SEMESTER- II

HCT-2.1: BIOLOGY OF CHORDATES

Total: 64 h

Course Outcomes (COs):

CO1: Described the general characters and classification of chordates
CO2: Impart knowledge in comparative anatomy and development systems of chordates.
CO3: Became able to discuss some and very important phenomena in Chordates.
CO4: Identified the taxonomic status of the entire chordates.
CO5: Identified the taxonomic status and evolutionary significance of entire Chordates. Gained basic knowledge of Pisces and their anatomical features.
CO6: Impaired the knowledge on ecological adaptations and some special features like parental care in Amphibians.
CO7: Know about the important group of Reptiles and their anatomical and physiological features and popularized with harmful and harmless eco-friendly Reptiles.
CO8: Make students to understand the basic information about Ornithology, Anatomical features, and special adaptations of Aves, which may useful for developed students' career as wildlife photographers.
CO9: Understand the basic information about mammals with special reference to its Anatomical features and significance and maintenance of domestic Mammals.

Unit-I **16 h**

General characters of Chordata:

Theories of origin of chordates, Protochordata: Outline classification; General characters of Hemichordata, Urochordata and Cephalochordata. Life cycle of Salpa, Doliolum and Branchiostoma. Retrogressive metamorphosis. Origin, evolution and general characters of Agnatha (Ostracoderms and Cyclostomes) and Gnathostomata (Placoderms).

Unit-II **16 h**

Pisces:

Chondrichthyes and Osteichthyes, deep-sea adaptations, adaptive radiation in bony fishes, migration in fish, sensory, hydrostatic and lateral line system.

Amphibia:

Origin and evolution, adaptations in amphibia, neoteny, breeding behaviour and parental care.

Unit-III **16 h**

Reptiles:

Origin, adaptive radiation and evolution. Extinct reptiles, venomous and non-venomous snakes in India. Snake venom, snake bite, associated bones and muscles, snake bite treatment.

Aves:

Origin of birds and evidences, aerial adaptations and mechanism of flight, courtship and breeding behaviour, avian migration.

Unit-IV **16 h**

Mammals:

Origin and evolution of mammals, Prototheria, Metatheria and Eutheria, and aquatic mammals. Structure of cutaneous, branchial and pulmonary respiration. Integuments of tetrapod and epidermal derivatives: glands, scales, horns, nails, hoofs, feathers, and hairs.

Reference Books

1. Marshall, A.J and Williams. W.D (Ed). Textbook of Zoology: Vertebrates-VII Ed.Vol. II. AITBS Publishers and distributors, 1995.
2. Young, J.Z. The Life of Vertebrates, III rd Ed Clarendon PressOxford,1981.
3. William N McFarland, F and Harvey PoughTom.J.C and Heiser, J.B. Vertebrate Life. Collier-Macmillan Publishers, London,1979.
4. Romer, W.B. The Vertebrate Body. Saunders, Philadelphia,1956.

HCT 2.2: PARASITOLOGY AND PALEOZOOLOGY

Total: 64 h

Course Outcomes (COs):

CO1: Acquired knowledge on an overview of parasitism
CO2: Known morphology, life cycle, epidemiology, pathogenicity, diagnosis and treatment of certain protozoan, helminthes, nematodes, arthropod and vertebrate parasites causing direct or indirect harm to mankind.
CO3: Identified different stages and adult parasites by slide/micro-photograph
CO4: Prepared and submitted project on vertebrate parasites.
CO5: Having knowledge about the geological history, geological time scale and associated fauna.

Unit-I **16 h**

Introduction: Concept of parasitism; Origin and evolution of parasitism; Types of animal relationships or symbiotic relationships; Types of parasites and hosts.

Protozoan parasites:

Life cycle, transmission and pathogencity of protozoan parasites; *Entamoeba histolytica* and *Trypanosoma, Leishmania, Trichomonas, and Plasmodium.*

Trematodes: *Schistosoma, Fasciola*; **Cestoda:** *Teania, Echinococus*.

Unit-II **16 h**

Ectoparasites:

Morphology, habitat, lifecycle, pathogenecity and prevention of ectoparasites;
a) Ticks b) Mites c) Flee d) Mosquitoes.

Insect vectors:

Morphology, Life cycle and medical importance of disease transmitting insect vectors and their control measures; *Aedes, Culex, Anopheles*, Housefly.

Unit-III **16 h**

Diseases Transmitted by bacteria: Cholera and Tuberculosis.

Diseases Transmitted by virus: Dengue fever, Hepatitis and KFD.

Nematodes:

General morphology, biology and distribution of nematodes, Economic importance of Nematodes of human, animals and insects.

Important nematode pests and parasites; Nematode diseases of man and animals and their control measures (Ascariasis, Trichinellosis, Enterobiosis, Wuchereriasis)

Unit-IV **16 h**

Paleozoology:

Survey of life through different geological time scale. Formation and types of fossils and fossilization. Taphonomy. Assessment of fossil records. Carbon dating of fossils, trace fossils and 14 living fossils. Significance of fossils, geological time scale and associated fauna.

Reference Books

1. Smyth, J.D. Animal Parasitology, Cambridge low Edition.U.K., 2000
2. Arora, D.R. and Arora, B. Medical Parasitology. 1st Edition. Satish kumar jain for CBS

Publisher ad Distributors, New Delhi, 2001.
3. Chatterjee, K.D. Parasitology (Protozoology and Helminthology). 12th Edition. Chatterjee Medical Publishers, Calcutta, 2001.
4. Thomas C. Cheng. General Parasitology. 2nd Edition. Acdemic Press, California, 1999.
5. Sobti, R.C. Medical Zoology. Shoban Lal Nagin Chand & Co. Jalandhar. India, 1999.
6. Roberts L.S. and Janovy J. Foundations of Parasitology, McGraw-Hill Publishers, New York, USA.
7. Modern Parasitology: A Textbook of Parasitology, FEG Cox., Wiley-Blackwell, U. K.
8. Qaise H. Baqri and M.Shami Jairajpuri, Bibliography of Nematology of India. CBS Publishers, 1995.
9. Ravichandra N.G. Methods and Techniques in Plant Nematology, 2001.

HCT- 2.3: BIODIVERSITY

Total: 64 h

Course Outcomes (COs):

CO1: To create knowledge about biodiversity management; in-situ and ex-situ conservation through technical aspects.
CO2: Applied biotechnology in biodiversity including molecular taxonomy, GIS.
CO3: Being aware of the significance and faunal diversity, distribution of the hotspots in biogeographic realms at international, national, local levels and their patterns in respect of their latitude and altitude gradients. Analyze species area relationship.
CO4: Get a deep knowledge on biodiversity richness in global scale and biogeography of India.
CO5: Analyze various threats to our biodiversity and able to suggest measures for conservation Strategies.

Unit-I **16 h**

Concepts, Definition. Values of biodiversity:

Consumptive use and Productive use; Social, Ethical, Aesthetic, Option & Environment service values. Biodiversity at global, national and local levels. Hot spots of biodiversity; India as a mega diversity nation. Endemism and endemic species. Genetic diversity: Nature and origin of genetic variations; Measurement of genetic diversity. Species diversity: History and origin of species diversity; Species diversity indices; Measures of diversity – Alpha, Beta & Gamma diversity. Ecosystem diversity: Classification and nature of ecosystems (in brief);Ecosystem diversity of India (in brief)

Unit-II **16 h**

Agro- biodiversity:

Origin and evolution of cultivated species diversity; Vavilovian centers ; Diversity in domesticated animal species. Threats to biodiversity: Deforestation & habitat destruction, Hunting & Overexploitation; Introduction of exotic species, Pollution. Endangered, Vulnerable, Rare and Threatened species. Conservation of Biodiversity: Objectives and action plans; Strategies – In situ and Ex- situ conservation; Peoples movement, Role of educational Institutions and NGO's, Biodiversity Awareness programmes

Unit-III **16 h**

Biodiversity and Biotechnology:

Role of Biotechnology in Assessment of biodiversity and bioresources; Biodiversity conservation; Utilization of Biodiversity / Bioresources. GMO's and their impact on biodiversity. Biodiversity legislation: Legal aspects with special reference to India; CITES; Trade related Intellectual Property Rights.

Unit-IV **16 h**

Biodiversity conventions:

Earth Summit and other conventions; Convention on Biological Diversity. Biodiversity Management: Organizations associated with biodiversity management– IUCN, UNEP, UNESCO, WWF, FAD,WCMC – their role and contributions. Bioprospecting; Biopiracy; Biosafety. Future strategies for Biodiversity Conservation in India.

Reference Books

1. Dasmann. F Raymond. Wildlife Biology. Wiley Eastern Ltd. India.1982.

2. Encyclopedia of Nature and Science. Vols 1-18. BayBooks Pvt.Ltd. Sydney, 1974.

3. Burnie. D. (Ed). Animal: the Definitive Visual Guide tothe Worlds Wildlife. D.K.Publications,2001.
4. EIA – A Biography Clark, B. D., Bissel, B. D. and Watheam, P. School of Forestry and Environment, SHIATSDeemed University, Allahabad.
5. Wildlife Ecology, Conservation and Management Anthony R.E. Sinclair, John M. Fryxell and Graeme Caughly Blackwell Publishing, U.S.A. 2006.
6. Collection and preservation of animals Jairajpuri M. S. Zoological Survey of India 1990
7. Biodiversity conservation in managed and protected areas Katwal/Banerjee Agrobios, India 2002.
8. Biodiversity and its conservation in India Negi, S.S. Indus Publishing Co., New Delhi. 1993.
9. Wildlife Ecology, Conservation and Management Sinclair, Anthony R.E., Fryxell, John M. and Caughly, Graeme Blackwell Publishing, U.S.A. 2006.
10. Vertebrate Zoology and Evolution. Yadav, B.N. IBD, Dehradun. 2000
11. Indian Wildlife Resources Ecology and Development Sharma, B.D Daya Publishing House, Delhi.
12. Collection and preservation of animals Jairajpuri M. S. Zoological Survey of India 1990.

SCT-2.1: IMMUNOLOGY

Total: 64 h

Course Outcomes (COs):

CO1: Attained knowledge about concept of health diseases, anatomical barriers, innate and adaptive immunity
CO2: Described structure and function of different important molecules like antigens, immunoglobulins, MHC molecules, cytokines and components of complement systems.
CO3: Conceptualized the components and function of hypersensitivity as well as principle of vaccination
CO4: Demonstrated different lymphoid organs by picture/slide.
CO5: Described ELISA technique.

Unit-I: **16 h**

Introduction to immunity:
History; Types of Immunity –Innate and Acquired immunity.
Cells and organs of immune system:
Immune cells:
Lymphocytes (T & B cells), Monocytes, Macrophage; Eosinophills, Basophills, Neutrophils and Mast cells.
Primary and secondary lymphoid organs:
Bone marrow, Thymus, Spleen and Lymph nodes.

Unit-II: **16 h**

Antigens:
Antigens, factors influencing immunogenicity, Adjuvant, Epitope, Hapten.
Immunoglobulins:
Basic structure of the immunoglobulins; Types and functions of Immunoglobulins, Monoclonal antibodies.
Antigen-antibody reactions and immune-techniques:
Agglutination; Precipitation; Immunofluorescence; RIA; ELISA, Immunoelectrophoresis and Western blotting.

Unit-III: **16 h**

Immune response:
Humoral and cell mediated immune responses, Primary and secondary immune modulation; Cytokines; Role of complement system in immune response (Classical pathway, Alternate pathway**);** Immune response against bacterial (tuberculosis), Parasitic (malaria) and viral (HIV) infections; Congenital and acquired immune-deficiencies; Autoimmune disorders.

Unit-IV: **16 h**

Major histo-compatibility complex (MHC) and hypersensitivity:
Transplantation and graft rejection, Genetic organization of H2 and HLA complexes, HLA typing; Immediate and delayed hypersensitivity.
Vaccines and vaccination:
Types of vaccines and their significance; Vaccine delivery systems.

Reference Books

1. Austyn, J.M. and Kathym, J. Wood. Principles of Cellular and Molecular Immunology. Oxford University Press. Oxford, 1993.
2. Benjamin, Elisunshine, Geoffrey Leskowitz. Immunology: A Short Course. 3rd Edition. New York, 1996.
3. Kubey, J.M. Essential Immunology. 6th Edition. Blackwell Scientific Publications, New York, 1990.
4. Rao, C.V. An Introduction to Immunology. Narona Publishing House, New Delhi, 2002.
5. Rotti, I. Essential Immunology. Blackwell, London, 1994.
6. Stibes, D.P. and Terr, A.I. Basic and Clinical Immunology. 7th Edition. Appleton and Large. California, 1991.

SCT-2.2: Biochemistry

Total: 64 h

Course Outcomes (COs):

CO1: Comprehended the energy source, chemical bonds and the principles of thermodynamic understood the importance of acid base balance
CO2: Attained the knowledge of macromolecules such as carbohydrates, protein and fat, their types and significance. Understood the knowledge of cholesterol and its biological significance
CO3: Described the enzymes, mechanism of enzyme action and factors affecting the enzyme activity
CO4: Understood central metabolic pathway
CO5: Analyzed qualitatively carbohydrates, proteins and lipids and quantitatively proteins by Lowry method.
CO6: Described the principle and applications of paper chromatography

Unit-I: **16 h**

Introduction:

Scope, structure of atoms, molecules and chemical bonds (covalent, coordinate, ionic and hydrogen bonds); Stabilizing interactions (Vander-Waals, electrostatic, hydrogen bonding, hydrophobic interaction); Principles of biophysical chemistry (pH, buffer, reaction kinetics, thermodynamics, colligative properties); Normality and molarity of solutions.

Nucleic acids: Composition, functions; Synthesis and metabolism of nucleic acids, Salvage pathways, its regulation and diseases.

Unit-II: **16 h**

Carbohydrates:

Composition, structure, functions and metabolism: Glycolysis, Citric acid cycle, Oxidative phosphorylation; Gluconeogenesis, Glycogenolysis, Regulation of blood sugar, Impaired Glucose Tolerance, Glycosuria, Insulin, Glucagons, Diabetes mellitus, Lactic acidosis, Glycated hemoglobin. Inborn errors associated with carbohydrate metabolism.

Unit-III: **16 h**

Proteins:

Composition, conformation of proteins (primary, secondary, tertiary and quaternary structure; domains; motif and folds); functions and metabolism: Transamination, Deamination, oxidative deamination, Urea cycle and Transmethylation.

Lipids:

Composition, structure, metabolism: Oxidation of fatty acids (Alpha and Beta oxidation), Prostaglandins, Cholesterol.

Hypercholesterolemia, Lipoproteins, Atherosclerosis. Disorders of lipid metabolism.

Unit-IV: **16 h**

Vitamins:

Composition, structure, functions, metabolism of vitamins.

Enzymes:

Principles and mechanism of enzyme catalysis, Enzyme and enzyme kinetics, Isozymes, Factors affecting enzyme activities, Feedback and allosteric inhibition enzyme regulation, Role of C-AMP in regulation, Clinical and industrial applications of enzymes.

Reference Books

1. Conn E.E, Stumpt P.K, Bruencing G and Dol. R.G. Outlines of Biochemistry. John Wiley, Singapore, 1995.
2. David L.Nelson and M.M.Cox. Principles of Biochemistry. 3rd Edn. Worth Publishers, 41, Madison Avenue, NY, 2000.
3. Harper H.A. A Review of Physiological Chemistry, Lange Medical Publication, 2nd Edn., 1993.
4. Lehninger A.L, Nelson D.L and Cox M.M, 2nd Edn. Principles of Biochemistry, CBS Publishers and Distributors, New Delhi, 1993.
5. Lubert Stryer. Biochemistry, 4th Edn. W. H. Freeman & Co. 1995.
6. Plummer, D.T. Practical Biochemistry, 3rd Edn. Tata McGraw Hill Publishing Co., Ltd. New Delhi, 1993.

OET- 2.1: ECONOMIC ZOOLOGY

Total: 32 h

Course Outcomes (COs):

CO1: Gain knowledge on the concepts of origin, growth and study of Sericulture as science, to acquaint the general aspects of Sericulture industry.
CO2: Identify various types of honey bee, importance of wax and identify what to look for in comb during hive inspections
CO3: Understand the principles, importance, purpose and application of the basic technologies in fisheries and aquaculture.
CO4: Gain skill on the economic importance of poultry farming to determine the best poultry management system.
CO5: Promote women entrepreneurship in rural areas through incorporation of women into economic activity.
CO6: Understand basic characteristics of common breeds of livestock species.

Unit-I: **16 h**

Introduction: Importance of Economic Zoology.
Vermiculture: Establishment of vermiculture unit; Earthworm as a tool for the conversion of biodegradable organic waste into vermicompost; Earthworms as supplementary feed for poultry and fish; Vermiprotein and Vermiwash.
Beekeeping: Beekeeping practices in India; Foraging and colony organization in Honeybees; Composition anduses of honey and bee-products.
Sericulture: Importance of sericulture as a rural industry; Life cycle of *Bombyx mori*; Modern rearing methods,reeling, grading and marketing.
Lac culture: Cultivation and uses of lac.

Unit-II: **16 h**

Fisheries: Culture of major carps and exotic carps; Off-shore fisheries-Sardin; Composite fish culture; Ornamental fishes; Pearl culture; Fish by-products.
Poultry keeping: Different breeds of chicken and different breeding systems; Egg production and economics.
Pest management: Pests of economically important crops; Household pests; Damages caused by pests; Integrated Pest Management (IPM)- Different components and general idea about the bio-control agents; Vertebrate (birds and rodents) pest management.

REFERENCE BOOKS RECOMMENDED:

1. Sathe T.V. Vermiculture and Organic farming
2. Imms AD General Text Book of Entomology. Vol I & II Champman & Hall London
3. Jhingran VG. Fish and Fisheries of India. Hindustan Publishing Corporation, New Delhi
4. Mishra RC Prospectives in Indian Apiculture Allied Scientific Publication
5. Pedigo LP Entomology and Pest Management IV Edition Prentice – Hall Publications

6. Srivastava KP Text Book of Applied Entomology Vol I & II Kalyani Publication Von Embden HF Pest Control 2nd Edition Cambridge University Press.
7. Alford: A textbook of Agricultural Entomology, Blackwell Science Ltd. 1999
8. Dhaliwal and Arora: Trends in Agricultural Insect Pest Management, Commonwealth Publications, New Delhi, 1994
9. Tazima. Y. 1958. Silkworm egg. CSB Publication, Bombay.
10. Yashimoro Tanaka. Sericology, CSB Publication, Bombay, 1964.
11. Tanaka, Y. "Genetics of the Silkworm, Bombyx mori" – advances in genetics, Demerec.M. (Ed), Vol.5, Academic Press, New York, 1953.
12. Tazima, Y. "The Genetics of the Silkworm". Logos Press Ltd., London, 1964.
Tazima, Y. The Silkworm an Important Laboratory Tool. Kodnasha Ltd., Tokyo, 1978.

OET- 2.2: Animal Behaviour

Total: 32 h

Course Outcomes (COs):

CO1: Learn the baseline information and knowledge for animal behavior.
CO2: Associate the likely role of external and internal stimuli on various animals during the day, season and year.
CO3: Relate daily behavioural rhythms in diurnal and nocturnal periodicities.
CO4: Predict and anticipate variety of animal actions (costs and benefits) as assessed by innate and learned behaviour; displays.
CO5: Integrate the animal behaviour as balanced mechanism to develop animal personality.

Unit-I: **16 h**

Introduction to animal behavior:
Introduction, Definition and history (Lorenz, Tinbergen and Karl von Frisch); Diversity and unity in the study of behavior and complex behavior, Significance of study of animal behavior, Neural aspects of behavior.

Types of animal behavior:
Types of behavior: Innate and acquired behavior. Genetic basis of behavior, Stereotyped behavior: Kinesis, taxis, orientation and reflexes. Social organization in insects.

Unit-II: **16 h**

Motivation and communication:
Motivation, Models of motivation drive. Migration and homing with special reference to birds. Chemical, visual, tactile and audible communication. Communication, functions of communication. Application of pheromones and their biological actions in invertebrates and vertebrates.

Ecology and behavior:
Ecological aspects of behavior – Habitat selection, Food selection, Anti –predator defense mechanism. Aggression, territoriality, Dispersal, Parental care and mating, Courtship behavior systems. Social organizations in primates.

Reference Books

1. Aubrey Manning and Marian. S. Dawkins. An Introduction to Animal Behaviour. Cambridge University Press, 1995.
2. McFarland. D. The Oxford Companion to Animal Behaviour.
3. McFarland.D. Animal Behavior Psychology, Ethology and Evolution. Pitman Publications, 1985.
4. Slater.P.J.B. Essentials of Animal Behaviour. Cambridge University Press, 1999.
5. Krebs J.R and Davies, N.B. An Introduction to Behavioural Ecology-III (Ed). Blackwell Science Ltd, 1993.
6. Eibl-Eibesfeldt, I. Ethology. The Biology of Behaviour. Holt, Rhineheart and Winston, Newyork.
7. Gould J.L. The mechanism and evolution of behavior.

8. Hinde R.A. Animal Behaviour: A synthesis of Ethology and Comparative Psychology. Mc Graw Hill, New York.
9. Bradbury J.W. and S.L. Vehrencamp. Principles of Animal Communication. Sinauer Associates, Sunderland, Massachusetts, USA.
10. Alcock J.W. Animal Behaviour: An Evolutionary approach. Sinauer Associates, Sunderland, Massachusetts, USA.

Second Semester

HCP2.1: PRACTICAL COURSE IN BIOLOGY OF CHORDATES BASED ON HCT-2.1

1. Biology of scoliodon:
    a) Study of external features of scoliodon
    b) Study of digestive system of scoliodon
    c) Study of male urogenital system of scoliodon
    d) Study of female urogenital system of scoliodon
    e) Study of cranial nerves of scoliodon
    f) Study of placoid scales and ampulla of Lorenzini
    g) Study of brain of scoliodon
    h) Study of membranous labyrinth

2.Biology of rat:
    a) Study of external features
    b) Study of circulatory system
    c) Study of male reproductive system
    d) Study of female reproductive system
    e) Study of brain

3.Study and mounting of scales from bony fishes

4.Comparative anatomy of heart, brain, integument & its derivatives, aortic arches, urogenital system in different vertebrates,

5.Osteology of frog, birds and rat

6.Distinguish bones of different animal organisms.

7.Recognize migratory birds.

8.Outline the causes of extinction of animals.

9.To handle small animal organism without affecting their internal organs

10. Interpret anatomical differences among vertebrates.

11. Differentiate the organ systems in different vertebrates.

12. Perform preliminary survey on migratory birds.

13. Design the net for collecting fishes and identify different fishes.

14. Develop the aesthetic sense in protecting animal organisms.

15. Any other practical's depending upon feasibility

HCP-2.2: PRACTICAL COURSE IN PARASITOLOGY AND PALEOZOOLOGY BASED ON HCT- 2.2

1. Study of protozoan parasites of human and domestic animals.
2. Staining blood films for the study of protozoa parasites (especially malarial parasite).
3. Collection of specimen for the study of parasites.
4. Study of intestinal parasites of frog and insects.
5. Preparation of permanent slides of the hard parts of insects
6. Study of vectors and their mouth parts: a) Mosquito b) Flea c) Ticks d) Housefly e) Cockroach
7. Study of ecto-parasites - Lice, Leech, Ticks and Mites.
8. Study of helminthes parasites - *Taenia, Wucheria, Fasciola, Ascaris, Ancylostoma* .
9. Slides and specimens: Pathogens of Malaria, Filariasis, Leishmaniasis, Trypanosomiasis, Ascariasis. Diseases of Liver fluke, Tapeworm etc.
10. Field visit to collect the soil samples and isolation and identification of important soil nematodes
11. Any other practical depending on feasibility

HCP-2.3: PRACTICAL COURSE IN BIODIVERSITY BASED ON HCT- 2.3

1. Determine the required size of quadrant to study the vegetation by species area curve method.
2. Determine the required number of quadrat to study the vegetation in a given area by species area curve method.
3. Analyze the vegetation by quadrat method. i. Line transect method ii. Belt transect method
4. Estimate the litter arthropod diversity by a trap method.
5. Analyze the population structure of tree species in a given area.
6. Estimate the standing forest floor litter.
7. Nutrients cycling in forest: Soil sampling & Organic carbon analysis.
8. Identify marine and fresh water planktons (preserved water samples may be used).
9. Separate, mount and study the appendages of prawn; penaeid and non-penaeid.
10. Study of animal architecture (photographs / diagram / abandoned specimen); Hive of honey bee, nest of paper wasp, nest of potter wasp, Mount of termite, Nests of Weaver Bird and tailor bird.
11. Comparative study of mouth parts (preserved specimen / diagrams only); House fly, female Mosquito, Cockroach, Butterfly / moth, Bug, beetle.
12. Using photographs / paintings / coloured drawings identify and study distribution and ecological role of common bivalves and gastropods that occur along a sea-shore.
13. Compare and interpret given sonograms of bird calls (any two e.g. Courtship calls, Alarm calls)
    Identify and describe false colour images of land use patterns from a satellite image; City, reservoir, forest, agricultural land, sea-shore.

SCP-2.1: PRACTICAL COURSE IN IMMUNOLOGY BASED ON THE SCT- 2.1

1. Study of cells and organs of the immune system.
2. Haemagglutination test for blood group determination.
3. Determination of differential count of WBC.
4. Determination of total count of WBC using haemocytometer.
5. Estimation of the haemoglobin content by cyanmethemoglobin method.
6. Separation of serum from the blood
7. Separation of plasma from the blood.
8. Purification of IgG from the serum.
9. Determination of antibody titre.
10. Electrophoretic separation of serum/plasma proteins.
11. Immunochromatography technique to detect
12. Hepatitis-B virus
13. HCG in urine sample for pregnancy
14. HIV (tri-dot assay)
15. Radial immunodiffusion test to detect the concentration of unknown antigen.
16. Ouchterlony double diffusion test to detect the concentration of unknown antigen.
17. Demonstration of ELISA
18. Any other practical depending on feasibility

SCP-2.2: PRACTICAL COURSE IN BIOCHEMISTRY BASED ON THE SCT- 2.2

1. Qualitative analysis of carbohydrates (Starch, Glycogen, Sucrose, Lactose, Maltose, Glucose, Fructose).
2. Qualitative analysis of proteins (Egg albumin, Casein, Gelatin, Peptone)
3. Precipitation reaction of proteins (Egg albumin, Peptone)
4. Estimation of amino acids by Sorenson's Formal titration (Arginine, Alanine, Leucine, lysine etc.)
5. Demonstration of Beer Lambert's law (Methylene blue, Safranine etc.).
6. Determination of concentration of Glucose and Maltose by calibration curve.
7. Determination of amylase activity.
8. Determination of effect of temperature, pH and incubation period on amylase activity.
9. Any other practical depending on feasibility