G.T.N. ARTS COLLEGE (Autonomous)

Dindigul

(Affiliated to Madurai Kamaraj University)

(Accredited by NAAC with 'B' Grade)

DEPARTMENT OF ZOOLOGY

SYLLABUS

Choice Based Credit System

Academic Year 2017 - 2020

G.T.N. Arts College (Autonomous), Dindigul
(Affiliated with Madurai Kamaraj University)
(Accredited with 'B' Grade by NAAC)
Department of Zoology
FIRST SEMESTER

Part	Study Comp.	Course Code	Course Title	Hrs per cycle	Credit	Internal Marks	External Marks	Total Marks
I	**Tamil/Other languages**	17UTAL11	,f;fhy ,yf;fpaKk; GidfijAk	6	3	25	75	100
II	**English**	17UENL11	English for Enrichment I	6	3	25	75	100
III	**Core I**	17UZOC11	Invertebrata	4	4	25	75	100
III	**Core Practical I**	17UZOC2P	Invertebrata & Chordata Practical	2	--	--	--	--
III	**Allied I**	17UCHA11	Organic, Inorganic & Physical Chemistry	4	4	25	75	100
III	**Allied Practical**	17UCHA2P	Volumetric Analysis	2	--	--	--	--
IV	**Skill Based I**	17UZOS11	Ecology	2	2	25	75	100
IV	**Skill Based II**	17UZOS12	Sericulture	2	2	25	75	100
IV	**Non-Major Elective I**	17UZON11	Human Biology	2	2	25	75	100
V	**Physical Education**	17UPEV2P	Physical Education Practical	--	--	--	--	--
			Total	30	20			700

SECOND SEMESTER

Part	Study Comp.	Course Code	Course Title	Hrs per cycle	Credit	Internal Marks	External Marks	Total Marks
I	**Tamil/Other languages**	17UTAL21	,ilf;fhy ,yf;fpaKk; GjpdKk;	6	3	25	75	100
II	**English**	17UENL21	English For Enrichment II	6	3	25	75	100
III	**Core II**	17UZOC21	Chordata	4	4	25	75	100
III	**Core Practical I**	17UZOC2P	Invertebrata & Chordata Practical	2	2	40	60	100
III	**Allied II**	17UCHA21	Organic & Physical Chemistry	4	4	25	75	100
III	**Allied Practical - I**	17UCHA2P	Volumetric Analysis	2	1	40	60	100
IV	**Skill Based III**	17UZOS21	Economic Entomology	2	2	25	75	100
IV	**Skill Based IV**	17UZOS22	Fisheries Biology	2	2	25	75	100
IV	**Non-Major Elective II**	17UZON21	Entrepreneurial Zoology	2	2	25	75	100
V	**Physical Education**	17UPEV2P	Physical Education Practical		1	40	60	100
			Total	30	24			1000

Programme	I B.SC ZOOLOGY	**Credits:**	4
Semester	I	**No. of Hrs per week**	4
Course Title	**Invertebrata**		
Course Code	**17UZOC11**	**Max. Marks**	100
		Part	III

Objectives

To enhance the knowledge of students about the classification, systematic position, biology of important invertebrates, life cycle and adaptation of human endo parasite, Economic importance of Mollusca, significance of living fossil.

Unit I Taxonomy 12 hours

Definition, Principles of classification, Grades of Organization, Symmetry and Coelom, Binomial nomenclature - Outline classification of Animal kingdom up to class level with example - Flow chart only. General characters of the following phyla:

i) Protozoa, ii) Porifera, iii) Coelenterata, iv) Platyhelminthes, v) Nematoda, vi) Annelida, vii) Arthropoda, viii) Mollusca, ix) Echinodermata.

Unit II Protozoa and Porifera 12 hours

1. Protozoa

Paramecium – (Type study): General organization, Cyclosis, Contractile vacuole and sexual reproduction conjugation only, ***Plasmodium vivax*** - Structure, pathology, prevention and control measures, General topic - Nutrition in protozoa.

2. Porifera

Leucosolenia – (Type study): Structure - Spicules, Canal system, Reproduction and Development, General topic - Canal system in sponges.

Unit III Coelenterata and Helminthes 12 hours

1. Coelenterate

Obelia – (Type study): Structure of Obelia colony, Medusa, and Nematocyst, Reproduction and Development (Metagenesis), General topic - Polymorphism in Coelenterata, Coral reefs.

2. Helminthes

Fasciola hepatica **(Liver Fluke) – Type study:** External characters, Excretion, Reproduction and Development (Life cycle), **Ascaris** -Structure, Pathology and control measures, General Topic - Parasitic adapdation in Platyhelminthes

Unit IV Annelida and Arthropoda 12 hours

1. Annelida

Earth worm – (Type study): External morphology, Setae, Nephridia, Nervous system and Reproductive system, General topic - Metamerism in Annelids.

2. Arthropoda

Penaeus **(Marine Prawn) – Type Study:** External morphology, Appendages and Respiratory System, Affinities of Peripatus, Larval forms of Crustaceans.

Unit V Mollusca and Echinodermata 12 hours

1. Mollusca

Sepia – (Type Study) - External Morphology, Digestive System, Ink gland and circulatory system, General Topic - Torsion in Mollusca, Economic importance of mollusca.

2. Echinodermata

Star fish – (Type Study) - External morphology, Pedicellaria, Water vascular system, General Topic - Larval forms in Echinodermata.

Text Book

1. Nair, N. C., Leelavathy, S., Soundara Pandian, N., Murugan, T., Arumugam, N., A. (2010), "*Text Book of Invertebrata"*, Saras Publication, Kottar, Nagercoil.

Reference Books

1. Dhami P.S. and Dhami, J. K., (2003), "*Invertebrate Zoology"*, R. Chand and Company, New Delhi
2. Ekambaranatha Ayyer, M and Ananthakrishna, T. M., (2003), "*Manual of Zoology*", Viswanathan publishers – Chennai.
3. Jordon, E. L. and Verma P.S., (2005), "*Invertebrate Zoology"*, R. Chand and Company, 7361, Ram Nagar, New Delhi – 110 055; ISBN 81-219 -0367.

Programme	I B.SC ZOOLOGY	**Credits:**	2
Semester	I	**No. of Hrs per week**	2
Course Title	**Invertebrata and Chordata Practical**		
Course Code	**17UZOC2P**	**Max. Marks**	100
		Part	III

Objectives

To develop the skill of the students to identify animals on their systematic position, differentiate invertebrates from chordates.

Dissections

Earthworm - Nervous System.

Cockroach - Digestive System.

Frog - Arterial System and Venous System.

Mountings

Cockroach - Trachea; **Honey bee:** Mouth Parts; **Pila**: Radula; **Shark:** Placoid Scales.

Spotters

Protozoa: Paramecium, Paramecium-conjugation, Euglena. Porifera: Simple Sponge, Sponge-Gemmule, Sponge –Spicules Coelenterata: Obelia colony, Obelia medusa, Physalia, Sea anemone. Helminthes: Liver fluke, Redia larva, Cercaria larva, Ascaris (Male and Female) Annelida: Earthworm, Neries, Leech. Arthropoda: Prawn, Mysis larva, Peripatus.

Mollusca: Pila, Chiton, Sepia, Echinodermata: Starfish, Sea-cucumber, Bipinnaria larva. Prochordata: Amphioxus, Amphioxus - Balanoglossus, Ascidian. Agnatha: Petromyzon.

Pisces: Narcine, Hippocampus, Eel, Catla. Amphibian: Bufo, Rhacophorus, Salamander. Reptilia: Poisonous Snakes: Cobra, Krait. Non -Poisonous Snakes: Dryophis and Ptyas.

Lizards – Chameleon and Draco. Aves: Pectoral and Pelvic girdle of Pigeon, Archaeopteryx.

Aves: Pectoral and Pelvic girdle of Pigeon, Archaeopteryx.

Mammals: Bat, Loris.

Programme	I B.SC ZOOLOGY	**Credits:**	4
Semester	I	**No. of Hrs per week**	4
Course Title	**Invertebrata**		
Course Code	**17UZOA11**	**Max. Marks**	100
		Part	III

Objectives

To create basic knowledge in animal diversity, classification, nomenclature, characteristics of different phyla and structure and functions organ systems in invertebrates.

Unit I Taxonomy and Protozoa **12 hours**

Outline classification and nomenclature - General characters of Phylum Protozoa (10 points). **Amoeba - Type study**- External morphology, Nutrition, Locomotion, excretion and reproduction (Binary fission) - Plasmodium: Life history and transmission.

Unit II Porifera and Coelenterata **12 hours**

General characters of phylum Porifera and Coelenterata - **Obelia - Type study**- Structural organization of Obelia colony, Medusa and Life cycle of Obelia (Metagenesis) - Canal system of Sponges - Coral reef – Types, formation and significance.

Unit III Platyhelminthes and Nematoda **12 hours**

General characters of Platyhelminthes and Nematoda - **Fasciola- Type study**- External characters, Excretion, Reproduction and Development (Lifecycle) - **Filarial Worm:** Life history and transmission - Parasitic adaptations of helminthes worms.

Unit IV Annelida and Arthropoda **12 hours**

General characters of Annelida and Arthropoda - **Earth worm - Type study**. External Morphology, Digestive system, Nervous System - Peripatus and its affinities - Pest and pest control: Pest of Paddy- *Leptocorisa varicornis*, Triporeyaincertulas - Pest of Coconut-Oryctes rhinoceros, Rhyncophorus

Unit V Mollusca and Echinodermata **12 hours**

General characters of Mollusca and Echinodermata - **Star fish – Type Study** External Morphology, Water vascular System, Reproduction and Development - **Oyster Culture:** Structure of edible oyster-types of culture and its food value - Economic importance of Mollusca

Text Book

1. Nair, N. C., Leelavathy, S., Soundara Pandian, N., Murugan, T., Arumugam, N., A. (2010), "*Text Book of Invertebrata*", Saras Publication, Kottar, Nagercoil.

Reference Books

1. Dhami P.S. and Dhami, J. K., (2003), "*Invertebrate Zoology"*, R. Chand and Company, New Delhi.
2. Ekambaranatha Ayyer, M and Ananthakrishna, T. M., (2003), "*Manual of Zoology"*, Viswanathan Publishers – Chennai.
3. Jordon, E. L.and Verma P.S., (2005), "*Invertebrate Zoology"*, R. Chand and Company, 7361, Ram nagar, New Delhi – 110 055; ISBN 81-219 -0367.

Programme	I B.SC ZOOLOGY	**Credits:**	2
Semester	II	**No. of Hrs per week**	2
Course Title	**Invertebrata and Chordata Practical**		
Course Code	**17UZOA2P**	**Max. Marks**	100
		Part	III

Objectives

To develop the skill of the students to identify animals on their systematic position and also to differentiate invertebrates from chordates.

Dissections

Earth worm: Nervous system

Frog - 1. Arterial system

2. Venous system.

Mounting

Earthworm- Body setae

Honey bee - Mouth parts.

Invertebrata

1. **Protozoa** i) Amoeba, ii) Paramecium, iii) Euglena
2. **Coelenterata** i) Hydra, ii) Obelia – Colony, iii) Obelia – Medusa, iv) Jelly fish, v) Sea anemone
3. **Helminthes** i) Liver fluke, ii) Redia larva, iii) Cercaria larva iv) Ascaris male and female
4. **Annelida** i) Nereis, ii) Earth worm
5. **Arthropoda** i) Honey bee – Queen, Drone, and workers. ii) Silk worm – Moth, Larva and cocoon
6. **Mollusca** i) Pila ii) Pearl oyster.
7. **Echinodermata** i) Star fish – oral and aboral view.
8. **Chordata**

Prochordata i) Amphioxus, ii) Balanoglossus and iii) Sea ascidian.

Pisces i) Catla, ii) Mugil iii) Eel

Reptilia - Poisonous Snakes: Cobra, Krait and Viper.

Non -Poisonous Snakes: Dryophis and Ptyas.

Osteology - Rabbit: i) Pectoral girdle, ii) Pelvic girdle, iii) forelimb, iv) hindlimb

Programme	I B.SC ZOOLOGY	**Credits:**	2
Semester	I	**No. of Hrs per week**	2
Course Title	**Ecology**		
Course Code	**17UZOS11**	**Max. Marks**	100
		Part	IV

Objectives

To understand the importance of environmental factors, differentiate the habitats of animals, to assess the basic concepts of ecosystem and gain knowledge about the characters of population, pollution, biodiversity and wild life conservation.

Unit I Physico – Chemical factors **6 hours**

Light: Light on Land and in water, Biological effects of Light – (Effects on light on metabolism, reproduction, development and pigmentation only).

Temperature: Thermal stratification and Biological effects. (Effects on temperature on metabolism, Reproduction, development and morphology only).

Medium & Substratum: Soil as a medium for the living organisms. Soil profile and adaptation of soil animals.

Unit II Habitat **6 hours**

Terrestrial habitat: Ecological classification of Land, their fauna, and their adaptation.

Fresh water: Thermal stratification, types of ponds and pond fauna. Marine habitat: stratification, Plankton and their adaptations. Estuarine habitat: Estuarine fauna and their adaptations.

Unit III Population Ecology **6 hours**

Types, density and estimation - natality and mortality. Animal Relationship: Intra specific Inter specific relationship - neutralism, mutualism (Hermit Crab and Sea anemone), commensalism (Sucker fish and Shark), parasitism (*Taenia solium*), predation and competition.

Unit IV Community Ecology **6 hours**

Definition, characteristics, diversity - dominance, stratification, Periodicity Ecosystem: Definition - components - food chain and its types. Food web - ecological pyramids – Biogeochemical cycles - carbon, and nitrogen cycles.

Unit V Pollution and Social issues **6 hours**

Pollution: - Green house effect and global warming, Solid waste management, rain water harvesting disaster management. Wild life conservation - Biological clocks and rhythms.

Text Book

1. Arumugam, N., (2007), "*Concepts of Ecology"*, Published by Saras publications, Kottar, Nagercoil.

Reference Books

1. Dash, M. C., (2009), "*Fundamentals of Ecology"*, Published by Tata Mc Craw Hill Publishing Company Limited, New Delhi 110 002. ISBN: O – 07 – 460103 – 2.
2. Odum, E. P., (2005), "*Fundamentals of Ecology"*, Published by W.B. Saunders Publishers, Philadelphia.
3. Sharma, P. D., (2006), "*Environmental Biology"*, Published by Rastogi Publications, Ganapathi Shivaji road, Meerut –250002.

Programme	I B.SC ZOOLOGY	**Credits:**	2
Semester	I	**No. of Hrs per week**	2
Course Title	**Sericulture**		
Course Code	**17UZOS12**	**Max. Marks**	100
		Part	IV

Objectives

To provide skilled based knowledge about the techniques involved in silkworm rearing, reeling, mounting, cocoon marketing, disease control measures of silkworm pathogens along with the biology of silk moth.

Unit I **6 hours**

Introduction and importance of sericulture, Sericulture industry in India and Sericulture as a cottage industry, Morphology of egg, larva, pupa and moth of Mulberry Silkworm – Sexual dimorphism, Classification of silk worm, Life cycle of Mulberry Silkworm- Metamorphosis, Moulting and Voltinism

Unit II **6 hours**

Anatomy of silkworm - Digestive system, Excretory system and Reproductive system. Anatomy and physiology of silk glands, Endocrine glands.

Unit III **6 hours**

Rearing appliances and their uses, Rearing operation - Disinfectants, brushing, feeding, bed cleaning, Incubation of eggs – Maintenance of optimum temperature and humidity, Rearing of young age larvae (Chawki rearing) and Rearing of late age larva - methods.

Unit IV **6 hours**

Mounting - Spinning, Methods of mounting, Harvesting of cocoons, Marketing of cocoons-Physical and Commercial characters, Defective cocoons - Classification, Cocoon reeling - Appliances used for reeling.

Unit V **6 hours**

Protozoan disease – Pebrine, Viral disease – Grasserie, Bacterial disease – Flacheri, Fungal disease – Muscardiene, Pest of silk worm - Uzifly.

Text Book

1. Johnson M., Kesary M,. (2015), "*Sericulture"*, CSI Press, Marthandam.

Reference Books

1. Ganga G., Sulochana Chetty, (2015), "*J. An Introduction of Sericulture"*Oxford, New Delhi.
2. Hisao Aruga, (1994), "*Principles of Sericulture"*, Oxford & IBH Publishing Company Private Limited.
3. Krishnasamy S., Narasimnamma M.N., Suryanarayanan S.K., Kamaraj S., (1995), "*Silkworm Reaing Sericulture Manual II"*, Oxford & IBH Publishing Company Private Limited.

Programme	I B.SC ZOOLOGY	**Credits:**	2
Semester	I	**No. of Hrs per week**	2
Course Title	**Human Biology**		
Course Code	**17UZON11**	**Max. Marks**	100
		Part	IV

Objectives

To provide information regarding nutrition, their deficiency diseases, chromosomal abnormalities, human genome, physiology of vital organs, basic concepts in embryology and applied biology.

Unit I Health and Hygiene **6 hours**

Composition of food, Digestion and absorption of food, Balanced diet, Vitamin deficiencies, Calorific value of food, Malnutrition and Obesity, protein deficiency.

Unit II Genetics **6 hours**

Sex determination in Man -Chromosomal abnormalities (Down, Turner's, Klinefelter's syndromes) –Human Blood groups, Eugenics, Euthenics (brief account), Human genome project Objectives and application.

Unit III Physiology **6 hours**

Respiration – Structure of lungs, Inspiration and expiration; Blood: Blood Composition; Structure and function of heart, Electrocardiogram (ECG), Blood pressure, Blood urea; Structure of kidney, Nephron and Formation of urine.

Unit IV Embryology **6 hours**

Structure of Human sperm and ovum - Menstrual cycle – Menopause – Pregnancy- Parturition–Twins.

Unit V Applied Biology **6 hours**

Infertility, Sperm bank, IVF and types, Artificial insemination, Test tube baby, Birth control and Contraception.

Text Books

1. Arumugam, N. (2008) *Developmenyal Biology*, Saras Publications, Kottar – 629002.
2. Arumugam, N., Maria Kuttikan (2013) *Animal Physiology*, Saras Publications, Kottar –629002.

Reference Books

1. Ambika Shanmugam (2006) *Biochemistry*, 10, III Cross Street, West C. I. T. Nagar, Chennai – 600 035.
2. Balinsky, B.I. (2002) *An Introduction to Embryology*, W.B. Saunders Co. Philadelphia.
3. Gupta.P. K. (1999) *Genetics*, Rastogi Pub., Meerut, ISBN81–7133–413–X.

Programme	I B.SC ZOOLOGY	**Credits:**	4
Semester	II	**No. of Hrs per week**	4
Course Title	**Chordata**		
Course Code	**17UZOC21**	**Max. Marks**	100
		Part	III

Objectives

To enhance the knowledge of the students in understanding the taxonomy, comparative anatomy of important vertebrates animals along with various adaptations of fishes, birds and mammals.

Unit I Chordata and Prochordata **12 hours**

Outline classification of Chordata up to class level with examples and Salient features of Chordata - Prochordates – classification with examples and general characters - **Amphioxus:** External morphology, Digestive system ,excretory system - Retrogressive metamorphosis in Ascidian - Balanoglossus is an invertebrate chordate.

Unit II Agnatha and Pisces **12 hours**

Classification of Pisces up to order level and salient features of Pisces - **Scoliodon**: External morphology, Scales, fins, Digestive system, circulatory system and Reproductive system - Migration in fishes - Adaptations of Deep Sea fishes.

Unit III Amphibia and Reptilia **12 hours**

Classification of Amphibia, Salient features of Amphibia - Parental care in Amphibia - Classification of Reptiles up to order level and salient features of reptiles - **Type study - Calotes**: Respiratory system, circulatory and reproductive system - Identification of Poisonous and Non-poisonous snakes – Poison Apparatus, venom and Biting mechanism - Golden age of Mesozoic Reptiles.

Unit IV Aves and Mammalia **12 hours**

Classification of Aves upto order level and salient features of Aves - **Pigeon:** Digestive system and Respiratory system only - Flight adaptation in birds, Evolutionary importance of Archaeopteryx - Salient features of Prototheria, Metatheria and Eutheria - **Rabbit:** External morphology, nervous system (Brain) and Reproductive system only - Dentition in mammals.

Unit V Comparative Anatomy **12 hours**

Fore limbs of Vertebrates - Heart of Vertebrates - Pelvic girdle of Vertebrates - Brain of Vertebrates.

Text Book

1. Arumugam, N., (2008), "*Text book of Chordata*", Saras Publiation, Kottar, Nagercoil.

Reference Books

1. Jordon E.L., Verma P.S., (2013), "*Chordate Zoology"*, S. Chand and Company Limited., NewDelhi.

2. Kotpal R.L., (2003), "*Modern Textbook of Zoology – Vertebrates",* Rastogi Publications, Meerut.

3. Saxena R. K., and Saxena S., (2008), "*Comparative Anatomy of Vertebrates"*, Viva books Private Limited., New Delhi.

Programme	I B.SC ZOOLOGY	**Credits:**	4
Semester	II	**No. of Hrs per week**	4
Course Title	**Chordata**		
Course Code	**17UZOA21**	**Max. Marks**	100
		Part	III

Objectives

To cater basic knowledge in animal diversity, classification, nomenclature, characteristics of different phyla and structure and functions organ systems in chordates.

Unit I Phylum Chordata and Prochrodates **12 hours**

1. General characters of Phylum Chordata and classification
2.General characters of prochordates- Salient features of Hemichordata / Urochordata Cephalochordata with one example each.
3. **Amphioxus - Type Study -** External features, Digestive system, excretory system, Nervous system, Sense organs, and Reproductive system.
4. Balanoglossus is an invertebrate Chordate.

Unit II Pisces and Amphibia **12 hours**

1. General characters of Class Pisces and Amphibia.
2. **Shark - Type study -** External features, Digestive system, Respiratory system, Brain, Lateral line Sense organs and Urino – genital system
3. Economic importance of fishes.
4. Parental care in amphibia.

Unit III Reptilia **12 hours**

1. General characters of Class Reptilia. .
2. Identification of poisonous and non – poisonous snakes.
3. Biting mechanism of poisonous snake, Venoms of snake, first - aid and treatment for snake bite.
4. Decline of Dinosaurs.

Unit IV Aves **12 hours**

1. General characters of Class Aves.
2. i) Birds as glorified reptiles.
   ii) Archaeopteryx –a connecting link.
3. Migration of birds.
4. Flight adaptation in Birds.

Unit V Mammalia **12 hours**

1. General characters of Class Mammalia.
2. **Rabbit - Type study** -Digestive system, Respiratory system, Brain.
3. Dentition in mammals.
4. Adaptations of aquatic mammals
5. Egg laying Mammals and Pouched mammals

Text Book

1. Arumugam, N., (2008), "*Text book of Chordata"*, Saras Publiation, Kottar, Nagercoil.

Reference Books

1. Jordon E.L., Verma P.S., (2013), "*Chordate Zoology"*, S. Chand and Company Limited, NewDelhi.
2. Kotpal R.L. (2003), "*Modern Textbook of Zoology – Vertebrates",* Rastogi Publications, Meerut.
3. Saxena R. K., and Saxena S., (2008), "*Comparative Anatomy of Vertebrates"*, Viva books Private Limited, New Delhi.

Programme	I B.SC ZOOLOGY	**Credits:**	2
Semester	II	**No. of Hrs per week**	2
Course Title	**Invertebrata and Chordata Practical**		
Course Code	**17UZOA2P**	**Max. Marks**	100
		Part	III

Objectives

To develop the skill of the students to identify animals on their systematic position and also to differentiate invertebrates from chordates.

Dissections

Earthworm: Nervous system

Frog: 1. Arterial system

2.Venous system

Mounting

Earthworm – Body setae

Honeybee: Mouthparts

Invertebrata

1.Protozoa i)Amoeba ii)Paramecium iii)Euglena

2.Coelenterata i)Hydra ii)Obelia-colony iii)Obelia-Medusa iv)Jellyfish v)Seaanemone

3.Helminthesi)Liverfluke ii) Redia larva iii) Cercaria larva iv) Ascaria male and female

4.Annelida i) Nereis ii) Earth worm

5. Arthropoda i) Honey bee- Queen, Drone and Workers

ii) Silk worm- Moth, Larva and cocoon

6.**Mollusca** i) Pila ii) Pearl oyster

7. Echinodermata i) Star fish- Oral and aboral view

8. Chordata

Prochordata i) Amphioxus ii) Balanoglossus and iii) Sea ascidian

Pisces iCatla ii) Mugil iii) Eel

Reptila – Poisonous Snakes: Cobra, Krait and Viper

Non-Poisonous Snakes: Dryophis and Ptyas

Osteology – Rabbit: i) Pectoral girdle ii) Pelvic girdle iii) Fore limb iv) Hind limb

Programme	I B.SC ZOOLOGY	**Credits:**	2
Semester	II	**No. of Hrs per week**	2
Course Title	**Economic Entomology**		
Course Code	**17UZOS21**	**Max. Marks**	100
		Part	IV

Objectives

To enable the students to understand the development of insect, their metamorphosis, biology of beneficial insects, to create awareness about insect pest management, integrated pest control measures and significance of agriculture and medical entomology.

Unit I **6 hours**

Insect development - Types of Metamorphosis and Hormonal control, Larval and pupal types.

Unit II **6 hours**

Beneficial insects - i) Apiculture – Types of Bees, beehives, production of honey and its uses; ii) Lac insect and Lac culture and uses.

Unit III **6 hours**

Helpful insects - Scavenger, Pollinators, Predators, and Parasites effecting biological control.

Unit IV **6 hours**

Principles and Methods of Pest control: Physical, Chemical, Mechanical, Biological, and Integrated pest management

Unit V **6 hours**

Medical Entomology - House holds insect pests and their control measures — Cockroach, Termites and Lepisma.

Disease causing vectors - House fly, Mosquito, Tsetse fly, - Life cycle diseases transmitted and their control measures.

Text Book

1. David B. Vasantha Raj, Ramamurthy V. V. (2016), "*Text book of Economic Entomology"*, Popular Book Depot, Chennai – 15.

Reference Books

1. Ramakrishna Ayyar T.V (2011 ed), "*Hand book of Economic Entomology for South India"*, Madras, Government Press.
2. Dennis Hill, (1975), "*Agricultural insect pests of the tropics and their control"*, Cambridge University Press.
3. Metcalf. Flint & Metcalf, (1998), "*Destructive and Useful insects"*, IV Edition, McGraw-Hill Book Company, New York.

Programme	I B.SC ZOOLOGY	**Credits:**	2
Semester	II	**No. of Hrs per week**	2
Course Title	**Fisheries Biology**		
Course Code	**17UZOS22**	**Max. Marks**	100
		Part	III

Objectives

To make the students to aware of fisheries science and its importance, Fish culture and feeding mechanism, parental care, pathology of fishes and its control measures, Economic importance of common south Indian fishes and their preservation methods.

Unit I **6 hours**

Importance of Fisheries - Divisions of Indian fishery- Marine and Inland fisheries - Economic importance of fishes - Construction of fishponds.

Unit II **6 hours**

Culturable species of fishes – Eg: Indian Major Carps, Exotic Carps and Catfishes - Natural food – Live feed – Artemia & algae – feeding habits of fishes, Mechanism of feeding - Parental Care in fishes.

Unit III **6 hours**

Fish culture: Induced spawning of Indian carps - Paddy cum Fish culture – Monoculture - Composite fish culture - Sewage fed fisheries - Cage fish culture.

Unit IV **6 hours**

Fishing crafts and Gears in India – Trap Setters, Trawl nets, Gill net and Dip nets, Hooks and lines - Parasites of fishes: Endoparasite – *Ligula intestinalis*, Ectoparasite – Argulus - Diseases of fishes: Bacterial - Vertical Scale disease; Viral – Epizootic ulcerative syndrome; Fungal- Gill rot: Nutritional deficiency disease – Lipoid hepatic degeneration.

Unit V **6 hours**

Fish preservation – Principles and methods – Drying, Pickling, Icing, Freezing, Deep freezing, Canning - Products of fishes – Fish oil - CIFT, CMFRI.

Text Book

1. Arumugam N., (2009), "*Aquaculture"*, Saras Publication, Nagercoil.

Reference Books

1. Jhingran V. G, (2009), "*Fish and Fisheries of India"*, Hindustan Publishing Corp. Delhi.
2. Pandey and Shukla, (2005), "*Fish and Fisheries"*, Rastogi Publications, Meerut.
3. Khanna S.S, Singh H.R, (2014), "*A Text Book of Fish Biology & Fisheries"*, Published by Narendra Publishing House.

Programme	I B.SC ZOOLOGY	**Credits:**	2
Semester	I	**No. of Hrs per week**	2
Course Title	**Entrepreneurial Zoology**		
Course Code	**17UZON21**	**Max. Marks**	100
		Part	IV

Objectives

To provide a comprehensive knowledge in various thrust areas to start profitable business and to develop a dynamic and successful entrepreneur skill which includes animal husbandry, poultry, aquaculture, apiculture and sericulture techniques.

Unit I Animal Husbandry & Dairy technology **6 hours**

Animal Husbandry: Introduction – Breeds of Cattle – cow and diseases – Mastitis, foot and mouth diseases – Dairy technology: Introduction – Scope of dairy farming, Pasteurization of milk, Standard composition of milk, food and nutritive value, grading of milk- Lactometer and dairy products.(Yohort, Cheese).

Unit II Poultry farming **6 hours**

Indian and Exotic breeds, construction of poultry house, Equipments - Brooder, Waterer and feeder - Rearing of broiler, layers and nutritive value of eggs - Lighting, Summer and winter management.

Unit III Aquaculture **6 hours**

Marine and freshwater fishes - Biological value of fish and Economy of ornamental fishes - Commercial values of shell fish, prawn, edible oyster, pearls, crab.

Unit IV Apiculture and Lac culture **6 hours**

Apiculture: Bees – queen, drones, worker, royal jelly, life history, hive types and nutritional value of Honey - Lac culture: Lac insect – host plant, collection and processing Lac –types– uses.

Unit V Sericulture **6 hours**

Mulberry sericulture: Silk Industry in India, Mulberry cultivation, Life history of *Bombyx mori.* Seed production, rearing appliances, rearing of silk worm, Silk reeling, reeling appliances and Commercial value of silk - Non mulberry sericulture: Tasar, Muga, Erisilk and commercial value.

Text Book

1.Jayasurya R., Arumugam N, Leelavathy S., Soundara Pandian N., Murugan T., Thangamani A., Prasannakumar S., Narayanan L.M., Johnson Rajeshwar J., Nair N.C. (2013) *Economic Zoology*, Saras Publication, Nagercoil.

Refeence Books

1. Ganga G., Sulochana chetty (1977) J. *An Introduction of Sericulture*. Oxford, New Delhi.

2. Gnanamani R. (2003) *Modern aspects of commercial poultry keeping*, Giri Pub, Madurai.

3. Gupta C. B., Srinivasan N. P. (1997) *Entrepreneurship development in India*, Sultan Chand and Sons, Educational Publishers, New Delhi.

Programme	B.Sc Zoology	**Credits:**	4
Semester	III	**No. of Hrs per week**	4
Course Title	Cell Biology		
Course Code	17UZOC31	**Max. Marks**	100
		Part	III

Objectives

To provide basic knowledge about microscope and microscopic techniques, prokaryotic and eukaryotic cell, Ultra structure and function of cell organelles, cell division, cancer biology, stem cells and aging.

Unit I **12 Hours**

Historical review - Cell Theory and Protoplasm theory, Structure and Characteristic features of Prokaryotic and Eukaryotic cell, Microscopy: Principle, structure and working mechanism of Compound Microscope and Electron Microscope, Cytological techniques: Microtomy - Fixation, Dehydration, Clearing, Embedding, Sectioning, Staining, Mounting and Labelling.

Unit II **12 Hour**

Plasma membrane -Models and functions, Ultra Structure and Functions of Cellular Organelles - Mitochondria, Golgi apparatus, Endoplasmic Reticulum, Ribosomes.

Unit III **12 Hours**

Ultra Structure and Functions of Cellular Organelles - Lysosomes, Centrioles, Nucleus, Chromosome and Giant chromosomes.

Unit IV **12 Hours**

Cell cycle, Cell division - Stages and Significance of Mitosis and Meiosis, Comparison between Mitosis & Meiosis.

Unit V **12 Hours**

Cancer - Characteristics, Properties, Types, Causes, Diagnosis and Treatment, Molecular basis of aging and genes responsible for aging, Stem cells- Types, properties and applications of stem cells, Karyotyping.

Text Book

1. Arumugam, N. A. (2010), "*Cell and Molecular Biology"*, Saras Publication, Kottar, Nagercoil.

Reference Books

1. De Robertis and De Robertis. (2004), "*Cell and Molecular biology"*, WB Saunders Co, Philadelphia.
2. De Robertis., E.D. Nowinski and Saez. (2001), "*Cell biology"*, WB Saunders Co, Philadelphia.
3. David Freifelter. (2005) "*Molecular Biology"*, N.K. Mehra for Narosa publishing house, New Delhi – 110 002.

Programme	B.Sc Chemistry	**Credit**	4
Semester	III	**No. of Hrs per week**	4
Course Title	Microbiology, Cell Biology, Genetics, Molecular Biology and Biotechnology		
Course Code	17UZOA31	**Max. Marks**	100
		Part	III

Objectives

To enable the students about ultra structure and function of prokaryotic cell and morphology of bacteria, structure and functions of the cell organelles, Genetics laws and hereditary disorders, structure and function of genetic materials and its biotechnological applications.

Unit I Microbiology **12 Hours**

Structure of a prokaryotic cell (*E. coli*) - Structure of T_4 Phage - Bacteria-Salient features, classification based on shape and nutrition - Viral disease - AIDS (Pathogenesis, Symptoms, Prevention and Control).

Unit II Cell biology **12 Hours**

Structure and functions of the following cell organelles: Cell membrane – Mitochondria – Nucleus - Ribosome

Unit III Genetics. **12 Hours**

Mendel's Laws – Mono and Dihybrid crosses - Multiple Allele (ABO & Rh blood grouping) - Sex linked inheritance in Man.

Unit IV Molecular biology **12 Hours**

Structure and functions of DNA - Structure and functions of RNAs (t RNA, m RNA, and r RNA) - DNA replication.

Unit V Biotechnology **12 Hours**

Enzymes and Vectors - Recombinant DNA -Construction and applications - Transgenic animals – Dolly – Methods and Applications DNA finger printing – Methods and Applications.

Text Books

1. Arumugam, N, (2014), "*Cell Biology and Molecular Biology"*, Saras Publications.
2. Dulsy Fatima, N, Arumugam, (2009), "*Microbiology and Immunology"*, Saras Publication,
3. Kumerasan, V, (2015), "*Text Book of Biotechnology"*, Saras Publications.
4. Meyyan, R. P., (2013) "*Genetics"*, Saras Publications.

Reference Books

1. Black. J., (1999), *Microbiology – Principles and explorations*, Printice Hall International Inc, New Jersey.
2. De Robertis and De Robertis, (2006), "*Cell and Molecular Biology"*, WB Saunders Company, Philadelphia, 3rd Edition.
3. Dubey, R. C., (1995), "*Text book of Biotechnology'*, S. Chand and Company, New Delhi.
4. Gupta, P. K,. (2006), "*Genetics"*, Rastogi Publications, Meerut, 3rd Edition.

Programme	B.Sc Zoology	**Credit**	4
Semester	IV	**No. of Hrs per week**	4
Course Title	Developmental Biology		
Course Code	17UZOC41	**Max. Marks**	100
		Part	III

Objectives

To enrich the knowledge of the students about the phases of development, gametes structure and types, gametogenesis, mechanism of fertilization and cleavage, organogenesis, placentation and regeneration and also to know about Assisted Reproductive Technology.

Unit I **12 Hours**

Historical review - Theory of preformation, Theory of epigenesis, Biogenetic law and Germ Plasm Theory, Embryogenesis - Ontogeny, Phylogeny, Gametogenesis: Spermatogenesis: Sperm - structure and types, Oogenesis: Ovum - structure and types, Egg membranes.

Unit II **12 Hours**

Fertilization - Process of fertilization, Chemotaxis, Fertilizin and Antifertilizin reaction, Acrosomal reaction, Cortical reaction, Amphimixis and significance of fertilization, Cleavage - Salient features, Planes and Patterns of cleavage, Blastula and its types, Fate map and Gastrulation in frog , Parthenogenesis - Types and significance.

Unit III **12 Hours**

Organogenesis: Derivatives of Ectoderm, Mesoderm and Endoderm, Development of eye and heart in frog , Embryonic adaptation: Foetal membranes in chick, Placentation in mammals: Types - Classification of placenta based on the type of foetal membranes involved, Distribution of villi, Nature of Contact, Types of Tissues involved (Histology) and Functions of the Placenta

Unit IV **12 Hour**

Experimental embryology: Organizer concept - Organizer in Amphibian Embryo, Experiment, Properties and Structure of Organizer, Gradient theory - Types of Gradient Theories- Single Gradient Theory, Double Gradient Theory, Experimental evidences, Amphibian metamorphosis and its hormonal control, Regeneration - Types, Events in Regeneration, Factors affecting Regeneration and Wolffian Regeneration.

Unit V **12 Hours**

Human embryology: Menstrual cycle - Phases of menstruation, Pregnancy, Parturition, Hormonal control of Reproduction, Birth control measures – Contraception, Infertility, Assisted Reproductive Technology in man (ART) - Artificial Insemination (AI) - In Vitro Fertilization Technology (IVF) – Test tube baby.

Text Book

1. Arumugam, N. A., (2008) "*Text Book of Embryology"*, Saras Publication, Kottar, Nagercoil.

Reference Books

1. Balinsky, B.I., (1981), "*An Introduction to Embryology"*, W. B. Saunders Company, Philadelphia.
2. Jonathan M. W., Slack (2012), '*Essential Developmental Biology"*, Wiley-Blackwell.
3. Verma S. and Agarwal V.K,. (2000), "*Chordate Embryology"*, S. Chand and Company, New Delhi.

Programme	B.Sc Zoology	**Credit**	2
Semester	IV	**No. of Hrs per week**	2
Course Title	Cell and Developmental Biology		
Course Code	17UZOC4P	**Max. Marks**	100
		Part	III

CELL BIOLOGY

1. Microscopy: Handling of dissection and compound microscopes.
2. Spotters- Histological slides: i) Muscle- Striated, Non- striated, Cardiac, ii) Bone and Connective tissues.
3. Observation of Mitotic stages in Onion root tip.
4. Preparation of Blood smear and observation of different forms of WBC.
5. Charts on- Mitochondria, Golgi apparatus, Endoplasmic reticulum, Ribosomes.

DEVELOPMENTAL BIOLOGY

Study the following prepared slides and Museum specimens.

1. Developmental stages of mammalian sperm and ovum.
2. Mammalian sperm.
3. Mammalian egg.
4. Observation of live stages - life cycle of any one insect (egg, larval stages, pupa & adult).
5. Early developmental stages of Frog: cleavage, blastula, gastrula and neurula.
6. Observation of developmental stages of chick embryo- 24 Hours, 48 Hours, 72 Hours and 96 Hours.
7. Placenta of Sheep and Man.

Programme	B.Sc Chemistry	**Credit**	4
Semester	IV	**No. of Hrs per week**	4
Course Title	Developmental Biology, Biochemistry, Physiology, Immunology and Evolution		
Course Code	17UZOA41	**Max. Marks**	100
		Part	III

Objectives

To enable the students to know about the structure of gametes, fertilization & cleavage, classification and structure of carbohydrates, proteins and lipids, mechanism of physiological systems, the lymphoid organs and also about evolutionary theory and fossil structures.

Unit I Developmental biology **12 hours**

Structure of sperm and ovum in Frog - Fertilization, Blastulation and Gastrulation in Frog - Test tube baby methods

Unit II Biochemistry **12 Hours**

Classification and structure of Carbohydrates.(Mono, Di, Polysaccharides with one example each) - Classification and structure of proteins with examples (primary, secondary, tertiary, and quaternary structure) - Classification and Structure of Lipids with examples.

Unit III Physiology (Human) **12 Hours**

Digestion of Carbohydrates, Protein, and Lipids - Mechanism of respiration and Transport of gases - Structure of Nephron and Formation of urine

Unit IV Immunology **12Hours**

Lymphoid organs Primary (Thymus, Bone marrow) and secondary (Spleen, lymph nodes) - Immunoglobulin: IgG – structure & functions - Antigen – antibody reaction

Unit V Evolution **12 Hours**

Lamarckism - Darwinism and Modern synthetic theory - Human Evolution – Fossils.

Text Books

1. Ambika Shanmugam, (2007), "*Biochemistry"*, 10, III Cross Street, West C.I.T. Nagar, Chennai – 600 035.
2. Arumugam, N., (2012), "*Developmental Zoology, Animal Physiology, Ecology and Evolution*", Saras Publications.
3. Dulsy Fatima, N. Arumugam, (2009), *Immunology*, Saras Publication.

Reference Books

1. Balinsky, B.I., (2001), "*An Introduction to Embryology"*. W.B. Saunders Company, Philadelphia.
2. Gordon, S. Maleon, et al,. (2000, "*Animal Function – Principles and Adaptations"*, The Macmillan Company.
3. Kuby, J., W.H, (1999), "*Immunology"*, Freeman and Company, New York.
4. Moody, P.A, (1997). "*An introduction to Evolution"*, Kalyani Publishers, Ludhiana.
5. Robert. K. Murray., Daryl. K. Granner., Peter. A.Mayes., Victor. W. Rodwell, (2004), "*Harper's Biochemistry"*, Prentice Hall International.

Programme	B.Sc Zoology	**Credits:**	2
Semester	IV	**No. of Hrs per week**	2
Course Title	**Microbio., Cell Bio., Genetics, Mol. Bio., Biotech., Dev. Bio., Biochem., Physiol., Immunol. and Evol. Practical**		
Course Code	17UZOA4P	**Max. Marks**	100
		Part	III

List of Practicals

1. Preparation of Onion root tip and observe the Mitotic stages.
2. Mendelian Monohybrid ratio with coins.
3. Self observation and recording of some common Mendelian traits.
4. Qualitative test for ammonia, urea, and uric acid.
5. Qualitative test for Carbohydrates, protein and lipid.
6. Antigen – antibody reaction (in blood grouping).

List of Spotters:

1. Different morphological appearance of Bacteria.
2. Mitochondria, Golgi body, Endoplasmic reticulum, Lysosome and Ribosome.
3. Mitotic stages identification.
4. Meiotic stages identification.
5. Mendelian traits in Human population.
6. DNA – Model
7. tRNA – Model
8. Following stages of Frog embryo: i) Egg ii) Sperm iii) Blastula iv) Gastrula.
9. Frog embryo
10. Sheep placenta.

Programme	III B.Sc Zoology	**Credit**	4
Semester	V	**No. of Hrs per week**	4
Course Title	Biostatistics		
Course Code	17UZOC51	**Max. Marks**	100
		Part	III

Objectives

To enhance the knowledge of the students in, Collection and tabulation of data, to present the data in various diagrams and to compute measures of central tendency and dispersion.

Unit I **12 hours**

Collection of Data - Types of Data (Primary and Secondary data). Sources of primary and secondary data, Methods of data collection (Census method, Sampling method), Classification of data, Tabulation of data, Numerical presentation of data (Raw data, Individual series, Ordered array)

Unit II **12 hours**

Diagrammatic Presentation of Data - Advantages and limitations - Types of diagrams - One dimensional diagram - Line diagram, Bar diagram - Simple, Component and Percentage - Two Dimensional diagram - Pie diagram, Three Dimensional diagram – cubes, Pictograms, Cartograms

Unit III **12 hours**

Graphic presentation of data – Advantages, Types of graphs - Graphs of time series, Graphs of one variable, Graph of two or more variables, Range Chart, Band graph, Graphs of Frequency Distribution – Histogram, Frequency polygon, Frequency curve, Ogives

Unit IV **12 hours**

Measures of Central tendency - Definition – Average; Mean – Individual, discrete and continuous series; Median- Individual, discrete and continuous series; Mode - Individual, discrete and continuous series; Merits and demerits of Mean, Median and Mode.

Unit V **12hours**

Measures of Dispersion - Definition – Average – Range; Quartile deviation; Standard deviation; variance; Rank Correlation;

Text Book

1. Arumugam N, (2005), "*Biostatistics and Computer application"* Saras Publications, Kottar, Nagarcoil.

Reference Books

1. Gupta S.P, (2006), "*Statistical methods"*, Sulthan chand and Sons, Educational Publishers, New Delhi.
2. Khan A.S, Khanum A, (2004), "*Fundamental of Biostatistics"*, Ukaas Publishers, Hyderabad.
3. Baskararao T, (2001), "*Methods of Biostatistics"*, PARAS Publications, Hyderabad.

Programme	III B.Sc Zoology	**Credit**	4
Semester	V	**No. of Hrs per week**	4
Course Title	Biotechnology		
Course Code	17UZOC52	**Max. Marks**	100
		Part	III

Objectives

To enlighten our students on various biotechnological tools, its basic principles, molecular mechanism involved and its beneficial application. Also to encourage the students to take biotechnology courses as it provide ample scope for their bright career.

Unit I **12 hours**

Definition, Scope and importance of biotechnology in India. Restriction enzymes; **Steps in Gene cloning,** Introduction of recombinant DNA into host cells - Transformation, Microinjection, Electroporation, Liposome fusion). Screening and selection of recombinants. (Insertional inactivation, blue-white selection), Hybridization techniques (Colony hybridization), Blotting techniques (Southern and Western). Genomic library, DNA probe, cloning vectors: Plasmids – types, characteristic features an ideal gene cloning vector - pBR 322, pUC8, Ti plasmid, Lambda phage, cosmid, phagemid, Yeast artificial chromosome, Gene Amplification through PCR.

Unit II **12 hours**

Animal cell and Tissue culture: Requirements for animal cell culture laboratory, substrate, liquid media and gases; Maintenance of aseptic condition, Explant - Isolation, culture and disaggregation; Primary and secondary culture, subculture, prevention of contamination and storage of animal cells (cryopreservation) Large scale culture – (Mono layer culture), Bioreactors – (CSTB and Air lift Bioreactor), Organ Culture: Techniques, advantages, applications Artificial skin & Cartilage. Stem cell culture. Hybridoma technology / Monoclonal antibody production.

Unit III **12 hours**

Transgenic animals – Pharmaceutical products – insulin, Interferon, interleukin, uerokinase – Ethical issues of genetic engineering, retrieval of genetic information - biowarfare. Gene therapy – concepts, applications and its ethical, legal and socioeconomic aspects - Recombinant vaccines - Ethical implications of cloning - Reproductive and therapeutic cloning – biopiracy – Ethical implications of Human Genome Project. Enzyme technology - Definition, Production of β- Galactosidase enzyme, Enzyme immobilization and their application.

Unit IV **12 hours**

Biotechnological methods of sewage water treatment – primary, secondary and tertiary treatment. Bioremediation: Definition, types, Role of genetically engineered organisms in bioremediation (Super bug, phyto-remediation). Aqua culture technology: - DOT-ELISA, Gene probe PCR. DNA finger printing techniques and its application in forensic medicine, Microarrays, Biochip, Bioweapons.

Unit V **12 hours**

Intellectual Property Rights - Types of IP: Patents, Trademarks, Copyright & Related Rights, Design, Draft design, Traditional Knowledge, Geographical Indications-importance of IPR – patentable and non patentables – patenting life – legal protection of biotechnological inventions – world intellectual property rights organization (WIPO). IP rights in India.

Text Book

1. Kumaresan V, (2007), *Biotechnology*, Saras Publication, A.R.P. Camp Road, Periavilai, Kottar P.O., Nagercoil, K.K. Dist., - 629002.

Reference Books

1. Sasidhara R, (2006) *Animal Biotechnology,* MJP Publishers, Chennai.
2. Old, R.W and S.B. Primrose, (1996) *Principles of Gene Manipulation: An Introduction to Genetic Engineering*. 2nd Edition. Blackwell Scientific Publications, Oxford.

3. Sree Krishna, V., (2007) "*Bioethics and Biosafety in Biotechnology"*, New Age International Private Limited Publishers. ISBN (13): 978-81-224-2248-1.
4. Subbaram, N., (2003), "*Patents*", Pharma Book Syndicate, Hyderabad.

Programme	III B.Sc Zoology	**Credit**	4
Semester	V	**No. of Hrs per week**	4
Course Title	Genetics and Molecular Biology		
Course Code	17UZOC53	**Max. Marks**	100
		Part	III

Objectives

To deepen students' understanding of Mendilian genetics, chromosomal and gene mutations, hereditary diseases, structure and functions of genetic materials, Lac Operon concept, Transposable elements.

Unit I GENETICS **12 hours**

I. Fundamental Genetics

Mendelian Principle: Mendel and his experiments and the laws of inheritance - Law of Dominance, Law of Segregation or Monohybrid cross, Law of Independent Assortment or Dihybrid Cross, Quantitative traits- Skin color in man, Inbreeding - Disorders.

II. Gene Interactions

Kinds of Interaction: Allelic genic interaction- Incomplete dominance (Eg. Sickle cell Anaemia in man), Non- Allelic geneic interaction - Epistasis: Dominant (Plumage color in poultry), Recessive (Coat color in mice) - Biochemical basis, Complementary genes: Flower color in sweet peas, Multiple alleles - ABO Blood groups and Rh factor in Human beings.

Unit II Genes and Chromosomes **12 hour**

Linkage: Types – Complete and Incomplete, Linkage in Maize, Factors affecting Linkage, Crossing Over: Types, Mechanism of crossing over, Crossing Over in Drosophila, Sex determination: Man - Sex Determination by Chromosomes, Sex Determination by Barr body, Environmental Sex determination, Chromosomal aberrations: Structural and Numerical, Genetic control of behavior - Nest cleaning behavior in honey bees, biological rhythms in Drosophila.

Unit III Human Genetics **12 hours**

Karyotype Analysis, Inherited disorders - Allosomal (Klinefelter's syndrome and Turner's syndrome), Autosomal (Down syndrome), Sex Linkage - Sex-linkage in Man (Hemophilia and Colour blindness), Simple Mendelian Traits in man, Eugenics and Euthenics, Pedigree Analysis, Human Genome Project - Basic concept, P53 Genes - Structure and Function, Human Suppressor Gene.

Unit IV Molecular Biology- Nature of genetic material **12 hours**

Evidences to prove DNA as the genetic material, Molecular structure of DNA and its properties, Molecular structure of RNA and its Types, DNA Replication and its types: Semi Conservative method, Conservative method and Dispersive method, Gene Mutation: Types of gene mutations, Features of genetic code, Variable Tandem Repeats, Single Nucleotide Polymorphism, Satellite.

Unit V Gene **Expression and Regulation** **12 hours**

Protein synthesis – Components of protein synthetic machinery, Mechanism of Protein synthesis – Central dogma, Transcription and Translation in Prokaryotes, Regulation of Gene expression - Regulation of Gene expression in Prokaryotes and Eukaryotes, Operon concept - Lac Operon. Recombination in bacteria: Transformation, Transduction, Conjugation, Sexduction, Transposons - Transposable elements in Maize, Drosophila and Bacteria and its medical significance.

Text Book

1. Meyyan, R.P,. (2014), "*Genetics",* Saras Publications, Nagercoil.

Reference Books

1. Eldon John Gardener, Michael J. Simmons and Peter Snustad D, (2006), "*Principles of Genetics"*, John Wiley & Sons Publications, New York.
2. Geneby James D. Watson, Tunia A. Baker, Stephen P. Bell, Alexander Gann, Michel Lavine and Richard Losick, (2005), "*Molecular biology"*, Dorling Kindersly, Delhi.
3. Bhatnagar, S.M. et al, 4th Edition, (1999), "*Essentials of Human Genetics"*, Orient Longman.

Programme	III B.Sc Zoology	**Credit**	3
Semester	V	**No. of Hrs per week**	2
Course Title	Poultry Farming		
Course Code	17UZOE51	**Max. Marks**	100
		Part	III

Objectives

It is a job oriented course, deals with poultry breeds and its importance, infra structure of poultry farming, managemental practices.

Unit I **6 hours**

1**.** Choosing commercial layers and Broilers

2. Poultry Housing - Selection of site for commercial poultry farm - Construction of poultry shed - Rearing system – 1+ 3 housing system - All in all out system, multiple rearing systems.

3. Deep litter system. Advantages and disadvantages of deep litter System. Nest box, brooders, Feeders, Waterers.

4. Cage rearing: Types of cages - Waterers – Nipple drinker system only - Management of cage birds - Advantages and disadvantages of cage rearing.

UnitII

6hours

1. Practical aspects of Chick rearing (Brooding).

2. Management of layer –final housing, feed and feeding, egg collection, culling.

3. Management of broilers-selection of quality chicks, broiler growing programme, feed management, catching procedure, marketing.

Unit III **6 hours**

1. Lighting 2. Summer management.

3. Winter management. 4. Debeaking.

Unit IV **6 hours**

1. Non – nutritive feed additives.

2. Feed stuff for Poultry – Carbohydrates, Protein, Lipid, Vitamins and minerals.

3. Poultry manure.

Unit V **6 hours**

1. Poultry Diseases:

i) Viral disease - Ranikhet, Fowl pox.

ii) Bacterial disease - Salmonelloses Botulism.

iii) Fungal diseases - Aspergillosis.

iv) Parasitic diseases - Coccidiosis.

2. Vaccination Programme – Vaccination schedule for layers and broilers only.

Text book

1. Gnanamani, R., "*Modern aspects of commercial Poultry Keeping"* 9 Edition, Jan – 2003. Giri Publication, Alwar nagar, Nagamalai, Madurai – 19, Tamilnadu.

Reference Books

1. Naidu. P.M.N, "*Poultry Keeping in India"*, Indian council of Agricultural research, New Delhi.
2. Scott. M.L., Nesmehi.M.C, and R.J.Young, "*Nutrition of the Chicken",* New York.
3. Singh.R.A., "*Poultry Production",* New Delhi.

Programme	III B.Sc Zoology	**Credit**	3
Semester	V	**No. of Hrs per week**	2
Course Title	Dairy Farming		
Course Code	17UZOE52	**Max. Marks**	100
		Part	IV

Objectives

To enable students to gain knowledge on various dairy breeds of indigenous and exotic breeds. Skill development in milk processing and associated activities.

Unit I **6 hours**

Scope of Dairy farming, Dairy breeds of India- Cow and Buffalow. Exotic breeds- Cow. Systems of breeding – Hybrid vigour – grading up. Merits and demerits of inbreeding and outbreeding.

Unit II **6 hours**

Digestive system of Cow and glands related to digestion. Common cattle feed – their nutritive value – minerals. Feed additives and silage preparation. Feeding and management of pregnant cow and calf.

Unit III **6 hours**

Viral diseases – rinderpest, Foot and mouth disease. Bacteiral diseases – Mastitis, Anthrax, Haemorrhagic – septicaemia. Metabolic diseases – Milk fever and bloat.

Unit IV **6 hours**

Anatomy of udder and physiology of milk production. Milk – composition, Pasteurization and Nutritive value, Colostrum and their importance, Techniques to produce quality milk-Techniques to detect milk adultration, Spoilage of milk Preparation of Dahi, Butter,Ghee, Gova, Flavored milk, butter milk, ice cream .

Unit V **6 hours**

Housing and equipments for dairy cows- Records to be maintained in a Dairy. Artificial insemination – Semen collection and storage - Techniques. Role of co-operative societies in milk production and marketing.

Text Book

1. G.C. Banerjee, (2012), "*A Text book of Animal Husbandry),* Oxford & IBH Publication, New Delhi.

Reference Books

1. Sukumar De, (2008), Outline of Dairy technology, Oxford University Press
2. *"Handbook of Animal husbandry"*, (2000), Publication and information division-ICAR, New Delhi.
3. Smit G, (2003), "*Dairy Processing – Improving Quality"*. CRC-Woodhead Publication.

Programme	III B.Sc Zoology	**Credit**	4
Semester	VI	**No. of Hrs per week**	4
Course Title	Microbiology and Immunology		
Course Code	17UZOC61	**Max. Marks**	100
		Part	III

Objectives

To enhance the knowledge of students in basics microbiological techniques, food, medical, industrial, environmental, and agricultural microbiology and also to understand the fundamental of the immune system, immune organs, antigens - antibody structure and interaction, vaccines and immunization schedule.

Unit I **12 hours**

Scope of microbiology – contribution of Anton Van Leewanhoek, Louis Pasteur and Robert Koch. Bacteria – Shapes, classification of bacteria – based on flagella, nutrition and temperature tolerance – Ultra structure of bacteria, structure and functions of cell wall, plasmamembrane, mesosome, Ribosome, nucleoid and plasmids - Structure of T_4 Phage, classification of virus based on symmetry.

Unit II **12 hours**

Sterilization techniques, methods of isolation of pure culture, Types of culture medium, Bacterial growth – food borne infections, food preservation methods. Bacterial diseases - Typhoid & Gonorrhoea, Viral diseases – AIDS & Hipatitis B, Fungal diseases – Candidiasis and Dermatophytosis.

Unit III **12 hours**

Bioreactor and its types, Microbial production of vinegar, lactic acid, commercial production of penicillin, streptomycin. Production of Biofertilizer – Symbiotic nitrogen fixation – Rhizobium, root nodulation - mechanism, crop field application and Azolla – Biomanure, microbial degradation of Xenobiotics. Biogas production, Bioremediation & its types - bio-leaching.

Unit IV Immune system and Immune organs **12 hours**

Types of Immunity - Innate and Acquired, **Vaccines** - Types, Live, Killed, Immunization Schedule, **Lymphoid organs:** Primary - Thymus, Bone marrow, Bursa of Fabricius, Secondary - Spleen and lymph node. **Cells of immune system**: T cells, B cells and Null cells- Natural Killer cells.

UnitV Antigens and Antibodies **12hours**

Antigens: Epitopes, Paratopes, essential factors for Antigenicity, Antigens and Haptens- a Comparison, **Immunoglobulin** - Classes, properties and function of immunoglobulin, IgG - Structure. **Antigen and Antibody reactions** - Salient features, Detection (Types)- In vitro methods - precipitation and agglutination, **Major Histocompatibility Complex** - Structure and functions. Immunotechnique - ELISA.

Text Books

1. Arumugam N., (2009) "*Text book of Microbiology"*, Saras Publication.
2. Dulsy Fatima and Arumugam N., (2009) "*Immunology"*, Saras Publication.

Reference Books

1. Prescott.L. Harley and Klein. (2004) "*Microbiology"*, Wmc Brown McGraw Hill Publications.

2. Ananthanarayanan R., JayaramPaniker C.K. (1994) "*Text book of Microbiology"*, V Edition, Orient Longman.
3. Roitt I. M., (2000), "*Essential Immunology"*, Blackwell Scientific Publishers.
4. Kuby J., (1999), "*Immunology"*, W.H. Freeman and Company, New York.

Programme	III B.Sc Zoology	**Credit**	4
Semester	VI	**No. of Hrs per week**	2
Course Title	Biostatistics and Biochemistry Practical		
Course Code	17UZOC6P	**Max. Marks**	100
		Part	III

BIOSTATISTICS

1. Frequency distribution
2. Presentation of data- Bar Diagram, Pie Diagram, Histogram
3. Calculation of Mean, Median, Mode
4. Calculation of Standard Deviation and Coefficient of Variation

BIOCHEMISTRY

1. Qualitative analysis of protein, carbohydrates and lipids.
2. Instrumentation - Principle and uses of
    i) pH meter
    ii) Electrophoresis – Paper Electrophoresis
    iii) Chromatography – Paper chromatography
    iv) Colorimeter
    v) Centrifuges

Programme	III B.Sc Zoology	**Credit**	4
Semester	VI	**No. of Hrs per week**	4
Course Title	Biochemistry and Physiology		
Course Code	17UZOC62	**Max. Marks**	100
		Part	III

Objectives

To enhance the knowledge of the students in structure and classification of biological molecules, and their molecular mechanism and various metabolic reactions. Also to know about the animal physiology and their hormonal control.

Unit I **12 hours**

1. Carbohydrate: Outline classification- Structure of Monosaccharide (Glucose) Disaccharide (Sucrose) and Polysaccharide (Starch / glycogen)
2. Protein: structure and classification of Protein – aminoacids, Primary, Secondary, Tertiary and Quaternary Structure.
3. Lipid: Classification, Fatty acids, Chemical properties of fatty acids and Essential fatty acids.

Unit II **12 hours**

1. Enzymes: Properties, Classification of enzymes, Mechanism of enzyme action and factors affecting enzyme action
2. Vitamins: Classification and biological functions of Fat and Water soluble vitamins and deficiency diseases.

Unit III **12 hours**

1. Carbohydrate Metaboism – Gluconeogenesis, Glycogenolysis, Shunt pathway.
2. Protein Metabolism – Transamination, Deamination
3. Lipid Metabolism – β Oxidation
4. Circulation: Composition and functions of blood, Mechanism of Heart beat, Pace Makers, ECG, Blood Pressure and Blood Coagulation, Level of Blood sugar, Urea and Cholesterol in man.

Unit IV **12 hours**

1. Respiration: Respiratory pigments-Transport of Oxygen and Carbon-di-oxide, Respiratory Quotient - Mechanism of pulmonary respiration.
2. Excretion: Structure of nephron and formation of Urine.
3. Muscle Physiology: Ultra structure of muscle-Theories of muscle contraction.
4. Osmoregulation in Crustaceans and teleost fish.
5. Thermoregulation: Poiklotherms and Homeotherms.

Unit V **12 hours**

1. Hormons of various endocrine glands – Pituitary, Thyroid, Parathyroid, Adrenal, Islets of Langherhans, Testis, Ovary, Placenta, Thymus, Pineal gland and their functions in man.
2. Diseases related to hormones.

Text Books

1. Ambika Shanmugam, (2007), "*Text book of Biochemistry"*, 10, III Cross Street, West C.I.T. Nagar, Chennai – 600 035. (Unit – I to II)
2. Arumugam, N., Maria Kuttikan, (2013), "*Animal Physiology"*, Saras Publications, Kottar –629002. (Unit – III to V)

Reference Books

1. Lenninger, (2001), "*Principles of Biochemistry"*, Nelson & Company, CBS Publishers and Distributors, Delhi – 110 032. CBS ISBN, 81 – 239 – 0295 -6.
2. Bell, Davidson and Scarborough, (2005), "*Text Book of Physiology and Biochemistry",* ELBS & E & S – Livingstone. ISBN 443 00691 – 1
3. Gordon, S.Maleon, et al,. (2005), "*Animal Function – Principles and Adaptations",* The Macmillan Company.

Programme	III B.Sc Zoology	**Credit**	4
Semester	VI	**No. of Hrs per week**	3
Course Title	Genetics, Molecular Biology, Microbiology and Immunology Practical		
Course Code	17UZOC6Q	**Max. Marks**	100
		Part	III

GENETICS AND MOLECULAR BIOLOGY

1. Study of Mendelian traits in Man.
2. Verification of Mendelian ratios (Monohybrid and Dihybrid) using color beads.
3. Study of Abnormal Karyotypes –
    i. Down syndrome (Autosomal).
    ii. Turner syndrome and
    iii. Klinefelter syndrome (sex chromosomal) (Pictures).
4. Pedigree analysis: Symbols used in sex chromosomal (x linked) disorders.
5. DNA and RNA models
6. Bacteria - Conjugation, Transformation and Transduction

MICROBIOLOGY

1. Sterilization – Wet (Autoclave), Dry (Hot air oven)
2. Isolation of bacteria from soil - Serial dilution method.
3. Pure culture technique
    i. Streak method
    ii. Pour plate method
    iii. Spread plate method.
4. Simple staining of bacteria
5. Gram staining technique.
6. Microscopic examination of living bacteria - hanging drop method.
7. Staining of fungi – bread mould.
8. Medical Microbiology: Bacterial Diseases: Tuberculosis and Gonorrhea.
9. Agriculture Microbiology: Symbiotic nitrogen fixation in Rhizobium.
10. Biomanure: Azolla.

IMMUNOLOGY

1. ABO – Rh blood grouping
2. Immuno diffusion
3. **Spotters –** Lymphoid organs

Programme	III B.Sc Zoology	**Credit**	4
Semester	VI	**No. of Hrs per week**	4
Course Title	Evolution and Animal Phylogeny		
Course Code	17UZOC63	**Max. Marks**	100
		Part	III

Objectives

To cater basic knowledge in origin of life and organic evolution, understand the theories, evolutionary factors mechanism of evolution, importance of fossils, human evolution.

Unit I Origin of life and Evidences for Evolution: 12 hours

Abiogenesis, Biogenesis, Biochemical origin of life, Urey - Miller experiment. **Anatomical evidences**- Homology and Analogy, Vestigial organs, Atavism and connecting links - Peripatus and lung fishes, **Embryological evidences -** Biogenetic law, **Physiological and Biochemical evidences -** examples, **Paleaontological evidences-** Fossil connecting links- Archaeopteryx & Ichthyostega.

Unit II Theories of Evolution: 12 hours

Lamarckism, Neo – Lamarckism, Darwinism, HMS Beagle, Neo – Darwinism, Mutation theory of De Vries, Modern synthetic theory.

Unit III Variation as raw material for Evolutuion:
12hours

Variation - Sources (Factors) of Variation, Hardy – Weinberg Law and Evolution, Speciation- Allopatric and Sympatric, Neoteny and Evolution - Types, Factors, Example- Okiopleura, Axolotyl.

Unit IV Patterns of Evolution and Adaptation 12 hours

Adaptive coloration and Mimicry, Adaptive radiation - Limb pattern of Placental mammals, Darwin's Finches, Horse evolution and Orthogenesis

Unit V Fossils and Evolution of Mankind 12hours

Fossils - Conditions, Types, Methods of dating fossils, Significance, Geological time table, Human evolution – Fossil records and phylogeny of man, Cultural evolution, and evolutionary future of mankind.

Text Book

1. Arumugam N., (2010), "*Organic Evolution",* Saras Publications, Nagercoil.

Reference Books

1. Dobzhansky Th., Ayala FJ, Stebbins GI and Valentine J.W, (1997), "*Evolution",* Surjeet Publication, Delhi.
2. Rastogi., V.B., (2003), "*Organic Evolution"* Kedar Nath and Ram Nath, Meerat.

3. Moody, P.A, "*An introduction to Evolution",* Kalyani Publishers, Ludhiana.

4. Dobzhansky., "*Evolution, Genetics and Man"*, Oxford and IBH Publishing Company, New Delhi.

Programme	III B.Sc Zoology	**Credit**	4
Semester	VI	**No. of Hrs per week**	3
Course Title	Physiology, Biotechnology and Evolution Practical		
Course Code	17UZOC6R	**Max. Marks**	100
		Part	III

PHYSIOLOGY:

1. Amylase activity in human saliva in relation to Temperature and pH.
2. Estimation of dissolved Oxygen in various water samples.

BIOTECHNOLOGY:

1. Isolation of genomic DNA
2. Isolation of plasmid –Demonstration
3. Isolation of Protein by PAGE - Demonstration
4. Isolation of Protein by PAGE –Demonstration.
5. PCR amplification - Demonstration.
6. Southern and northern blot - Demonstration.
7. RAPD & RFLP - Demonstration.

Spotters / charts / photos: PBR 322, PUC 8, Ti plasmid, Lambda Phage, Restriction enzyme, recombinant DNA, Gene cloning, Electrophoration, Microinjection, Lipofection, Monoclonal antibody, stem cells, Dolly, Transgenesis, Animal cloning, organ culture, Anaerobic digester, Fermented.

EVOLUTION:

1. Homologous and Analogous organs
2. Vestigial organs.
3. Examples of evolutionary importance: Peripatus and Limulus.
4. Animals with adaptive coloration: Leaf insect, Stick insect and Chameleon.

Programme	III B.Sc Zoology	**Credit**	3
Semester	VI	**No. of Hrs per week**	2
Course Title	Computer Applications and Career Enhancement Studies		
Course Code	17UZOE61	**Max. Marks**	100
		Part	III

Objectives

To enable the students to develop the skill in operating computer and to know their characteristic features. Also to develop the communication skill and personality development.

Unit I **6 hours**

Introduction to Computer - Block diagram, Characteristics of computer, Generations of computer, Types of Network- a) LAN b) VAN c) MAN, Network topologies

Unit II **6 hours**

MS Word: File Menu: New, Open, Save & Print, Editing Menu: Cut, Copy, Paste and Find & Replace, Insert Menu: Page numbers & Pictures.

Unit III **6 hours**

MS Word: Format Menu: Font, Bullet & Numbering, Paragraph & Background, MS Excel, Tools: Spelling & Grammar, Data: Sort

Unit IV **6 hours**

Internet: Internet concept- Types of internet connections- Internet services, Browsing techniques- Website- Email and Internet Accession, Applications of Internet.

Unit V **6 hours**

General knowledge - Current affairs (Self study only). Numerical ability, Reasoning ability, abbrivations, Pedagogy, Skill in English language, writing applications, designing a resume, facing an Interview.

Text Book

1. Sundaralingam R., Arumugam N., Kumaresan V., Gopi A., Meena A. (2014), "*Biostatistics, Computer Application and Bioinformatics"*, Saras Publication.

Reference Books

1. Vasanthi Ramanathan, "*Computer application in Business"*, Meenakshi Pathippagam, 4/593, Vandiyur main road, Sadasivam Nagar, Madurai – 20.
2. Mittal C. (2003), "*Fundamentals of Information Technology"*, Pragathi Prakasam, Meerut.
3. MS - OFFICE for Win 95- Microsoft office Press.

Programme	III B.Sc Zoology	**Credit**	3
Semester	VI	**No. of Hrs per week**	2
Course Title	Bioinstrumentation		
Course Code	17UZOE62	**Max. Marks**	100
		Part	III

Objective s

To learn various instrumentation and analytical techniques employed for understanding biological molecules and processes.

Unit I INTRODUCTION TO LABORATORY PRACTICES 6 hours

Guide lines for good laboratory practices; Laboratory symbols; Cleaning and sterilization of labware and reagents; handling and care of laboratory animals; Laminar flow hood: types and use; Chemical balance: types and working mechanism; Concepts of molecular weight, atomic weight, preparation of solutions of a particular molarity and percentage; Buffers: definition and preparation of buffers, pH meter; Safety and ethical issues in laboratory settings

Unit II CELLULAR TECHNIQUES 6 hours

Microscopy - Light microscope, SEM, TEM, Atomic force and scanning tunneling electron microscope; Cryopreservation - principle and procedure; Fluorescence activated cell sorting; Xray crystallography.

Unit III SEPARATION TECHNIQUES 6 hours

Centrifugation - working principle and types of centrifugation; Spectrophotometry; Mass spectrometry; Chromatography - principle and types of chromatography

Unit IV MEDICAL INSTRUMENTATION 6 hours

ESR measurement, haemoglobin measurement, blood pressure, blood flow, ECG, cardiac pacemakers; X-ray imaging, CT scan and NMR imaging; Ultrasound imaging; medical applications of laser; Biosensors - glucose biosensor, alcohol biosensor, artificial retina, environmental biosensors, cantilever -based biosensors, DNA biosensor

Unit V MOLECULAR ANALYSIS 6 hours

Isolation of DNA, RNA and proteins; Electrophoresis of DNA and proteins; Polymerase chain reaction; ELISA; Immunofluorescence; Fluorescent in situ hybridization; Southern and Western blotting.

Text Books

1. Khandpur, R.S, (2004), "*Biomedical instrumentation"*, Tata McGraw Hill, New Delhi.
2. Wilson, K.M. and Walker, J.M. (2010), "*Principles and Techniques of Biochemistry and Molecular Biology"*, Cambridge University Press, UK.
3. Cooper GM., (2000), "*The Cell: A Molecular Approach"*. 2nd edition, Sinauer Associates, Sunderland (MA), USA.

Reference Books

1. Cottenill R.M.J., (2002), "*Biophysics: An introduction"*, John Wiley and Sons, UK.
2. Das D., (1996), "*Biophysics and Biophysical Chemistry for Medical and Biology students"*, Academic Calcutta.
3. Joseph Sambrook and David Russell, (2001), "*Molecular Cloning: A Laboratory Manual"*, Cold Spring Harbour Press, USA.

Certificate Courses

Programme	III B.Sc Zoology	**Credit**	2
Semester	V	**No. of Hrs per week**	2
Course Title	Mushroom Cultivation		
Course Code	17CZOO51	**Max. Marks**	100

Objectives

Create entrepreneurs and to bring a source of income to our student community.

Unit I **6 Hours**

Introduction to Mushroom; Different parts of a typical mushroom, Variations in mushroom morphology – white milky, oyster and paddy straw; identification of edible and non-edible mushrooms.

Unit II **6 Hours**

Values of Edible Mushrooms – Nutritive – proteins, Fats, Vitamins, Carbohydrates, minerals, Energy, Medicinal and Economical values.

Unit III **6 Hours**

Spawn preparation – Laboratory requirements – Tissue culture, preparation of Mother Spawns and Bed spawns.

Unit IV **6 Hours**

Cultivation Technique – Bed preparation, Spawning, Culturing, Harvesting and Marketing Techniques; pests and pathogens of mushrooms and their management with reference to White Milky Mushroom and Oyster Mushroom.

Unit V **6 Hours**

Preservation, Value added products of Mushroom and identification of Business opportunities. Field Visit and interaction with Mushroom cultivators.

Text Books:

1. *"Handbook on Mushroom, cultivation and processing"*, NIIR Board of consultants and Engineers, Asia pacific Business Press Inc., Delhi, India.
2. Biswas, S., Datta, M., and Ngachan, S.V., (2012) "*Mushrooms – A manual for cultivation"*. PHI learning Private Limited, New Delhi, India.

Reference Books:

1. Pathak Yadav Gour, (2010), "*Mushroom production and Processing Technology"*, Published by Agrobios (India).
2. Hard, M.E., (2013), "*The Mushroom Edible and otherwise its habitat and its time of growth"*, MJP publishers, Chennai, India.

Programme	III B.Sc Zoology	**Credit**	2
Semester	VI	**No. of Hrs per week**	2
Course Title	Clinical Lab Technology		
Course Code	17CZOO61	**Max. Marks**	100

Objectives

This syllabus has been formulated to impart basics knowledge of Renal, Liver functions, Serology, Biochemistry and apparatus, units and volumetric analysis in the Clinical Lab Technology.

Unit 1 Renal Function Tests **6 Hours**

1. Urinary System
2. Renal Function
3. Renal Function Tests
4. Urine Collection, Preservation and Analysis.

Unit 2 Liver Function Tests **6 Hours**

1. Introduction
2. Secretion of Bile
3. Function of The Liver
4. Metabolism of Bilirubin
5. Liver Function Tests

Unit 3 Lipids & Lipoproteins **6 Hours**

1. Cholesterol
2. Triglycerides
3. Phospholipids
4. Non Esterified Fatty Acids
5. Lipo Proteins
6. Apo Lipo Proteins

Unit 4 Biochemistry **6 Hours**

1. Sugar
2. Urea
3. Creatinine
4. Uric Acid
5. Cholestrol
6. S.G.O.T.
7. S.G.P.T
8. Gamma Gt
9. T. Protein
10. Triglycerides

Unit 5 Serology **6 Hours**

1. R.A. Factor
2. C- Reactive Protein
3. ASO - Anti Streptolysin Antigen
4. V.D.R.L
5. Anti CCP (Anti Cyclic Citrulinated Peptide)
6. Immunology _ HIV and Antigen & Antibody Reaction (Rapid & ELISA).

Text Book

1. Godkar P.B and Godkar D.P. (2005) Textbook of Medical Laboratory Technology Vol 1 & 2.

Reference Books

1. Walker H.K., Hall W.D., Hurst J.W. (1990) *Clinical Methods: The History, Physical, and Laboratory Examinations*. 3rd edition. Eds Boston: Butterworths.
2. Baveja C.P. and Baveja V. (2019) *Textbook of Microbiology for MLT* – 2nd eds, Arya Publications
3. Maheshwari Nanda (2017) *Clinical Pathology, Haematology and Blood banking* (for DMLT students).