

HCT- 3.1 Ecology and Wildlife Biology

Total: 64 h

Course Outcomes (COs):

- CO1:** Students will be able to apply knowledge to solve problems related to wildlife conservation and management.
- CO2:** Students will have a greater knowledge of how wildlife conservation and management relates to the economy and environment, both currently and in the future.
- CO3:** Students will be able to critically evaluate current events and public information related to wildlife conservation and management as being scientifically-based or opinion-based and contribute to the knowledge base of information.
- CO4:** To develop awareness about the environment and the interaction of various components.
- CO5:** Description of nature of ecosystem, production, food webs, energy flow, biogeochemical cycles, resilience of ecosystem and ecosystem management.
- CO6:** Understanding the biosphere, biomes and impact of climate on biomes.

Unit-I

16 h

A. Ecosystem: Historical account, Scope, Basic concepts and Approaches to the study of Environmental Biology. Components of Environment - An overview of abiotic factors and Biotic factors. Concepts of habitat and Ecological niche. Ecotone and Edge effect. Food chains, Food-webs and their structure in Ecological Pyramids in aquatic, terrestrial and parasitic Environments.

B. Population Ecology: Introduction. An overview of important population attributes – Density, Natality, Growth rates, Growth forms and concept of carrying capacity, Patterns in human population growth and its explosion -Remedial measures. Mortality - life tables and survivorship curve, sex ratio, age distribution, dispersal and dispersion, aggregation and Allee's principle, population fluctuation and cyclic oscillations and Population interactions.

Unit-II

16 h

Wildlife studies:

Definition of wildlife, values of wildlife, significance and scope of wildlife conservation, wildlife distribution; Global distribution, Indian wild fauna, wildlife byproducts and trade, Ethical value, Scientific value, medicinal value, game and recreation value, ecological value, wildlife as natural resource in India.

Wildlife categories and causes of depletion:

IUCN Red list, Categories of wildlife; Extinct, Endangered, Threatened, Vulnerable, rare; data deficient categories. Causes of wildlife depletion: Degradation and destruction of natural habitats, Exploitation for commercial purposes, Deforestation, Agricultural expansion and grazing, Urbanization and industrialization, Forest fires. Human-wildlife conflicts.

Unit-III

16 h

Wildlife conservation:

Historical background, Need of conservation projects in India, Ex- situ & in-situ conservation. National parks, Wildlife sanctuaries, wildlife reserves, Biosphere reserves. National parks and wildlife sanctuaries in Karnataka. Umbrella species, flagship species based conservation programmes. Mitigation of human-wildlife conflicts.

Unit-IV**People and conservation:**

Traditional knowledge, Traditions & cultures, Women in conservation Traditional Societies (e.g. bedas, kadu kurubas, trible peoples).

Role of NGOs in conservation: International NGOs; UNEP, GEF, WCS, Bird Life International Important NGOs in India & their contributions , WWF, ATREE, BNHS, WTI, Kalpavriksha etc. Important NGO movements, Chipko movement, Narmada Bachavo Aandholan, Pani Panchayats, Seed Movement etc.

Reference Books

1. Ali, S. and Ripley S.D. Hand Book of Birds of India and Pakistan, Oxford University, 1969.
2. Chatrath, K.J.S. Wetlands of India, Ashish Publishing House, New Delhi, 1992.
3. Heywood, V.H. (Eds). Global Biodiversity Published for UN Environmental Programme, Cambridge University Press, 1995.
4. Hosetti, B.B. Concepts in Wildlife Management, Daya Publishing House, Delhi, 1996.
5. Hosetti, B.B. and Venkateshwarlu M. Wildlife Trends in Biodiversity Conservation and Management, Daya publishing House, Delhi-35, India, 2001.
6. Hosetti, B.B. Glimpses of Biodiversity, Daya Publishing House, Delhi-35, India, 2002.
7. Stiling, P. Ecology: Theories and Applications IV Ed. Prentice Hall of India Pvt. Ltd., New Delhi-110 001 2002.
8. Khanna, D.R. and P.R. Yadav. Biology of Birds, Discovery Publishing House, New Delhi 110 002, 2005.
9. Sharma, B.B. High Altitude Wildlife of India, IBH Publ. House New Delhi, 1994.
10. Ganguly, G. Sinclair and R.E. Anthony, Wildlife Ecology and Management, Blackwell Scientific Publ. Boston, 1994.
11. Negi, S.S. Hand Book of National Parks, Wildlife Sanctuaries and Biosphere Reserves in India. Indus Publ., New Delhi, 2002.

HCT 3.2 Ethology

Total: 64 h

Course Outcomes (COs):

- CO1:** Acquire basic knowledge on animal behavioural patterns and their role in the formation of social groups.
- CO2:** Students will acquire new knowledge and ideas in the mechanism of instinct and behaviour, understand how animals learn, analyze any problem with behaviour and understand the importance of evolution for animal behaviour.
- CO3:** Students will acquire knowledge of natural selection and behaviour, the relationship between predators and prey, and social behaviour.

Unit-I

16 h

Definition and types of animal behaviour:

Innate behaviour – Taxes, reflexes, motivation and instincts- fixed action patterns sign stimuli and releases, types of sign stimuli

Learned behaviour- Habituation, conditioned reflexes and insight learning, Latent learning, imprinting- Mechanism of imprinting, types of imprinting.

Unit-II

16 h

Foraging and anti-predator behaviour:

Feeding strategies – search and selection of food, Anti-predator behaviour – avoiding detection through colour and markings (Mullarian mimicry), Warning colouration, Batesian mimicry.

Biological communications:

Nature and functions of communications, forms and signals of communications- Visual, auditory, chemical communications.

Unit-III

16 h

Sexual behaviour:

Seasonality, isolation and territories with suitable examples, Sexual behaviour – Courtship behaviour, Pheromones in insects and mammals, Lee -Boot's effect, Whitten effect, Bruce effect, Coolidge effect, Castro Vandenbergh effect. Courtship signals, Selected examples of courtship and mating behaviour, Courtship as conflict behaviour, parental care, nesting behaviour.

Unit-IV

16 h

Social organization:

Introduction, Advantages of grouping, Social organization in insects with special reference to ants and honeybees, Quasi social, semi social and eusocial, Social organisation in sub-human primates. Altruism.

Biological rhythms:

Types of rhythms, biological clocks and their significance.

Reference Books

1. Manning A. and Dawkins M. An Introduction to Animal Behaviour- IV Ed., Cambridge Univ. Press, 1997.
2. Harjindra Singh, A Text Book of Animal Behaviour, 1st Edition, Anmol Publications 1990.
3. Krebs, J.R. and Davies, N.B. An Introduction to Behavioural Ecology, 3rd Edition, Blackwell Scientific Publications.
4. Reena Mathur, Animal Behaviour, 1st Edition, Vivek Rastogi for Rastogi and Company, 1996.
5. Ranga, M.M., Animal Behaviour, 1st Edition, Agro Botanical Publishers, 1994.
6. Vinod Kumar, Animal Behaviour, 1st Edition. Himalaya Publishing House, 1996.

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HCT 3.3 Animal physiology

Total: 64 h

Course Outcomes (COs):

- CO1: Student should know about feeding types, role of major nutrients, need for vitamins and deficiency causes of the same.
- CO2: Students gain fundamental knowledge of physiology of digestion and balanced diet.
- CO3: Student should understand the mechanism of respiration, exchange of gases, mechanism of Inspiration and exhalation.
- CO4: Student should understand how blood circulates.
- CO5: Student should understand the mechanism of neuronal transmission. How the muscles are contracted and relaxed.

Unit-I

16 h

Digestion and Respiration:

Functional anatomy of digestive system. Digestion and absorption. Neuroendocrine regulation of gastro – intestinal movements and secretions. Respiration- external and internal respiration Respiratory quotient Respiratory Pigments Transport of respiratory gases. Respiratory acidosis and alkalosis and regulation of blood PH.

Unit –II

16 h

Circulation and Excretion:

Cardiac physiology: physiology of heartbeat, Rhythmicity, and diseases associated with heart. Components of blood and functional significance. Cascade of biochemical reactions (factors) involving in blood coagulation.

Nitrogen excretion in aquatic and terrestrial animals – ammonotelism with examples Ureotelism and uricotelism with examples- Ornithine cycle in human. Physiology of urine formation in human

Unit-III

16 h

Nervous Coordination:

Structure and types of neuron. Glial cells and functions Fundamentals of nerve impulse-

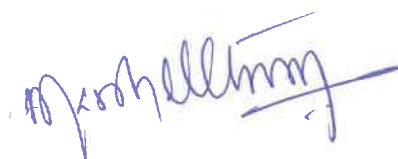
Basic concepts of nerve impulse, sodium potassium pump, resting potential, Action potential, role of ion channels. Types of synapses- electrical and chemical, gap junctions, ligand gated channels and the mechanism of synaptic transmission, cholinergic adrenergic and Gabaergic transmitters, Neuromuscular junction. Molecular biology of sodium, potassium, ionic channels, patch clamp studies and their importance - -

Unit – IV

16 h

Muscular Physiology:

Types of muscles: striated, nonstriated and cardiac muscles. Ultra structure of striated muscle. Muscle contraction – Muscle proteins, sliding filament theory, Energetics of muscle contraction. Defects in muscle function, muscle coordination diseases, muscular dystrophy. Aging physiology concepts related to muscle function.

Reference Books

1. Text Book of Medical Physiology, 13th Edition Guyton & Hall Saunders Publications.
2. Animal Physiology: Adaptations and Environment, Knut – Schmidh & Nielson. Cambridge University Press.
3. Medical Physiology, Boron & Boulpaep Elsevier Publications.
4. Biochemistry, 7th Edition, Berg Jm., Tymoczko J.L., Strayer L.. W.H. Freeman Publications.
5. Lahniger's Principles of Biochemistry, 6th Edition. Michael M. Cox and David Nelson Macmillan Publishers.

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SCT 3.1 Endocrinology

Total: 64 h

Course Outcomes (COs):

- CO1:** Describe different classes of chemical messengers and their physical characteristics.
- CO2:** Explain how the secretion of hormone is regulated through positive and negative feedback mechanisms.
- CO3:** Summarize the anatomy, regulation, and physiological functions of the hormones of the hypophysis, thyroid, parathyroid, pancreas adrenal, hypothalamus and adrenal glands.
- CO4:** Describe the anatomy of male and female reproductive systems including hormonal functions and pathophysiology.
- CO5:** To understand the basic information about the endocrine glands & their secretions.
- CO6:** To understand the working principles of hormones and their related deficiency diseases.

Unit-I

16 h

Introduction:

Historical developments in endocrinology; Classification of hormones; Techniques in endocrinology. Structure and functions of thyroid, parathyroid, adrenal gland, pancreas and pineal glands. Positive and negative feedback of hormone action; Calcium and Glucose homeostasis.

Unit II

16 h

Mechanism of hormone action:

Types of hormone receptors-membrane bound cytoplasmic and nuclear receptors. Regulation of receptor number, signal transduction- secondary messengers, cyclic AMP, prostaglandin, Calmodulin mediated pathways, genomic mechanism of hormone action. Steroid hormones, termination of hormone action.

Unit-III

16 h

Biosynthesis, mechanism of hormone action and growth factors:

Biosynthesis of peptide hormone - Insulin; General mechanism of action of peptide hormone; Signal transduction.

Biosynthesis of steroid hormones - Corticosteroids, Sex steroids; General mechanism of action of steroid hormones; Termination of hormone action.

Biosynthesis of Catecholamines, Thyroid hormones and Prostaglandins.

Unit IV

16 h

Hypothalamus and hypophyseal axis:

Hypothalamus- structure and functions, hypothalamo hypophyseal portal system, regulation of hypophyseal secretions. Morphology of pituitary gland (fishes – mammals). Causes for impaired and excessive secretions. Pathophysiology of hormonal impairments such as cretinism, Cushing syndrome and Addison's disease. Pathophysiology-pituitary dwarfism, gigantism and acromegaly.

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Reference Books

1. Molecular Endocrinology by Bolander F.F. Academic Press International, 1989.
2. Vertebrate Endocrinology by Norris D.O. 2nd Edition, Lea and Febiger
3. Comparative Endocrinology by Turner and Bugnara
4. Endocrinology by Mac E Hadley. Prentice – Hall International
5. Text Book of Endocrinology 6th Edition by Williams R.H. Saunders Company

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SCT 3.2 Entomology

Total: 64 h

Course Outcomes (COs):

- CO1:** The student will explain how insects originated and evolved on earth.
CO2: The student gain knowledge regarding fossil insects.
CO3: The student will be able to describe diversity, systematics, biology and habits of insects.
CO4: The student will explore the external morphology of insects.

Unit-I

16 h

Morphology of insects:

External features and their articulation. Study of head-antennae, mouth parts, thorax - legs, wings, abdominal appendages, genitalia. Taxonomy - historical development of classification of insects, Basis of insect classification, Classification of insects up to orders.

Insect physiology:

General structure and functions. Digestive system, Excretory system, Nerve system, Reproductive system, Respiratory system and Endocrine system.
Metamorphosis, Sense organs.

Unit-II

16 h

Insect-plant interactions:

Theory of co-evolution, role of allelochemicals in host plant mediation, host plant selection by phytophagous insects, establishment of insect population on a plant surface.

Agricultural entomology:

Pests - definition and its ecology, features responsible for evolutionary success of insect species, factors responsible for achieving the status of pest. Pest of major crops (adaptations and control) Cereals: Rice & Maize. Oil seeds: Sun flower & Groundnut. Vegetable crops: Brinjal and Ladies finger. Miscellaneous: Sugarcane, Cotton and Coconut.

Unit-III

16 h

Insects and sociality:

Group of social insects and their social life, evolution of sociality, social organization and social behaviour - Honeybees, Ants, Termites and Wasps.

Integrated pest management (IPM):

History, different phases of pest control, Quarantine, Physical, Cultural, Chemical, Biological control and, genetic and biotechnological methods of control. Pheromones- production and their use in pest surveillance and management.

Unit-IV:

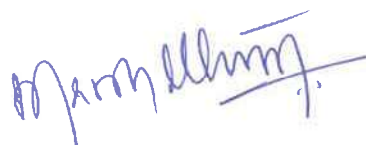
16 h

Forensic entomology:

Introduction, forensically important insects, collection of data from cadaver site, interpretation of data for predicting time and cause of death.

Veterinary and forest entomology:

Common insects attacking humans and domestic animals; their life history, mode of attack, type of injury or infection, treatment and control especially with reference to house fly, blow flies, blood sucking insects. Insect pests of timber and forest products.

Reference Books

1. Awasti V.B. Introduction to General Entomology, 3rd Ed. Scientific publication (India), Jodhpur, 2009.
2. Awasti V.B. Agricultural Insect Pests and Their Control. Scientific publishers (India) Jodhpur, 2007.
3. Beranays, E. A and Chapman, R.F. Host Selection By Phytophagous Insects. Chapman & Hall Cambridge University, New York, USA, 2006.
4. Chapman R.F. The Insects: Structure and Function. 5th Edition, Cambridge University Press, 1998.
5. Dhaliwal G.S. Ramsingh and B.S. Chillar. Essentials of Agricultural Entomology. Kalyani Publishers, New Delhi, 2006.
6. Gullan, P.J. and Cranston, P. The Insects: An Outline of Entomology. 4th Edn., Wiley : Blackwell Press, 2010.
7. Kerkut G.A. and Gilbert L.I. Comprehensive Insect Physiology, Biochemistry and Pharmacology, vol. I-XIII. Pergamon Press. Oxford and New York, 1985.
8. Pedigo, L. Entomology and Pest Management, 6th Edt., Prentice - Hall, Upper Saddle River, New Jersey, 2009.
9. P.W. Price et. al., Insects Ecology-Behaviour, Population and Communities. Cambridge University Press, 2011.
10. Turner R.B. Analytical Biochemistry of Insects. Elsevier Scientific Publishing Co., Amsterdam, 1977.
11. Wall R. and Shearer D. Veterinary Entomology: Arthropod Ecto-parasites of Veterinary Importance. Chapman & Hall. USA, 1997.
12. Wigglesworth V.B. The Principles of Insect Physiology. English Language Book Society and Methaune & Co., Ltd., 1965.





OET 3.1 Pollution

Total: 32 h

Course Outcomes (COs):

- CO1:** Acquired a basic understanding of environment and its associated problems viz, air pollution, water pollution and solid waste pollution and their management and control.
- CO2:** Understand the factors of Climate change like Greenhouse gases, Global warming, Acid rain, Ozone layer destruction and Effect of Climate change on public health.

Unit I

16 h

Concept of Biosphere:

Its components, hydrosphere, atmosphere, and lithosphere, Origin of life in the biosphere. Water pollution: Definition, sources Types and classification of pollutants. Effects of Water Pollution, River Pollution, Oxygen sag curves and Eutrophication Drinking water: Collection, purification and distribution. Wastewater treatment: Primary, secondary and tertiary treatment.

Unit II

16 h

Atmospheric pollution:

Primary and secondary air pollutants. Biological effects of Nox, SO_x, SPM, Hydrocarbons, Acid rain, Global warming, Photochemical smog and Ozone hole. Solid waste and Biomedical waste: Sources, collection, transport, treatment and Disposal methods.. Noise Pollution: Sources, Biological effects, Control measures and OSHA standards.

Reference Books

1. J. Jeffrey Peirce, P. Aarne Vesilind, Ruth F. Weiner (1997) Environmental Pollution and Control, 4th ed. Elsevier Science & Technology Books.
2. Harendra K. Sharma, Jayashree B Tirpude, Yogita K Meshram, Priyadarshini P Chahande (2023) A Text Book of Environmental Chemistry and Pollution Control. AG Publishing House.
3. Pandey et al., (2010) Text Book of Environmental Pollution. Narendra Publishing House.

OET 3.2 Reproductive Health

Total: 32 h

Course Outcomes (COs):

- CO1:** Know the anatomy of male and female reproduction; Hormones and its role in fertilization and reproductive health.
- CO2:** Describe the structural and functional features of human reproductive system, fertilization, implantation, pregnancy, gestation, placenta, parturition and lactation.
- CO3:** Understand the symptoms, mode of transmission, diagnosis and treatment of different sexually transmitted diseases and their socio economic dimensions.

Unit-I

16 h

Male and Female reproductive system, Structure and functions of Primary and accessory reproductive organs, formation of spermatozoa and egg. Onset of puberty and its Hormonal control in male and female, Menstrual cycle and its hormonal control. Events of fertilization.

Unit-II

16 h

Sexually transmitted diseases (STD): Meaning, Psychological aspects of STD. Incidence, causes, transmission, symptoms, diagnosis and treatment of Gonorrhoea, Syphilis, Herpes, Chlamydia, genital warts, AIDS, Vaginitis.

Reference Books

1. Jejeebhoy, S. J., & Santhya, K. G. (2014). Sexual and reproductive health: Current status and future needs. In S. J. Jejeebhoy, P. M. Kulkarni, K. G. Santhya et al. (Eds.), Population and Reproductive Health in India: An Assessment of the Current Situation and Future Needs (pp. 175–246). New Delhi, India: Oxford University Press.
2. Knobil E and Neil Encyclopedia of Reproduction Vol. I – IV Academic Press
3. Knobil E and Neil The Physiology of Reproduction Vol. I & II Raven Press Ltd., 1994.
4. Saidapur Reproductive Cycles of Vertebrates Allied Publications New Delhi

Third Semester

HCP-3.1: PRACTICAL COURSE IN ECOLOGY AND WILDLIFE BIOLOGY BASED ON THE HCT- 3.1

1. Importance and scope of biodiversity
2. Methods of biodiversity study
3. Study of bio-geographical realms.
4. Biodiversity hotspots of the World.
5. Wildlife sanctuaries, National parks and Wetlands of India.
6. Wildlife sanctuaries of Karnataka
7. Critical studies on endangered, endemic, vulnerable, exotic, extinct species of India.
8. Critical studies on endangered and extinct species of World
9. On a phyto-geographic map of India locate & demarcate major sanctuaries / national parks.
10. Identify and describe false colour images of land use patterns from a satellite image; City, reservoir, forest, agricultural land, sea-shore.
11. Using photographs / paintings / coloured drawings identify and study distribution and ecological role of Endangered species of India
12. Using photographs / paintings / coloured drawings identify and study distribution and ecological role of Endemic species of Western ghats .
13. Using photographs / paintings / coloured drawings identify and study the extinct species of globe.
14. Determination of species diversity by Shannon-Weiner Index
15. Determination of species diversity by Simpson's index
16. Visit to a wildlife sanctuary, zoo/natural history Museum and submission of a report.
17. Audio-visual programmes.
18. Any other practical depending upon feasibility.



HCP 3.2: PRACTICAL COURSE IN ETHOLOGY BASED ON HCT-3.2

1. Imprinting
2. Insight learning
3. Classical conditioning
4. Operant conditioning
5. Courtship behavior:
 - a) Andean Flamingo
 - b) Lesser Flamingo
 - c) Peacock
 - d) Mallard Duck
 - e) Stickle Back Fish
 - f) Giraffe.
6. Insight behavior /learning:
 - a) Chimpanzee tool use
 - b) Orangutan in rain
 - c) Orangutan roof preparation.
7. Stereotyped behavior
 - a) Graylag goose /Imprinting
 - b) Stickleback fish
 - c) Herring gull.
8. Territorial Behavior
 - a) Common black bird
 - b) Wood pecker.
9. Nesting Behavior
 - a) Bower bird
 - b) Baya bird
 - c) Tailor bird.
10. Honey bee Communication
 - a) Round dance
 - b) Waggle dance.
11. To study the geo-taxis, photo-taxis, chemo-taxis and hydro-taxi of earthworms.
12. Sexual behaviour and pupation behaviour in Drosophila
13. Behaviour experiments in Rat/Captive Mice/Bruce mice and foraging experiments in Honeybees.
14. Trailing behaviour in ants
15. Any other practical depending on feasibility



HCP 3.3: PRACTICAL COURSE IN ANIMAL PHYSIOLOGY BASED ON HCT-3.3

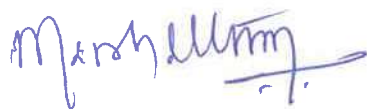
1. Qualitative analysis of carbohydrates
2. Qualitative analysis of polysaccharides
3. Qualitative analysis of proteins
4. Qualitative analysis of lipids
5. Estimation of protein in different animal tissues
6. Estimation of glucose
7. Total count of RBC
8. Total count of WBC
9. Differential count of WBC
10. Estimation of blood clotting time
11. Estimation of hemoglobin
12. Estimation of cholesterol and triglycerides
13. Analysis of pathological contents of urine
14. Identification of adulterants
15. Any other practical depending on feasibility



SCP-3.1: PRACTICAL COURSE IN ENDOCRINOLOGY BASED ON SCT-3.1

1. Display of endocrine glands in fish and rat/mice
2. Mounting of pituitary and pineal gland in fish and rat / mice
3. Study of procedure for adrenalectomy in rat
4. Study of histoarchitecture of endocrine glands
 - A. Pituitary of mammals (Rat)
 - B. Ovary of mammals (Rat)
 - C. Testis of mammals (Rat)
 - D. Adrenal, thyroid, pancreas glands of mammals (Rat)
5. Preparation of permanent histological slides of endocrine glands
Hormone assays and working principles of RIA & ELISA
6. Histological studies of reproductive systems in crab, fish, frog , pigeon and rats (slides)
7. Study of estrous cycle in rat- vaginal smear method Demonstration of following technique:
 - a) Thyroidectomy
 - b) Adrenalectomy in a suitable animal (rat/mice).
8. Effect of unilateral or bilateral adrenalectomy on serum GOT activity in albino rat.
9. Any other practical depending on feasibility





SCP-3.2: PRACTICAL COURSE IN ENTOMOLOGY BASED ON THE SCT- 3.2

1. Methods of collection and preservation of insects including immature stages.
2. External features of grasshopper/blister beetle.
3. Types of insect antennae, mouth parts and legs.
4. Wing venation, types of wings and wing coupling apparatus.
5. Types of insect larvae and pupae.
6. Dissection of digestive system in insects (cockroach).
7. Dissection of male and female reproductive systems in insects (cockroach).
8. Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera.
9. Study of characters of orders Thysanoptera, Hemiptera, Lepidoptera, Neuroptera.
10. Study of characters of orders Coleoptera, Hymenoptera and Diptera and their families of agricultural importance.
11. Identification and anatomical studies of major vector species of *Anopheles*, *Culex* and *Aedes*.
12. Study of common insects and their significance.
13. Insecticides and their formulations.
14. Pesticide appliances and their maintenance.
15. Sampling techniques for estimation of insect population and damage.
16. Any other practical depending on feasibility.