



Pro-forma for program and course outcomes (2.6.1) 2019-2020

Name of Teacher: Dr. S. R. Bhupalwar

Department: Zoology

Program: B.Sc. FY

Subject: Zoology

Course Code: CCZ-I

Paper Title: Biodiversity of Invertebrates-I

| Unit Number | Topics | Unit-wise Outcome |
|-------------|--|---|
| I | 1. Introduction of Non-chordates 2. Protozoa: General characters and classification up to class level with suitable examples; Locomotory Organelles and locomotion in Protozoa. Structure, Life Cycle, Pathogenicity and Control Measures of Plasmodium vivax. 3. Porifera:-General characters and classification up to class level with suitable examples; Canal System in Sycon; Economic importance of Porifera. | The students will be able to identify a given invertebrate up to class level. |
| II | 1. Coelenterata: General characters and classification up to class level with suitable examples; Polymorphism in Hydrozoa. 2. Platyhelminthes: General characters and classification up to class level with suitable examples; Structure, Life Cycle, Pathogenicity and Control Measures of Taenia solium. 3. Nematelminthes: General characters and classification up to class level with suitable | Ability to understand a contribution of invertebrates in the given habitat. |
| | examples; Structure, Life Cycle, Pathogenicity and Control Measures of Ascaris lumbricoides. | |



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| <p>III</p> | <p>1. Annelida: General characters and classification up to class level with suitable examples; Metamerism in Annelida; vermiculture and vermicomposting.</p> <p>2. Arthropoda: General characters and classification up to class level with suitable examples; Vision in Arthropoda, Metamorphosis in Insects. Cockroach- External Morphology, Digestive system, Respiratory system, Nervous system. Economic importance of insects.</p> | <p>Ability to understand and appreciate the ecological and economic important of invertebrate and vertebrates.</p> |
| <p>IV</p> | <p>1. Mollusca: General characters and classification up to class level with suitable examples; Economic importance of Mollusca.</p> <p>2. Echinodermata: General characters and classification up to class level with suitable examples; Star Fish- External Morphology, Larval forms in Echinoderms.</p> <p>3. Hemichordate: General Characters and Affinities.</p> | <p>Ability to identify and describe external morphology and internal anatomical features of representative invertebrate species.</p> |

Specify Course Outcome: Identify and classify Invertebrate organism base on morphological and anatomical.

Specify Program Outcome: Identify, Explain and classify animals morphologically, anatomically and embryologically with practice of cytological & microscopic technique

Signature of Teacher: Dr. S. R. Bhupalwar



Pro-forma for program and course outcomes (2.6.1) 2019-2020

Name of Teacher: Dr. S. R. Bhupalwar

Department: Zoology.

Program: B.Sc. FY Semester-I

Subject: Zoology.

Paper Title: Biodiversity of Chordates: P-II.

| Unit Number | Topics | Unit-wise Outcome |
|-------------|--|---|
| I | Introduction of Chordates salient features and classification of chordates up to class level. Origin and Ancestry of Chordata Protochordata: Urochordata-General features and Phylogeny of Urochordata; Cephalochordata- General features and Phylogeny of Cephalochordata. Agnatha: General characters and classification of Agnatha with suitable examples. Cyclostomata: General characters with suitable examples. | Students will be able to identify and understand the biodiversity of chordates. |
| II | Pisces: General characters and classification up to order level with suitable examples; Scoliodon (Dogfish): External morphology, Digestive system, Respiratory system, Circulatory System, Nervous system, Urinogenital system. Economic importance of Fishes. Amphibia: General characters and classification up to order level with suitable examples; Parental care in Amphibians; Hibernation and aestivation in Frog. | Ability to understand anatomical relation between different vertebrate classes. |
| III | Reptiles: General characters and classification up to order level with suitable examples; Poisonous and non-poisonous snakes; Biting mechanism in snakes; Importance of snake Venom. Aves: General characters and classification up to order level with suitable examples; Flight Adaptations in birds; Migration in birds. | Learner will be able to understand the economic importance of chordates. |



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| IV | Mammals: General characters and classification up to order level with suitable examples. Rat- External characters, Digestive system, Respiratory system, Circulatory system, Nervous system - Brain and spinal cord, Eye and Ear. | Students will understand characters life study of mammals. |
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Specify Course Outcome: To identify and classify animals based on morphological and anatomical.

Specify Program Outcome: To understand the anatomical structure of vertebrates.

Signature of Teacher: Dr. S. R. Bhupalwar



Pro-forma for program and course outcomes (2.6.1) 2019-2020

Name of Teacher: Dr. S. R. Bhupalwar

Department: Zoology

Program: B.Sc. FY. Semester-II

Subject: Zoology Course Code: CCZ-II

Paper Title: Comparative Anatomy of Vertebrates-III

| Unit Number | Topics | Unit-wise Outcome |
|-------------|---|--|
| I | 1. General characters, origin and Ancestry of Vertebrates. 2. Integumentary System: Development, General structure and function of integument; Derivatives of integument- Epidermal and Dermal derivatives; 3. Skeletal System- Evolution of visceral arches; Comparative account of Limbs and girdles. | Interpret the comparative anatomical structure of integument and their derivatives of vertebrates. Compare the evolutionary evidences in skeletal system of vertebrates. |
| II | 1. Digestive System: Brief account of alimentary canal and digestive glands. 2. Respiratory System: Brief account of different respiratory organs in vertebrates- Gills, lungs, skin, air sacs and Accessory respiratory organs. | Demonstrate the comparative anatomical structure of Alimentary canal, Lungs and Accessory respiratory organs in vertebrates. |
| III | 1. Circulatory System: Brief account of Evolution of heart in vertebrates. Modifications of aortic arches in vertebrates; Blood circulation in various vertebrate groups- Single and Double circulation 2. Urinogenital System: Developmental | Describe the Circulatory System and Urinogenital System in vertebrates with reference to evolutionary changes. |
| | Succession of kidney, Evolution of urinogenital system in vertebrates. | |



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| IV | 1. Nervous System: Structure of Neuron; Comparative account of Brain of Vertebrates. 2. Sense Organs - Types of receptors- Mechanoreceptors; Photoreceptors; Phonoreceptors. | Explain the Comparative account of Brain of Vertebrates. Clarify the concept of sense organs. |
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Specify Course Outcome: Clarify the concept of Comparative Anatomy of Internal organs of Vertebrates.

Specify Program Outcome: Identify, Explain and classify animals morphologically, anatomically and embryologically with practice of cytological & microscopic technique

Signature of Teacher



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Pro-forma for program and course outcomes (2.6.1) 2019-2020

Name of Teacher: Dr. S. R. Bhupalwar

Department: Zoology

Program: B.Sc. F. Y. Semester-II

Subject: Zoology

Course Code: CCZ-II

Paper Title: Developmental Biology of Vertebrates: P-IV.

| Unit Number | Unit Name | Topics | Unit-wise Outcome |
|-------------|-----------|---|---|
| 1 | I | 1. Introduction of Developmental Biology 2. Early Embryonic Development: Gametogenesis: Spermatogenesis and oogenesis in mammals; vitellogenesis in birds; 3. Types of eggs: a) On the basis of amount of yolk b) On the basis of distribution of yolk | Explain the basic processes of vertebrate embryonic development |
| 2 | II | 1. Gametes of Frog: a) Structure of sperm; b) Structure of ovum; 2. Frog Embryology: a) Fertilization; b) Cleavage; c) Blastulation; d) Gastrulation; e) Formation of three germinal layers; 3. Regeneration in chordates. | Describe the various steps in vertebrate development. |
| 3 | III | 1. Chick Embryology: (Extra-embryonic membranes) - Structure and functions of- Amnion; Chorion; Yolk sac; Allantois 2. Placentation in mammals: Classification on the basis of- Origin; Histology; Distribution of villi. Functions of Placenta. | Explain about the different embryonic and extra-embryonic structures. |
| 4 | IV | 1. Stem Cell: a) Sources; b) Types – Embryonic, Haemopoietic, Adult, Nervous; c) Role of stem cells in human health. 2. Infertility in Humans-Causes, diagnosis and | Learn Assisted Reproductive Technologies |



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| | | treatment. 3. Assisted Reproduction Technologies- a) In-Vitro Fertilization (IVF) b) Gamete Intra-Fallopian Transfer (GIFT); c) Intra cytoplasmic Sperm injection (ICSI); d) Zygote Intrafallopian transfer (ZIFT); e) Intrauterine Insemination (IUI) 4. Parthenogenesis: a) Natural; b) Artificial. | |
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Specify Course Outcome: Specify Course Outcome: Learn and describe basic embryonic and extraembryonic development, developmental processes and assisted reproductive technologies.

Specify Program Outcome: Identify and classify animals based on morphological and anatomical features, development in chick & amphibians and practice cytological & microscopic technique.

Signature of Teacher: Dr. S. R. Bhupalwar



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Pro-forma for program and course outcomes (2.6.1) 2019-2020

Name of Teacher: Dr. S. R. Bhupalwar

Department: Zoology

Program: B.Sc. F.Y .Semester-II

Subject: Zoology

Course Code: CCZP-I

Paper Title: Biodiversity of Invertebrates and Chordates & Comparative Anatomy and Developmental Biology of Vertebrates-V

| Unit Number | Topics | Unit-wise Outcome |
|-------------|--|--|
| I | <ol style="list-style-type: none">1. Study of at least two museum specimens from Invertebrate Phyla. (Protozoa to Echinodermata and Hemichordata).2. Study of at least two museum specimens from Protochordata to Mammalia.3. Demonstration based on Models, Charts and Computer Aided Techniques: i) Cockroach: Digestive system, Nervous system. ii) Scoliodon: Digestive system, Heart and ventral Aorta, Afferent arteries, Brain.4. Key for Identification of poisonous and non-poisonous snakes.5. Permanent Mountings - i) Mouth parts of Cockroach; ii) Trachea of Cockroach; iii) Salivary glands of Cockroach; iv) Nereis Parapodia; v) Mounting of different types Scales (From Locally Available Fishes): Cycloid, Ctenoid | <p>Ability to identify and describe structure and functions of different body parts of invertebrates and vertebrates.</p> <p>Students would be able to prepare temporary and permanent mountings of biological material.</p> |



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| | <p>i) Practical record book duly signed by the teacher in charge/Head of the Department. ii) Five permanent stained micros. ii) preparations. iii) Animal Album or Articulated complete skeleton of any locally available animal iv) Excursion report</p> | |
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- Specify Course Outcome: Explain and demonstrate identification of animals, vertebrates, embryological stages and field reporting.
- Specify Program Outcome: Identify and classify animals based on morphological and anatomical features, development in chick & amphibians and practice cytological & microscopic technique.

Signature of Teacher: Dr. S. R. Bhupalwar



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Pro-forma for program and course outcomes (2.6.1) 2019-2020

Name of Teacher: Dr. S. R. Bhupalwar

Department: Zoology

Program: B.Sc. SY Semester-VI

Subject: Zoology

Course Code: CCZ III

Paper Title: GENETICS (VI)

| Unit Number | Topics | Unit-wise Outcome |
|-------------|--|--|
| I | 1) Introduction to Genetics 2) Mendelism i) Mendel's Laws of inheritance ii) Monohybrid, dihybrid cross and ratio. iii) Incomplete dominance. iv) Back cross and test cross. 3) Interaction of genes i) Complementary factor (9:7) ii) Supplementary factor (9:3:4) iii) Inhibitory factor (13:3) iv) Duplicate genes (15:1) v) Lethal genes (1:2:1) | Learn the basic of Mendel's Laws of inheritance by using the different examples cross and ratio. |
| II | 1) Multiple Alleles and Genes i) Inheritance of ABO Blood groups in Man. ii) Rh factor and Erythroblastosis foetalis in man. iii) Multiple genes – skin pigmentation in man. 2) Linkage and Crossing over i) Linkage – definition, types and significance ii) Crossing over – a) Mechanism of crossing over, b) Factor affecting crossing over, c) Significance of crossing over. | Interpret the concept of Multiple Alleles Inheritance. Learn the Linkage and Crossing over. |



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| III | <p>1) Sex determination i) Chromosomal methods of sex determination. ii) Bridge's ratio theory of genic balance.</p> <p>2) Sex linked inheritance i) Sex linked inheritance in Drosophila. ii) Sex linked inheritance in man – colourblindness, haemophilia, Hypertrichosis</p> <p>3) Cytoplasmic Inheritance-Ex. Kappa Particles (Paramecium)</p> <p>4) Mutation i) Chromosomal mutations – Structural alterations & Numerical alteration (Polyploidy). ii) Gene mutations – Sickle Cell Anaemia. iii) Mutagenic agents.</p> | <p>Explain the Sex determination examples of Sex linked inheritance and Mutation.</p> |
| IV | <p>1) Human Genetics i) Syndromes – Turner, Klinefelter, Down, Cat – Cry, patus. ii) Inborn errors of metabolism – Phenylketonuria (PKU), Alkaptonura, Albinism. iii) Human pedigree analysis with symbols. 2) Nature and functions of genetic materials. i) DNA – structure, functions and replications ii) RNA – Structure, types and functions. iii) Genetic code</p> | <p>Extend the Human Genetics with respect to Inborn errors of metabolism. Outline of Nature and functions of genetic materials.</p> |

Specify Course Outcome: Learn and interpret the basic concepts of Heredity and Variation of Genetics.

Specify Program Outcome: Explain and clarify animals anatomy, physiology, endocrinology, biochemistry, histology, genetic, genetic engineering technique and evolution also practice histotechniques and haematology.

Signature of Teacher: Dr. S. R. Bhupalwar



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Pro-forma for program and course outcomes (2.6.1) 2019-2020

Name of Teacher: Dr. S. R. Bhupalwar

Department: ZOOLOGY

Program: BSc SY

Subject: Zoology

Course Code: CCZ III (B)

Paper Title: COMPARATIVE ANATOMY AND PHYSIOLOGY (P-VII)

| Unit Number | Unit Name | Topics | Unit-wise Outcome |
|-------------|---------------------------------------|---|---|
| I | 1) Comparative Anatomy of Vertebrates | i) Integument ii) Heart iii) Kidney | classify and compare anatomical feature |
| II | 1) Enzyme 2) Nutritions | i) Nature and Classification of enzymes. ii) Mechanism of enzyme action. iii) Factors affecting on enzymes activity i) Digestion of carbohydrates, proteins and lipids. ii) Vitamins – Fat soluble and Water soluble vitamins (Sources, deficiency diseases and effects | Name and classify Enzyme and nutrition |
| III | 1) Respiration | i) Definition of Aquatic and Aerial respiration. ii) Respiratory organs in man. iii) Mechanism of respiration. | Explain ,functions of respiratory system |
| | 2) Circulation | iv) Transport of O ₂ and CO ₂ i) Blood – composition and functions. ii) Structure and working of heart. iii) E.C.G. and Blood Pressure. iv) Blood clotting. | Explain and analyse blood and heart and their different conditions. |



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| IV | 1) Excretion 2) Nerve Physiology Muscle Physiology | i) Modes of excretion in animals (Ammonotelism, Ureotelism and Uricotelism) ii) Structure of kidney (V.S.) iii) Structure of uriniferous tubules. iv) Physiology of urine formation. v) Composition of urine. i) Structure and types of neurons. ii) Structure of synapse. iii) Conduction of nerve impulse. i) Types of muscles- smooth muscles, skeletal muscles and cardiac muscles. ii) Ultra structure of skeletal muscles. | Define and explain excretion. Label and analyse structure and functions of kidney. Explain neural system. Explain muscle physiology. |
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Specify Course Outcome: Learn and interpret the animal anatomy and physiology.

Specify Program Outcome Explain and clarify animals' anatomy, physiology, endocrinology, biochemistry, histology, genetic, genetic engineering technique and evolution also practice histotechniques and haematology.

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Pro-forma for program and course outcomes (2.6.1) 2019-2020

Name of Teacher: Dr. S. R. Bhupalwar

Department: Zoology

Program: B.Sc. SY

Subject: Zoology

Course Code: CCZ IV (Section A)

Paper Title:-VIII- GENETIC ENGINEERING AND EVOLUTION

| Unit Number | Topics | Unit-wise Outcome |
|-------------|--|--|
| I | 1) Introduction of Genetic Engineering 2) Recombinant DNA Technology i) Tools: - A) Enzymes: - a) Lysing b) Ligases c) Nucleases (Exonucleases, Endonucleases, Restriction Endonucleases) d) Synthetases (DNA polymerase, Reverse transcriptase) B) Vectors: - Cloning vectors (Plasmid -psBR322, Bacteriophage-Lambda phage, Virus-SV40, Cosmid vectors) 3) Techniques: - i) Gel-Electrophoresis ii) PCR (Polymerase Chain Reaction) iii) Southern, Northern and Western Blotting. | Learn and understand Recombinant DNA Technology and other techniques of Genetic Engineering. |
| II | 1) Construction of rDNA 2) c-DNA libraries and Genomic libraries 3) Transgenesis and Transgenic animals (Transgenic cattle, sheep, pig and fish) 4) Cloning and cloned animals (Dolly sheep) 5) DNA fingerprinting | Extend the knowledge of Construction of rDNA and Transgenic animals. |
| III | 1) Concept of Evolution 2) Theories of organic evolution i) Lamarck's theory ii) Darwin's theory iii) Modern synthetic theory-Neo-Darwinism iv) Hugo De Vries theory | Interpret the concepts of evolution relate to Theories of organic evolution. |



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| IV | 1) Evidences of organic evolution a) Anatomical b) Embryological c) Paleontological d) Biochemical 2) Adaptations:-Aquatic, Terrestrial, Fossorial, Volant and Desert. 3) Hardy-Weinberg's law | Identify the evolutionary evidences. Illustrate the animal adaptation to their environment. |
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Specify Course Outcome: Gain the better knowledge of advance techniques of Genetic Engineering and Concept of Evolution.

Specify Program Outcome: Specify Program Outcome: Explain and clarify animals' anatomy, physiology, endocrinology, biochemistry, histology, genetic, genetic engineering technique and evolution also practice histo-techniques and haematology.

Signature of Teacher: Dr. S.R. Bhupalwar



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Pro-forma for program and course outcomes (2.6.1) 2019-2020

Name of Teacher: Dr. S. R. Bhupalwar

Department: Zoology

Program: B.Sc. SY

Subject: Zoology

Course Code: CCZ IV (Section B)

Paper Title: ENDOCRINOLOGY, HISTOLOGY AND BIOCHEMISTRY: IX

| Unit Number | Unit Name | Topics | Unit-wise Outcome |
|-------------|---|---|---|
| I | 1) Endocrinology | i) Pituitary gland ii) Thyroid gland iii) Adrenal gland iv) Islet's of Langerhans (Pancreas) v) Menstrual Cycle. | Define, label and explain endocrine glands. |
| II | 1) Histology of mammalian organs and tissues. | i) Stomach ii) Intestine iii) Pancreas iv) Liver v) Kidney vi) Testes vii) Ovary. | Define, explain histology of mammalian organs and tissue. |
| III | 1) Carbohydrate metabolism | i) Glycogenesis, Glycogenolysis and Gluconeogenesis ii) Glycolysis iii) Krebs's cycle | Define and explain cellular respiration. |
| IV | 1) Protein metabolism 2) Lipid metabolism | i) Deamination and Transamination ii) Ornithine cycle i) B-Oxidation ii) Ketosis, Ketogenesis and Ketolysis. | Define and explain protein and lipid metabolism. |

Specify Course Outcome: Learn and Interpret the endocrine system, histology and biochemistry

Specify Program Outcome: Explain and clarify animals' anatomy, physiology, endocrinology, biochemistry, histology, genetic, genetic engineering technique and evolution also practice histotechniques and haematology.

Signature of Teacher: Dr. S. R. Bhupalwar



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Pro-forma for program and course outcomes (2.6.1) 2019-2020

Name of Teacher: Dr. S. R. Bhupalwar

Department: Zoology

Program: BSc SY Subject: Zoology

Course Code: CCZP II

Paper Title: Practical Paper: Genetics, Genetic Engineering and Evolution-X

| Unit Number | Topics | Unit-wise Outcome |
|-------------|---|--|
| I | <ol style="list-style-type: none"> 1. Problems based on Monohybrid and Dihybrid cross. 2. Problems based on interaction of genes (Complementary, Supplementary, Inhibitory Duplicate factors) 3. Problems based on blood group inheritance in man. 4. Problems based on sex linked inheritance. 5. Culture of Drosophila and its observation of genetic characters like eyes and wings. 6. Preparation of temporary slides of salivary gland chromosomes from chironomous larva . 7. Study of permanent slide of sickle cell anaemia. 8. Study of chromosomal abnormalities in man with the help of photographs/charts and Karyotypes a) Down's syndrome b) Klinefelter's syndrome c) Turner's syndrome 9. Human pedigree analysis- various symbols used. 10. Estimation of DNA by Diphenyl amine (DPA method) 11. Study of human genetic traits (Rolling tongue, Length of index and ring finger, ear lobes) by using Hardy Weinberg's principle. 12. Calculation of frequencies of recessive and dominant gene in a population by using Hardy Weinberg Principle. 13. Calculation of heterozygote and homozygote in population by using Hardy Weinberg's principle. 14. Study of evidences by using photograph/charts and models a) Analogous and Homologous organs b) Connecting link (Peripatus and Archaeopteryx) c) Embryological evidences | Solve the problems based on Genetics and explain the various types of genetic diseases and Evolutionary study. |
| | 15. Study of adaptations (Museum Specimens). | |



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Specify Course Outcome: Solve the problems based on Genetics and explain the various types of genetic diseases and compare the various evolutionary links.

Specify Program Outcome: Explain and clarify animals anatomy, physiology, endocrinology, biochemistry, histology, genetic, genetic engineering technique and evolution also practice histotechniques and haematology.

Signature of Teacher: Dr. S. R. Bhupalwar



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Pro-forma for program and course outcomes (2.6.1) 2019-2020

Name of Teacher: Dr. S. R. Bhupalwar

Department: Zoology

Program: BSc SY

Subject: Zoology

Course Code: Practical Paper: CCZP III

Paper Title: Comparative Anatomy and Physiology, Endocrinology, Histology and Biochemistry-XI

| Unit Number | Topics | Unit-wise Outcome |
|-------------|--|---|
| I | <ol style="list-style-type: none"> 1) Qualitative detection of digestive enzymes (Protease, Amylase and Lipase) in cockroach. 2) Detection of human salivary amylase. 3) Estimation of oxygen consumption in fish or any other suitable aquatic animal. 4) R.B.C. counting. 5) W.B.C. counting. 6) Estimation of Haemoglobin. 7) Detection of blood groups. 8) Measurement of B.P. by using B.P. apparatus (Demonstration only). 9) Qualitative detection of nitrogenous waste products (Ammonia, Urea, Uric acid) in bird's excreta and urine of Mammals. 10) Preparation of Haematin crystals. 11) Temporary preparation of squamous epithelium, ciliated epithelium, skeletal muscle fiber and blood smear. 12) Study of histological structure of following organs – stomach, intestine, pancreas, liver, kidney, testis, ovary, thyroid and pituitary. 13) Structure of synapse, structure of neurons (slide/chart) 14) Types of nerve cells - Unipolar, Bipolar, Multipolar (Slides) 15) Location of endocrine glands through charts or models. 16) Preparation of block. 17) Compulsory educational excursion tour to visit various zoological important centres | To explain, perform, identify, demonstrate histological slide, endocrine glands, blood, human physiological conditions, biochemical juices. |

Specify Course Outcome: Comparative study of anatomy and physiology and Histological study of various endocrine glands and tissues and its composition of various biomolecules.



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Specify Program Outcome: Explain and clarify animals anatomy, physiology, endocrinology, biochemistry, histology, genetic, genetic engineering technique and evolution also practice histotechniques and haematology.

Signature of Teacher: Dr. S. R. Bhupalwar



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Name of Teacher: Dr. S. R. Bhupalwar

Department: Zoology

Program: B.Sc. Second Year Semester-III

Subject: Zoology

Course Code: SECZ-I(B)

Paper Title:

Uranology

| Unit | Unit Name/Topics | Unit wise Outcome |
|-------------|--|--|
| I | Definition, Structure an Functions of Urinary System, Physiology of Mechanism of Urine formation | Students develops the skill a for the qualitative analysis and composition of urine. |
| II | Constituents and composition of Urine i. Normal constituents and abnormal constituents of Urine ii. Qualitative tests for sugar, albumin, ketone bodies, bile salta and bile pigments Practical – Study of normal and abnormal constituents of Urine | |
| III | Renal function tests i. Definition, importance of tests like urea, creatinine, uric acid, proteins ii. Importance of Dialysis Practical – Biochemical Qualitative and Quantitative tests for Urine | |
| IV | Collection and preservation of Urine Sample i. Physical and Chemical Examinations of abnormal constituents ii. Microscopic Examination of Urine iii. Preparation of Urine Report iv. Urinometer Practical - Study of Microscopic Examination of urine | |

Specify Course Outcome: Students develops the skill a for the qualitative analysis and composition of urine.

Specify Program Outcome: Students develops the skill a for the qualitative analysis and



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composition of urine.

Signature of Teacher: Dr. S. R. Bhupalwar



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Name of Teacher: Dr. S. R. Bhupalwar

Department:

Zoology

Program: B.Sc. Second Year Semester-IV

Subject: Zoology

Course Code: SECZ - II

Paper Title: Apiculture

| Unit | Unit Name/Topics | Unit wise Outcome |
|-------------|---|--|
| I | Biology of Bees i. History, Classification and Biology of Honeybees ii. Social Organization of Honey bees | Student understand about Classification and social organization of honey bees. |
| II | Rearing of Honey Bees Artificial Bee Rearing (Apiary), Believes – Newton and Langstroth, Bee Pasturage, Selection of Bee Species for apiculture, Bee keeping equipment, Methods of extraction of honey (Indegenous and Modern) Practical – Visit to the Apiculture centers, Collect practical information of artificial Bee Hives and its mechanism | Rearing, diseases and enemies. The economics of honey bees and entrepreneurship. |
| III | Diseases and Enemies Bee diseases and enemies, Control and preventive measures | Students learn bee diseases, enemies, control and preventive measures. |
| IV | Economy of Bees and Entrepreneurship a. Products of Apiculture industry and its uses (Honey, Bees wax, Propolis, Pollen etc.) b. Bee keeping industry – recent efforts, Moern methods in employing artificial believes for Cross pollination in horticulure gardens Practical – Collection of natural bee hives, wax, honey etc. | Products of apiculture industries and its uses, modern methods, cross pollination in horticulture gardens. |

Specify Course Outcome: Students learn complete study of culture of Bees.



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Specify Program Outcome: Students learn complete study of culture of Bees.

Signature of Teacher: Dr. S. R. Bhupalwar

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Name of Teacher: Dr. S. R. Bhupalwar

Department: Zoology.

Program: B. Sc. T. Y.

Subject: Zoology.

Course Code: DSEZ-I.

Paper Title: ECOLOGY AND ZOOGEOGRAPHY- P-XII.

| Unit Number | Unit Name | Topics | Unit-wise Outcome |
|-------------|-----------|---|---|
| 1 | I | 1. Ecology-Introduction and Scope of Ecology 2. Introduction to Ecosystem 2.1. Components of an ecosystem a) Abiotic components – Light, Temperature & Water b) Biotic components – Producers, Consumers & Decomposers. 2.2. Types of Ecosystem- Aquatic- Pond ecosystem. Terrestrial- Desert Ecosystem. 2.3. Food Chain, Food Web, Ecological Pyramids. 2.4. Energy Flow in an Ecosystem. 3. Bio-geochemical Cycles 3.1. Gaseous Cycle- Oxygen Cycle 3.2. Sedimentary Cycle- Sulphur Cycle 4. Spheres of Earth 4.1. Atmosphere 4.2. Lithosphere 4.3. Hydrosphere 4.4. Biosphere 4.5. Ecological Succession-, Trends, Basic Types, Hydrarch and Xerarch | Explain Interactions of organisms with their environments and consequences of these interactions on ecosystem dynamics. |
| 2 | II | 1. Population Ecology – Characteristics of Population 1.1 Natality 1.2 Mortality 1.3 Population Dispersal 1.4 Population density | Illustrate inter-relationship between individuals in population and communities. |



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| | | <p>1.5 Age distribution 1.6 Population Growth Form 1.7 Population Equilibrium and Fluctuation 2. Biotic interactions 2.1 Positive interactions – Commensalism, Mutualism 2.2 Negative interactions – Competition, Predation, Parasitism</p> | |
| 3 | III | <p>1. Pollution – Sources, Effects and Control 1.1 Air Pollution 1.2 Water Pollution 1.3 Noise Pollution 2. Energy Resources 2.1 Conventional energy resources and their limitations 2.1.1 Fossil Fuels 2.1.2 Nuclear Power 2.1.3 Hydel Power 2.2 Non-conventional energy resources – Advantages, Limitations & Latest developments 2.2.1 Solar Energy 2.2.2 Wind Energy 2.2.3 Tidal Energy</p> | Explain of the current environmental issues with ecological concepts involved. |
| 4 | IV | <p>1. Adaptations 1.1 Aquatic Adaptations 1.2 Desert Adaptations 1.3 Volant Adaptations 2. Wildlife Conservation and Endangered Species 2.1 Aims & necessity of wildlife conservation 2.2 Wild life and Endangered species of India 2.3 Measures to protect endangered species in India 2.4 Sanctuaries and National parks in India 3. Zoogeographical Realms – Physical features and fauna of following Realms in Brief. 3.1 Oriental Realm 3.2 Australian Realm</p> | Inspect structural adaptations; conservation and management of natural resources |

Specify Course Outcome: Explain, illustrate and inspect ecological systems, pollution, resource management and their relationship and impact on life forms.

Specify Program Outcome: Explain and illustrate ecological, ethological and parasitological aspects also practice techniques of biostatistics, Bio-informatics, vermicomposting and aquarium keeping.

Signature of Teacher: Dr. S. R. Bhupalwar



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Pro-forma for program and course outcomes (2.6.1) 2019-2020

Name of Teacher: Dr. S. R. Bhupalwar

Department: Zoology.

Program: BSc TY. Subject: Zoology.

Course Code: DSEZ-I

Paper Title: APPLIED PARASITOLOGY – I, P-XIII (B)

| Unit Number | Unit Name | Topics | Unit-wise Outcome |
|-------------|-----------|--|--|
| 1 | I | 1. Introduction to Parasitology : 1.1 Brief introduction of Parasitology, Parasitism, Parasite, Host, Vector, Host parasite relationship. 1.2 Scope and Branches of Parasitology. 2. Parasitic Protozoa: Classification and general organization of parasitic Protozoa 3. Study of Systematic Position, Geographical distribution, Morphology, Life Cycle, Pathogenicity, Diagnosis, Prophylaxis and Treatment of 1. Entamoeba histolytica, 2. Giardia intestinalis, 3. Trichomonas vaginalis | Define and Explain basics in parasitology and classify parasitic protozoans. |
| 2 | II | Study of Systematic Position, Geographical distribution, Morphology, Life Cycle, Pathogenicity, Diagnosis, Prophylaxis and Treatment of 1. Trypanosoma gambiense 2. Balantidium coli 3. Sarcocystis cruzi, 4. Plasmodium vivax 5. Eimeria tenella | Explain diseases caused by parasitic protozoans. |
| 3 | III | Parasitic Platyhelminthes: Trematodes 1. Introduction, Classification, General | Explain parasitic diseases caused by Trematodes. |



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| | | organization of Trematodes. 2. Study of Systematic Position, Geographical distribution, Morphology, Life Cycle, Pathogenicity, Diagnosis, Prophylaxis and Treatment of i. Schistosoma haematobium. ii. Paragonimus westermani. iii. Gastrodiscoides hominis. 3. Parasitic adaptations in Trematodes. 4. Larval forms in Trematodes. | |
| 4 | IV | Parasitic Platyhelminthes: Cestodes 1. Introduction, Classification, General organization of Cestodes. 2. Study of Systematic Position, Geographical distribution, Morphology, Life Cycle, Pathogenicity, Diagnosis, Prophylaxis and Treatment of i. Taenia saginata. ii. Taenia solium iii. Echinococcus granulosus. 3. Parasitic adaptations in Cestodes 4. Larval forms in Cestodes | Explain parasitic diseases caused by cestodes. |

Specify Course Outcome: Outline information and diseases of parasitic protozoans and helminths.

Specify Program Outcome: Explain and illustrate ecological, ethological and parasitological aspects also practice techniques of biostatistics, Bio-informatics, vermicomposting and aquarium keeping.

Signature of Teacher



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Pro-forma for program and course outcomes (2.6.1) 2019-2020

Name of Teacher: Dr. S. R. Bhupalwar

Department: Zoology.

Program: B.Sc. T. Y.

Subject: Zoology.

Course Code: DSEZ-II.

Paper Title: Ethology, Biometry and Bioinformatics: P-XIV

| Unit Number | Unit Name | Topics | Unit-wise Outcome |
|-------------|-----------|--|---|
| 1 | Ethology | 1. Classification of Animal Behaviour- 1.1. Inborn or stereotyped animal behaviour – Taxis and Instincts with examples. 1.2. Acquired animal behavior – Imprinting, Conditioning, Habituation, Reasoning. 1.3 Social Behaviour in Insects – Honeybee. | Explain basic sense of different behaviours. |
| 2 | Ethology | 1. Communication in animals 1.1 Auditory Communication 1.2 Chemical Communication 1.3 Visual Communication 1.4 Tactile Communication 2. Mimicry and Colouration 2.1 Types of Mimicry- Protective and Aggressive 2.2 Types of Colourations- Protective, Aggressive and Warning | Classify sensory systems with their intelligence. |
| 3 | Biometry | 1. Collection and Classification of Data 1.1 Methods of collection of data 1.2 Types of classification of data - Geographical, Chronological, Quantitative, Qualitative, Continuous, Discontinuous. 2. Measures of Central Tendency | Define basic statistical techniques useful in biological studies. |
| | | Arithmetic Mean, Median and Mode 3. Graphic Representation of Data 1.1 Histogram 1.2 Pie Diagram 1.3 Polygon Frequency Curve | |



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| 4 | Bioinformatics | 1.1 Computer and their Applications in Biology 1.2 Internet and its Uses 1.3 World Wide Web 1.4 Search Engines 1.5 Broad Applications of Bioinformatics 1.6 Introduction to Biological Database a) NCBI b) Pub Med | Explain internet and web browsers. |
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Specify Course Outcome: define, explain and classify animal behavior, statistical techniques and internet.

Specify Program Outcome: Explain and illustrate ecological, ethological and parasitological aspects also practice techniques of biostatistics, Bio-informatics, vermicomposting and aquarium keeping.

Signature of Teacher



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Pro-forma for program and course outcomes (2.6.1) 2019-2020

Name of Teacher: Dr. S. R. Bhupalwar

Department: Zoology.

Program: B. Sc. T. Y.

Subject: Zoology.

Course Code: DSEZP-II.

Paper Title: APPLIED PARASITOLOGY – II: P-XV (B).

| Unit Number | Unit Name | Topics | Unit-wise Outcome |
|-------------|--|---|--|
| 1 | Parasitic Nematodes: Animal Nematodes | 1. Introduction, Classification, General organization of Animal Nematodes. 2. Study of Systematic Position, Geographical distribution, Morphology, Life Cycle, Pathogenicity, Diagnosis, Prophylaxis and Treatment of- 1. Enterobius vermicularis 2. Ancylostoma duodenale. 3. Wuchereria bancrofti. 3. Larval forms in Animal Nematodes | Identify and explain animal nematodes. |
| 2 | Parasitic Nematodes: Plant Nematodes | 1. Introduction, Classification, General organization of Plant Nematodes 2. Study of Systematic Position, Geographical distribution, Morphology, Life Cycle, Pathogenicity, Diagnosis, Prophylaxis and Treatment of- 1. Meloidogyne (Root knot nematode), 2. Heterodera (Cyst nematode) | Identify and explain plant nematodes. |
| | | 3. Tylenchulus (Citrus nematode) | |



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| 3 | Parasitic Arthropodes | 1. Systematic Position, Geographical Distribution, Morphology, Life Cycle, diseases and Control Measures of – i. Acarina-Ticks & Mites. ii. Parasitic Hemiptera -Bed Bug (Cimex lacturalis) 2. Parasitic flies-Outline Classification, Morphology, role as vectors of Human diseases and Control Measures of House Fly (Musca domestica), Bot Fly (Dermatobia hominis) | Identify and explain parasitic arthropods. |
| 4 | Insect Vectors | Morphology, pathogenecity and Control Measures of – i) Siphonaptera ii) Anopleura iii) Mallophaga iv) Hymenoptera 2. Mosquitoes as a vector in the transmission of Malaria, Dengue fever, Elephantiasis, Yellow Fever, Chikungunia and their control measures 3. Chemical and Biological Control of Insets. | Identify and explain mosquito-borne parasitic diseases. |

Specify Course Outcome: Identify and explain various parasitic diseases with causative organisms.

Specify Program Outcome: Explain and illustrate ecological, ethological and parasitological aspects also practice techniques of biostatistics, Bio-informatics, vermicomposting and aquarium keeping.

Signature of Teacher



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Pro-forma for program and course outcomes (2.6.1) 2019-2020

Name of Teacher: Mr. Shaikh Ubaid S. K. Masood.

Department: Zoology.

Program: B. Sc. T. Y.

Subject: Zoology

Course Code: DSEZP-I.

Paper Title: Ecology, Zoogeography Ethology, Biometry and Bioinformatics: Practical Paper- XVI.

| Unit Number | Unit Name | Topics | Unit-wise Outcome |
|-------------|--------------|--|---|
| 1 | Ecology | <ol style="list-style-type: none">1. Estimation of Dissolved O₂ from Water Sample.2. Estimation of Dissolved CO₂ from Water Sample.3. Estimation of Population Density from Water Sample/ Terrestrial area.4. Determination and study of Atmospheric Humidity.5. Study of positive and negative interactions (biotic interaction) in animals.6. Estimation of Chlorides, Salinity, Hardness from given water sample for Water quality status7. Ecological Adaptations (Any two examples from each to be studied) a) Volant Adaptations. b) Aquatic Animals (from fresh water and marine environment). c) Desert Animals.8. Report on a Field Visit to Zoo Park/National Park/Biodiversity Park/Wild Life Sanctuary to study management, behavior and enumeration of wild animals. | Analyse abiotic factors and adaptations in ecosystem. |
| 2 | Zoogeography | <ol style="list-style-type: none">1. Museum study of Vertebrate Endangered Species or Threatened Wild Animals on the Basis of charts/ models/ photographs (Any Five).2. Identification of Zoogeographical Realms from the Map and Identify Specific Fauna of Respective Regions. | Categorise endangered species and zoogeographical realms. |



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| 3 | Ethology | 1. To study the Positive and Negative Phototropism with suitable examples. 2. To study the Positive and Negative Chemotactic Response with suitable examples. 3. Study of Colouration of animals with suitable examples. | Demonstrate animal behavior. |
| 4 | Biometry | 1. Problems Based on Mean, Mode, Median. 2. Classification of Data- i) Histogram, ii) Pie-Diagram, iii) Polygon Frequency Curve. | Interpret and construct biological data. |
| 5 | Bioinformatics | 1. To perform online search on Biological information/Literature 2. How to access the biological data from NCBI and Pub Med 3. BLAST- Sequence Search & alignment. | Analyse biological data online. |

Specify Course Outcome: Analyse and demonstrate ethology, ecosystem and interpretation of biological data via statistical techniques and internet.

Specify Program Outcome: Explain and illustrate ecological, ethological and parasitological aspects also practice techniques of biostatistics, Bio-informatics, vermicomposting and aquarium keeping.

Signature of Teacher: Dr. S.R. Bhupalwar



Shikshan Sanstha's Dharmabad

Lal Bahadur Shastri Mahavidyalaya, Dharmabad-431809

Pro-forma for program and course outcomes (2.6.1) 2019-2020

Name of Teacher: Dr. S. R. Bhupalwar

Department: Zoology.

Program: B.Sc. TY Semester-VI

Subject: Zoology.

Course Code: DSEZP-II.

Paper Title: Applied Parasitology {XVII (B)}

| Unit Number | Unit Name | Topics | Unit-wise Outcome |
|-------------|-----------|--|--|
| 1 | I | Identification, classification and description of Protozoan Parasites through permanent slides/photomicrographs i. Entamoeba histolytica, ii. Giardia intestinalis, iii. Trichomonas vaginalis iv. Trypanosoma gambiense v. Balantidium coli vi. Sarcocystis cruzi, vii. Plasmodium sp. viii. Eimeria tenella 1 Collection, staining, identification and description of Parasitic protozoa from Blood sample or rectal contents of suitable animals – i. Ciliates, ii. Flagellates, iii. Malarial parasites, iv. Coccidian Parasites 2 Identification, classification and description of Parasitic platyhelminths through permanent slides/photomicrographs or specimens - i. Schistosoma haematobium ii. Fasciola hepatica iii. Paragonimus westermani. iv. Gastrodiscoides hominis | Able to identify, classify parasites and practice mounting of parasites. |



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| | <p>v. Taenia saginata, vi. Taenia solium vii. Echinococcus granulosus viii. Diphylobothrium lattu</p> <p>2. Collection, Preservation, Staining, Mounting, identification and description of Trematodes and Cestodes from locally available different hosts (Gills & intestines).</p> <p>3. Identification, classification and description of Parasitic Nematodes (Animals & Plants) through permanent slides/photomicrographs or specimens – i. Enterobius vermicularis ii. Ancylostoma duodenale. iii. Ascaris lumbricoides iv. Wuchereria bancrofti.</p> <p>v. Meloidogyne (Root knot nematode), vi. Heterodera (Cyst nematode) vii. Tylenchulus (Citrus nematode) viii. Anguina (Seed Gall- nematode)</p> <p>6. Collection, Preservation, Mounting, identification and description of Animal Nematodes from locally available different hosts (intestines).</p> <p>7. Collection, Preservation, Mounting, identification and description of Plant Nematodes from soil samples.</p> <p>8. Study of following arthropods through permanent slides/ photographs: Aedes, Culex, Anopheles, Pediculus humanus, Xenopsylla cheopis, Cimex lectularius Phlebotomus argentipes, Musca domestica.</p> <p>9 Collection, preservation, Preparation of permanent slides and description of mouth-parts of - House fly ii. Mosquito iii. Bed bug iv. Head louse</p> <p>10. Submission of a brief report on parasites of vertebrates.</p> | |
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Specify Course Outcome: Identify, classify parasites and practice mounting of parasites.

Specify Program Outcome: Explain and illustrate ecological, ethological and parasitological aspects also practice techniques of biostatistics, Bio-informatics, vermicomposting and aquarium keeping.

Signature of Teacher: Dr. S. R. Bhupalwar



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Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Dr. S. R. Bhupalwar **Department: Zoology**

Program: B.Sc. Third Year **Subject: Zoology**

Course Code: SECZ-III(E) **Year: 2018 – 19**

Paper Title: Parasites of Public Health Importance

Credits: 02 (Marks: 50)

| Unit | Unit Name/Topics | Unit wise Outcome |
|-------------|---|--|
| I | <p>Brief introduction of Parasitology, Parasitism, Parasite, Host, Vector.</p> <p>MALARIAL PARASITES.</p> <p>History, Geographic distribution, Taxonomic position of different Species of malarial parasites.</p> <p>Distinguishing characters of different species of human malarial parasites, Life cycle, Pathogenicity, Prevention and control measures of Malarial parasites.</p> | <p>To acquaint the students learn about history, distribution, different types of malarial diseases</p> |
| II | <p>PARASITIC PLATYHELMINTHES</p> <p>History, Geographic distribution, Morphology, Life Cycle, Pathogenicity, Prevention and control measures of Schistosoma haematobium and Taenia solium</p> | <p>Ability to understand the students about platyhelminthes history, distribution, structure, life cycle, diseases control treatment of different helminth parasites</p> |



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| III | LYMPHATIC FILARIAL PARASITES- Wuchereria bancrofti. History, Geographic distribution of lymphatic filariasis, Taxonomic position of Filarial worm (Wuchereria bancrofti), Distinguishing characters, Life cycle, Pathogenicity, Prevention and control measures. | Ability to understand the students lymphatical filarial parasites characters, life cycle, pathogenicity, prevention and control measures |
| IV | INSECTS OF MEDICAL IMPORTANCE Morphology, Medical importance and Control of Pediculus humanus, Xenopsylla cheopis Anopheles, Culex, Aedes | Students learn about insect vectors of human diseases, transmitters, preparation of mouth parts of arthropod insects |



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Pro-forma for program and course outcomes (2.6.1)

Name of Teacher: Dr. S. R. Bhupalwar

Department: Zoology

Program: B.Sc. Third Year

Subject: Zoology

Course Code: SECZ-IV(H)

Year: 2018 – 19

Paper Title: Sericulture

Credits: 02 (Marks: 50)

| Unit | Unit Name/Topics | Unit wise Outcome |
|-------------|--|--|
| I | Introduction of Sericulture 1.1 History and Scope of Sericulture, Present status of sericulture in India. 1.2 Types of silkworm- Mulberry, Tasar, Eri and Muga silkworm 1.3 Systematic position, Morphology, Life Cycle of Silkworm 1.3 Cultivation of Mulberry- Planting, grafting and Harvesting. 1.4 Mulberry diseases and pest managements. a) Foliar Disease b) Root rot Disease c) Root knot Disease d) Common pest of Mulberry | Students learn about history, scope, status, types of silk worm and cultivation, harvesting and diseases of Silk worms |
| II | Silk worm Rearing 1.1 Prerequisite for silkworm rearing. 1.2 Silkworm Rearing Equipments 1.3 Rearing Practices- Procurement of quality seeds, Brushing, Preparation of feed bed and feeding, Bed Cleaning, Spacing, Mounting, Harvesting of Cocoons, Post Cocoon Processing Stifling, Reeling. 1.4 Role of Environmental factors in rearing | Students understand about rearing, practice, equipments, feeding, role of environment factors of rearing in silkworms |
| III | Pests and Diseases 1.1 Introduction and classification of different types of silkworm diseases | Students ability to understand about silk worms, pests, diseases, fungal infections, control prevention of silk worms. |



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| | <p>1.2 Influence of environment and Nutrition on the incidence of diseases.</p> <p>1.3 Pests of silkworm: Uzi fly, dermestid beetles and vertebrates</p> <p>1.4 Pathogenesis of silkworm diseases: Protozoan, viral, fungal and bacterial</p> <p>1.5 Control and prevention of pests and diseases</p> | |
| IV | <p>Sericulture Economics and Marketing</p> <p>1.1 Mulberry cultivation (per hectare) –Cost and returns under irrigation and rainfed condition.</p> <p>1.2 Economics of egg production: Expenditure and income.</p> <p>1.3 Economics of silkworm rearing: Investment and returns</p> <p>1.4 Economics of silk reeling (per kg of raw silk): Cost and returns for different types of reeling establishments.</p> <p>1.5 Sericulture marketing organization for seed cocoon, raw silk and silk fabric</p> <p>1.6 Traditional and regulated markets, their merits and limitations</p> | <p>Students learn about mulberry cultivation, investment, sericulture marketing and organization and traditional and regulated markets, merits and limitations of sericulture.</p> |