

GOVERNMENT COLLEGE FOR WOMEN (AUTONOMOUS), KUMBAKONAM
PG & RESEARCH DEPARTMENT OF ZOOLOGY
B.SC., ZOOLOGY - REVISED COURSE STRUCTURE UNDER CBCS
(For the candidates admitted from the Academic year 2018 - 19 onwards)

					Revised
Sem	Course code	Course Title	Inst, Hrs/Week	Credits	Marks
I	17GT1	Part I Language Tamil	6	3	100
	17GE1	Part II Language English	6	3	100
	18ZC101	Part III Core Course 1 - Invertebrate Theory	6	5	100
	18ZCB02P1	Part III Core Course II - Invertebrata and Chordata Practical	3	-	-
	181AZ1	Part III Allied Course I - Biology of Invertebrate and Chordata Theory	6	4	100
	182AZ2P	Part III Allied Course II - Practical	3	-	-
			Total	30	15
II	17GT2	Part I Language Tamil	6	3	100
	17GE2	Part II Language English	6	3	100
	18ZC203	Part III Core Course III - Chordata Theory	3	5	100
	18ZC202P1	Part III Core Course II - Invertebrate and Chordata Practical	5	5	100
	182AZ2P	Part III Allied Course II - Practical	2	3	100
	182AZ3	Part III Allied Course III - General Principles of Zoology and Commercial Zoology.	4	3	100
	18UVE	Part IV Value Education Yoga	2	2	100
	UGCES	Part IV Environmental Studies	2	2	100
			Total	30	26
III	17GT3	Part I Language Tamil	6	3	100
	17GE3	Part II Language English	6	3	100
	18ZC304	Part III Core Course IV - Cell Biology Theory	6	5	100
	18ZC405P2	Part III Core Course V - Cell Biology And Ecology Practical	3	-	-
	184AB3	Part III Allied Course V - Botany Theory	5	4	100
	184AB2P	Part III Allied Course II -	2	-	-

		Botany Practical			
	18Z3NMEC1	Part IV Non – Vermiculture	2	2	100
		Total	30	17	500

Sem	Course code	Course Title	Inst, Hrs/Week	Credits	Marks
IV	17GT4	Part I Language Tamil	6	3	100
	17GE4	Part II Language English	6	3	100
	18ZC405P2	Part III Core Course V - Cell Biology, Ecology Practical	2	5	100
	18ZC406	Part III Core Course VI - Ecology Theory	5	4	100
	184AB2P	Part III Allied Course II - Botany Practical	3	4	100
	184AB3	Part III Allied Course III - Botany Theory	4	3	100
	SBSC	Part IV Skill 1. Sericulture	2	2	100
	18Z4NMEC2	Part IV Non – Major Elective course I- Apiculture	2	2	100
		Total	30	26	800
V	18ZC507	Part III Core Course VII - Evolution	6	6	100
	18ZC508	Part III Core Course VIII - Developmental Biology and Immunology	5	5	100
	18ZC509	Part III Core Course IX – Animal Physiology	5	5	100
	18ZC510P3	Part III Core Course X- Evolution , Developmental Biology & Immunology and Animal Physiology Practical	5	5	100
	18ZC5EC3:1	Part III Elective Course I – Biostatistics			
	18ZC5EC3:2	2. Agricultural Pest management	5	5	100
	18ZC5EC3:3	3.Ornamental Fish culture			
	SBAC	Part IV Skill Based II 1.Aquaculture	2	2	100
	SBVC	Part IV Skill Based III – 1.Vermitechnology	2	2	100

		Total	30	30	700
VI	18ZC611	Part III Core Course XI - Genetics and Molecular Biology	6	5	100
	18ZC612	Part III Core Course XII - Microbiology And Biotechnology	6	5	100
	18ZC613P4	Part III Core Course XIII - Genetics and Molecular Biology , Microbiology And Biotechnology Practical	6	5	100
	18Z6EC4:1	Part III Elective Course II - 1.Biochemistry 2.Endocrinology 3.Fish Processing Technology	5	4	100
	18Z6EC4:2				
	18Z6EC4:3				
	18Z6EC5:1	Part III Elective Course III - 1.Human Nutrition 2. Poultry science 3.Economic Entomology	4	3	100
	18Z6EC5:2				
	18Z6EC5:3				
	U23NM6ER	Part III Employability readiness	2	2	100
		Extension Activities	-	1	-
	GS	Gender Studies	1	1	100
		Total	30	26	600

Total no of Papers : 38
Total Hours : 180
Credit : 140

Marks : 3800

I – SEMESTER
CORE COURSE I – INVERTEBRATA

Objectives: To make thorough understanding students on kingdom classification, general characters and special functions with special reference to various major and minor, phylum of invertebrata such as protozoa, porifera, cnidaria, Annelida, Arthropoda, mollusca and Echinodermata along with general topics.

UNIT – I

Animal Kingdom: Classification, taxonomy and nomenclature.

Phylum: Protozoa – General characters and classification up to class level with suitable examples.

Detailed Study: Paramecium.

General Topics: 1. Human Protozoan Diseases: Amebiasis, Leishmaniasis, Malaria
2. Locomotion in Protozoa.

UNIT – II

Phylum: Porifera and Coelenterata (Cnidaria) General characters and classification up to class level with suitable examples.

Detailed Study: Sycon and Aurelia.

General Topics: 1. Canal system in Porifera.
2. Coral and coral reefs.

UNIT – III

Phylum: Platyhelminthes and Aschelminthes (Nematoda). General characters and classification up to class level with suitable examples.

Detailed Study: Liver fluke and Ascaris.

General Topics: 1. Parasitic adaptation in helminthes.
2. Human Nematode parasites – *Wuchereria bancrofti* and Enterobius.

UNIT – IV

Phylum: Annelida and Arthropoda. General characters and classification up to class level with suitable examples.

Detailed Study: Nereis and Prawn.

General Topics: 1. Larval forms in Crustacea.
2. Economic Importance of Honey Bee, Silk Worm, Mosquito and Housefly.

UNIT – V

Phylum: Mollusca and Echinodermata. General characters and classification up to class level with suitable examples.

Detailed Study: Pila and Starfish.

General Topics: 1. Torsion in Gastropoda.
2. Larval forms of echinoderms.

Reference books:

1. Ekambaranatha Iyer and T.N Anantha Krishnan (1992). A manual of Zoology Vol-I (Invertebrata) Part I and II Viswanathan and co.
2. Barrington E.J.W (1979). Invertebrates structure and function 2nd edn. ELBS and Nelson.
3. Jordon E.Z and P.S. Verma (1995). Invertebrate Zoology 12th ed. Sultan Chand and co.
4. Kotpal R.L., (All series) Protozoa, Porifera, Coelenterata, Annelida, Arthropoda, Mollusca and Echinodermata – Rastogi publications.
5. Barnes R.D (1940-1995). The invertebrates volume I to IV Mc graw hill book co.

CORE COURSE III - INVERTEBRATA AND CHORDATA PRACTICAL

INVERTEBRATA:

- Dissections:**
1. Earthworm – nervous system, Digestive system
 2. Pila – Digestive system

Mountings:

1. Earthworm – body setae and pineal setae.
2. Prawn – appendages.
3. Pila - Radula mounting
4. Mouthparts of Housefly / Honeybee / Mosquito

Spotters:

1. Protozoa: Amoeba, Paramecium, Paramecium conjugation, Paramecium binary fission, Euglena, plasmodium.
2. Porifera: Sponge, Sponge spicules, Sponge Gemmule
3. Coelenterata: Obelia entire, Physalia, Porbita, Sea anemone, Aurelia, Madrepora, Fungia.
4. Platyhelminthes: Liver fluke, Tape worm, Tape worm scolex, Planaria.
5. Nematelminthes: Ascaris (male and female), Enterobius.
6. Annelida: Nereis, Nereis Parapodium, Heteronereis, Cheatopterus, Leech.
7. Arthropoda: Prawn, Nauplius larva, Zoea larva, Mysis larva, Limulus, *Bombyx mori*, Honeybee, Peripatus, Scolopendra.
8. Mollusca: Pila, Mytilus, Chiton, Dentalium, Sepia, Octopus.
9. Echinodermata: Starfish, Pedicellaria, Sea urchin, Bipinnaria larva, Aristotle's lantern, Ophiuroid.

CHORDATA:

Virtual Dissections: Fish - Digestive system, Reproductive system - Male and Female.
Frog / calotes - digestive and nervous system using video clippings.
Rat-demonstration of digestive, arterial, venous and urino genital systems using video clippings.

Mountings: Shark Placoid scales.

Spotters:

1. Prochordata: Amphioxus, Ascidian, Tornari larva and Petromyson
2. Pisces: Shark, Clarius, Echeneis, Hippocampus, Eel, Exocoetus and Gambusia.
3. Amphibia: Alytes, Axolotl larva, Hyla and Ichtyophis
4. Reptilia: Naja naja, Viper, Draco and Chelone mydas,
5. Aves: Pigeon, Quill feather
6. Mammalia: Bat, Rabbit
7. Dentition: Rabbit, Dog and Man
8. Osteology: Frog pectoral pelvic girdles, forelimb and hindlimb bones, skull.

Students will be introduced to learning of dissections / anatomy adapting CDs/web sources.

COURSE I - ALLIED ZOOLOGY
BIOLOGY OF INVERTEBRATES AND CHORDATES

Objectives: To acquire knowledge on the biological aspects of phylum invertebrata and phylum chordata along with general characters, classification and general topics.

UNIT- I

Phylum: Protozoa, Porifera and Coelenterata - General characters and classification up to class level with suitable examples.

Detailed Study: Paramecium.

General Topic: Canal system in Sponges.

UNIT- II

Phylum: Platyhelminthes and Annelida - General characters and classification up to class level with suitable examples.

Detailed Study: Earthworm.

General Topic: Human nematode parasites (Ascaris and Enterobius).

UNIT- III

Phylum: Arthropoda, Mollusca and Echinodermata - General characters and classification up to class level with suitable examples.

Detailed Study: Starfish.

General Topic: Mouth parts in Insects (Honey Bee and Mosquito).

UNIT- IV

Class: Pisces, Amphibia and Reptilia - General characters.

Detailed Study: Shark.

General Topic: Identification of Poisonous and non poisonous snakes.

UNIT- V

Class: Aves and Mammalia - General characters.

Detailed Study: Rabbit.

General Topic: Migration of Birds.

Reference books:

1. Ekambaranatha Ayyar. M. Outlines of Zoology. Viswanathan Publication.
2. Ayyar M.E.K. A Manual of Zoology. Vol I and II. Viswanathan Publication.
3. Jordan E.L. Invertebrate Zoology. S. Chand and co.,
4. Jordan E.L. Chordate Zoology. S. Chand and co.,
5. Kotpal R.L. Modern Text book of Zoology. First edition Invertebrates. Rastogi publications.
6. Hyman I.H. The Invertebrates. Vol-I. McGraw Hill Publications in the Zoological Sciences.
7. Hyman I.H. The Invertebrates. Vol-II. McGraw Hill Publications in the Zoological Sciences.
8. Alexander R.M. The Chordates. Cambridge University press. 1st Edition

ALLIED ZOOLOGY COURSE II – PRACTICAL

Major Practical

- 1) Earthworm – Digestive system (or) Nervous system.
- 2) Enumeration of RBC.
- 3) Blood Grouping.
- 4) Observation of mitotic stages in Onion root tip.

Minor Practical

- 1) Observation of Paramecium movement.
- 2) Mounting of body setae.
- 3) Mounting of cycloid and ctenoid scales.
- 4) Preparation of buccal smear and observation of squamous epithelium.

Spotters

Amoeba, Sponges, Hydra, Taenia solium, Leech, Grasshopper, Pila, Starfish.

Shark, *Rana hexadactyla*, *Naja naja*, Pigeon, Rabbit.

Epithelial, muscular and vascular tissues.

Newton's bee hive, Honey, Lae, Lae insect, *Bombyx mori*, Ornamental fishes- Guppy, Gold Fish, Leghorn, Broiler, Country fowls egg.

Submissions

- 1) Album of Indian cow breeds.
- 2) Vermicompost prepared in groups.

Record

II - SEMESTER Core Course III CHORDATA

Objectives: To comprehend the knowledge on phylum chordate (Subphylum prochordata and subphylum vertebrata) – their general characters, classification (Prochordates, fishes, amphibians, reptiles, birds, and mammals) along with interesting general topics of the subject.

UNIT – I

Sub Phylum: Prochordata - General characters and classification up to class level with suitable examples.

Detailed Study: Amphioxus (Exclusive of endoskeleton).

General Topic: 1. Origin of Chordates.

2. Retrogressive metamorphosis in ascidians.

UNIT – II

Class: Pisces and Amphibia: General characters and classification up to class level with suitable examples.

Detailed study: Scoliodon and Frog (Exclusive of endoskeleton).

General topics: 1. Accessory respiratory organs in fishes.

2. Parental care in Amphibia.

UNIT – III

Class: Reptilia: General characters and classification up to class level with suitable examples.

Detailed study: Calotes (Exclusive of endoskeleton).

General topics: 1. Identification of poisonous and non poisonous snakes.

2. Golden age of Reptiles.

UNIT – IV

Class: Aves: General characters and classification up to class level with suitable examples.

Detailed study: Pigeon (Exclusive of endoskeleton)

General topics: 1. Migration in birds.

2. Flight adaptations.

3. Flightless birds.

UNIT – V

Class: Mammals: General characters and classification up to class level with suitable examples.

Detailed study: Rabbit (Exclusive of endoskeleton).

General topics: 1. Aquatic mammals.

2. Dentition in mammals.

Reference Books:

1. Ekambaranatha Iyer and T.N. Anantha Krishnan (1992). A manual of Zoology. Vol-I (Invertebrata) Part I and 2 Viswanathan and co.
2. Dhama D.S and J.K Dhama (1978). Chordate Zoology. R. Chand and co.
3. Jordon E.L and P.S Verma (1995). Chordate Zoology and elements of animal physiology. S. Chand and co.
4. Muthukumarasamy P and K. Palanivel (1990). Thandudaiya vilangugal. BARD.

III SEMESTER
CORE COURSE IV - CELL BIOLOGY

Objectives: To understand the structure and functions of cellular organelles – their ultra structure and applications of microscope for better understanding of molecular structure of cells.

UNIT - I

The cell - Definition, Cell theory, types of cells, size, shape, volume, number.
Detailed study of cell structure. Prokaryotic and eukaryotic cells.
Microscopy- Compound, fluorescent and Electron.
Centrifuge and Electrophoresis. Principle and applications.

UNIT - II

Plasma membrane - Ultra Structure & Functions.
Cytoplasm - Composition and physicochemical properties
Golgi complex - Ultra Structure and Functions.

UNIT - III

Ultra structure and functions of Endoplasmic reticulum, ribosomes - mitochondria and Lysosome.

UNIT - IV

Interphase nucleus- Ultra structure and functions.
Chromosomes - Ultra structure. Types and functions - Giant chromosomes.

UNIT - V

Cell cycle - cell division - Amitosis, Mitosis and Meiosis.
Cancer: Types and Characters.

Reference Books:

1. Verma P.S and Agarwal (1985). Cytology. S. Chand and Co.
2. Bernies Anantharaj (2008). Cytology.
3. Thiagarajan S and Nadarajan A. Cell Biology. Tee Jay publications.

CORE COURSE – V – CELL BIOLOGY AND ECOLOGY PRACTICAL

Cell Biology

1. Operation of compound and dissection microscopes.
2. Preparation and observation of squamous epithelial smear.
3. Onion root tip- Squash preparation and study of mitotic stages.
4. Mounting of polytene chromosome in chironomous larva.
5. Spotters: Epithelial, muscular, Vascular and nervous tissues.
6. Spotters: Centrifuge, Camera Lucida, Micrometer.

Ecology

1. Estimation of salinity.
2. Estimation of Dissolved oxygen.
3. Observation of freshwater or marine planktons.
4. Estimation of soil pH and moisture.
5. Spotters - Secchi disc, Animal associations.
6. Visit to a local polluted area /solid waste sewage treatment plant.
7. Construction of a food web diagram based on a local visit.

VERMICULTURE

Objectives: To inculcate the knowledge on the importance of vermiculture (Earthworms) with special emphasis on morphological, anatomical characters, selection of suitable earthworm, soil condition, small and large scale vermicomposting and their beneficial application of vermicomposting in agriculture and horticulture.

UNIT- I

Earthworms - Morphological and anatomical characteristics - Ecological Classification - Saprophages, Geophages, Epigeic, Endogeic and Anecic forms.

UNIT – II

Selection of suitable earthworm species for vermicomposting - Biology of composting earthworms - *Eudrilus eugeniae* and *Lampito mauritii*.

UNIT - III

Soil organic matter decomposition – earthworms and humus formation – Sources of organic wastes - problems in traditional composting – Importance of vermicomposting.

UNIT - IV

Vermiculture and Vermicomposting - small scale and large scale vermicomposting- requirements - phases - methods: Pit, Box, Heap and windrow - collection of vermicompost and vermicast - Principles - Precautions - Factors affecting vermicomposting.

UNIT- V

Applications of vermicompost in agricultural and horticultural practices –Economics of vermicomposting - Financial supports – Eligibility for financial support.

References Books:

1. Ramalingam R (2006). Earthworm Culture. Tamil Nadu Higher Education Board, Chennai.
2. Edwards C.A and P.J. Bohlen (1996). Ecology of Earthworms. 3rd Edition. Chapman and Hall.
3. Ismail S.A (1970). Vermicology. The Biology of Earthworms. Orient Longman, London.
4. Lee K.E (1985). Earthworms – Their ecology and Relationship with soil and Land use. Academic Press. Sydney.

ECOLOGY

Objectives: To imbibe the knowledge on the Environment – their general principles, definition and scopes, which influence the living organism through ecosystem structure and components, various habitats, sources of pollution and conservation of wild life.

UNIT - I

Ecology: Definition, scope and branches. Abiotic factors: water, soil, temperature, light. Biotic factors: Animal relationship - symbiosis, commensalism, mutualism, antagonism, antibiosis, parasitism, predation and competition.

UNIT - II

Ecosystem: Definition, ecological hierarchy, A typical ecosystem: Pond ecosystem, Primary production, Secondary production, food chains, food web, Trophic levels, energy flow, pyramids of biomass and energy - Biogeochemical cycles- nitrogen and phosphorus.

UNIT - III

Community ecology: Types and characteristics - stratification - community interdependence - ecotone - edge effect - ecological niche - ecological succession. Population ecology: Definition, density, natality, mortality, age distribution, age pyramids, population growth, population equilibrium, biotic potential, dispersion and fluctuation.

UNIT - IV

Habitat Ecology: Habitat characteristics and fauna and its adaptation in rivers, muddy, rocky, mangroves, estuaries and deep sea, forest, desert, cave.

UNIT - V

Environmental pollution - sources, effects of air, water, soil and noise pollution.
Bio accumulation, bio magnification and bio remediation.
Wild life and conservation - IUCN categorization, *in situ* and *ex situ* conservation.

Reference Books:

1. Bernis Anandharaj and Soolnilaiyiyal. Chrisolite publications. Adyar, Chennai.
2. Odum E.P (1971). Fundamentals of ecology. W.B Saunders Company, Philadelpnia.
3. Kendeigh S.C (1961). Animal ecology. Prentice Hall.
4. Clarks GL (1954). Elements of Ecology. John Wiley and sons Newyork.
5. Purohit S.S., Shami DH and Agarval A.K (2004). Environmental sciences - A new approach. Agrobi, Jodhpur.
6. Krishnamurthy K.V (2003). Introduction to Biodiversity. Oxford and IBH.

SKILL BASED
1. SERICULTURE

Objectives: To make the students learning about the sericulture (culture of silkworms) their types, life cycle, culture methods, mulberry culture, spinning of silk and budget.

UNIT – 1

Introduction, History, Growth - Types of silk, Types of Silkworms.

UNIT – II

Life cycle of *Bombyx mori* - Adult, Egg, larva, Chrysaliss, Cocoon, Imago,
Silk gland
Equipments for Sericulture - Growing plates, Rearing plates - Chandrika, Ant wells.

UNIT- III

Silkworm Culture - Environmental conditions, Types, Space, Feed, Moulting, Cleaning
of bed and sterilization. Growth, Inoculation, Culture of larval stages.

UNIT – IV

Mulberry culture - selection of mulberry, Soil, season, land, weeding, watering,
Harvesting.

UNIT – V

Spinning of silk - Realing, Re-realing, Testing - Applications of silk. Pests and predators–
diseases - Budget.

References Books:

Thiyagarajan and Sritharan (2013). Sericulture. Sri Murugan publications

NMEC II – APICULTURE

Objectives: To comprehend the knowledge on the apiculture (culture of honeybees)-their species diversity, natural and artificial lives, handling and, maintenance of colony and possible prospects of apiculture as self employment venture.

UNIT - I

Honey Bee: Systematic position – species of honey Bees. Bee Colony, Castes. Natural colonies.

UNIT - II

Types of Bee hives – Structure of natural beehive. Artificial beehive – different types.

UNIT - III

Apiary care and Management – selection of sites – Catching and transforming a colony – Handling and maintenance of the colony – Natural enemies and diseases of honey bees and control methods.

UNIT - IV

Instruments employed in Apiary. Newton's hive, honey extractors and smokers.
Honey: Extraction and apiculture used – Chemical composition – nutritive and medicinal values.

UNIT - V

Present studies of apiculture in India. Prospect of apiculture as self employment venture. Preparing proposal (Layout and budget) for financial assistance of funding agencies.

Reference Books:

1. Cherian R and K. Ramanathan (1992). Bee Keeping in India.
2. Mishra R.C (1985). Honey bees and their management in India. ICAR.
3. Morse R.A (1990). The ABC and XYZ of Bee culture. 40th edn. A. I. Root and Co., Ohio.
4. Rare S (1998). Introduction to Bee keeping. Vikas Publishing House.
5. Singh S (1982). Bee keeping. ICAR.
6. Sharma P and Singh L (1987). Hand book of bee keeping. Controller printing and Stationer, Chandigarh.

**V SEMESTER
CORE COURSE VII – EVOLUTION**

Objectives: To understand the scientific principles and concepts of animal evolution by means of understanding their evidences, mechanism, and animal distribution paving the way forward greater evolution including man.

UNIT – I

Theories of Origin of life- abiogenesis, biogenesis, cosmozoic theory, special creation theory, Theory of biochemical origin of life.

Theories of Evolution : Lamarckism, Darwinism, Devries theory of mutation and modern synthetic theory of evolution.

UNIT – II

Geological time scale.

Evidences of evolution - Anatomical, Embryological, Biochemical Paleontological (Fossils, fossilization), living fossils (Limulus and Nautilus) and connecting links (Peripatus, and Balanoglossus, Archeopteryx).

Patterns of evolution - sequential, convergent, divergent, straight-line evolution.

UNIT-III

Types of Evolution- Micro, Macro, Mega, Quantum, Monophyletic, Polyphyletic, Parallel and iterative evolution.

Species - Concept, Speciation - types, factors influencing speciation.

Isolating mechanisms.

Mimicry and coloration.

UNIT- IV

Mutation : Gene Mutation, Chromosomal mutations - Structural and numerical.

Population Genetics: Hardy Weinberg principle, Factors affecting Hardy Weinberg equilibrium.

UNIT-V

Animal distribution - continuous and discontinuous. Evolution of horse. Human evolution - Biological and Cultural evolution of man.

Reference Books:

1. Darwin C (1872). The origin of species. Grolier Enterprises Corp, USA.
2. Savage G.M (1979). Evolution. CMS Printing press.
3. Rastogi VB. (1985). Organic Evolution. Kedarnath and Ramnath press.
4. Strickberger M.W (2000). Evolution. Jones and Barlett publishers.
5. Verma and Agarwal. Concepts of Evolution.

CORE COURSE VIII – DEVELOPMENTAL BIOLOGY AND IMMUNOLOGY

Objectives: To inculcate the present perspective on the development of animal embryos of various taxonomic groups through experimental analysis using modern biological tools and also to understand the immune system of living organism.

UNIT – I

Historical perspective - Aim and scope of Developmental Biology.

Gametogenesis - Spermatogenesis and Oogenesis, Vitellogenesis, Egg membranes.

Fertilization - Sperm - Egg interaction (acrosome reaction), biochemical events, post Fertilization events.

Parthenogenesis.

UNIT – II

Types of animal eggs.

Cleavage - Patterns of cleavage, Blastulation and gastrulation in frog and chick.

Cell lineage, fate map. Differentiation- Organizer concept, Competence, Nuclear transplantation.

UNIT – III

Organogenesis of eye and ear in frog.

Extra embryonic membranes in chick and physiology of placenta in Mammals.

Metamorphosis in frog - Regeneration in Invertebrates and Vertebrates - Concept of Test tube baby.

UNIT – IV

Immunology: Immunity - Types of Immunity. Lymphoid organs - Types, Function, Organization. Lymphoid cells, Antigen - Antibody - structure and type, Antigen antibody reaction.

UNIT – V

Immune Response: Humoral and cell Mediated.

Transplantation Immunology: Types of Grafts. Mechanism of Allograft rejection Auto Immunity - Rheumatoid Arthritis.

Hypersensitivity - Types.

Reference Books:

1. Verma P.S and Agarwal V.K (1975). Chordate Embryology. Published by S. Chand and Company
2. Chandrasekaran R and Thiagarajan (2012). Development Biology. Sri Murugan Publications.
3. Rastogi Balinsky. Introduction to Embryology.
4. Barrington. Invertebrate structure and function (metamorphoses).

Core Course VI – ANIMAL PHYSIOLOGY

Objectives: To acquire knowledge on the structure and functions of animals – their body parts, organs and behaviour through understanding of their nutrition, respiration, circulation, excretion, endocrine system with physico-chemical coordination.

UNIT – I

Food and Nutrition: Physiological importance of carbohydrates. Proteins, Lipids, Vitamins and Minerals, Balanced diet - Malnutrition.

Digestion: Feeding mechanisms - Microphages, Liquid Feeders. Types of Digestion, Mechanism of Digestion, Gastro Intestinal Hormones

Absorption and assimilation in Man.

UNIT – II

Respiration: Structure of lungs, Respiratory pigments in animals, Transport of O₂ and CO₂ in man.

Circulation: Blood – Composition, function and clotting.

Heart – structure and function of human heart.

UNIT – III

Excretion: Types of Excretion - Excretory products.

Excretion in man - Structure of Kidney, nephron. Mechanism of Urine formation.

Osmoregulation: Euryhaline, stenohaline, osmoregulators and Osmo conformers.

Osmoregulation in freshwater and marine.

UNIT – IV

Muscles: Types of muscles, ultra structure of skeletal muscle - Properties and mechanism of muscle contraction - sliding filament theory.

Nervous system: Types of neuron - structure of neuron - conduction of nerve impulse - reflex action - Neurotransmitters.

Receptor - Types of Receptors - Structure of photo and phono receptors.

UNIT – V

Endocrine gland - structure and functions of pituitary, thyroid, parathyroid, Islets of langerhans, adrenal, sex glands, thymus, pineal gland.

Reproduction: Types of reproduction - reproduction in man.

Reproductive cycle - Hormonal control.

Reference Books:

1. Agarwal RA (1998). Animal physiology and biochemistry. S. Chand publication, Ahil. K. Srivastava Ramnagar, Kaushal kumar, New Delhi.
2. Bernis Anandharaj., Udarcheyaliyal. Chrisolite publications. Adyar, Chennai.
3. Guyton and Hall. Textbook of Medical physiology. IX ed WB. Saunders Publication.
4. Hoar W.S (1983). General and Comparative physiology. Prentice Hall of India.
5. Harper H.A (1993). Review of Physiological chemistry. Muruzen Asian Ed.

Core Course X- PRACTICAL

EVOLUTION, DEVELOPMENTAL BIOLOGY AND IMMUNOLOGY, ANIMAL PHYSIOLOGY

Evolution

1. Animal of evolutionary significance - Peripatus, Archaeopteryx.
2. Homologous organ - Fore Limb modification.
3. Analogous organ - Wings of insect and bird.
4. Colouration - Chameleon, Lycodon and Krait.
5. Mimicry - Leaf insect, Stick insect, Monarch and Viceroy Butterfly.

Developmental Biology

1. Observation of prepared microslides to study the following.
Frog: Egg, Cleavage, Blastula, Yolk Plug stage.
Chick: Egg, Developmental stages 24, 48, 72, 96, Yolk sac placenta.

Animal Physiology

1. Salivary amylase activity of human saliva in relation to Temperature.
2. Qualitative tests for Ammonia, Urea and uric acid.
3. Enumeration of RBC.
4. Enumeration of WBC.
5. Haemoglobinometer, Kymograph, Sphygmomanometer (Spotters).
6. Models of haemoglobin and ATP.

Immunology

- Dissections – Immunological Organs in fish (demonstration only).
ABO Blood grouping.
Spotters: IgG, Thymus.

Biostatistics

1. Calculation mean, median, mode, standard deviation, Standard error for any one animal data.
2. Diagrammatic representation (Pie and Bar) of data collected among class students (Hb, Height, Weight).

ELECTIVE COURSE I- (1)BIOSTATISTICS

Objectives: To comprehend the knowledge on the importance of statistical application in biological aspects through methods of data collection, processing of data and analysis of data and also applying the computer aided package like SPSS.

UNIT - I

Biostatistics: Introduction, Definition and Scope. Methods of data Collection - primary and secondary data, Variables and its types, Sampling techniques. Functions of statistics and limitations of statistics.

UNIT - II

Processing of data: classification and tabulation of data. Presentation of Data. Diagramatic (Bar and Pie) and graphical presentation (Histogram, Frequency curve, Frequency polygon).

UNIT - III

Analysis of Data: Measures of central tendency - mean, median, mode.

UNIT - IV

Measures of dispersion: SD, SE, Variance and Co-efficient of Variation - Correlation (Karl Pearson) and Regression (Simple Linear).

UNIT - V

Hypothesis testing: Introduction to test of significance - Chi square test , Students t-Test (based on mean with two samples, Testing correlation co-efficient and paired t-Test), ANOVA - one way.

Introduction to statistical packages – SPSS

Reference Books:

1. Ramakrishnan P (1996). Biostatistics. Saras publications, Nagercoil.
2. Dr. Gurusamy M.P., Dr. Kamsa Mohaideen. M and Prof. Kamalraj M (2011). 14th edition Statistics. Vannan publications, Sivakasi.
3. Ramachandran V (2007). Biostatistics. Vol-I and II. Nithyaas printers, Chennai.

SKILLBASED I (2) AGRICULTURAL PEST MANAGEMENT

UNIT – I

Introduction – Types of damage to plants by Insects – Direct and indirect effects – Types of insect pest – Assessment of insect population.

UNIT – II

Insect pests of crops – paddy, sugar cane, Coconut and Cotton.

UNIT – III

Methods used in pest control – Physical, mechanical, chemical and Biological methods used to control insect pests, IPM, -Biological pesticides NPV, CVP- Predators Bell.

UNIT – IV

Birds: Damage causing birds - Parakeet, Munia, sparrow, Pigeon, teals biological control measures – Beneficial birds: bee –eater, drango and owls.

UNIT – V

Filed Rodents – Biology and control measures of Bandicoot, soft fured filed rat, Filed mouse, Indian gerbil and house rats.

Reference Books:

1. Chapman R.F (1993). The Insects. Structure and Functions. ELBS. London
2. Chandler A.C and Read C.P (1961). Introduction to Parasitology. John Wiley and Sons, New York.
3. David B.V., Muralirangan N.C and Meera Muralirangan (1992). Hamful and beneficial Insects. Popular book Depot.
4. David B.V and T. Kumaraswami (1998). Elements of Economic Endomology. Popular Book Depot., Chennai.
5. David B.V (1992). Pest management and Pesticides. Indian Scenario Namrutha publications.
6. Krishnan N.T (1993). Ecolomic Entomology. J.J. Publications, Chennai.
7. Mani M.S (1973). General Entomology. Oxford and Delhi.
8. Nayar K.K., Ananthkrishnan T.N and David, V.D (1990). General and applied Entomology. Tata Mc Grow Hill. New Delhi.

SKILLBASED I (3) ORNAMENTAL FISH CULTURE

Objectives: To learn the culture practices and methods in ornamental fishes along with popular ornamental fishes, mass production through breeding techniques, food and feeding and disease management.

UNIT -1

Importance and scope of the ornamental fish culture – economics. Commercial value and potential, Trends of ornamental fish farming in the world and in India.

UNIT-II

Morphology and significance of ornamental fishes -Zebra Fish, Gold Fish, Angel fish, Molly, Guppy.

UNIT – III

Mass production of fancy fishes through fish farming: Preparation for breeding – Carp, Fighter fish – food and feeding, live feed: rotifers, tubifex, artificial feed.

UNIT – IV

Aquarium design, construction and preparation: Size, Shape, Substrate, Ornamental aquatic plants. Construction and function of biofilters, aerator and accessories for fish tanks: hood and lights, nets, suction tube and maintenance of water quality: controlling ammonia, pH, feeding regimes.

UNIT – V

Disease management: common viral, bacterial, fungal, protozoan and crustacean infections and their treatment and control.

References Books:

1. Rath R.K (2000). Fresh water aquaculture. Scientific Publishers (India). P)O Box 91, Jodhpur.
2. Jhingaran AVG (1991). Fish and fisheries of India. Hindustan Publication Copany.
3. Jameson, JD and Santhanam R (1996). Manual of ornamental fishes and farming technology. Fisheries college and research Institute, Thoothukudi
4. Michael Beazley (1998). Complete guide to tropical aquarium fish care. Read and consume book Ltd. London.

SKILL BASED II (1) AQUACULTURE

Objectives: To understand the through knowledge on the culture of fishes, prawns, etc through farm designing, selection of candidate species, feed management, harvesting transport and marketing the fish and prawn.

UNIT-I

Aquaculture – Importance and scope - cultivable species of fish (IMC).

UNIT-II

Types of farming: extensive, intensive and semi intensive culture, Integrated farming, induced breeding.

Construction and Management of fish farm.

UNIT-III

Culture of common carp species - Catla, Rohu, Mirgal, Freshwater prawn culture.

Ornamental fish culture - Gold fish, Angel, Guppy.

UNIT-IV

Types of feed: Feeding schedule.

Fish disease management: Common bacterisl and diseases - their symptoms and treatment (Any three in each).

UNIT-V

Harvesting and transport - Marketing: Marketing the fish to local market and for export.

Quality control and norms of MPEDA for export of fishes.

Fish processing - Canning and Freezing.

Reference Book

1. Bardasch JE., RYTHER and Mc Larrey WO (1972). Aquaculture: The farming and husbandry of Freshwater and marine organisms. Wiley interscience.
2. Jhinngan VG (1982). Fish and fisheries of Indian. Hindustand Publishing.
3. Pillai T.V.R (1995). Aquaculture principles and practices. Fishing new Books, Blackwell Science Ltd., Oxford.
4. Ramasamy P (1992). Diseases of Shrimp in aquaculture systems. Vanitha Publications.
5. Santhanam R (1987). Fisheries Science. Data publishing house.
6. Santhanam R (1997). Manual of Fresh water Aquaculture. Oxford and 1BH Pub. co. Ltd., New Delhi.

SKILL BASED III (1) – VERMITECHNOLOGY

Objectives: To acquire the knowledge on the culture of earthworm for the effective agriculture practices through vermitechnique methods.

UNIT- I

Importance of Vermicomposting- Problems in traditional composting - Sources of organic wastes. Earthworms - General Characters, Ecological Classification - Saprophages, Geophagus, Epigeic, Endogeic and Anecic forms. Biology of *Eudrilus eugeniae* and *Eisenia foetida*.

UNIT – II

Importance of Earthworm in Agriculture, Fishing, food, therapeutics and pollution control - soil organic matter decomposition - earthworms and humus formation - benefits of humus in soil.

UNIT – III

Vermiculture: Small scale, large scale. Vermicomposting - Requirements- phases - methods (Pit method, Box method, Heap method, windrow method) – collection of vermicompost - Vermiwash.

UNIT - IV

Principles of vermicomposting - Precaution - Factors affecting Vermicomposting - advantages of vermicomposting - applications of vermicompost in agricultural practices.

UNIT- V

Economics of Vermicomposting - Financial supports for Vermicompost - Khadi and Village Industries Commission (KVIC) -National Bank for Agriculture and Rural Development (NABARD) - eligibility for financial support.

References Books:

1. Edwards C.A and P.J Bohlen (1996). Ecology of Earthworms. 3rd Edition. Chapman and Hall.
2. Ismail S.A (1970). Vermicology. The Biology of Earthworms. Orient Longman, London.
3. Lee K.E (1985). Earthworms – Their ecology and Relationship with soil and Land use. Academic Press. Sydney.

SEMESTER VI
CORE COURSE IX – GENETICS AND MOLECULAR BIOLOGY

Objectives: To comprehend the knowledge on the fine structure of genetic materials their regulation and action and to know the molecular aspects of DNA – fine structure, transcription, and translation.

UNIT- I

Genetics: Mendelian laws

Interaction of genes - complementary, supplementary, inhibitory and lethal. Multiple alleles - ABO blood group system.

Linkage and Crossing over in *Drosophila* - types, mechanism

UNIT- II

Sexdetermination - Man, *drosophila* and *Bonellia*.

Sex linked inheritance, Sex limited and Sex influenced inheritance

Extra chromosomal inheritance – Shell coiling in *Limnaea*, Kappa particles in *paramecium*.

UNIT - III

Human Genetics: Pedigree analysis, Karyotype - Autosomal and Sex chromosomal syndromes in man.

Inborn errors of metabolism with reference to phenylalanine metabolism, Sickle cell anemia. Eugeneics and Euthenics.

UNIT - IV

Molecular Biology:

DNA as the genetic material - Griffith experiment. Gene concept, Fine structure of DNA and RNA - DNA Replication.

UNIT - V

Transcription - Genetic Code - Translation.

Gene expression and regulation in prokaryotes.

Lac operon model.

Reference Books:

1. Verma P.S and V. K. Agarwal (1997). Genetics. S.chand and Co. New Delhi.
2. Bernis Ananandharaj (2006).Genetics.Chrisolite Publications.
3. Winchester A. Genetics. Oxford and IBH Publications.
4. Sinnott Dunn and Dobzhansky. Principles of genetics. Mc Graw Hill Co, London.
5. Elden J and Gardner. Principles of Genetics. Wiley Eastern Publication.
6. Veer Bala Rastogi. A text book of Genetics. Kerdarnath Ramnath Publication.
7. Verma P.S and V.K Agarwal (1997). Genetics. S. Chand and Co. New Delhi.

Core course – XII- MICROBIOLOGY AND BIOTECHNOLOGY

Objectives: To learn the general structure of bacteria, virus and fungi – their culture, food spoilage and recombination in bacteria and also to understand the biotechnological, principles – Scope and importance through gene cloning, tools of genetic engineering vectors – their application in medicine and Intellectual Property Right Values.

UNIT - I

Outline classification of microorganisms - General structure of Bacteria, virus and fungi.
Sterilization techniques, bacterial growth, methods of culturing bacteria - pure culture and culture characteristics.
Food microbiology - food poisoning, food spoilage, food preservation.

UNIT - II

Recombination in bacteria, transformation, conjugation, sexduction,
Recombination in bacteriophage, transduction, lytic and lysogenic cycles of bacteriophage.
Medical microbiology - Tuberculosis, leprosy and AIDS.

UNIT - III

Biotechnology: Scope and importance.
Genetic Engineering : Gene cloning: Isolation of desired DNA - insertion of DNA into vector – introducing rDNA into host - identification, selection and expression of cloned DNA.
Tools - Tools of genetic engineering: Restriction endonucleases (Eco R1, Hind III, B and H1) and DNA ligases.
Vectors - Plasmids - pBR322, Cosmids.

UNIT - IV

Molecular probes: Blotting techniques - Southern, Northern and Western blotting PCR, DNA finger printing.
Gene bank and libraries.
Monoclonal Antibodies: production and uses.
Stem cell technology.

UNIT - V

Application of biotechnology in Medicine: Gene Therapy, Vaccine production, knowledge based drug designing.
Transgenic animals.
Biotechnology and future: IPR and ethical concerns.

Reference Books:

1. Old and Prim Rose. Principles of Gene Manipulation. Latest Edition.
2. Balasubramania D (1996). Concepts in Biotechnology. University Press (India) Ltd., Hyde
3. Dharmarajan M (1989). Genetic Engineering. S.Viswanathan and Co.,
4. Dubey R, C (1995). Text book of Biotechnology. S.Viswanathan and Co.,
5. Gupta. Principles of Biotechnology.
6. Ananthanarayanan. Text book of microbiology. Orient Longmen.
7. David Freifelder. Microbial genetics. Narosa Publishing house.

ELECTIVE COURSE II- (1)BIOCHEMISTRY

Objectives: To imbibe the knowledge an biochemical substances of Carbohydrates, Proteins, Fat and Enzymes – their role in the metabolic events in the living organisms.

UNIT - I

Introduction, Definition, and Scope of biochemistry. Water - physical properties - Structure and role of water in life - pH and Buffers - Biological buffer systems.

UNIT - II

Carbohydrates - structure and classification (with one example) - Metabolism - Glycolysis, Glycogenolysis - TCA cycle and Oxidative phosphorylation.

UNIT - III

Structure and classification of amino acids and proteins.
Protein metabolism - Oxidative deamination, transamination, Decarboxylation and Transmethylation.

UNIT - IV

Structure and Classification - Fatty acids and Lipids.
Metabolism - β -oxidation.
Structure of Nucleic acids.

UNIT -V

Enzymes - Classification and Characteristics
Mechanism of Enzyme action – Lock and key hypothesis.
Biochemical Classification and characteristics of Hormones.

Reference Books:

1. Jain J.L., Sunjay Jain and Nithay Jain. Fundamentals of Biochemistry. Chand Publications.
2. Jain J.L. Fundamentals of Biochemistry.
3. Ambika and Shanmugam. Fundamental of Biochemistry for Medical students.
4. Abraham Mazur and Benjamin Harrow. Text Book of Biochemistry.
5. Rabert and K. Murray. Harper's Biochemistry.
6. Lehninger. Principles of Biochemistry.

ELECTIVE COURSE II-(2) ENDOCRINOLOGY

Objectives: To gain the knowledge on the scope and functions of endocrine system – their hormones in invertebrates and chordates, hormonal control of metabolism and reproduction and therapeutic uses of hormones.

UNIT – I

Endocrinology - Scope; Historical perspectives; Endocrine glands in vertebrates: Localisation and organization; Rat: Hypothalamus, pineal, pituitary, thymus, thyroid, pancreas, adrenal, ovary and testis.

UNIT – II

Hormonal regulation invertebrates: Hypothalamus – Releasing hormones. Adenohypophysis - Adrenocorticotrophic hormone (ACTH), Growth hormone (GH), Prolactin (PRL), Luteinizing hormone (LH), Follicle stimulating hormone (FSH), Thyroid stimulating hormone (TSH). Neurohypophysis - Oxytocin, Vasopressin. Pars intermedia - Melanocyte stimulating hormone. Adrenal - glucocorticoid and mineralocorticoids. Thyroid - Thyroid hormones. Gonads - Progesterone, androgens and estrogens. Pancreas - Insulin, Glucagon. Pineal - Serotonin, Melatonin.

UNIT - III

Hormonal control of reproduction in crustacean and Insecta: Pheromone, Allomone, Hormone - behavior - pest control.

UNIT – IV:

Endocrine abnormalities: Acromegaly, Cretinism, Dwarfism, Gigantism, Goiter, Diabetes mellitus and infertility - Etiology, symptoms, diagnosis.

UNIT – V

Induced breeding in fish and Prawn. Therapeutic uses of hormones (i.e. Insulin, thyroid hormones, growth hormones and glucocorticoid). Uses of hormones in assisted reproduction (farm animals and human). Hormonal contraceptives.

Reference Books:

1. Adiyodi KG and Adiyodi RG (1983). Reproductive biology of invertebrates. John Wiley and sons Ltd, New York.
2. Bentley PJ (1982). Comparative vertebrate endocrinology. 2nd edition, Cambridge University press, England.
3. Hadley ME (1992). Endocrinology. 3rd edn. Prentice hall, New jersey.
4. Matsumoto A and Ishi S (1992). Atlas of endocrine organs: Vertebrates and Invertebrates. Springer Verlag, Germany.
5. Tumer CD and Bagnara JT (1984). General endocrinology. 6th edn. Saunders WB company, Philadelphia.
6. Wilson JD and Foster DW (1992). William's Textbook of endocrinology. 8th edn. Saunders company, Philadelphia.

ELECTIVE COURSE II-(3) FISH PROCESSING TECHNOLOGY

Objectives: To understand the methods of fish processing techniques through the nutritional properties, role of microbes on the spoilage of fishes, fresh fish handling preservation, and canning methods during fish preservation.

UNIT – I

Fish Biochemistry - Chief components of food in fish. Nutritive enzymes and their role in fish spoilage - Nutritive value of protein - General character of fish fat, spoilage of fish at different stages.

UNIT – II

Fish Microbiology - Microbial spoilage of fish - plant sanitation - importance - regulatory measures, Microbial spoilage of fish - plant sanitation - importance - regulatory measures, microbial flora in various type of semi - processed and processed fishery products.

UNIT – III

Fresh fish handling and preservation: Mechanism of spoilage - (Fish analysis, bacterial chemical reactions). Handling of fish on board and shore - use of ice and salt, use of antibiotics and chemicals.

UNIT – IV

Freezing of fishes - different techniques - physico chemical changes and nutritional changes during freezing - spoilage of frozen fish.

UNIT - V

Canning of fishes - principles of canning - preservation, additives and pickle salting - salting of fish - Indian curing - Bacteriology of salted fish - smoking of fish - hot and cold smoking - smoking methods.

Reference Books:

1. Biswas KP (1980). A text book of fish, fisheries and Technology. Narendra publishing house.
2. Gopakumar K (2000). Tropical fishery products. Oxford and IBH.
3. Govindan TK (1992). Fish processing technology. Oxford and IBH.
4. Mpeda (1995). Dried fish and fishery products.
5. Santhanam R (1987). Fisheries science. Daya publishing House.
6. Winton AL and Winton KB (1993). Fish and fish products. Agro Botanical Publishers.

ELECTIVE COURSE III- (1)HUMAN NUTRITION

Objectives: To incubate the knowledge an the values of nutritive substances for healthy living of mankind through nutritive foods, balanced diet, gastrotrich nutrition, and managing the faculty food habits by therapeutic diets.

UNIT - I

Food as a source of nutrition, Physiological importance of carbohydrates, Proteins, Lipids, Vitamins and Minerals

UNIT - II

Water as nutrient - regulation of water balance. Determination of energy value of foods - direct and indirect colorimetry - basal metabolic rate.

UNIT - III

Nutritional value of foods - cereals, fruits, milk, egg, meat, fish - Nutritional value of common Indian recipes - Balanced diet.

UNIT - IV

Effect of cooking and heat processing on the nutritive value of foods - Nutritional requirements: Infants, School children, Pregnant and lactating mothers - Geriatric Nutrition.

UNIT - V

Faulty food habits: obesity, Diabetes and cardiac problems - Health education - Malnutrition: Marasmus and Kwashiorkor - Therapeutic diets.

Reference Books:

1. Banerjee G.C (1978). Animal Nutrition. Oxford & IBH publishing co, New Delhi.
2. Swaminathan M (1978). Advanced text book on Food and Nutrition, Volume II, The Bangalore printing and Publishing Co, Ltd. Bangalore.
3. Swaminathan M (1989). Handbook of Food and Nutrition. A Bappco Publication Bangalore.
4. Sheel Sharma (2006). Human Nutrition and Meal Planning. Jnanada Prakashan (P&D), New Delhi.

ELECTIVE COURSE III- (2)POULTRY SCIENCE

Objectives: To familiarize the students in learning the poultry science through identification of stocks, poultry housing, manure preparation, and management aspects.

UNIT – 1

Introduction – Progress of Poultry industry in South Indi. Some common types of poultry- Plymouth rock, Light Sussex, Minorca, Rhode island Red and White leghorn, their advantageous features – choosing commercial laying stock – Poultry housing – The deep litter system – Poultry manure.

UNIT – II

Management – practical aspects of chick rearing – Management of growers, layers and broilers- Lighting and temperature – Summer and Winter Management – Debeaking.

UNIT – III

Poultry Nutrition – Requirements – Food additives – Food stuffs for Poultry – Feed ingredients.

UNIT - IV

Factors affecting egg size – storage, preservation methods, marketing – grading – economics of poultry production – maintenance of farm records and accounts.

Reference books:

1. Biooster S (1989). Diseases of poultry. Oxford and IBH.
2. Felwel and Fox (1992). Practical Poultry feeding. ELBS Edition.
3. Jull MA (1972). Poultry Husbandry. Tata McGraw Hill
4. Ganamani K. (1997). Modern aspects of Poultry keeping. Hytone Publishers, Madurai.
5. Sastry, Thomas and Sigh (1982). Farm Animals Management and poultry production. Vikas Publishing house.
6. Sigh J and More EN (1982). Liver stock and poultry production. Prentice Hall of India.

ELECTIVE COURSE III-(3)ECONOMIC ENTOMOLOGY

Objectives: To imbibe the knowledge on the beneficial insects utilizing them for economic gain through pest control, public health and role of honeybee and silkworm for livelihood options.

UNIT – I

Classification of Insects up to orders and their diagnostic characters with familiar and important examples. Insect Reproduction, Development and Metamorphosis.

UNIT - II

Harmful Insects: Classification of Insects pests, Reasons for Insect Pests, Injuries and Damages caused by Insect pests. Assessment of Insect pest population, Assessment of pest damage. Pest surveillance and forecasting pest outbreak. Methods and principles of pest control – Chemical, Mechanical Biology – Integrated.

UNIT – III

Insect pests: Destructive insects; Their bionomics and life cycle. Pest of Cultivated crops – Rice, Sugarcane, Coconuts, Cotton. Pest of vegetables. Pest of stored products.

UNIT – IV

Insects in relation to public health and household. Insects associated with human beings. Insects associated with household materials.

UNIT – V

Beneficial insects – Their bionomics, life cycle and by products. Honeybees, silkworm and Lac insect. Helpful Insect: Insect pollinators, predators and parasites, weed killers, soil builders and scavengers.

Reference Books:

1. Chapman RF (1993). The Insects. Structure and Functions. ELBS. London.
2. Chandler AC and Read CP (1961). Introduction to Parasitology. John Wiley and Sons, New York.
3. David BV, Muralirangan NC and Meera Muralirangan (1992). Harmful and beneficial Insects. Popular book Depot.
4. David BV and Kumaraswami (1998). Elements of Economics Entomology. Popular Book Depot. Madras.
5. David BV (1992). Pest management and pesticides: Indian Scenario. Namrutha publications.
6. Krishnan NT (1993). Economics Entomology. JJ Publications, Madurai.
7. Mani MS (1973). General Entomology. Oxford and TEM.
8. Nayar KK, Ananthakrishnan TN and David VD (1990). General and applied Entomology. Tata Mc Grow Hill New Delhi.