

# **SYLLABUS**

## **B.Sc., ZOOLOGY**

**(For candidates admitted from the Academic year 2017 Onwards)**



**P.G. DEPARTMENT OF ZOOLOGY**

**JAMAL MOHAMED COLLEGE (AUTONOMOUS)**

**(Nationally Accredited with 'A' Grade by NAAC)**

**TIRUCHIRAPPALLI- 620 020.**

# B.Sc ZOOLOGY – Course Structure under CBCS

(Applicable to the candidates admitted from the academic year 2017 -2018 onwards)

SEM	COURSE CODE	PART	COURSE	COURSE TITLE	Ins. Hrs /Week	CREDIT	MARKS		TOTAL
							CIA	ESE	
<b>I</b>	17U1LT1/LA1/LF1/LH1/LU1	I	Language – I		6	3	25	75	100
	17UCN1E1	II	English - I		6	3	25	75	100
	17UZO1C1	III	<b>Core – I</b>	Biology of Invertebrates	4	4	25	75	100
	17UZO1C2 P		<b>Core – II</b>	Practical-I: Biology of Invertebrates	4	3	20	80	100
	17UZO1A1		<b>Allied – I</b>		4	3	25	75	100
	17UZO1A2		<b>Allied – II</b>		4	3	20	80	100
	17UCN1VE	IV	Value Education	Value Education	2	2	-	100	100
<b>TOTAL</b>					<b>30</b>	<b>21</b>			<b>700</b>
<b>II</b>	17U2LT2/LA2/LF2/LH2/LU2	I	Language – II		6	3	25	75	100
	17UCN2E2	II	English – II		6	3	25	75	100
	17UZO2C3	III	<b>Core – III</b>	Biology of Chordates	5	4	25	75	100
	17UZO2C4 P		<b>Core – IV</b>	Practical-II: Biology of Chordates	4	3	20	80	100
	17UZO2A3		<b>Allied – III</b>		4	3	25	75	100
	17UZO2A4		<b>Allied – IV</b>		3	2	20	80	100
	17UCN2ES	IV	Environmental Studies	Environmental Studies	2	2	-	100	100
<b>TOTAL</b>					<b>30</b>	<b>20</b>			<b>700</b>
<b>III</b>	17U3LT3/LA3/LF3/LH3/LU3	I	Language– III		6	3	25	75	100
	17UCN3E3	II	English – III		6	3	25	75	100
	17UZO3C5	III	<b>Core– V</b>	Cell & Molecular Biology	4	4	25	75	100
	17UZO3C6 P		<b>Core– VI</b>	Practical-III: Cell & Molecular Biology	3	2	20	80	100
	17UZO3A5		<b>Allied– V</b>		4	3	25	75	100
	17UZO3A6		<b>Allied–VI</b>		3	2	20	80	100
	17UZO3N1	IV	Non Major Elective -I	Health Education	2	2	-	100	100
17UCN3S1	Skill Based Elective - I		Soft Skills Development	2	2	-	100	100	
<b>TOTAL</b>					<b>30</b>	<b>21</b>			<b>800</b>
<b>IV</b>	17U4LT4/LA4/LF4/LH4/LU4	I	Language–IV		6	3	25	75	100
	17UCN4E4	II	English– IV		6	3	25	75	100
	17UZO4C7	III	<b>Core– VII</b>	Animal Physiology	4	4	25	75	100
	17UZO4C8 P		<b>Core - VIII</b>	Practical-IV : Animal Physiology	4	3	20	80	100
	17UZO4A7		<b>Allied– VII</b>		4	3	25	75	100
	17UZO4A8		<b>Allied–VIII</b>		4	2	20	80	100
	17UZO4N2	IV	Non Major Elective - II	Vermiculture Technology	2	2	-	100	100
17UCN4EA	V	Extension Activities	NCC, NSS, etc.	-	1	-	-	-	
<b>TOTAL</b>					<b>30</b>	<b>21</b>			<b>700</b>
<b>V</b>	17UZO5C9	III	<b>Core – IX</b>	Bio. Stat., Bio. Info & Computer App.	6	5	25	75	100
	17UZO5C10		<b>Core – X</b>	Genetics	5	5	25	75	100
	17UZO5C11		<b>Core – XI</b>	Microbiology	5	5	25	75	100
	17UZO5C12		<b>Core - XII</b>	Developmental Biology	5	5	25	75	100
	17UZO5M1 P		Major Based Elective – I	Practical-V: Bio. Stat., Gen., MB & DB	5	4	20	80	100
	17UZO5S2	IV	Skill Based Elective -II	Applied Zoology	2	2	-	100	100
	17UZO5S3		Skill Based Elective – III	Biotechnology	2	2	-	100	100
17UZO5EC1		<b>Extra Credit Course - I</b>	Water Pollution Management	-	<b>4*</b>	--	<b>100*</b>	<b>100*</b>	
<b>TOTAL</b>					<b>30</b>	<b>28</b>			<b>700</b>
<b>VI</b>	17UZO6C13	III	<b>Core– XIII</b>	Biochemistry and Biophysics	5	5	25	75	100
	17UZO6C14		<b>Core– XIV</b>	Immunology	5	5	25	75	100
	17UZO6C15		<b>Core - XV</b>	Economic Entomology	5	5	25	75	100
	17UZO6C16		<b>Core XVI</b>	Environmental Biology and Evolution	5	5	25	75	100
	17UZO6M2 P		Major Based Elective- II	Practical-VI: Bio, Imm, Eco En & E. Bio. Evo.	5	4	20	80	100
	17UZO6M3		Major Based Elective- III	Poultry Science	4	4	25	75	100
	17UCN6GS	V	Gender Studies	Gender Studies	1	1	-	100	100
17UZO6EC2		<b>Extra Credit Course- II</b>	Wildlife Biology	-	<b>4*</b>	--	<b>100*</b>	<b>100*</b>	
<b>TOTAL</b>					<b>30</b>	<b>29</b>			<b>700</b>
<b>GRAND TOTAL</b>					<b>180</b>	<b>140</b>	-	-	<b>4300</b>

\* Not Considered for Grand Total and CGPA.

**Any Core paper can be converted to a Practical paper (if need be) and the Subject Code has to be changed as 17P\*\*1CP or 17U\*\*1AP (Example).**

SEMESTER		SUBJECT CODE	Skill Based Elective/ Major Based Elective (Any one to be selected for each semester)
V	Skill Based Elective - II	17UZO5S2	Applied Zoology Solid Waste Management
V	Skill Based Elective - III	17UZO5S3	Biotechnology Recombinant DNA Technology
V	Major Based Elective – I	17UZO5M1 P	Practical-V: Bio. Stat., Gen., MB & DB Practical-V: Instrumentation- I
VI	Major Based Elective – II	17UZO6M2 P	Practical-VI: Bio, Imm, Eco En & Eni. Bio Evo Practical-VI: Instrumentation- II
VI	Major Based Elective – III	17UZO6M3	Poultry Science Pisciculture

Semester	Subject code	Paper Title	Hour	Credit	Internal	External	Total
iii	17UZO3A5	Animal Structure & Function	4	3	25	75	100
	17UZO3A6 :P	Practical-I: Anl. Structure & Function	3	2	20	80	100
iv	17UZO4A7	Commercial Zoology	4	3	25	75	100
	17UZO4A8:P	Practical-II: Commercial Zoology	4	2	20	80	100

**SEMESTER I: CORE I  
BIOLOGY OF INVERTEBRATES**

**Course Code :17UZO1C1**  
**Hours/Week : 4**  
**Credit : 4**

**Max Marks : 100**  
**Internal Marks : 25**  
**External Marks : 75**

**Objective:**

To understand the fundamental organization, adaptations and significance of invertebrate animals and to highlight the importance of invertebrate taxonomy.

**UNIT I TAXONOMY & PROTOZOA**

**12 hours**

Principles and methods of taxonomy: Concepts of species and hierarchical taxa, biological nomenclature, classical and quantitative methods of animal taxonomy.

Protozoan general characters and outline classification upto classes with examples.

Type study: *Paramecium* general organization, Cyclosis, #Conjugation#.

General topics: Protozoan diseases in Man.

**UNIT II PORIFERA & COELENTERATA**

**12 hours**

General characters and outline classification upto classes with examples.

Type study: Sycon- General organization, Spicules and Reproduction.

Type study: *Obelia*- Structure of Obelia colony, Medusa, Nematocyst and Reproduction.

General topics: Canal system in Sponges, #Coral and Coral Reefs#.

**UNIT III PLATYHELMINTHES & ASCHELMINTHES**

**12 hours**

General characters and outline classification upto classes with examples.

Type study: *Liver fluke*- Morphology, digestive, excretory and reproductive systems.

Type study: *Ascaris*- #Sexual dimorphism#, Morphology, digestive, excretory and reproductive systems.

General topics: Helminth parasites in Man.

#### **UNIT IV ANNELIDA & ARTHROPODA**

**12 hours**

General characters and outline classification upto classes with examples.  
Type study: *Earthworm*- Morphology, Setae, Nephridia, nervous and reproductive systems.

Type study: *Prawn*- Morphology, #Appendages#, digestive, excretory and reproductive systems.

General topics: Larval forms in Crustaceans, Mouth parts in Insects.

#### **UNIT V MOLLUSCA & ECHINODERMATA**

**12 hours**

General characters and outline classification upto classes with examples.  
Type study: *Lamellidens* – Morphology, digestive, excretory, respiratory and reproductive systems.

Type study: Star fish - Morphology, pedicellaria, Water vascular system.

General topics: #Economic importance of Molluscs #, Larval forms of Echinoderms.

#### **#.....# Self-Study portion**

#### **Text Book:**

Jordan, E.L. and P.S.Verma. Invertebrate Zoology, S. Chand & Co. 3<sup>rd</sup> Edition, 2000  
2007.

#### **Books for Reference:**

1. Kotpal, R.L. Invertebrata, Rastogi Publication, Meerut. 2<sup>nd</sup> Edition, 2000.
2. Ekambaranatha Ayyar, Outlines of Zoology. Vols. I & II S. Viswanathan (Printers & Publishers ) Pvt. Ltd., Chennai. 1993.

**SEMESTER- I: CORE- II**  
**PRACTICAL – BIOLOGY OF INVERTEBRATES**

**Course Code: 17UZO1C1P**  
**Hours / Week: 4**  
**Credit : 3**

**Max Marks : 100**  
**Internal Marks : 20**  
**External Marks : 80**

**I. Major Practicals:**

Cockroach - Nervous, Digestive, Reproductive system  
Earthworm - Nervous system

**II. Minor Practicals:**

Earthworm- Body setae  
Mouth parts – Honey Bee, Housefly, Mosquito, and Cockroach.

**III. Spotters:**

**a) Classify giving reasons:**

Entamoeba, Paramecium, Euglena, Sycon, Hydra, Obelia, Aurelia, Sea anemone, Planaria, Holothuria, Taenia, Ascaris, Earthworm, Penaeus, Crab, Spider, Butterfly, Rhinoceros beetle, Pila, Freshwater mussel, Octopus, Chiton, Dentalium, Sepia, Starfish, Sea urchin and Sea cucumber.

**b) Draw Labelled Sketch:**

T.S. of Taenia, T.S. of Fasciola, Ephyra larva, Nauplius larva, Zoea larva

**c) Biological Significance:**

Sponge – Gemmule, Physalia, Leech, Peripatus, Limulus, Bipinnaria,

**d) Relate structure and function:**

Taenia – Scolex , Nereis – Parapodium, Peneus – Petasma, Star fish –Tube feet, Echeneis - Sucker.

**IV Record**

A record of lab work shall be maintained and submitted at the time of Practical examination for valuation.

**SEMESTER II: CORE III  
BIOLOGY OF CHORDATES**

**Course Code: 17UZO2C3**  
**Hours/Week : 5**  
**Credit : 4**

**Max Marks : 100**  
**Internal Marks : 25**  
**External Marks : 75**

**Unit – 1 PROTOCHORDATES: 15 hours**

General characters and classification upto classes with examples.

**Type study:** Amphioxus – Digestive, excretory and reproductive systems.

**General Topic:** Biological significance of Ascidians.

**UNIT - II: PISCES and AMPHIBIA: 15 hours**

General characters and classification upto classes with examples.

**Type study:** Shark and Frog - External characters, digestive, respiratory, circulatory, nervous and urinogenital systems.

**General Topic:** Fish migration, Accessory respiratory organs in Fish, Parental care in Amphibia, Neoteny.

**UNIT - III: REPTILIA: 15 hours**

General characters and classification upto classes with examples.

**Type study:** Calotes - External characters, digestive, respiratory, circulatory, nervous and urinogenital systems.

**General Topic:** Identification of Poisonous and Non-poisonous snakes of South India.

**UNIT - IV: AVES: 15 hours**

General characters and classification upto classes with examples.

**Type study:** Pigeon - External characters, digestive, respiratory, circulatory, nervous and urinogenital systems.

**General Topic:** Flightless Birds, Flight adaptation and Migration in Birds.

**UNIT - V: MAMMALIA: 15 hours**

General characters and classification upto classes with examples.

**Type study:** Rabbit – External characters, digestive, respiratory, circulatory, nervous and urinogenital systems.

**General Topic:** Dentition in Mammals, Adaptations of Aquatic Mammals.

**Reference:**

1. Manual of Zoology Vol. II CHORDATA – by Ekambaranatha Iyer and S. Viswanathan (Printers & Publishers) Chennai. 1993.

2. Kotpal, R.L. Vertebrata, Rastogi Publication, Meerut. 2<sup>nd</sup> Edition, 2000.

**SEMESTER II: CORE IV  
BIOLOGY OF CHORDATES – PRACTICAL**

**Course Code : 17UZO2C4P**  
**Hours/Week : 4**  
**Credit : 3**

**Max Marks : 100**  
**Internal Marks : 20**  
**External Marks : 80**

**Objective:**

To study the anatomy and physiology of Chordates and to observe the various biological systems through virtual techniques.

**I. Major Practicals:**

Virtual laboratory technique: Video clippings of Arterial system, Venous system, Digestive system and Reproductive system of Frog / (Fish, Birds).

Demonstration Dissection: digestive system, nervous system and reproductive system of Fish, Brain of Frog.

**II. Minor Practicals:**

Mounting: Placoid Scale of Shark, Teleost Fish (Ctenoid, Cycloid types), Gills and Fins of fish, Feathers (Ultra structure),

**III. Spottors:**

**a) Classify giving reasons:**

Amphioxus, Balanoglossus, Anabas, Tilapia, Eel, Ichthyophis, Rhacophorus, Hemidactylus, Cat fish, Duck, Eagle, Viper, Loris, Owl, Cobra.

**b) Draw Labelled Sketch:**

T.S of Amphioxus, Quill feather.  
Frog - Pectoral girdle, Pigeon - Pelvic girdle.

**c) Biological Significance:**

Ascidian tadpole larva, Coelacanth fish, Ichthyophis, Chameleon.

**d) Relate structure and function**

Rabbit – Dentition, Synsacrum in Bird, Echeneis - Sucker.

**e) Give adaptive significance:**

Exocetus. Ambystoma, Sphenodon, Bird, Bat.

**IV Record Note**

\* A record of lab work shall be maintained and submitted at the time of Practical Examination for valuation.



**SEMESTER III: CORE V  
CELL AND MOLECULAR BIOLOGY**

**Course Code: 17UZ03C5**  
**Hours/Week : 4**  
**Credit : 4**

**Max Marks : 100**  
**Internal Marks : 25**  
**External Marks: 75**

**Objective:**

To elucidate the structure and function of cell organelles and to describe genome organization and regulatory control.

**UNIT I** **12 hours**

Prokaryote and Eukaryote cell - Cell organization and components, Ultra structure of Plasma membrane – Unit membrane, #Fluid Mosaic model and functions#. Cytoplasm: Components and functions.

**UNIT II** **12 hours**

Ultra structure and functions of Endoplasmic Reticulum, Ribosomes, Golgi complex, Lysosomes and Mitochondria.

**UNIT III** **12 hours**

Structure and functions of Nucleus, Nucleolus, Nuclear envelope, #Nuclear pore complex# and Chromosomes. Cell Cycle and Cell division - Mitosis and Meiosis.

**UNIT IV** **12 hours**

DNA and RNA: Molecular structure, Types and Functions. DNA replication. Protein synthesis: Transcription and Translation.

**UNIT V** **12 hours**

Cancer cells: Characteristics, causes and types, treatment by Radiotherapy and Chemotherapy and Prevention- Oncogenes - #Apoptosis#-Tumor suppressor Gene.

**#.....# Self-Study portion**

**Text Books:**

1. De Robertis, E.D.P. and De Robertis, E.M.F., Cell and Molecular Biology, VIII Ed., Lea and Febiger, Philadelphia. 1987.
2. Verma, P.S and Agarwal V.K., Concepts of Molecular Biology, Chand & Company Ltd., New Delhi. 2015.

**Books for Reference:**

1. Gupta, P.K. A text book of Cell and Molecular Biology, Rastogi Publications, Meerut. 1999.
2. Powar, C.B. Essentials of Cytology, Himalaya Publishing House, New Delhi. 2<sup>nd</sup> Edition, 1997.

**SEMESTER III: CORE VI**

**CELL AND MOLECULAR BIOLOGY- PRACTICAL**

**Course Code : 17UZO3C6P**

**Hours/Week : 3**

**Credit : 2**

**Max Marks : 100**

**Internal Marks : 20**

**External Marks : 80**

**Objective:**

To develop skill in handling Microscope and to study blood and cellular constituents.

**Contents:**

1. Study of Compound Microscope: Setting and Handling Procedure.
2. Micrometric measurement of cell.
3. Squash preparation of Onion root tip for study of Mitotic stages.
4. Squash preparation of grasshopper testis for Meiotic stages.
5. Smear preparation of human blood for RBC and WBC studies.
6. Squash preparation of Salivary gland of Chironomous larva for Polytene Chromosome studies.
7. Models of DNA, tRNA and DNA replication.
8. Spotters: Epithelial, Muscular, Vascular tissues.

**Record Note**

\* A record of lab work shall be maintained and submitted at the time of Practical examination for valuation.

**SEMESTER III: NON MAJOR ELECTIVE – I  
HEALTH EDUCATION**

**Course Code : 17UZO3N1**

**Hours/Week : 2**

**Credit : 2**

**Max Marks : 100**

**Internal Marks : -**

**External Marks : 100**

**Objective:**

To impart awareness on Public Health and Hygiene and to create knowledge on Health Education.

**UNIT I**

**6 hours**

**Health:** Definition – Dimensions of health. Health education: Definition – objectives – principles. Nutrition and health: Balanced diet: macronutrients – micronutrients – vitamins and minerals. Food hygiene: perishable – nonperishable – shelf life – sterilization – food poisoning.

**UNIT II**

**6 hours**

**Environment & Health:** Water, Air and Noise pollution. Pollutants: Effects, prevention and control. Effects of smoking and alcoholism. Causes effects and control measures of Life style diseases: Stroke - Obesity – type 2 diabetes

**UNIT III**

**6 hours**

**Concept of disease:** Phases of disease – Prepathogenesis and Pathogenesis –concept of prevention and control – Common Helminthic and Arthropod borne diseases. Immunity: Types of vaccinations – Live – Attenuated – Killed – Toxoid – Transgenic vaccines.

**UNIT IV**

**6 hours**

**Communicable diseases:** Bacterial and Viral diseases – Causative agents and factors. Mode of transmission: air – water – droplets – contact. Symptoms and treatment of Tuberculosis, Typhoid, Hepatitis A & B and AIDS. Family planning: Definition – scope – contraceptive devices. Assisted Reproductive Technologies

**UNIT V**

**6 hours**

**Mental Health:** Definition - characteristics – causes and prevention of mental health - Occupational health & hazards – prevention. #Health care services# – Primary health care – Hospitals – Principles of First Aid – First aid procedures for Accidents, food poisoning, snake bites and heart attacks.

**Text Book:**

1. E. Park & Park: Textbook of Preventive and Social Medicine (Published by Banarsidos Bhanot, 1<sup>st</sup> Edition, 1278 Napier Town.)

**Book for Reference:**

1. Leelavathy. S. Nair, Revised enlarged edition. A Text book of Invertebrates, Saras Publications. 2001



**SEMESTER IV : CORE- VII**  
**ANIMAL PHYSIOLOGY**

**Course Code: 17UZO4C7**  
**Hours/Week : 4**  
**Credit : 4**

**Max Marks : 100**  
**Internal Marks : 25**  
**External Marks : 75**

**Objective:**

To learn the Physical and Chemical properties of living matter and to understand the co-ordinated functions of various organs and organ systems. Also to learn about the hormonal regulations and their defects in Man.

**UNIT I**

**12 hours**

Homeostatic mechanisms: Thermoregulation in Poikilotherms & Homeotherms - Tolerance to high temperature, cold and freezing - Acclimatization and acclimation – Physiology of hibernation and aestivation - Osmotic and ionic regulation in crustaceans, fishes, birds and mammals. Adaptation to Pressure, High altitude - Buoyancy.

**UNIT II**

**12 hours**

Excretion: Ammonia toxicity – Detoxification pathways. Excretion in different habitats - Nervous co-ordination: Ionic basis of excitability – Resting Membrane Potential. Electrogenesis - Propagation of Action Potential – Interneuron Transmission – Electrical synapse – Chemical synapses – Neurotransmitters.

**UNIT III**

**12 hours**

Types of Muscle – Mechanism of Muscle contraction - Receptor Mechanism: Mechano reception, Pressure receptors – Gravity receptor – Phonoreception: Tango receptors – Mammalian ear - Photoreception: Retinal pigments – Photochemistry of vision.

**UNIT IV**

**12 hours**

Bioluminescence: Occurrence – chemistry of light production – Chromatophores and colour change – functional significance. Animal electricity: Electric organs – production of electric discharge – Functional significance. Animal behaviour: Biological clock – Endogenous rhythm – Circadian rhythm – Circannual and lunar periodicity – Pheromones.

## **UNIT V**

**12 hours**

Endocrine glands: Structure, Secretion and functions of endocrine glands – Pituitary – Thyroid – Pancreas – Adrenal. Hormones: Chemical nature – functions – deficiency diseases – Mechanism of hormone action – Neuroendocrine regulation. Endocrine glands in relation to human reproduction.

### **Text books:**

1. Singh, H. R. Animal Physiology and Related Biochemistry. SHOBAN Lal Nagin Chand and co., Educational Publishers, New Delhi.
2. A. Mariakuttikan, N. Arumugam. Saras Publications, Animal Physiology. 3<sup>rd</sup> Edition, 2004,

### **Books for Reference:**

1. Rastogi, S. C. Essentials of Animal Physiology. Wiley Eastern Limited. New Delhi. 1979.
2. Berry A. K., A Text book of Animal Physiology. Emkay Publications. 1<sup>st</sup> Edition, 1998.
3. Hoar, S. Williams. General and Comparative Physiology. Prentice Hall. 1987.
4. Parameswaran, R., Anantha Krishnan, T. N. Anantha Subramanian. Outlines of Animal Physiology, K. S. Viswanathan Pvt. Ltd. Chennai.

**SEMESTER IV: CORE VIII**  
**ANIMAL PHYSIOLOGY - PRACTICAL**

**Course Code: 17UZO4C8P**  
**Hours/Week : 4**  
**Credit : 3**

**Max Marks : 100**  
**Internal Marks : 20**  
**External Marks : 80**

**Objective:**

To assess the Qualitative and Quantitative nature of cellular constituents and functional aspects.

**ANIMAL PHYSIOLOGY**

1. Human Salivary Amylase activity in relation to Temperature and pH
2. Effects of Temperature on the ciliary activity of Freshwater Mussel and calculation of  $Q_{10}$
3. Identification of Nitrogenous Waste Products.
4. Total count of RBC and WBC & Differential count of WBC.
5. Quantitative tests for Carbohydrates, Proteins, and Lipids.
6. Simple tests for Sugar, Albumin, and Urea in Human Urine.
7. Estimation of Haemoglobin.
8. Estimation of the rate of  $O_2$  consumption in fish with reference to body weight.

**SPOTTERS**

Centrifuge, pH meter, Colorimeter, ECG, Sphygmomanometer, pregnancy test kit, Haemoglobinometer, Haemocytometer, Amino acids Model.

**SEMESTER IV: NON MAJOR ELECTIVE - II**  
**VERMICULTURE TECHNOLOGY**

**Course Code : 17UZO4N2**

**Hours/Week : 2**

**Credit : 2**

**Max Marks : 100**

**Internal Marks : -**

**External Marks : 100**

**Objective:**

To impart a detailed knowledge on vermiculture technology and to highlight the benefits of ecofriendly agriculture by way of organic farming utilizing the byproducts of vermiculture. Also to create knowledge and avenues for self employment.

**UNIT I VERMICOMPOSTING AGENTS 6 hours**

History of Indian Earthworm culture - Need for Vermiculture - Earthworm types – Biology of *Lampito mauritii* and *Eudrilus eugeniae* – Trophic classification of Earthworm: Epigeic, Anecic & Endogenic; Clitellates & Non-Clitellates – Morphology, Anatomy and Physiology of Earthworms – Life cycle of Earthworm - Role of Earthworms in composting.

**UNIT II VERMITECHNOLOGY 6 hours**

Raw materials and requirements of vermicomposting – Worms for Vermiculture – Vermiculture practice – Vermibed preparation- Maintenance of composting - Collection of vermicompost – Efficiency of vermicompost.

**UNIT III VERMICOMPOST PROPERTIES 6 hours**

Types of Vermicomposting – Worm casts . – General problems in production of vermicompost - Physical, Chemical and Biological properties of Vermicompost - Effects of vermicompost on soil properties - Vermiwash unit.

**UNIT IV VERMICOMPOST APPLICATION (USES OF EARTHWORM) 6 hours**

Advantage of vermicompost – Vermicomposting from Agricultural and Urban Solid Wastes – Recycling of wastes through vermicomposting – Earthworms as Bioreactors and Bioindicators - Organic farming - Vermicompost and its applications.

**UNIT V VERMICOMPOSTING POTENTIALS & ECONOMICS 6 hours**

Small Scale or Indoor vermicomposting – Large scale or outdoor vermicomposting. Vermicompost – Quality & Economics - Role of Earthworm in sustainable Agriculture - Prospects of vermiculture as a self-employment venture.



**Text Books:**

1. Sultan Ahmed Ismail. The Earthworm, Others India Press, Mapura 403507, Goa, India. 2005.
2. Seethalakshmy. A Text book of Vermitechnology, Saras Publications. 3<sup>rd</sup> Edition, 2012.
3. Prakash Malhotra (2008). Economic Zoology, Adhyayna Publishers & Distributors, New Delhi.

**Book for Reference:**

1. Edwards, C.A. and Loft, J.R. Biology of Earthworms, 3<sup>rd</sup> Edition, Chapman Publications. 1977.
2. NIIR Board, The complete Technology Book on Vermiculture and Vermicompost. 2006, New Delhi.

## SEMESTER V: CORE IX

### BIostatistics, Computer Application and Bioinformatics

**CourseCode : 17UZO5C9**

**Hours/Week : 5**

**Credits : 4**

**Max Marks : 100**

**Internal Marks : 25**

**External Marks : 75**

#### **Objective:**

To acquire basic knowledge in biostatistics and bioinformatics; and to understand the importance of computers as bio statistical tools.

### **BIostatistics**

#### **UNIT I**

**15 hours**

Statistical data: Sources, Primary data and secondary data – Collection and Tabulation of data - Representation of data: Line diagram, Bar diagram, Histogram, Frequency Polygon, Scatter diagram and Pie chart – Sample and sampling methods.

#### **UNIT II**

**15 hours**

Measures of central tendency: Mean, Median and Mode – Measures of dispersion: Range, Mean deviation, Standard Deviation and Standard Error – Test of significance: Student 't' test - Probability: Addition probability and multiplication probability

### **COMPUTER APPLICATION**

#### **UNIT III**

**15 hours**

Generations of Computers - Classification – Components and properties – Software types, operating system and Hardware – Computer programming languages – computer networking: Internet and intranet – Computer applications – Basics of SPSS

### **BIOINFORMATICS**

#### **UNIT IV**

**15 hours**

Bioinformatics: Definition, History, Scope and Importance – Components of Bioinformatics - Biological data bases: Primary databases: PIR, GENBANK, Secondary databases: MMDB - PDB.

#### **UNIT V**

**15 hours**

Bioinformatics tools - Classification – Features and application BLAST, FASTA and RasMol – Phylogenetic Trees: Structure, construction and interpretation – DNA barcoding.

**Text Books**

1. Rastogi, V.B., Fundamentals of Biostatistics. Ane's books Ltd., New Delhi. 2006.
2. Ram, B. Computer Fundamentals – Architecture and organization – Wiley Eastern Ltd. New Delhi. 1995.
3. Subramanian. C, A textbook of Bioinformatics. Dominant Publishers and Distributions, New Delhi, India. 2004.

**Books for Reference**

1. Arora, P.N., Biostatistics, Himalaya Publishing House. 1998.
2. Ramakrishnan, P., Biostatistics, Saras Publications, Nagercoil. 1996.
3. Ravikant,T., PC Software made simple, Tata McGraw Publishing Co Ltd. 1995.
4. V. Rajaraman. Fundaments of Computer, Prentice Hall of India. 1985.
5. Murthy, C.S.V., Bioinformatics, Himalaya Publishing Horse, Mumbai, India. 2003.

## SEMESTER V: CORE X

### GENETICS

**Course Code : 17UZO5C10**  
**Hours/Week : 5**  
**Credit : 5**

**Max Marks : 100**  
**Internal Marks : 25**  
**External Marks : 75**

#### **Objective:**

To discern the concept of gene, the role of genes in determining characters, the principles of inheritance and mechanism of heredity and variation.

#### **UNIT I MENDEL'S LAW AND INHERITANCE**

**15 hours**

Mendel's laws – Monohybrid and Dihybrid Experiments – Test cross and Back cross – Linkage and linked genes - Crossing over and gene mapping – Multiple alleles : ABO & Rh blood group in man, coat colour in rabbit - polygenic inheritance.

#### **UNIT II SEX DETERMINATION**

**15 hours**

Sex determination in man and Drosophila – sex chromosome and their evolution – chromosomal theory of sex determination – Environmental and Hormonal factors in sex determination – sex linked inheritance in man : colour blindness and haemophilia. Chromosomal aberration.

#### **UNIT III GENES AND GENETIC CHANGES**

**15 hours**

Concept of gene - split genes, -Genetic code – Gene expression and gene regulation - Lac operon – Mutation: types of gene mutation ,chemical mutagenesis, - DNA damage and repair - Chromosomal aberration: Euploidy, aneuploidy, polyploidy, and structural changes; Deficiency, Amplification, Duplication, translocation and inversion.

#### **UNIT IV. MICROBIAL GENETICS**

**15 hours**

DNA and RNA as genetic material: Avery, Griffith experiment, Hershey and Chase experiment - Recombination in Bacteria: Transformation, Conjugation, Transduction - Recombination in phages – Lytic and Lysogenic cycles-Genetic application of bacteria.

#### **Unit- V HUMAN GENETICS**

**15 hours**

Human Genetics: Karyotype and Pedigree analysis – Syndromes in man: Turner, Klinefelters, and Downs. Inborn Errors of Metabolism and Hereditary diseases in Man: Phenylketonuria, Alkaptonuria, Albinism, Thalassaemia and Sickle cell anemia – Genetic counseling – Eugenics and Euthenics – Human genome project.

**Text Books:**

1. Verma. P.S. and V.K. Agarwal, Genetics. S. Chand & Co., New Delhi.3<sup>rd</sup> Edition,1997.
2. Verma. P.S. and V.K. Agarwal. Concept of Genetics, Human Genetics and Eugenics., S. Chand & Company Ltd, New Delhi.1998.

**Reference**

1. Friefelder, D., Microbial Genetics. Narosa Publishing, New Delhi.2<sup>nd</sup> Edition,1997.
2. Goodenough, Ursula. Genetics. Saunders College Publishing International, New York. 1997.
3. Lewin, B. Gene VI. Wiley Eastern Ltd., New Delhi.1998.
4. Rothwell, N.V., Human Genetics. Prentice Hall of India, New Delhi.1979.
5. Sinnott, E.W., L.C. Dunn and L.C. Dobzhansky, T., Principles of Genetics. Tata McGraw Hill., New Delhi.1985.
6. Gardner, A.S., Principles of Genetics. Wiley Eastern, Pvt., Ltd.1984.
7. Mitra, S., Genetics – a blue print of life. Tata McGraw Hill Pub. Co., Ltd., Delhi. 1994.
8. R.P. Meyyan, Genetics, Saras publication, 114 /35. A.R.P. Camp road, Periavilar, Kottor (post).Nagerkoil. 2012.

## SEMESTER V: CORE XI

### MICROBIOLOGY

**Course Code : 17UZO5C11**  
**Hours/Week : 5**  
**Credit : 5**

**Max Marks : 100**  
**Internal Marks : 25**  
**External Marks : 75**

#### **Objective:**

To familiarize the fundamentals of microbes and their significance in Industry, Agriculture, Food and Human Health.

#### **UNIT I CONCEPT AND CLASSIFICATION 15 hours**

History and Scope- contributions of Louis Pasteur-Robert Koch-Alexander Fleming –Antonie Van Leeuwenhoek. Outline classification of microbes – Whittaker's five kingdom concept- Prokaryotes and Eukaryotes. # Theory of spontaneous generation #

#### **UNIT II MICROBIAL CHARACTERISTICS 15 hours**

Basic structure and salient features of : Virus, Bacteria, Fungi, Yeast and Algae. Staining techniques: Simple Staining Gram Staining. # Acid Fast Staining #.

#### **UNIT III MICROBIAL CULTURE 15 hours**

Nutritional requirements - Types of media- Culture of Bacteria – Types of bacterial culture- Pure culture. Bacterial growth curve- factor affecting Bacterial growth curve. - Disinfection: physical and chemical agents of sterilization and filtration. # Culture and handling methods #.

#### **UNIT IV INDUSTRIAL, AGRICULTURAL AND FOOD MICROBIOLOGY 15 hours**

Industrially useful Microorganisms – Fermentation of Alcoholic beverage - Uses of microorganisms in Agriculture: Nitrogen fixers, Biofertilizers, Biopesticides, # Biocontrol agents #.Role of Microbes in Sewage treatment. Microorganisms as source of food: Dairy products, preservation of food, food spoilage, food poisoning.

#### **UNIT V MEDICAL MICROBIOLOGY 15 hours**

Microbial Diseases of Man – Bacterial disease: TB, Typhoid, Leprosy, # Syphilis and Tetanus #. Viral disease: Influenza, Chicken pox, Hepatitis, Dengue and AIDS.

**#.....# Self-Study portion**

**Text Books:**

1. Dubey R.C and Maheswari D.K. Text Book of Microbiology, S. Chand and Company Ltd, New Delhi. 2009.
2. Ananthanarayanan, R and Jayaram Panicker, C.K. Text Book of Microbiology, Orient Longman, Chennai and Hyderabad. 2000.

**Books for Reference:**

1. Sharma,P.D., Microbiology , Rastogi Publications. 1998.
2. Pelczar, Chan and Krieg, Microbiology, Tata Mc Graw Hill Pub. Co. Ltd. 1993.

## SEMESTER V: CORE XII

### DEVELOPMENTAL BIOLOGY

**Course Code: 17UZO5C12**

**Hours / Week: 5**

**Credit : 5**

**Max Marks : 100**

**Internal Marks : 25**

**External Marks: 75**

#### **Objective:**

To understand the sequential changes from cellular organization to organ grade level of organization in the development of multi-cellular organisms, and to highlight the relevance of human embryology to modern fertility techniques.

#### **UNIT I**

**15 hours**

**Gametogenesis:** Historical concepts in Embryology. Spermatogenesis. Oogenesis. Structure of Sperm and ovum - Egg membranes.

#### **UNIT II**

**15 hours**

**Fertilization:** Significance– Physical & Chemical factors involved - Cytological and Physiological changes - Post–fertilization changes: changes in the organisation of the egg cytoplasm caused by fertilization - Parthenogenesis

#### **UNIT III**

**15 hours**

**Gastrulation and Embryogenesis:** Types of eggs– Cleavage patterns & Laws – morphogenetic gradient in the egg cytoplasm - Fate map – Gastrulation in Frog – Principles and patterns of gastrulation - Cell lineage - Organizer : Concepts and Induction process.

#### **UNIT IV**

**15 hours**

**Organogenesis; Differentiation & Post Embryonic Development:** Organogenesis – Development of eye and kidney in chicks. Differentiation: Chemical basis, Genes and differentiation - Placentation in Mammals - Classification of Placenta. Metamorphosis in Amphibians - Neuro endocrine control of insect metamorphosis – Regeneration.

#### **UNIT V**

**15 hours**

**Advances in Developmental Biology:** Medical implications: Infertility- Artificial Insemination – IVF – Embryo Transfer, Cloning. Cryopreservation of gametes and Embryos - Contraceptive devices and Vaccines.



Reference.

1. Lewis Wolpert (2007) Principles of Development (III edition) Oxford University Press, UK.
2. Gilbert, F.S. (2006) Developmental Biology, 8th edition, Sinauer Associates, Inc. Publishers, Massachusetts.
3. Balinsky, B.I. (2004) An Introduction to Embryology, 5th edition, Thomas Asia Pvt. Ltd, Chennai.

## SEMESTER V: MAJOR BASED ELECTIVE- I

### BIostatistics, Bioinformatics, Computer Application, Genetics, Microbiology, Developmental Biology – Practical V

Course Code : 17UZO5M1P

Hours/Week : 5

Credit : 4

Objective:

Max Marks : 100

Internal Marks : 20

External Marks : 80

To acquire basic knowledge on computational biology and to study the practical applications of Genetics, Microbiology, Embryology and Biotechnology.

#### BIostatistics, Bioinformatics AND Computer Application

Measurement of the length and weight of fish or any other animal, and calculation of the mean and median values. Calculation of mean and median for leaves & mussels shells.  
EXEL: Production of bar diagram and pie chart for statistical data. Calculation of mean median and standard deviation.

Retrieval of nucleotide sequences and aminoacid sequences from NCBI , EMBL, DDBJ, SWISS- PROT, PDB

**Spotters:** Input devices : mouse, keyboard, and scanner. Output devices: monitor, printer, CPU

#### GENETICS

Mendelian traits in Man

Calculation of gene frequencies

Drosophila: Culture & Genetic importance

- Mutants

- Male and Female identification

Human Genetics: Karyotypes - Pedigree analysis and - Syndromes.

#### MICROBIOLOGY

Culture techniques of bacteria: Inoculum preparation, culture in liquid media, culture in solid media, and counting of bacteria using agar plating technique.

**Gram Staining:** Gram +ve and Gram–ve bacteria identification

#### Equipments in Microbiology

Inoculation loop, Autoclave, Laminar flow hood and Bacteriological incubator

#### DEVELOPMENTAL BIOLOGY

Examination of prepared slides to study the following:

Frog: Egg – cleavage – blastula – yolk plug stage

Chick: Egg – 24hrs, 48hrs, 72 hrs

**OBSERVATION RECORD** \* A record of lab work shall be maintained and submitted at the time of Practical examination for valuation.

**SEMESTER V: MAJOR BASED ELECTIVE- I**

**INSTRUMENTATION - I – PRACTICAL V**

**Course Code : 17UZO5M1P : 2**  
**Hours/Week : 5**  
**Credit : 4**

**Max Marks : 100**  
**Internal Marks : 20**  
**External Marks : 80**

**Practical**

1. To give hands on training for usage of the pH Meter
2. To measure EC in water samples using Electrical Conductivity Meter
3. To measure Turbidity in water samples using Turbidity Meter
4. To give hands on training for usage of Centrifuge / Ultra Cooling Centrifuge
5. To measure the colour of water samples using Colorimeter
6. To measure the intensity of colour of solution using Spectrophotometer
7. To give hands on training for usage of BOD Incubator / Bacterial Incubator
8. To give hands on training for usage of Paper Chromatography
9. To give hands on training for usage of Thin Layer Chromatography
10. To give hands on training for usage of Laminar Flow

## SEMESTER V: SKILL BASED ELECTIVE II

### APPLIED ZOOLOGY

Course Code : 17UZO5S2  
Hours/Week : 2  
Credit : 2

Max Marks : 100  
Internal Marks : -  
External Marks : 100

#### Objective:

To disseminate information on economic aspects of Zoology and thereby motivate for self employment.

#### UNIT I

6 hours

**Vermiculture:** Classification of earthworm; Species of Earthworms – Life cycle of *Lampito mauritii* – Preparation of vermin bed; vermiwash; Vermicompost – Economic importance. Earthworms in medicine – bio waste management - #Organic farming#.

#### UNIT II

6 hours

**Apiculture:** Classification of honey bee; Species of Honey Bees - colonial structure of honey bee – Biology of Honey bee – Types of bee hives –Extraction of honey – Nutritive and medicinal value of honey.

**Lac culture:** Classification of lac insect – species of lac insect – host plant ; Types; Life cycle of Lac insect – Extraction of Lac – Processing – purification - #Economic importance of Lac#, Uses of Lac: Medicinal – Industrial – Ornamental.

#### UNIT III

6 hours

**Sericulture:** Classification; Species; Life cycle of *Bombyx mori*. Rearing of silk worm: Paraffin paper rearing – Box rearing – New net method – Co-operative methods. Moriculture – types of mulberry plants – planting methods. Diseases of silk worm : Protozoan – Bacterial - Viral diseases (each two) - Reeling of silk – #Economic importance of sericulture#.

#### UNIT IV

6 hours

**Aquaculture:** Freshwater fishes (Indian major carps) – Site selection and construction of pond – Fish feed – Induced breeding – Fish diseases – rearing methods: Furunculosis, Epizootic Ulcerative Syndrome (EUS) and #Vibriosis# – Fresh water Prawn culture. Ornamental fish culture .

#### UNIT V

6 hours

**Poultry farming:** Types of fowls – Rearing methods of Broilers and Layers – Poultry nutrition – Poultry diseases (NCD, IBV & Fowls). Issues and limitations of poultry farming.

**Dairy farming:** Breeds of Dairy animals (Cow, Buffalo and Goat) and their characteristics. Dairy farm: Construction Methods – #Rearing of cattle# - Raising the dairy calf, – Farm equipments (Milk machines, chaff cutter, milk cans and containers for liquid food).

**#.....# Self-Study portion**

**Text Book:**

1. Ganga.G and Sulochana Chetty. J., An introduction to Sericulture(2<sup>nd</sup> edition) Oxford & IBH Publishing company.

**Books for Reference:**

1. Shukla.G.S. and Upadhyya.V.B. Economic Zoology (Rastogi Publications).
2. Ahsan, J and Sinha, S.P. A Handbook on Economic Zoology, S.Chand& Co.
3. Sardersingh – Beeking in India.
4. Santhanam – Aquaculture.
5. Ullal.S.R. and Narasimhanna, M.N – Central Silk Board, Govt. of India, Bombay.
6. Singh – Livestock and poultry production.
7. Jhingran – Fish and fisheries.
8. T.V.R. Pillai – Coastal Aquaculture.
9. Maine product export development authority – Freshwater fishes, Ornamental fishes, Shrimph culture – MPEDA Publication series.

**SEMESTER V: SKILL BASED ELECTIVE II  
SOLID WASTE MANAGEMENT**

**Course Code : 17UZO5S2 : 2**  
**Hours/Week : 2**  
**Credit : 2**

**Max Marks : 100**  
**Internal Marks : -**  
**External Marks : 100**

**Unit – I** **6 hours**  
Sources, generation, classification & composition of solid wastes. Solid waste management methods - Sanitary land filling, Recycling, Composting, Vermi composting - Incineration, energy recovery from organic waste.

**Unit – II** **6 hours**  
Solid Waste Management Plan - Waste minimization technologies - Hazardous Waste Management - Sources and Classification - Physicochemical properties - Hazardous Waste Control & Treatment.

**Unit – III** **6 hours**  
Hospital Waste Management, Hazardous Waste Management & Handling rules, 1989 & 2000 (amendments)

**Unit- IV** **6 hours**  
Disaster Management, Fly ash generation & utilization, Primary, secondary & tertiary & advance treatment of various effluents.

**Unit- V** **6 hours**  
Disposal of wastes - methods – incinerations – principle features of incineration – site selection and plant layout of incineration – sanitary land fill – advantages and disadvantages.

**References :**

1. Solid Waste Management CPCB. New Delhi.
2. Ecotechnology for pollution control & environmental management - By R.K. Trivedi & Arvind Kr.
3. Basic Environmental Technology - J.A. Nathanson

**SEMESTER V: SKILL BASED ELECTIVE III  
BIOTECHNOLOGY**

**Course Code: 17UZO5S3**  
**Hours/Week : 2**  
**Credit : 2**

**Max Marks : 100**  
**Internal Marks : -**  
**External Marks : 100**

**Objective:**

To impart knowledge on Modern Biotechnology and the basics of Genetic Engineering and to correlate their applications in Industry and Environmental Protection.

**UNIT - I: BIOTECHNOLOGY - SCOPE AND IMPORTANCE** **12 hours**

Biotechnology: Definition, Scope and Importance – History of Biotechnology- Biotechnology in India- Global scenario. Biotechnology in Environment, Agriculture, Animal Husbandry and Medicine.

**UNIT-II: GENETIC ENGINEERING** **12hours**

Recombinant DNA Technology: Enzymes-Cloning vectors; Plasmid, Cosmid, artificial chromosomes and shuttle vector- Gene cloning Strategy; principles and methods- DNA cloning and whole animal cloning-Gene regulation and expression in prokaryotes and eukaryotes.

**UNIT- III: MOLECULAR TECHNIQUES AND MARKERS** **12 hours**

PCR, RT-PCR, RFLP, RAPD and AFLP and application of RFLP in DNA finger printing- Agarose gel electrophoresis- SDS-PAGE, Blotting Techniques, Southern and Western Blotting. Gene Library and Gene Bank.

**UNIT- IV: INDUSTRIAL BIOTECHNOLOGY** **12 hours**

Fermentation: Principles, Fermenter design and Types - Process, Scale up and Downstream Processing - Production of Antibiotics, Vaccines and Vitamins by fermentation.

**UNIT – V: ENZYME BIOTECHNOLOGY**

**12 hours**

Enzymes- Classification- Source-Mechanism of Enzyme Action- Production in large scale- Extraction and purification- Enzyme immobilization- Applications.

**Text Book:**

1, R C Dubey, Text Book of Biotechnology, S.Chand& Company Ltd. 2006

**Books for Reference:**

1. I.J Higgins, Best, D.J. and Jones, J. Biotechnology – Principles and Applications. Blackwell Scientific Publications, Oxford, London, Edinburgh.1988.
2. S. B Primrose. Modern Biotechnology. Blackwell Scientific Publications, Oxford, London.1989.
3. Kumaresn, V.2009. Applied Animal Biotech. Saras Publication, Nagercoil.



**SEMESTER V: SKILL BASED ELECTIVE- III**

**RECOMBINANT DNA TECHNOLOGY**

**Course Code: 17UZO5S3:2**  
**Hours/Week : 2**  
**Credit : 2**

**Max Marks : 100**  
**Internal Marks : 25**  
**External Marks : 75**

**UNIT I : RECOMBINANT DNA TECHNOLOGY**

**6 hours**

Introduction to r – DNA technology and Genetic engineering, Steps involved – a brief history of development of r – DNA Technology. Isolation of DNA fragments/genes- Mechanical shearing, restriction endonucleases digestion.

**UNIT II : ENZYMES INVOLVED**

**6 hours**

Restriction endonucleases, DNA – dependent DNA polymerase, RNA – dependent DNA polymerase (reverse transcriptase), DNA dependent RNA polymerase, alkaline phosphatase, terminal transferase, polynucleotide kinase, DNA ligase, S-1 nuclease.

**UNIT III : VECTORS**

**6 hours**

Definition, desirable characteristics in a vector; cloning and expression vectors, plasmid vectors for use in prokaryotes and eukaryotes; shuttle vectors (PBR and PUC series) bacteriophage vectors (T and Mix vectors) cosmid vectors, BAC and YAC vectors, M13 vector. Ti plasmids as vectors for plant cells. Use of linkers & adapters

**UNIT IV : GETTING DNA INTO CELLS AND CLONING STRATEGIES**

**6 hours**

Transformation – Transfection and *Agrobacterium* mediated gene transfer, Electroporation, lipofection, microprojectile bombardment, micro injection, chemical mediated transformation; phage – mediated transfer, gene gun other latest methods. Cloning of genes: Construction of genomic and cDNA synthesis and libraries, Polymerase Chain reactions-method for amplification, ESTs, Differential display and subtractive approaches

**UNIT V : SELECTION, SCREENING AND ANALYSIS OF RECOMBINANTS 6 hours**

Genetic selection and screening methods (use of chromogenic substrates, insertional inactivation, complementation of defined mutations and other methods, reporter genes), lethal synthesis, replica plating, delayed enrichment, limited enrichment, penicillin enrichment., screening using nucleic acid hybridization, polymerase chain reaction, DNA sequencing. DNA finger printing (RFLP, RAPD, Micro array. Promoter mapping, s1 nuclease mapping, Primer extension-chromosome walking, site directed mutagenesis. Application in human genes. Human genome sequencing & human microbiome sequencing.

**Reference:**

1. Molecular biology of gene VI (2007) 6 edition. James D. Watson, Tania A. Baker, Stephen P. Bell,
2. Alexander Gann, Michael Levine, Richard Losick, Inglis CSHLP. Benjamin Cummings publishers.
3. Molecular cloning 2001 (3rd edition) – A lab manual. Joseph Sambrook, David Russell, CSHL press.
4. Instant notes in molecular biology 1998. Turner, P.C, McLennan A.G., Bates A.D., and White M.R.H., Viva books private limited. New Delhi.
5. Cell and Molecular Biology 2009 (6th edition). Karp, G. John Wiley and sons, Inc., New York
6. Cell and Molecular Biology (eighth edition). De Robertis, EDP and De Robertis, Jr.EMF BI Waverly Pvt., Ltd.
7. DNA Cloning: A Practical Approach Volume 1: Core Techniques (The Practical Approach Series) (2nd edition)1995. D. M. Glover, B. D. Hames Oxford University Press, USA.

## SEMESTER V: EXTRA CREDIT – I

### WATER POLLUTION MANAGEMENT

**Course Code: 17UZO5EC1**

**Hours/Week : -**

**Credit : 4\***

**Max Marks : 100**

**Internal Marks : -**

**External Marks: 100**

#### **Objective:**

To learn about water quality, the reasons for its contamination, the ill effects of polluted water, the ways to protect and enhance its Quality.

#### **UNIT I**

Sources and Types of Water Pollution: Physical, Chemical and Biological sources. Water pollutants-oxygen demanding wastes, #Plant nutrients and synthetic organic compounds#.

#### **UNIT II**

Water Pollutants: Sources of Heavy Metals as Water Pollutants- Mercury, Copper, Cadmium, Chromium, Nickel, Zinc, Lead, Arsenic and Pesticides: Classification and ill effects. Pathogens:#Classification and harmful effects#.

#### **UNIT III**

Water Quality parameter: Total solids, Suspended solids, Turbidity, Colour, #Electrical conductivity, Taste & Odour#, Temperature, Alkalinity, Hardness, Silicate, Nitrogen and Phosphate, Dissolved oxygen, BOD and COD.

#### **UNIT IV**

Water Shed Management: Concept, Characteristics and Types of Water Shed – Water Resources Development – Water Investigation – #Water Shed Management and Water Budget#.

#### **UNIT V**

Water Quality Standards: #Indian and International standards# – WHO, EPA, ISI, ICMR. Environmental Laws and Water pollution Management: Water pollution, prevention and Control Act- Role of Governmental and Non-Governmental Organisation in water pollution control.

**#.....# Self-Study portion**

**Text Books:**

1. Goel, P.K and Trivedy, P. Physico - chemical analysis of water and Waste water. Karad Publications, 2005.
2. P.D. Sharma, Ecology and Environment, Rastogi Publication, 2010

**Books for Reference:**

1. G. Allen Burton, Jr., Robert Pitt. Stormwater Effects Handbook: A Textbook for Watershed Managers, Scientists, and Engineers. New York: CRC/Lewis Publishers. 2001.
2. Schueler, Thomas R. "Cars are leading Source of Metal Loads in California." Reprinted in The Practice of Watershed Protection. Center for Watershed Protection. Ellicott City, MD.2000.
3. Goel, P.K. Water Pollution - Causes, Effects and Control. New Delhi: New Age International. p. 179.2006.
4. Kennish, Michael J. Ecology of Estuaries: Anthropogenic Effects. Marine Science Series. Boca Raton, FL: CRC Press. pp. 415–17.1992.
5. Laws, Edward A.. Aquatic Pollution: An Introductory Text. New York: John Wiley and Sons. p. 430.2000

**SEMESTER VI: CORE – XIII  
BIOCHEMISTRY AND BIOPHYSICS**

**Course Code: 17UZO6C13**  
**Hours/Week : 5**  
**Credit : 5**

**Max Marks : 100**  
**Internal Marks : 25**  
**External Marks: 75**

**Objectives:**

- To enable students learn the nature of chemical constituents of living matter and the transformations of these chemical entities in biological systems.
- The last two chapters deal with the physical principles and properties involved in biological systems.

**UNIT I**

**15 hours**

**Introduction of Biochemistry** – Scope of Biochemistry – Elements of Life-Atomic structure – Chemical bonds – Acids and bases – pH – Water and its functions – Dissolved gases and their properties – #Buffer systems#.

**UNIT II**

**15 hours**

**Classification, Basic structure and properties** of: Carbohydrates, Proteins and Lipids. Vitamins: Water and Fat soluble vitamins – source, function and #deficiency diseases#.

**UNIT III**

**15 hours**

**Enzymes:** Classification – Characteristics – Mechanism of Enzyme Action – Factors affecting enzyme activity.

**Metabolisms:** Definition – Glycolysis - TCA cycle – #Oxidative phosphorylation#.

**UNIT IV**

**15 hours**

**Introduction to Biophysics** – Nature and Properties of Light –Electromagnetic spectrum – Absorption and Emission spectrum – Fluorescence and phosphorescence. Bioluminescence – Bio energetics: Free energy concepts – Laws of thermodynamics – #Redox potential# – ATP.

**UNIT V**

**15 hours**

**Principle, Working Procedure and Uses** of: pH meter, #Spectrophotometry#, Centrifugation, TLC, LC-MS and HPLC.

**#.....# Self-Study portion**

**Text book:**

1. Jain J.L. 2010. Fundamentals of Biochemistry. S.Chand & Co.

**Books for Reference**

1. Frunton J.S. & S. Simmonds, G.General and R.H.Dol. Outlines of Biochemistry  
John Wiley & Sons. 1987.
2. Arumugam,N and Annie. Biochemistry and Biophysics – Saras Publication;  
Nagarcoil, 2013.
3. Ackerman, E. Biophysical Science, Prentice Hall, New Delhi. 1962.
4. Daniel, M. Basic Biophysics for Biologists, Wiley International, New Delhi. 1992.
5. Das.D. Biophysics and Biological Chemistry, Academic Publishers, Calcutta. 1996.
6. Lehninger,L. Biochemistry. W.H Freeman & Co. 1990.

**SEMESTER VI : CORE – XIV  
IMMUNOLOGY**

**Course Code: 17UZO6C14**  
**Hours/Week : 5**  
**Credit : 5**

**Max Marks : 100**  
**Internal Marks : 25**  
**External Marks : 75**

**Objective:**

To learn the structural features of the components of the immune system as well as their functions, but the primary emphasis will be on the mechanisms involved in immune system development and responsiveness.

**UNIT I**

**15hours**

Scope – History - Innate immunity - Acquired immunity- Structure and functions of Primary and Secondary lymphoid organs.- Cells of Immune System : Types of Lymphocytes – Macrophages – Antigen Presenting Cells –Mast cells – Polymorpho nuclear cells

**UNIT II**

**15hours**

Antigens: Types and Properties of Antigens – Haptens – Adjuvants - Immunioglobulins –Types - Structure and Functions- Biological properties of Antibodies - Vaccines and its types

**UNIT III**

**15hours**

Immune response – Antigen – Antibody reaction – Primary and Secondary immune response – Humoral immunity - Cell mediated Immune response – Role of B cells in Antibody production – Cytokines – Lymphokines

**UNIT IV**

**15hours**

Major Histocompatibility Complex in man - Human Leukocyte Antigen (HLA) – Complements: Salient features – Functions – Hypersensitivity – Types – Anaphylaxis – Auto Immune diseases – Immunodeficiency diseases

**UNIT V**

**15hours**

Immunological Techniques: Agglutination – Precipitation – Simple double and single radial immune diffusion - Counter current and Rocket - Immunoelectrophoresis - ELISA – Western Blotting – WIDAL – VDRL test – Hybridoma technology

**Self-Study portion**

**MACROPHAGES – ADJUVANTS – LYMOHOKINES – ANAPHYLAXIS – VDRL TEST – WESTERN BLOTTING**

**Text Books:**

- 1.Nandhini Shetty (1994) Immunology, Introductory Text Book, New Age Int. (P) Ltd. Publications, New Delhi.
- 2.Dulsy Fatima et al., (2000) Immunology, Saras Publications, Nagercoil, Tamil Nadu.

**Books for Reference:**

1. Roitt, (3rd Edition) Immunology, Crover Medical Publishing Company, London
2. Barret, J. T. (1983) Text Book of Immunology (5<sup>th</sup> Edition), The C.V. Mosby Company.
3. Richard, H.M. (1992), Immunology (2<sup>nd</sup> Edition), Williams and Wilkins, Baltimore Maryland.
4. Hidemann, W.H. (1980) Essentials of Immunology, Elsevier Science Publishing Co. Inc.
5. Weinn. D.M. and Steward, L. (1993), Immunology, Singapore Publishers Private Ltd.,



**SEMESTER VI: CORE XV**  
**ECONOMIC ENTOMOLOGY**

**Course Code :17UZO6C15**  
**Hours/Week : 5**  
**Credit : 5**

**Max Marks : 100**  
**Internal Marks : 25**  
**External Marks : 75**

**Objective:**

To understand the fundamentals of insects by studying of their morphology, anatomy and physiology of various systems, acquire knowledge of Sericulture, Apiculture, Vector insects and integrated pest management.

**UNIT- I: INTRODUCTION AND CLASSIFICATION** **15 hours**

Classification of insect's upto orders and their diagnostic characters with familiar and important examples- Assessment of insect population - Economic importance of insects.

**UNIT- II: PRODUCTIVE INSECTS** **15 hours**

**Honey bee** – Life cycle, Types, Economic importance, Properties, Extraction, Preservation and uses of honey. Diseases of honeybees – Sac Brood Virus, Para Foul Brood, Stone Brood and Nosemosis.

**Silkworm** - Life cycle, Types, Economic importance, Rearing Silkworm, Uses of Silkworm. Diseases of Silkworm - Pebrine Septiconia,Grasserie and Muscardine.

**Lac insect** - Biology and Behaviour of Lac insect, uses of Shellac and Natural Enemies of the Lac insect. Its uses - Helpful insects: Insect pollinators, predators, Weed killers and scavengers.

**UNIT - III : PEST OF MAJOR CROPS** **15 hours**

Biology and lifecycle of Insect Pests of: Rice(Rice stem borer and Brown plant hopper), Sugarcane (Shoot borer and Top borer),Pulses(Pod borer and Pod fly),Oilseeds(Aphids and Leaf webber), Coconut(Leaf caterpillar and Red palm weevil) , Cotton(Thrips and Jassids), Vegetables (Brinjal and Tomato), Fruits(Mango hopper and Leaf miner). Major insect pest of stored products (Grain moth and Rice meal moth).

**UNIT- IV: INSEC VECTORS AND PESTS**

**15 hours**

Insects as Vectors of Human Diseases: Biology of Housefly, Mosquito, Sand flies, Lice, Bedbugs fleas, Pests of Poultry. Insect pests of domestic animals: Cattle – Biting midges and Cattle. Fowl – House fly and Little house fly. Sheep – Black fly and Stable fly and Goats – Feral and Horn Fly

**UNIT- V: PEST MANAGEMENT**

**15 hours**

Principles of Insect Control: Physical, Mechanical, Chemical and Biological Control. Advantages and Disadvantages of Biological Control. Pesticides in India – Precaution in handling pesticides. Integrated Methods of Pest Control. Non-conventional Methods of Pest Control.

**Text Books**

1. D.B.Tembhare. Modern Entomology. Himalaya Publishing House, Mumbai. (Page No. 568 and 582). 2005.
2. B.Vasantharaj david & T.Kumaraswamy, Elements of Economic Entomology, Popular Book Depot, Chennai. 2000.

**Books for Reference:**

1. Vasantharaj David, B and Kumaraswami, T., (1988). Elements of Economic Entomology.
2. Mani, M.S., (1982). General Entomology. Oxford and IBH Publishing CO.
3. Fenemor, P.G and Alka Prakash. Applied Entomology.
4. Maureen, A. Robinson and Judith, F. Wiggins., (1987). Animal types 1. Invertebrates, Century Hutchinson Australia Pte.Ltd.
5. Chandler, A.C. and Dead, C.P. Introduction to Parasitology. John Wiley and Sons, New York. 1961.
6. David, B.V. and T.Kumarasami. Elements of Economic Entomology. Popular Book Depot, Chennai. 1998.
7. David, B.V. Pest Management and pesticides in Indian Scenario, Namrutha Publications. 1992.
8. Krishnan, N.T. Economic Entomology, J.J. Publications, Madurai. 1993.

**SEMESTER VI : CORE – XVI**  
**ENVIRONMENTAL BIOLOGY AND EVOLUTION**

**Course Code : 17UZO6C16**  
**Hours/Week : 5**  
**Credit : 5**

**Max Marks : 100**  
**Internal Marks : 25**  
**External Marks : 75**

**Objective:**

To understand the relationship between every organism and its environment.  
To study the impact of ecological factors on the distribution and life of organisms.  
To have a clear understanding about the concept and theories of evolution.

**UNIT – I ECOLOGY, ENVIRONMENT AND ECOSYSTEM 15 hours**

Abiotic factors- Light, Water, Temperature and Soil and their impact on organisms. Ecosystem: Pond and River- Food Chain - Food Web -Tropic level –Energy Flow- Ecological Pyramids: Biomass, Number and Energy.

**UNIT-II SPECIES INTERACTION, POPULATION &COMMUNITY ECOLOGY 15 hours**

Biotic factors - Animal relationships – Symbiosis: Commensalisms and Mutualism– Antagonism: Antibiosis, Predation, Parasitism and Competition – Intraspecific and Interspecific competition. Population Ecology – Definition – Characteristics. Community Ecology: Types – Components – Ecotone – Edge effect – Ecological niche – Ecological succession – Concept of climax.

**UNIT- III NATURAL RESOURCES, BIODIVERSITY & CONSERVATION 15 hours**

Natural Resources - Renewable and Non-renewable - Resources Management. Wild life Conservation and Management. Biodiversity – Types – Mega diversity and hotspots with reference to India –Conservation of Biodiversity. Environmental Pollution: Air, Water and Land. Sewage and Solid Waste disposal and Management – Global Warming and Climate change – Green House Effect – Ozone Layer and its significance. Acid Rain.

**UNIT- IV CONCEPT AND THEORIES OF EVOLUTION 15 hours**

Evolution: Concept and Theories: Lamarckism – Darwinism – Neo-Lamarckism – Neo-Darwinism. Evidences of Evolution: Morphological and Anatomical (Homologous, Analogous and vestigial organs), Embryological evidences, Paleantological, Pysiological and Biochemical evidences – Elemental forces of evolution: Selection, Recombination, Isolation, Migration, Mutation and Genetic drift. Patterns of Evolution; Sequential Evolution, Divergent Evolution, Microevolution and Macroevolution, Mimicry.

**UNIT - V EVOLUTIONARY TIME SCALE AND EVOLUTION OF MAN 15 hours**

Geological time scale: Eras, Periods and Epochs – Fossils: Types and Formation – Dating of fossils. Extinction: Types, causes – Extinct animals- Living fossils – Connecting Links – Missing Links. Evolution of Man – Cultural and Biological evolution– Future evolution.

**Text Book:**

1. Odum, E.P. 1996. Fundamentals of Ecology (III Edn.), Natraj Pub. Dehradun.
2. Arumugam, N, 2006. Organic Evolution, Saras publication, Nagercoil.

**Books for Reference:**

1. Clarke, G.L. Elements of Ecology. John Wiley & Sons, N: y.3rd Edition, 1954.
2. Kendeigh, S.C. Animal Ecology. Prentice Hall. 2<sup>nd</sup> Edition, 1961.
3. Rastogi, V.B. and M.S. Jayaraj. Animal Ecology and Distribution of Animals, Kedarnath Ramnath. 1989.
4. Sharma, P.D. Ecology and Environment. Rastogi Publications. Meerut. 1990.
5. Southwick, C.H. Ecology and the quality of Environment. D.Vas Nostrand Co. 1976.
6. Verma, P.S. and V.K. Agarwal, Principles of Ecology. S.Chand & Co. New Delhi. 1996.
7. Savage. Evolution, Modern Biology Series, 3<sup>rd</sup> Edition, 1969.
8. Dowdeswell, P.M. The Mechanism of Evolution, Heinemann London 2<sup>nd</sup> Edition, 1956, Mayr, E.I. Animal species and evolution. Harvard University Press. (1963).
9. Simpson, G.G. The major features of Evolution, CUP. (1953).

**SEMESTER VI: MAJOR BASED ELECTIVE II  
BIOCHEMISTRY, BIOPHYSICS, IMMUNOLOGY, ECONOMIC ENTOMOLOGY,  
EVOLUTION AND ENVIRONMENTAL BIOLOGY – PRACTICAL VI**

**Course Code:**17UZO6M2 P  
**Hours/Week** :5  
**Credit** : 4

**Max Marks** : 100  
**Internal Marks** : 20  
**External Marks** : 80

**Objective:**

To study the biochemical constituents of macromolecules in animal systems; to impart knowledge on immune systems, the benefits of productive insects, evolutionary aspects and to develop skill in estimating environmental parameters.

**Biochemistry**

pH measurement of various samples.

Quantitative and Qualitative estimation of Proteins and Free Sugars.

Spotters: Models of Hemoglobin, ATP and TCA cycle

**Biophysics**

Verification of Beer Lambert's Law using Colorimeter

Paper Chromatography (Demo).

Spotters: pH meter, Spectrophotometer, Centrifuge, Electrophoresis and Colorimeter.

**Immunology**

Primary and Secondary Lymphoid organs in fish

Immunoglobulins: IgA, IgG, IgM and IgE.

Spotters: Immuno-electrophoresis – ELISA, Blotting techniques: Southern-Northern and Western.

**Economic Entomology**

Productive insects – Honey Bee, Lac Insect and Silkworm

Useful insects- Pollinators, Biocontrol insects

Pest of crops – Paddy, Pulses, Oil crops

Pest of animals – Fowls

**Evolution**

Colouration and Mimicry

Fossil :Nautiloid, Ammonoid

### **Environmental Biology**

Estimation of pH, Dissolved Oxygen, Salinity and Calcium

Examination of Plankton: Qualitative and Quantitative

Examination of Intertidal fauna: Rocky shore, Sandy shore, Muddy shore.

Spotters: Animal association, PH meter, Secchi disc, Turbidity meter, Electrical conductivity meter.

### **Field Trip**

Visit Sea shore to study Intertidal fauna and adaptations.

Submission of a Field Report is mandatory.

### **Record Work**

A record of lab work should be maintained and submitted at the time of Practical Examination for valuation.

## SEMESTER VI: MAJOR BASED ELECTIVE II

### INSTRUMENTATION - II – PRACTICAL VI

**Course Code:17UZO6M2 P : 2**

**Hours/Week :5**

**Credit : 4**

**Max Marks : 100**

**Internal Marks : 20**

**External Marks : 80**

#### **Practical**

1. To give hands on training for the usage of Advanced Microscope (Photo and Video mode)
2. To give hands on training for the usage of UV-Spectrophotometer
3. To give hands on training for the usage of Electrophoresis (AGE/ PAGE)
4. To give hands on training for the usage of Polymerize Chain Reaction (PCR)
5. To give hands on training for the usage of Tissue processor.
6. To measure terrestrial Gamma level using Scintillation Counter
7. To measure Alpha particle in abiotic and Biotic samples using Alpha Counting System
8. To measure Beta particle in abiotic and Biotic samples using Beta Counting System
9. To measure Beta particle in abiotic and Biotic samples using Low Beta counting
10. To measure gamma rays in abiotic and Biotic samples using NaI Gamma Detector

## SEMESTER VI: MAJOR BASED ELECTIVE III

### POULTRY SCIENCE

**Course Code:**17UZO6M3

**Hours/Week :** 4

**Credit :** 4

**Max Marks :** 100

**Internal Marks :** 25

**External Marks :** 75

#### **Objective:**

To provide knowledge on the fundamentals of poultry production and management and to create self employment potential.

#### **UNIT I INTRODUCTION**

**12 hours**

Poultry industry in India - Scope and objective - Poultry breeds and classes of fowls –General principle of building Poultry house – Poultry housing: Deep litter and cage rearing – Poultry equipments .

#### **UNIT II CULTURE PRACTICE**

**12 hours**

Rearing of fowls – Methods of rearing chicks, growers, layers and broilers – Growth and management of fowls in summer and winter. Lighting and debeaking – Culling of the flock.

#### **UNIT III POULTRY NUTRITION**

**12 hours**

Poultry nutrition – Nutritional requirement of fowls – Composition of feed - Feed formulation – Nutrition deficiency symptoms – Non nutritive feed additives - Quality Control.

#### **UNIT IV DISEASE MANAGEMENT**

**12 hours**

Poultry diseases - Viral Disease: Ranikhet disease and Fowl pox. Bacterial Disease: Salmonellosis and Fowl Cholera. Parasitic Diseases: Coccidiosis and Ticks – Vaccination programme – Prevention and Precaution for diseases – Fowl health products.

#### **UNIT V POULTRY PRODUCTS**

**12 hours**

Poultry products – Composition and nutritive value of eggs – Role of egg in human nutrition – Poultry meat processing – Marketing of poultry products – Use of feathers – Poultry manure - Economics of poultry keeping.

Field visit – Plan to promote Poultry Keeping for Employment Venture.



**Text books:**

1. M.R. Gnaanamani .Poultry Keeping, GIRI Publication, Madurai. 2003.
2. Shukla. Upadhya Economic Zoology. 2005.
3. Jull Morley,A.1971: Poultry Husbandry, Tata – McGraw Hill Publ. Co New Delhi.

**Books for Reference:**

1. The Rearing of Pullets – Bulletin No. 54, Her majesty’s stationary office, London.
2. Intensive Poultry Management for Egg Production. Bulletin No. 152. Her Majesty’s Stationary office London.
3. Nutrition of the Chicken – M.L.Scott *et al.*
4. Diseases of Poultry – Biester – Oxford & IBH.

## SEMESTER VI: MAJOR BASED ELECTIVE – III

### PISCICULTURE

**Course Code:17UZO6M3:2**  
**Hours/Week : 4**  
**Credit : 4**

**Max Marks : 100**  
**Internal Marks : 25**  
**External Marks : 75**

#### **Unit I**

**15 hours**

Fish culture: Biology and breeding habits of cultivable fisheries and shellfishes - criteria for the selection of cultivable species. Kinds of fish culture - Extensive, Intensive, Semi intensive and super intensive fish culture. Physical and chemical factors influencing fish culture. Seed production – Collection of natural seed – induced breeding techniques.

#### **Unit II**

**15 hours**

Culture pond and its management: Types of pond culture – Hatching pits, spawning pond, nursery pond, rearing pond, growing pond or stocking pond. Layout of a fish farm: Pond management – pre stocking management of pond, preparation of nursery pond, eradication of aquatic insects, predatory and weed fishes, fertilization of pond, stocking and pre stocking management, feeding and harvesting.

#### **Unit III**

**15 hours**

Composite and integrated fish culture: Composite fish culture – prawn culture with carps. Monosex fish culture : Integrated fish culture – fish cum paddy culture, suitable species for culture in paddy field, simultaneous culture of fish and paddy, Rotational culture of fish and paddy, fish cum duck farming, fish cum poultry farming, chick – pig – fish culture, cattle fish culture, paddy cum prawn culture.

#### **Unit IV**

**15 hours**

Diseases of fish : Disease caused by bacteria and viruses – Dropsy, Furunculosis, tail rot and fin rot : Fungal disease – Disease caused by protozoan parasites – Helminth parasites, copepod parasites, Anchor worm (Lernaea), Fish louse (Argulus), Eragasilus, Annelid and Molluscs parasites, fish leech, Glochidium, Parasites of visceral organs – control of fish diseases and parasites.

**Unit V**

**15 hours**

Economic importance of fish : Nutritive value of fish – Protein, carbohydrate, lipid and amino acids ; Fish oil, liver oil, methods of extraction, Nutritive value ; fish meal, fish protein concentrate, fish silage, Isinglass, fish manure.

**Reference books**

1. Fish Biology and Fisheries – A text book by S. S. Khanna and H. R. Singh, Narendra Publishing House, New Delhi.
2. Fish and Fisheries in India by V. G. Jhingran, 3rd Edn.
3. Aquaculture Principles and Practices by T. V. R. Pillai
4. Fisheries Science and Indian Fisheries – A Text Book by C. B. L. Srivastava, Kitab Mahal, Allahabad.
5. Coldwater Aquaculture and Fisheries by H. R. Singh and N. S. Lakra, Narendra Publishing House, New Delhi
6. Prawn and Prawn Fisheries in India by C. V. Kurian.

**SEMESTER IV: EXTRA CREDIT II  
WILDLIFE BIOLOGY**

**CourseCode:17UZO6EC2**

**Hours/Week : --**

**Credit : 4\***

**Max Marks : 100\***

**Internal Marks : 0**

**External Marks: 100\***

**Objective:**

To enlighten the importance of Wild Life Biodiversity and its conservation together with their habitat.

**UNIT I WILDLIFE RESOURCES**

Wildlife Definition – Importance - values - Causes for depletion – IUCN categories - Red data book - Endangered species in India.

**UNIT II WILDLIFE HABITAT**

Wildlife conservation – need – types -In situ and Ex situ. Wildlife Sanctuaries - National parks – Biosphere reserves - Zoological Park and Botanical garden. Vedanthangal bird sanctuary, Mudumalai sanctuary, Silent Valley – Nilgiri Biosphere Reserve - Mukurthi National park – Guindy Deer park.

**UNIT III WILDLIFE PRESERVATION & PROTECTION**

Zoos and their importance – Types of enclosures – Food and feeding of Zoo animals – Importance of Zoo Education – Biosphere reserves – Breeding centres – In situ and Ex situ studies .

**UNIT IV WILDLIFE ECOLOGY/ CENSUS**

Wildlife census techniques – Direct method: Line Transect method; Block count method. Indirect method: Pellet analysis method – Pug mark techniques – Radio – collaring method.

**UNIT V WILDLIFE LAWS & AMENDMENTS**

Wildlife Plan & Acts - Wildlife Protection Act 1972: Introduction - Schedules – Declaration of Wildlife Sanctuaries and National parks - Significance of NGO's in Wildlife Conservation - WWF.

**Text Books:**

1. Saharia, V.B. Wildlife in India. Nataraj Publications, Dehradun. 2<sup>nd</sup> Edition, 1982.
2. Singh, S.K. Textbook of Wildlife Management 2<sup>nd</sup> Edition, 2015. CBS Pub.

**Books for Reference:**

1. Giles, R. H. Jr (Ed). Wildlife Management Techniques. The Wildlife Society, Washington, D.C. Nataraj Publishers, Dehradun, India. 1984.
2. Seshadri, B. India's Wildlife reserves, Sterling publishers, New Delhi. 1986.

**SEMESTER III: ALLIED COURSE III  
ANIMAL STRUCTURE AND FUNCTION**

CourseCode : 17UZO3A5  
Hours/Week : 4  
Credit : 3

Max Marks : 100  
Internal Marks : 25  
External Marks : 75

**Objective:**

To study the basic principles of animal physiology, physical and chemical properties of living matter. Also to understand the physiology of various organs and organ systems, and to learn about the hormonal regulations and their defects in Man.

**UNIT I**

**12 hours**

Classification of Invertebrates upto phyla with salient features and suitable examples. Cockroach: External morphology, mouth parts, Digestive system, respiratory system, circulatory system, nervous system and reproductive system.

**UNIT II**

**12 hours**

General classification of Chordates – salient features of chordates with suitable examples. **Frog** – External features, digestive system, respiratory system, circulatory system, Nervous system and urino-genital system.

**UNIT III**

**12 hours**

Physiology of digestion and absorption, Respiration; Transport of oxygen and carbon-dioxide, structure of kidney and nephron in Human.

**UNIT IV**

**12 hours**

Composition and functions of human blood, Types of muscle, structure of neuron, Types of neuron, nerve impulse conduction - Physiology of vision in man.

**UNIT V**

**12 hours**

Endocrine glands :Structure and functions of Pituitary, Thyroid, Islets of Langerhans, Sex glands – Menstrual cycle.

#.....# Self-Study portion

**Text Book:**

1. Leelavathy, S. Nair Revised Enlarged Edition, A Text book of Invertebrates, SarasPublications.2001.

**Books for Reference:**

1. Ekambaranatha Ayyar, Outlines of Zoology. Vol. I S.Viswanathan (Printers & Publishers ) Pvt. Ltd., Chennai,1993.
2. VermaTyagi and Agarwal, Animal Physiology. S.Chand and Co. Delhi.1997.

**SEMESTER III: ALLIED COURSE III  
ANIMAL STRUCTURE AND FUNCTION**

**CourseCode : 17UZ03A6 P**  
**Hours/Week : 3**  
**Credit : 2**

**Max Marks : 100**  
**Internal Marks : 20**  
**External Marks : 80**

**Objective:**

To study the anatomy and physiology of some animal systems and to develop skill in dissecting a few invertebrate and chordates species. And also to acquire skill in identifying blood constituents and to make quantitative estimation of nitrogenous wastes.

**DISSECTION:**

Cockroach: Mouthparts, Digestive and Nervous systems.

Frog – Pro-dissector software: Digestive , Arterial and Venous systems.

Blood Grouping

Preparation of Blood Smear and Observation of RBC and WBC.

Qualitative estimation of excretory products: Ammonia, Urea and Uric acid.

**SPOTTERS:**

*Paramecium, Obelia, Aurelia, Ephyra larva, Fasciolahepatica, Taeniasolium, Nereis, Ascaris male and female, Earthworm, Prawn, Butterfly, Freshwater Mussel, Starfish.*

Shark, Frog, Snake, Pigeon, Rabbit.

## SEMESTER IV : ALLIED COURSE IV

### COMMERCIAL ZOOLOGY

**Course Code : 17UZO4A7**  
**Hours/Week : 4**  
**Credit : 3**

**Max Marks : 100**  
**Internal Marks : 25**  
**External Marks : 75**

#### Objective:

To disseminate information on economic aspects of Zoology and thereby motivate for self employment.

#### UNIT I 12 hours

**Vermiculture:** Classification of earthworm; Species of Earthworms – Life cycle of *Lampitomauritii* – Preparation of vermin bed; vermiwash; Vermicompost – Economic importance. Earthworms in medicine – bio waste management - #Organic farming#.

#### UNIT II 12 hours

**Apiculture:** Classification of honey bee; Species of Honey Bees - colonial structure of honey bee – Biology of Honey bee – Types of bee hives –Extraction of honey – Nutritive and medicinal value of honey.

**Lac culture:** Classification of lac insect – species of lac insect – host plant ; Types; Life cycle of Lac insect – Extraction of Lac – Processing – purification - #Economic importance of Lac#, Uses of Lac: Medicinal – Industrial – Ornamental.

#### UNIT III 12 hours

**Sericulture:** Classification; Species; Life cycle of *Bombyxmori*. Rearing of silk worm: Paraffin paper rearing – Box rearing – New net method – Co-operative methods.Moriculture – types of mulberry plants – planting methods. Diseases of silk worm : Protozoan(Pebrine) – Bacterial (Septicemia) - Viral diseases (Grasserie) - Reeling of silk – #Economic importance of sericulture#.

#### UNIT IV 12 hours

**Aquaculture:** Freshwater fishes (Indian major carps) – Site selection and construction of pond – Fish feed – Induced breeding – Fish diseases – rearing methods :Furunculosis, Epizootic Ulcerative Syndrome (EUS) and #Vibriosis# – Fresh water Prawn culture. Ornamental fish culture .

**UNIT V**

**12 hours**

**Poultry farming:** Types of fowls – Rearing methods of Broilers and Layers – Poultry nutrition – Poultry diseases (NCD, IBV & Fowls). Issues and limitations of poultry farming.

#.....# Self-Study portion

**Text Book:**

1. Ganga.G and Sulochana Chetty. J., An introduction to Sericulture(2nd edition) Oxford & IBH Publishing company.

**Books for Reference:**

1. Shukla.G.S. and Upadhya.V.B. Economic Zoology (Rastogi publications).
2. Ahsan, J and Sinha, S.P. A handbook on economic zoology, S.Chand& Co.
3. Sardersingh – Bee keeping in India.
4. Santhanam – Aquaculture.
5. Ullal.S.R. and Narasimhanna, M.N – Central Silk Board, Govt. of India, Bombay.
6. Singh – Livestock and poultry production.
7. Jhingran – Fish and fisheries.
8. T.V.R. Pillai – Coastal Aquaculture.
9. Maine product export development authority – Freshwater fishes, Ornamental fishes, Shrimph culture – MPEDA Publication series.



**SEMESTER IV: CORE IV  
COMMERCIAL ZOOLOGY - PRACTICAL**

**Course Code : 17UZO4A8 P**  
**Hours/Week : 4**  
**Credit : 2**

**Max Marks : 100**  
**Internal Marks : 20**  
**External Marks : 80**

**Objective:**

To acquire skill in identifying blood constituents and to make quantitative estimation of nitrogenous wastes. Also to study the applications of Vermiculture, Apiculture, Sericulture, Aquaculture and Poultry.

**Experiments:**

1. Dissect and display the Earth worm nervous system
2. Mounting of Earth worm: Body setae, Pineal setae.
2. Mounting of honey bee sting apparatus
3. Mounting of scales: Cycloid, ctenoid, placoid
4. Prawn appendages
5. Mounting the Mouth parts of Mosquito, Honey bee,

**Spotters**

Species of animals used in Vermiculture- *Lampito mauritii*, *Perionyx excavatus*  
Apiculture – *Apis indica* ;Sericulture – *Bombyx mori* ; Aquaculture – Major carps : Catla, Rohu and Mrigal: Prawn : Macrobrachium: Poultry : Layers & Broilers.

Animal products: Honey, Bee wax, Lac, Silk, and Hen's egg.

**Record Work**

A record of lab work shall be maintained and submitted at the time of Practical Examination for valuation.