycolysis and Krebs's cycle & Electron Transport Chain
- 4) Explain the process and application of terminal oxidation.
- 5) Explain Giant chromosomes; Lamp-brush and polytene chromosome agents.

B.Sc. Semester – III
Paper – V
Life and Diversity of Animals - Chordates
(Protochordata to Amphibia)

By the end of this programme, the students will be able to understand

- 1) Explain general characters and classification of Protochordata, Pisces, Amphibia, & Agnatha
- 2) Explain the Morphology and anatomy of Herdmania, Amphioxus.
- 3) Describe the Retrogressive metamorphosis of ascidian tadpole of Herdmania.
- 4) Scales of fishes, origin of paired fins ,migration and accessory respiratory organs and Embryology.
- 5) Explain Parental care and Neotony in Amphibia .
- 6) Explain Frog Embryology & Development of respiratory organs & Aortic arches in frog .

Paper – VI
Genetics

By the end of this programme, the students will be able to understand

- 1) Describe the Mendelian Principles & laws and its applications.
- 2) Explain Interaction of genes, quantitative genetics & extra nuclear genome .
- 3) Explain Cytoplasmic inheritance, Linkage and crossing over.
- 4) Explain the Concepts of genes & Genetic disorders in human.
- 5) Describe the methodology of Sex determination.
- 6) Explain Gene mutations & Lethal genes .

B.Sc. Semester IV
Paper - VII
Life and Diversity of Animals – Chordates
(Reptilia, Aves and Mammals)

By the end of this programme, the students will be able to

- 1) Identify, classify and distinguish the characters and adaptive features of animals
- 2) Explain Reptilia, Aves & Mammals.
- 3) Describe Poison apparatus, biting mechanism, snake venom and its importance.
- 4) Comparison of Ratitae and Caranitae, Flight adaptations and migration .
- 5) Explain the theories of evolution & genetic basis of evolution.
- 6) Explain the concept of Adaptations in animals.
- 7) Describe Races in Man

Paper VIII
Molecular Biology and Immunology

By the end of this programme, the students will be able to understand

- 1) Describe the Structure & properties of DNA, RNA as genetic material;
DNA replication.
- 2) Explain the process of Recombination in Bacteria.
- 3) Describe Genetic code & Protein synthesis.
- 4) Explain Gene regulation.
- 5) Explain the Concepts of immunity, Structure, types and functions of Antigen & Antibody.
- 6) Explain Antigen-antibody interaction and types of immune response.

B.Sc. Semester V
Paper IX
General Mammalian Physiology

By the end of this program, the students will understand the:

- 1) Explain the function/role of vitamins & Enzymes-biocatalyst,
- 2) Describe Glands and hormones associated with digestion.
- 3) Explain the physiology of digestion, respiration, circulation
- 4) Describe the relationship between Blood pressure, E.C.G. & working of Heart.
- 5) Describe Composition of blood, respiratory pigments in mammals.

Paper X
Applied Zoology

Students will get knowledge and will be able to:

- 1) Demonstrate the development of aquaculture unit, aquarium.
- 2) Culture prawn and oyster (for pearl).
- 3) Identify insect's pest (agriculture and veterinary). apply ways to control them
- 4) Describe the types of Silkworm, their Life cycle and economic importance.
- 5) Demonstrate sericulture, apiculture, lac culture units.

B.Sc. Semester VI

Paper -XI

General Mammalian Physiology

By the end of this program, the students will receive knowledge and they will be able to understand

- 1) Explain E.M. structure, types of Neurons & conduction of nerve impulse.
- 2) Explain Ultrastructure & properties of striated muscle.
- 3) Explain Muscle contraction- sliding filament theory.
- 4) Describe Structure & function of uriniferous tubule.
- 5) Describe Normal and abnormal constituents of urine, dialysis.
- 6) Describe Structure and functions of endocrine glands.

Paper - XII

Applied Zoology II

(Biotechniques, Micro technique, Biotechnology, Bioinformatics and Biostatistics)

By the end of this programme students will able to understand:

- 1) Implement Sterilization methods, Separation of biomolecules; Chromatography (Elementary idea), Electrophoresis.
- 2) Apply principles of colorimeter and spectrophotometers.
- 3) Use the micro technique procedure.
- 4) Implement Histochemical staining techniques for carbohydrates, proteins and lipids.
- 4) Describe the Recombinant DNA technology, application of biotechnology in Insulin and vaccineproduction.

M.SC. SEMESTER I

Paper 1T1

Structure and Function of Invertebrates

Students will be able to understand:

- 1) Classical and molecular taxonomy.
- 2) The Ultra structure of locomotary organelles, mechanism of locomotion in protozoans.
- 3) The dermal cells and skeletal organization in sponges.
- 4) Polymorphism and metagenesis in coelenterate
- 5) Theories of origin of metazoa.
- 6) Reproduction in helminthes.
- 7) Formation, evolution and significance of coelom.
- 8) Excretion in annelida.
- 9) Peripatus as connecting link between annelida and arthropoda.
- 10) Echinodermata- water vascular system and larval forms General account and affinities of ctenophora and rotifer a General account and affinities of entoprocta and ctoprocta.

**Paper-IT2,
General Physiology**

Students will be able to understand:

- 1) Describe Enzyme with Classification and its action/regulation.
- 2) Respiratory pigments- types, distribution and properties, structure and mechanism of O₂ transport. .
- 3) Physiology of Neurotransmitters, Colour change ,Bioluminescence, Thermoregulation, osmoregulation.
- 4) Molecular mechanism of hormonal action, membrane receptors and signal transduction.
- 5) Types of heart (myogenic and neurogenic), cardiac cycle.
- 6) Classification and metabolism- carbohydrates , lipids, proteins
- 7) Hydromineral metabolism.
- 8) Cerebrospinal fluid: chemistry and functions.
- 9) Mechanism of reflex action.
- 10) Physiology of environmental stress and strain.

**Paper-IT3
Cell Biology and Genetics**

Students will be able to understand:

- 1) Explain the structure and function of cell membrane ,cell organelles, microfilaments, and microtubules.
- 2) Differentiate between Cell division and cell cycle.
- 3) Describe the Cell signaling , signal transduction pathways, cellular communication and cancer.
- 4) Explain the mendelian, non-mendelian; extensions of mendelian principles and quantitative genetics & mutation.
- 5) Describe the Alterations of chromosomes and their genetic implications.
- 6) Apply the concept of Extra chromosomal inheritance.

**Paper-IT4
Advanced Reproductive Biology**

Students will be able to understand :

- 1) Describe the Methods of reproduction in protozoa.
- 2) Explain Regeneration in hydra, digesia and annelid worms; morphogenesis and hormonal control.
- 3) Explain Mechanism of vitellogenesis and metamorphosis in insects
- 4) Explain the process of Spermatogenesis, mechanism of oogenesis, and cytological and molecular events offertilization.
- 5) Explain Embryology, it's types of cleavage, blastulation, gastrulation and embryonic induction.
- 6) Describe the Male accessory sex glands in mammals.
- 7) Describe the process of Semen, sperm capacitation and decapacitation

M.SC. SEMESTER-II

Paper- V

Structure and Function of Vertebrates

On completion of the course, students will be able to explain:

- 1) Explain the source and ancestry of chordate
- 2) Explain General organization and affinities of Cephalochordata.
- 3) Describe Vertebrate's, integument, Sense organs, Autonomous nervous system,
- 4) Explain Evolution of urinogenital organs & heart.
- 5) Describe the Comparative anatomy in vertebrates -the brain, Appendicular skeleton.
- 6) Describe the Organs and mechanism of respiration in Amphibia, Structure, development and

Paper-VI

Comparative Endocrinology

Students will be able to

- 1) Explain Hormones and functions in Coelenterata, Helminths, & Echinodermata.
- 2) Explain structure, hormones and functions of Neurosecretory system in Annelida & Mollusca
- 3) Describe Neuroendocrine system, structure and hormones, Endocrine control of metamorphosis reproduction and colour change mechanisms in crustaceans & insects.
- 4) Describe Structure, hormones and functions of Pineal organ, Hypothalamo hypophysial system, Pituitary, Thyroid, Parathyroid ultimobranchial glands, Gastro-enteropancreatic endocrine system, Adrenal gland.
- 5) Explain Gonadal hormones in vertebrates and their hormonal actions, feedback mechanisms.

Paper VII

Molecular Biology and Biotechnology

Students are able to explain

- 1) Describe Cot $\frac{1}{2}$ and Rot $\frac{1}{2}$ values, organelle genome, structure, forms. replication & regulation of replication.
- 2) Explain the different mechanism of DNA damage and repair.
- 3) Explain Prokaryotic and eukaryotic transcription, its Regulation, translation, post translational modifications.
- 4) Explain the concept of Mobile DNA elements.
- 5) Explain Antisense and ribozyme technology and Immuno-biotechnology.

Paper VIII

Advanced Developmental Biology

students are able to explain

- 1) Describe Mammals, Implantation, Foetal membranes, Placental Hormones, Multiple ovulation and embryo transfer technology (MOET),
- 2) Describe the application of embryonic stem cells and its function.
- 3) Describe Embryonic sexing, cloning, screening for genetic disorder diagnosis (ICSI, GIFT etc.), Immunocontraception & Classical contraceptive techniques.
- 4) Explain the Role of mutants and transgenics in human welfare.
- 5) Explain Metamorphosis in Amphibia.
- 6) Describe the process of Regeneration in vertebrate, Apoptosis, Ageing.
- 7) Explain Polymorphism in insect.

M.SC. SEMESTER III

Paper- 3T1

Parasitology and Immunology

Under this paper the students will study:

- 1) Explain the relationship between parasites and their hosts.
- 2) Describe diseases of human, animals and even plants caused by the parasites.
- 3) Describe the application of parasitology in the manufacturing of drugs to combat parasites infections.
- 3) Explain the role of Immunology in biomedical sciences and to study infectious agents such as viruses, bacteria, fungi and parasites.
- 4) Explain cell growth and differentiation and how immune responses function.
- 5) Explain role of immunology and immunotherapy play in combating disease and how

Paper 3T2

Special group of animal physiology

Student understands.

- 1) Describe Histology of salivary gland and Histology of pancreas
- 2) Describe digestive system , bile juice, intestine etc
- 3) Describe functional anatomy of kidney formation of urine, constituent
- 4) Describe regulation of urine and renal failure.

Paper 3T3

Special group of animal Physiology

Student will be understanding

- 1) Describe type of heart, histology of heart and also anatomy of heart
- 2) Explain Cellular composition of blood function of blood
- 3) Explain Causes of blood sugar causes of lipid
- 4) Compare Plasma Protein albumin and globulin
- 5) Describe Lymph composition.

Paper 3 T4

Wild life and Avian Biology

Under this paper the students will study:

- 1) Wild life sciences that seeks to meet the increasing demand for research and monitoring of wildlife and their habitats and provide trained biologist to further do research in wildlife conservation.
- 2) Student with wildlife course are also free to join different streams like in entomology, foresters, as a zoo curator, in wildlife department , as a conservationist etc.
- 3) Wild life sciences has also another employment area for the students like in sanctuaries, National parks, Wildlife research centres, Environmental monitoring centres etc.
- 4) Avian biology is a new field which allows one to pursue the fascination about birds through the study of topics like physiology, anatomy, nutrition, behaviour etc.

- 5) Study of avian biology has world wide job opportunities that involve domestication of pets, commercial poultry industry, research institute and bird sanctuaries and zoos.
 - a. Explain Avian biology.
 - b. Describe the types and characteristics of wildlife and their habitat.
 - c. Describe physiology, anatomy, nutrition, behaviour of wildlife habitat.
 - d. Apply the knowledge of wild life and Avian Biology in wildlife conservation.

M.SC. SEMESTER III

Paper 4T1

Biotechniques, Biostatistics, Ethology, Toxicology and Bioinformatics

Under this paper the students will be able:

- 1) Implement Sterilization techniques, media for microbial culture, and inoculation methods
- 2) Explain Animal cell & tissue culture
- 3) Explain basic principle of sedimentation and centrifugation, chromatography, and Electrophoretic separation techniques
- 4) Use/Implement Central tendency, dispersion- mean, mode and median, Probability, standard error (SE), standard deviation (SD), significance tests - t- test, z- test, Chi square test- assumption, in solving problem.
- 5) Describe Antidotal therapy- Antidotes, type of antidotes and antidotal procedure.
- 6) Explain/use different bioinformatics tools and databases.
[- history, scope of bioinformatics in research, business and employment opportunities; Bioinformatics in India. Biological databases– Basic local alignment search tool (BLAST), and FASTA, Variants of BLAST, PSI-BLAST. And Phylogenetic analysis- Tree style, tree building methods]

Paper 4T2

special group of animal Physiology

Student will be understanding

- 1) Describe morphological differentiation of mammalian brain, brain stem, and cerebellum
- 2) Explain types and function of neuron.
- 3) Describe the ultrastructure of skeletal muscles and Molecular mechanism of muscles.
- 4) Explain ultra-structure of neuromuscular junction

Paper 4T3

Special group of animal physiology

Student will understand

1. Describe physiology and anatomy of respiratory organ and mechanism of respiration
2. Describe the process of transport of respiratory gases by blood.
3. Describe endocrine control of spermatogenesis and oogenesis likely diend cell sertoli cell.
4. Describe the structure of Placenta, Physiology of Lactation and role of hormones of Pheromones

Paper4T4
Radiation and Chronobiology

Under this paper the students will be able:

1. Describe the classification and roles of Radiation Biology
2. Explain/Apply Principles of radiation dosimetry, direct and indirect effects. Radiations lesions in DNA, radiobiological effect on cell.
3. Explain the effect of Radiation on Human Health
4. Describe the effect of Radiation in the developing embryo and fetus, radiation
5. Describe Circadian cycle, Concept of central and peripheral clock system, Circadian pacemaker system in invertebrates with particular reference to Drosophila, rodents.
6. Describe biological clock, Centers of biological clock, Supra chiasmatic nuclei, pineal gland

Course outcomes for B.Sc. (Physics)

B.Sc. 1st Year semester-I

Paper I. (Properties of matter and mechanics)

1. Explain different concepts and principles of Elasticity (i.e. stress, strain, Hooks law, types of elasticity, elastic limit, poissons ratio, cantilever, torsional pendulum, Maxwells Needle etc.)
2. Explain different laws of viscosity.
3. Use methods of determinations of surface tension of liquid.
4. Describe the mechanics of particle (i.e Newton's law s of motion, limitations of Newton's law, different types of co-ordinate system, system of particle, centre of mass, multistage Rocket, collision and moment of inertia.)

Paper II. (Electrostatics, time carrying fields and electric current)

1. Describe coulomb s law for electrostatics and conservative nature of electric field.
2. Explain the concept of dielectric and laws of dielectric.
3. Explain the terminologies, magnetic flux, Faradays law of electrostatics, study of transformer, kirchoffs law of electrostatics.
4. Solve/Resolve a.c circuits (LR, RC and LCR circuits), growth and decay in a.c circuits, power in a.c circuits, power factor, parallel resonanat circuits etc.

Sem 2 nd

Paper I (Oscillation, kinetic theory of gases and thermodynamics motion)

1. Explain simple harmonic motion and differential equation.
2. Describe principles and theories of gases & thermodynamics motion; kinetic theory of gases, Boyles law, charls law, ideal gas equation, assumption s of kinetic theory, pressure exerted on the gas.
3. Describe transport phenomena of gases i.e transport of mass, momentum and energy.
4. Explain the phenomenon of thermodynamics, entropy, enthalpy and their relationship, concept of inversion temperature, and liquification of gases.

Paper II (Gravitation, Astrophysics, magnetism and magnetostatics)

1. Explain the Newton's law of gravitation, concept of acceleration due to gravity,
2. relationship between gravitational constant and acceleration due to gravity and application of Newton's law.
3. Describe the Astrophysics i.e contents of universe, solar system, information about every planets in the solar system.
4. Explain magnetic materials, types of magnetic materials, various theories for magnetic materials and their applications.
5. Describe magnetism i.e magnetic dipole moment , various laws of magnetism, concept of Lorentz force, Lorentz force equation etc.

B.sc IInd Year

Sem 3 rd

Paper I (Sound waves, applied acoustics and Ultrasonic)

1. Describe waves in media, types of waves, sound , types of sound, human ear and it's response to the sound, limit of human audibility, musical scale and instruments.
2. Explain the transducer and their characteristics, recording and reproduction of sound, sabins formula for reverberation of time.
3. Explain the properties and production of ultrasonic waves, piezoelectric oscillation method, direction of ultrasonic waves and application of ultrasonic waves.
4. Describe rectifiers, half and full wave bridge rectifier, filters, regulated and unregulated power supply, zener diode etc

Paper II (physical optics aand electromagnetic waves)

1. Explain the interference of light, Newton's Rings, application of Newton's Rings, Michelson s interferometer and Fabry-Perot interferometer and comparison between them.
2. Explain diffraction of light, Fresnel s and Fraunhofer diffraction, plane diffraction grating, diffraction bin prism and comparison in interference and diffraction.
3. Describe polarization of light, polarisation by reflection, by scattering, by double diffraction etc.
4. Explain the electromagnetic waves, electromagnetic spectrum related to wavelength, Maxwells electromagnetic equation, trnsverse nature of electromagnetic wave etc.

Sem 4 th

Paper I (solid state physics, x-ray and laser)

1. Describe the crystal structure, lattices, lattice planes, lattice parameter and coordination numbers.
2. Explain the Reciprocal lattice, Lues theory, Braggs law and it's applications, nature of varius lattices,
3. Explain the X-ray sperctra, characteristics of x-rays, applications of x-rays in various fields.
4. Describe lasers (types of lasers, characteristics of lasers and application of laser in various fields)

Paper II (solid state electronics and molecular physics)

1. Explain light emitting diode (LED) , solar cell, photovoltaic cells, bipolar transistors and their construction and working, uses of all above.
2. Describe the unipolar transistors like JFET and MOSFET, construction and working of them and also uses of them.
3. Explain the molecular physics like Rotational, Vibrational spectra, rotational-vibrational spectra, selection rules for them and various energy states for each spectra.
4. Describe Raman spectroscopy like experimental set up, stokes line and antistokeslines , Raman spectrum and use of Raman spectroscopy in physics.

B.Sc IIIrd Year

Sem 5 th

Paper I (Atomic physics, free electron theory and statistical physics)

1. Explain the concept of atomic physics i.e spinning of electron, selection rules, L-S coupling and J-J coupling, transition states of electron.
2. Describe free electron theory i.e Drude Lorentz model, Bloch theorem, Kronning penny model, Hall effect, Hall coefficient etc.
3. Explain statistical physics i.e thermodynamic probability, Boltzmann relation.
4. Differentiate between Bose-Einstein and Fermi Dirac statistics and applications of them.

Paper II (Quantum mechanics, Nanomaterials and Nanotechnology)

1. Describe Quantum physics, planks radiation law, Compton effect, Heisenberg uncertainty principle.
2. Describe Schrodinger's time dependent and independent equations, expectation values of all dynamical quantities.
3. Explain Nanomaterials, 0D, 1D, 2D & 3D materials, Bottom up and top-down approaches, scale of particles.
4. Describe Nanotechnology i.e determinations of size of nanoparticles, Debye-Scherrer formula, Scanning electron microscopy, Transmission electron microscopy etc techniques.

Sem 6th

Paper I (Relativity, Nuclear physics and Biophysics)

1. Describe frame of reference, Inertial frame of reference, non-Inertial frame of reference, Michelson Morley experiment.
2. Explain Geiger Muller counter, cyclotron , accelerator, and nuclear reactors and nuclear reactors.
3. Explain Alpha decay, Beta decay, Gamma decay.
4. Describe Electrocardiogram (ECG), Electroencephalogram (EEG), Electroretinogram (ERG), Electromyograms (EMG) and Sonography and their working.

Paper II (Electronics, Fiber Optics, Communication and Digital electronics)

1. Explain amplifiers, i.e operational amplifier and their applications also oscillator (Hartley, Colpitts oscillator).
2. Describe Various types of optical fibre and dispersion in optical fiber, application of optical fibre in various fields.
3. Explain modulation and demodulation, types of modulation i.e frequency modulation, amplitude modulation etc. and their applications
4. Explain the digital electronics, various number system i.e unitary, binary, decimal, octal and hexadecimal number system,
5. Explain logic gates and their truth table, Boolean algebra and Boolean equation.

Department of Mathematics

Bachelor of Science

First Sem

Paper First Algebra and Trigonometry

1. Use transformation of matrix to find rank of matrix
2. Apply the matrix to system of linear equation
3. Use/implement theory of equation
4. Identity symbolic logic and algebra preposition
5. Prove the demovers theorem and its application

Paper Second Calculus and differential equation

1. Use differentiation maclaurins and tayloras theorem
2. Describe curvature concavity and convexity point of inflection
3. Use differential equation clauriuits equation and singular solution

Second sem

Paper Third vector calculus and geometry

1. Apply knowledge of scalar and vector product of three of four vectors
2. Explain gradient diverges curl and vector identities
3. Explain gradient diversion equation of second degree tracing of conix
4. Find equation of concentrated with given base equation of cylinder and its properties

Third Sem

Paper real analysis differential equation

1. Apply the concept of a limit of sequences and convergence of infinite series
2. Use series solution of differential equation a Bessel fuction and a legendry function
3. Apply laplas transformation in solving linear differential equation
4. Implement new concept like group cyclic group legendry theorem

Fourth Sem

Paper advance calculus and partial differential equation complex analysis and Abstract algebra

1. Apply partial differentiation jacobians envelopes and evaluates
2. Use maxima and minima beta and gymma function
3. Solve partial differential equation of 1st order
4. Solve geometrical a representation of complex number analytic function

Fifth sem

Leaner algebra and numerical analysis

1. Use vector space and their representation as matrix
2. Use approximation salutation of equation and interpolation
3. Solve leaner equation and numerical differentiation
4. Solve ordinary differential equation numerical integration with their derivation

Sixth Sem

Real analysis Discrete mathematics and elementary statics

1. Useriman integral mean value theorem of integral calculus
2. Define matrix space neighbour hoods limit point and internal point
3. Use algebra logic totological and contradiction
4. Use of probability of mathematical expectation moment generation function and theoretical distribution