ARULMIGU PALANIANDAVAR ARTS COLLEGE FOR WOMEN
(Autonomous)
(Re-Accredited with 'A' Grade by NAAC)
(A Government Aided College - Affiliated to Mother Teresa Women's University, Kodaikanal)
CHINNAKALAYAMPUTHUR (PO), PALANI -624 615.

PG DEPARTMENT OF ZOOLOGY

SYLLABUS

B.Sc (ZOOLOGY) - 2016-2017

P.G DEPARTMENT OF ZOOLOGY
UG Syllabus 2016-17

SEMESTER - I
PAPER - I
INVERTEBRATA I

Sub Code : **Contact Hours : 4 / week**
Contact Hours : 60 / semester

OBJECTIVES:

- To enable the students to understand the classification of animals.
- To acquire the knowledge about invertebrates and their diversity.
- To understand the economic importance of invertebrates.

Unit : I Taxonomy 15hrs

Introduction to Principles of Taxonomy - Protozoa, Metazoa, Radiata, Bilateria, Acoelomata, Pseudocoelomata, Coelomata. Principles of classification and binomial nomenclature.
General characters and outline classification up to class level with one example – Protozoa, Porifera, Coelenterata, Platyhelminthes, Annelida.

Unit : II Protozoa and Porifera 15hrs

Type Study : Paramecium
General topic : Life cycle of Plasmodium.
Type Study – Ascon sponge - Leucosolenia.
Canal system in sponges- with reference to Leucosolenia.

Unit : III Coelenterata 10hrs

Type study : Obelia colony.
General topic : Polymorphism in Coelenterata, Coral reefs.

Unit : IV Helminthes 10hrs

Liver fluke - Reproductive system.
General topic: Parasitic adaptations of Platyhelminthes.
Ascaris : Type study.

Unit :V Annelida 10hrs

Type study: Earthworm.
General topic: Metamerism in Annelida.

Text Book :

1. N.C.Nair,S.Leelavathy,N.Soundrapandian,T.Murugan,N.Arumugam (2012). A text book of Invertebrates. Saras Publication

Reference Books

1. A manual of Zoology Volume I Invertebrata.Ekambaranatha Ayyar, M., Ananthakrishnan, T.N.,S.Viswanathan (Printers & Publishers) Rt.Ltd. Chennai
2. Invertebrate, Phylum series, Kotpal, R.L. Rostagi Meerut (1990)
3. Jordan : Invertebrate Zoology (S.Chand & co)
4. R.D.Barnes : Invertebtate Zoology (Saunders)
5. Dhami and Dhami : Invertebrate Zoology
6. E.J.W. Barrington : Invertebrata structure and functions (Borton Houghton) (Miffin & ELBS)
7. L.H.Hymen : The Invertebrata Vol I to VI

SEMESTER - I
PAPER –II
INVERTEBRATA II

Sub Code : **Contact Hours : 4 / Week**
Contact Hours: 60 / semester

OBJECTIVES:

- To enable the students to understand the classification of animals.
- To acquire the knowledge about invertebrates and their diversity.
- To understand the economic importance of invertebrates.

Unit : I 10hrs

General characters and outline classification up to class level with following exampleArthropoda, Mollusca and Echinodermata

Unit : IIArthropoda 15hrs

Type Study: Prawn – external morphology, appendages, digestive, excretory systems, Reproductive systems and development.
Peripatus : Affinities (Living fossil)

Unit : III General Topics 10hrs

1. Mouth parts in insects.
2. Insect metamorphosis.
3. Economic importance of insects.

Unit : IV Mollusca 15hrs

Type Study : Pila – External morphology, body organization, Digestive system, Reproductive system and Osphradium only.
General Topics: Pearl culture, Economic importance of Oyster.

Unit : V Echinodermata 10hrs

Type study : Star fish - External morphology, Pedicellariae, Water Vascular system only.
General topic: Larval forms in Echinodermata.

Text Book :

1. N.C .Nair,S.Leelavathy,N.Soundrapandian,T.Murugan,N.Arumugam (2012). A text book of Invertebrates. Saras Publication

Reference Books

1.A manual of Zoology Volume I Invertebrata.Ekambaranatha Ayyar, M., Ananthakrishnan, T.N.,S.Viswanathan (Printers & Publishers) Rt.Ltd. Chennai
2.Invertebrata, Phylum series, Kotpal, R.L. Rostagi Meercut (1990)
3. Jordan : Invertebrate Zoology (S.Chand & co)
4. R.D.Barnes : Invertebtate Zoology (Saunders)
5. Dhami and Dhami : Invertebrate Zoology
6. E.J.W. Barrington : Invertebrata structure and functions (Borton Houghton)(Miffin & ELBS)
7. L.H.Hymen : The Invertebrata Vol I to VI

SEMESTER -II
PRACTICAL – I
PAPER - IV
INVERTEBRATA AND CHORDATA

Sub Code: **Contact Hours : 3/week**
Contact Hours : 45 /semester

Dissection Charts:
Earthworm: Nervous system.
Cockroach: Digestive system and Nervous system.
Frog: Arterial system and Venous system.

Mounting Charts:
Earth worm – Body setae and penial setae.
Cockroach – Mouth parts, salivary apparatus.
Prawn-Appendages.
Shark –Placoid scales.
Frog – Brain.

Spotters:
1. Protozoa- Paramecium-Entire, Paramecium binary fusion and conjugation.
2. Porifera – Ascon sponge, Gemmules, Spicules.
3. Coelenterata – Obelia colony, medusa of Obelia, Physalia and Madrepora.
4. Helminthes- Liver fluke, Redia larva, Cercaria larva, Ascaris male and female.
5. Annelida – Earthworm, Nereis, Leech and Trochophore larva.
6. Arthropoda – Prawn, Nauplius larva, Zoea larva, Mysis larva and Peripatus.
7. Mollusca - Pila, Sepia,Nautilus, Octopus.
8. Echinodermata – Star fish – oral and aboral View, Bipinnaria Larva.
9. Prochordata – Amphioxus, Balanoglossus, Ascidian .
10. Pisces –Anabas, Saccobranchus, Trichiurus savala,Hippocampus.
12. Amphibian – Frog, Bufo, Rhacophorus.
13. Reptilia – Calotes, Naja naja, Russels viper,Draco, Chameleon.
14. Birds – Pigeon, Archaeopteryx
15. Mammalia – Bat, Rabbit

SEMESTER - I
PAPER I
INVERTEBRATA, CHORDATA, GENETICS & ECOLOGY

Sub Code: **Contact Hours : 3 / week**

Contact Hours: 45 / semester

Unit : I **15hrs**

Outline classification of animal kingdom – classification of invertebrates with diagnostic characters with one example in each phylum, a) Amoeba b)Sponge c) Obelia d) Liver fluke e) Earthworm f) Ascaris g) Prawn h) Pila i) Starfish.

Unit : II **10hrs**

Classification of chordates upto order with one example
a) Balanoglossus b) Ascidian c) Amphioxus d) Shark e)Frog
f) Calotes g) Pigeon h) Rabbit.

Unit : III **5hrs**

Migration of Fishes

Identification of Poisonous and non-poisonous snakes

Dentition in mammals.

Unit : IV **10hrs**

Ecosystem: Pond Ecosystem,
Biogeo chemical cycles – Nitrogen cycle & Carboncycle
Wild life conservation

Unit :V **5hrs**

Laws of Mendel, Sex – linked inheritance in man,
Sex determination in man.

Text books:

N. Arumugam - A Text book of Invertebrates
A.Thangamani, S.Prasanna Kumar, L.M.Narayanan N. Arumugam - A Text book of Chordates
N. Arumugam, V.Kumaresan - A Text book of Ecology
Dr.R.P. Meyyan - A Text of Genetics.

B.SC., ZOOLOGY ANCILLARY
SEMESTER - II
PRACTICAL I
Invertebrata, Chordata, Immunology, Ecology and Embryology

Contact Hours : 2 / week
Contact Hours : 30 / semester

Cockroach - Digestive System and Nervous system (Dissection charts).

Frog - Arterial System (Visual Aid / Virtual Dissection)

Cockroach- Salivary glands.

Frog - Mounting of brain (Visual Aid / Virtual Dissection)

Spotters -Paramecium

Obelia colony

Obelia medusa

Ascaris entire (Male and female)

Prawn entire

Starfish (Oral and aboral view).

Immunology : Structure of Immunoglobulins (IgM, IgA, IgG)

Embryology: Frog - Blastula, Gastrula, Yolk plug stage

Ecology: Pond ecosystem (Visit a pond)

SEMESTER I
PART IV
SBC (Skill Based Course)
APICULTURE

Sub code : **Contact Hours: 02 / week**
Contact Hours: 30 / week

Unit : I **6hrs**

Introduction to Apiculture –Scope of Apiculture. Honey bee – Classification, types of honey bees – *Apis dorsata,Apis cerana, Apis florae, Apis indica* and *Apis mellifera*.

Unit :II **6hrs**

Apis indica – Social life of Indian Honey Bee. Morphology of Queen, Drones and Workers. Foraging behavior of Bees.

Unit : III **6hrs**

Choice of Bee in Apiculture – Desirable traits for Bee keeping, Poor choice, Good Choice, Best Choice.

6 hrs

Unit :IV

Principals of Bee keeping – Methods of bee keeping in India – Primitives hives – Wall type, Movable type, Bamboo hive. Modern hives – Langstroth hive, Newton hive. Appliances used in Bee keeping.

Unit : V **6 hrs**

Economic importance of Bee products – Chemical composition, Nutritive value and Medicinal uses of Honey, Bees Wax and Bee Venom and Disease of Honey Bees

Text books:

1.Dr.N.Arumugam, Dr.S.Murugan, Dr.J.Johnson Rajeshwar and Dr.R.Ram Prabhu, (2005), Applied Zoology, Saras Publication, Nagerkovil.

Reference Books:

1. Dhami.P.S & Dhami.J.K, (1976). Invertebrate Zoology, R.Chand & Co., Publishers, New Delhi

2. Ekambaranathayyar. M. (1973). A manual of Zoology Vishwanathan Printers and Publishers Private Ltd., Chennai.

SEMESTER II

PAPER III

CHORDATA

Subcode : **Contact Hours : 7 / Week**

Contact Hours : 105 / semester

Objectives :

- To make the students to appreciate the basic concepts of Chordate diversity.
- To acquire knowledge about various habits and adaptive radiations of vertebrates.

Unit : I Prochordata, Agnatha and Pisces **25hrs**

Chordata characteristics : Outline classification upto class level with examples.
Type study : Prochordata: Amphioxus.
General Topics : Affinities of Hemichordata.
Agnatha : Petromyzon – salient features only.
Type study : Shark.
General topics : Migration of Fishes.

Unit : IIAmphibia **15hrs**

Type study - Frog
General Topics - Parental care in Amphibia.

Unit : IIIReptilia **25hrs**

Type study : Calotes – External morphology, Circulatory system, Nervous system, Endoskeleton- Pectoral and Pelvic girdles only.
General topics : Mesozoic Reptiles – Adaptive radiation and Extinction.
Poisonous and Non- Poisonous snakes - Identification, Poison apparatus, Biting mechanism and First aid.

Unit IV Aves **15hrs**

Type study : Pigeon - External Morphology and Respiratory system only.
General topics :
Flight adaptation in birds.
Flightless birds.
Fossil bird – Archaeopteryx as connecting link.

Unit :V Mammalia **25hrs**

Type study : Rabbit-External morphology, digestive system, Circulatory system, reproductive system, Endoskeleton - Fore limb and Hind limb only.
General Topics:
Egg laying mammals.
Marsupials.
Dentition in mammals.
Adaptations of Aquatic mammals.

Text Book:

1.A.Thangamani,S.Prasannakumar,L.M.Naryanan,N.Arumugam (2010) A Text book of Chordates,Saras Publication.

Reference Book:

1.A manual of Zoology Volume I Chordata

2. Ekambaranatha Ayyar, M., Ananthakrishnan, T.N.,

3.S.Viswanathan (Printers & Publishers) Rt.Ltd. Chennai

4.The Chordates, 2nd Edition, Cambridge University Press, New York

5.Comparative Anatomy of the Vertebrates, Library of Congress Catelogue.

6.Vertebrates, Their structure and Life, Library of Congres Catelogue

7.Life of Vertebrates, J.Z.Young

B.SC., ZOOLOGY ANCILLARY
SEMESTER - II
PAPER- II
PHYSIOLOGY, IMMUNOLOGY, EVOLUTION & EMBRYOLOGY

Sub Code: **Contact Hours : 3 / week**
Contact Hours : 45 / semester

Unit : I **10hrs**

Nutrition – Role of enzymes in digestion

Respiration – Transport of respiratory gases

Excretion - Structure of Nephron, Ultrafiltration

Unit : II **10hrs**

Types of Immunity- Innate and acquired immunity

Lymphoid organs (Primary and secondary).

Structure and functions of Immunoglobulins.

Unit : III **10hrs**

Lamarckism and Darwinism.

Speciation - Allopatric & Sympatric

Unit : IV **10hrs**

Gametogenesis - Spermatogenesis, Oogenesis

Unit : V **5hrs**

Development of frog upto gastrulation

Test tube baby

Text Book:

1.A.Maria Kuttikan &N. Arumugam - Animal Physiology

2.Dulsy Fatima & N.Arumugam - Immunology

3.N.Arumugam - Embryology

4.N. Arumugam –Organic Evolution

SEMESTER II

PART IVSBC – Skill Based Course

POULTRY FARMING

Contact Hours :2hrs/week

Contact Hours: 30hrs/semester

Unit : I Introduction to Poultry Keeping 6hrs

Introduction of Poultry keeping – choosing commercial layers, broilers – White leghorn, Black Minorca, Australorp, Polymouth rock, Rhode Island and Ancona.

Unit : II Construction of Poultry house 6hrs

Construction of Poultry house – principle for the construction of Poultry house. Deep litter system component advantages and disadvantages. Cage system – Cage birds – Californian cages. Management of cage birds – advantages and disadvantages.

Unit : III Rearing and Management of Chick 6hrs

Poultry nutrition – essential & non-essential food, fibre contents, Vitamins and minerals, formulation of supplementary feed. Management of chicks – growers, layers and broilers, summer and winter management, Debeaking.

Unit : IV Poultry Products 6hrs

Poultry product – Eggs – Nutritive value of eggs, cleaning of egg, Preservation, Marketing. By products of poultry –feathers, Poultry manure.

Unit : V Poultry Diseases 6hrs

Poultry diseases and prevention – Ranikhet diseases, Fowl pox, Coryza, Coccidiosis and Polyneuritis.

Text Book

1. Poultry Keeping – M.R.Gnanamani

Reference Books

2. Arumugam, D.S.Murugan, Dr.Johnson Rajeshwar and Dr.R.Ramprabha,(2005), Applied Zoology, Saras Publications, Nagercoil.
3. Ravindranathan. K.r.92005), A text book of Economic Zoology, Dominant Publishers and Distributors, Delhi.
4. The Rearing of Pullets – Bulletin no.54, Her majesty's stationary office, London.
5. Intensive poultry management for egg production,Bulleting No.152. He majresy's stationary office, London.
6. Diseases of poultry – Biester Oxford & IBH.

SEMESTER -III
PAPER - IV
DEVELOPMENTAL BIOLOGY

Subject Code: **Contact Hours: 6 /week**
Contact Hours: 90/ semester

Objectives :

- Embryological processes of different organisms are described.
- Developmental patterns are well explained.
- To appreciate and accept the origin of life and Evolutionary processes.

Unit :I Basic concepts of Embryology: **15hrs**

History of Embryology- Theories ; Preformation, Epigenesis, Mosaic, Regulative, Gradient Theories. Von Baer's Law and Biogenetic law. Gametogenesis – Spermatogenesis, Oogenesis, Structure of Mammalian Sperm and Egg.

Unit : II Fertilizationand Cleavage **20hrs**

Types and Mechanism of Fertilization. Parthenogenesis - Natural and Artificial. Cleavage- Planes, Pattern and types of Cleavage, Cleavage in frog.

Unit : III Blastulation and Gastrulation **15hrs**

Blastulation in Frog andTypes of Blastula . Gastrulation -Fatemap ,Morphogenetic Movements, Gastrulation in frog.

Unit : IV Organogenesis: **20hrs**

Formation of Primary Organ rudiments, Development of Heart and Eye in Frog. Development and Significance of Foetal Membranes in Chick. Placentation inMammals.

Unit : VExperimental embryology **20hrs**

Organizer concept - Spemann experiments. Regeneration – Types and Events in regeneration ; Factors influencing regeneration , Physiological changes during regeneration, Wolffian regeration . Metamorphosis in Frog. Applied embryology – IVF – Methods , Procedure , Advantages and Disadvantages.

Text Book:

1. Dr.N.Arumugam, (2013), Developmental Zoology. Saras publication, Nagercoil.

Reference Books:

1. P.S. Verma and V.K.Agarwal, (1975) , Choradate Embryology , X Ed., S.Chand & Company Pvt.Ltd. Ramnager, New Delhi.

2. Dr. R.C. Delala and R.Verma., (1986-87), A Text Book of Chordate Embryology. VI Ed., Jai Prakashnath & Co.,Meerut city, India.

SEMESTER IV
PAPER - VI
BIOSTATISTICS & BIOINFORMATICS

SUB CODE: **CONTACT HOURS: 4 /week**
CONTACT HOURS: 60 /semester

Objectives :

- To enable the students to understand the data collection and analysis
- To ensure the students to have the knowledge of putting the result into statistical way.

UNIT I: **12hrs**

Introduction to Biostatistics, basic concepts of biostatistics- data, sample, variable. Collection of data-methods of data collection. Processing of data-classification and tabulation –types of classification, tabulation of data, parts of a table.

Diagrammatic presentation of Data-rules for drawing a diagram, kinds of diagrams.

Graphic presentation of Data-technic of constructing graphs of time series, graphs of frequency distribution.

Unit II **12hrs**

Measures of central tendency- Mean Median, Mode- for individual observations, discrete series, and continuous series.

Measures of dispersion: Range, Standard deviation, Standard error & Coefficient of variation.

Unit III: **12hrs**

Probability- Addition theorem and Multiplication theorem, Binomial distribution, Normal distribution and Poison distribution.

Unit – IVHistory,Scope and importance **12hrs**

Important contributions, sequencing development, Aims, Tasks and Applications.

DNA & Protein Sequencing Analysis:

Genomics

Structural functional and comparative genomics

Genome Mapping, DNA Sequencing methods-Sanger method automated method

Gene Expression Analysis- DNA Micro Arrays, Gene Chip.

Human Genome Project.

Proteomics

Protein Sequencing, Determination of structure,Prediction.

Protein Expression Analysis-2D PAGE.

Unit -V: Biological Databases **12hrs**

Nucleic Acid Sequencing Data bases – Gene Bank, EMBL, DDBJ & NCBI, Protein Sequence Databases – TrEMBL, PiR & SWISSPROT.

Sequence Alignment

Pair wise Alignment – FASTA, BLAST.

Multiple Alignment – CLUSTA

Text book

Biostatistics –P.Ramakrishnan (2010) Saras Publication.
Basic Bio informatics - S.Ignacimuthu

REFERENCE BOOKS:

1. S.P. Gupta - Statistical Methods
2. Norman T.J.Bailey - Statistical Methods in Biology
3. S.S.Palanisamy & M.Manoharan - Statistical Methods for Biologists
4. Introduction to bioinformatics -T.K.Attwood & D.J.Parry - Smith
5. Developing Bioinformatics & Computer Skills – Cynthia Gibas & Per Jamback

SEMESTER - IV

PRACTICAL – II
DEVELOPMENTAL BIOLOGY, GENETICS & BIOSTATISTICS AND BIOINFORMATICS

SubCode : **Contact Hours : 06 / week**
Contact Hours : 90/ semester

DEVELOPMENTAL BIOLOGY

1. Temporary Mounting of Chick Blastoderm.
2. Observation and study of prepared Micro Slide - Frog.
   - Two cell stage
   - Four cell stage
   - Blastula
   - Gastrula
3. Observation of Chick Blastoderm
   - 24 hrs, 48 hrs, 72 hrs, 96 hrs.

GENETICS

1. Mendal's Law of Segregation with beads of two different colours.
2. Observation of Simple Mendelian Traits.

Spotters

1. Syndromes - Down syndrome, Klinfelter's Syndrome, Turner's Syndrome.
2. Sex linked inheritance in Man – Colour blindness & Haemophilia.
3. Cytoplasmic inheritance-Kappa particles and Shell coiling in snail Limnaea.

BIOINFORMATICS

1. Internet Browsing – e.mail, Search engines.
2. Biological Data Bases:
   - Nucleic acid sequence Data Bases : NCBI, EMBL
   - Protein sequence Data Bases : SWISS – PROT, Tr-EMBL
3. Biological Websites

SEMESTER III
PART IV
NON MAJOR ELECTIVE - I
SERICULTURE

Sub Code : **Contact hours: 2 / week**
Contact hours: 30 / semester

Unit: I **6hrs**

Introduction to Sericulture- History and present status of Sericulture
Silkworm morphology, life cycle of Silkworm

Unit : II **6hrs**

Grainage- Reproductive seeds & industrial seeds – Voltinism- Univoltine,Bivoltine,Multivoltine eggs

Unit : III **6hrs**

Rearing- Rearing house, Rearing appliances, Types of brushing and bed cleaning.
Rearing of Chawkiworm,Rearing of Late age worms-Shelf rearing,Shoot rearing and Floor rearing, care during Moulting.

6hrs

Unit : IV

Feeding and Optimum Environmental conditions during rearing,Selection of ripe worms,spinning,mounting, harvest,storage and transport of cocoons, Uses of Silk.

Unit :**V** **6hrs**

Silkworm diseases.Flacherie,Muscardine,- Causative agent, Symptoms, Prevention and control measures.

Text Book:

1.Comprehensive Sericulture, G.Ganga (2003) Volume - 1 & Volume - 2,
Oxford & IBH Pub.,Co.,Pvt.,Ltd.,

Reference Books:

1.S.Krishnaswamy et al.(1972).Sericulture manual - 1(Mulberry Cultivation),
manual - 2 (Silkworm rearing) & manual -2 (Silk reeling).Food and
Agriculture Organisation of the United Nations, Rome.

2.Text book of Tropical Sericulture (1975) Japan Overseas Corporation
Volunteers 4 - 2, Hiroo,Sibuya Ku,ToKYO,Japan.

3.Sericulture in India,Venkata Narasaiah (2003), Ashish Publishing House
New Delhi.

SEMESTER - IV
PAPER V GENETICS

Sub Code : **Contact Hours : 04 / week**
Contact Hours : 60 /semester

Objectives :

- To provide basic knowledge about hereditary and environmental variations
- To help the students to appreciate the expressions of Genes.
- To understand the Genetic and Non-Genetic basis of various characters

Unit : I **15hrs**

Mendel's Law of Inheritance - Gregor Mendel's life, Monohybrid cross and Law of Segregation, Dihybrid Cross and Law of Independent Assortment, Alleles, Homozygote and Heterozygote , Genotype and phenotype, Back Cross and Test Cross.

Unit : II **10hrs**

Gene interactions - Allelic interaction - Incomplete dominance, Codominance, Lethal genes, - Non-allelic Gene Interaction – Epistasis - Dominant and Recessive, Complementary Gene Interaction, Supplementary Gene Interaction.

Unit : III **15hrs**

Multiple alleles - A , B , O and Rh blood group, Polygenic Inheritance - Inheritance of Skin Color in Man.

Linkage - Definition, Types of Linkage – Complete and Incomplete Linkage in Drosophila, Crossing Over Definition, Mechanism of crossing over, Theories of crossing over, Kinds of Crossing Over, Cytological Basis of Crossing over- Stern's experiment, Tetrad analysis.

Unit : IV **10hrs**

Sex Determination in Man and Drosophila. Sex Linked Inheritance in Man- Colour Blindness and Hemophilia. Extra Chromosomal Inheritance - Kappa particles in Paramecium and Shell Coiling in Snail.

Unit : V **10hrs**

Twin studies - Monozygotic and Dizygotic Twins.

Syndromes – Down's Syndrome, Klinefelter's Syndrome,Turner's Syndrome.

Pedigree chart - Eugenics - Positive and Negative. Inbreeding and Outbreeding.

Text Book:

1.R.P.Meyyan., (2013). Genetics, Saras Publication, Nagerkoil, VII Ed.,

Reference Books

1. P.S.Verma& T.K.Agarwal., (2007).S.Chand & Co., New Delhi.
2. Mckusick, V.A., (1968) Human Genetics, Prentice- Hall of India Private Limited, New Delhi.

SEMESTER IV
PART IV
SBC (Skill Based Course)
SERICULTURE

Sub Code : **Contact hours: 2 / week**
Contact hours: 30 / semester

Unit: I **6hrs**

Introduction to Sericulture- History and present status of Sericulture
Silkworm morphology, life cycle of Silkworm

Unit : II **6hrs**

Grainage- Reproductive seeds & industrial seeds – Voltinism- Univoltine,Bivoltine,Multivoltine eggs

Unit : III **6hrs**

Rearing- Rearing house, Rearing appliances, Types of brushing and bed cleaning.
Rearing of Chawkiworm,Rearing of Late age worms-Shelf rearing,Shoot rearing and Floor rearing, care during Moulting.

6hrs

Unit : IV

Feeding and Optimum Environmental conditions during rearing,Selection of ripe worms,spinning,mounting, harvest,storage and transport of cocoons, Cocoon Marketing.

Unit :**V** **6hrs**

Silkworm diseases.Flacherie,Muscardine,- Causative agent, Symptoms, Prevention and control measures.

Text Book:

1.Comprehensive Sericulture, G.Ganga (2003) Volume - 1 & Volume - 2,
Oxford & IBH Pub.,Co.,Pvt.,Ltd.,

Reference Books:

1.S.Krishnaswamy et al.(1972).Sericulture manual - 1(Mulberry Cultivation),
manual - 2 (Silkworm rearing) & manual -2 (Silk reeling).Food and
Agriculture Organisation of the United Nations, Rome.

2.Text book of Tropical Sericulture (1975) Japan Overseas Corporation
Volunteers 4 - 2, Hiroo,Sibuya Ku,ToKYO,Japan.

3.Sericulture in India,Venkata Narasaiah (2003), Ashish Publishing House
New Delhi.

SEMESTER -V
PAPER - VII
BIOCHEMISTRY

Sub Code: **Contact Hours : 6 / week**
Contact Hours : 90 / sem

Objectives :

- To know the chemical basis of biological phenomena.
- To enable the students to understand the metabolic cycles.
- To learn about the regulation of body functions.

Unit: I Carbohydrate and Carbohydrate metabolism 20hrs

Structure, Properties, Classificationand Biological importance.
Glycolysis, Kreb's cycle.

Unit : II Protein and Protein Metabolism: 20hrs

Proteins : Structure, Properties, Classification and Biological importance.
Deamination, Transamination& Transmethylation
Aminoacids : Structure, Properties and Classification

Unit : IIILipid and Lipid metabolism **20hrs** Structure, properties, classification and Biological importance
ß - Oxidation of Palmitic acid and its energetics.

Unit : IV Hormones **15hrs**

Classification of Hormones - Protein and Steroid hormones,
Mechanism of Protein hormone action.

Unit : V Enzymes and Vitamins **15hrs**

Classification, Mechanism of Enzyme action,
Factors affecting Enzyme activity. Coenzymes and Isoenzymes,
Vitamins - Classification and structure.

Text Book

1. N. Arumugam *et al.*,Text book of Biochemistry, Saras publications.

Reference Books

1. Lehninger, Nelsons & co – Principles of Biochemistry
2. Lubert stryer - Bio chemistry
3. Bell, Davidson & Scarborough – Text book of Physiology and biochemistry.
4. Jeyaraman, J.J., 1981. - Laboratory manual of Biochemistry

SEMESTER V
Paper - VIII
CELL & MOLECULAR BIOLOGY

Sub Code : **Contact Hours : 6 / week**
Contact Hours : 90 / semester

Objectives :

- Provides knowledge about the structural organization of cell.
- The cell organelles provide the importance of structure and march towards the fundamental functional status.
- It gives an insight into the molecular basis of all functions related to the cell.

Unit -I **10hrs**

Discovery of cell & Cell theory, Prokaryotes (E.coli),Eukaryotes(Animal cell). Microscopy: Compound and Electron microscopes.

Unit – II **20hrs**

Ultrastructure and functions – Plasma membrane, Endoplasmic reticulum, Lysosomes, Ribosomes, Golgicomplex and Mitochondria.

Unit –III **20hrs**

Nucleus, Nucleolus and Chromosome.

Cell division –Mitosis and Mitotic apparatus, Meiosis and Synaptonemal complex . Significance of cell division.

Unit –IV **20hrs**

Nucleic acids – Structure of DNA (Watson & Crick Model), Replication of DNA-Semi conservative replication, RNA – Types (mRNA, rRNA, & tRNA) and functions.

Unit – V **20hrs**.

Central Dogma of Protein synthesis-Transcription and Translation. Control of gene expression – lac operon.

Text book:

1. Arumugam(2005) - Cellbiology and MolecularBiology Saras Publications.Nagarcoil.

Reference Books :

1.P.S.Verma and V.K.Agarwal (2011),Cytology,S.Chand and Co., New Delhi

2.S.C.Rastogi(1988),Cell Biology,Tata Mc Graw Hill Publishing Co.,New Delhi

SEMESTER - V

ELECTIVE -1
IMMUNOLOGY

Subject Code: **Contact hours: 5 / week**
Contact hours: 75 / semester

Objectives :

- To enable the students to understand the basic concepts of defense mechanism.
- To expose the students into the field of medicine with powerful preventive, therapeutic and diagnostic tools.

Unit : I **15hrs**

History and Scope of Immunology – Types of Immunity - Innate and Acquired Immunity. Innate – Physical and Mechanical factors, Biochemical, Cellular Genetic factors and other factors. Acquired Immunity – Active & Passive Immunity – Natural and Artificial Immunity.

Unit: II **10hrs**

Antigen –Epitopes & Paratopes, Chemical nature of Antigen, Cross Reactive Antigen, Heterophil Antigen. Immunoglobulin G, A, M, D & E – Structure and Functions.

Unit: III **20hrs**

Lymphoid organs – Primary (Thymus, Bone Marrow and Bursa of Fabricius). Secondary (Spleen, Lymph node, Tonsil and Payer's patches). Cells of the Immune System – T celland its sub populations, B cell. Immune Responses- Cell mediated Immunity (CMI) and Antibody Mediated Immunity (AMI) .

Unit: IV **15hrs**

Major Histocompatibility Complexes – MHC restriction Phenomenon, MHC antigen, Human Leucocyte Antigen (HLA) and functions.
Transplantation Immunology – Graft Rejection.
Hypersensitivity reactions – Types : I, II, III, IV, & V.

Unit : V **15hrs**

Tumour Immunology- Properties, Causes, Tumour antigens, Factors, Immune responses and Immunotherapy. Autoimmune Diseases – Classification, Causes and Pathogenesis of Haemolytic anemia, Myesthema gravis and Lupus erythematosus.

Text Book

1.Dr.N.Arumugam *et al.*,(2013) – Text book of Immunology, Saras Publication.

Reference Books

1 Kuby, (1992), Immunology, IV Ed., - W.H. Freeman and company.

2 Evan M.Roitt., (1988), Essentials Immunology- VI Ed., ELBS imprint.

SEMESTER - V
ELECTIVE -2 MICROBIOLOGY

Subject Code: **Contact hours: 05/ week**

Contact hours: 75/Semester

Objectives :

- To enable the students to understand the basic concepts of microbial mechanism.
- To expose the students into the field of medicine with powerful preventive, therapeutic and diagnostic tools.

Unit : I Introduction **20hrs**

History and scope of microbiology.
Bacteria – classification of Bacteria, Ultra structure of Bacteria (*E.Coli*).
Virus - Classification of virus, Structure of viruses.
Bacterial culture – Batch Culture, Plate culture and Differential culture.
Bacterial growth - Growth Rate, Growth Curve
Culture Media-Preparation and types of culture media.

Unit : II Food Microbiology **15hrs**

Food spoilage (Meat, Milk, egg, Fruits and Vegetable)
Food Poisoning – Food intoxication-Botulism & Food infection- *salmonellosis*
Food Preservation – Pickling, Salting, Canning, Pasteurization & Refrigeration

Unit : III Agricultural & Environmental Microbiology **10hrs**

Agricultural and environmental microbiology: Biofertilizer – *Rhizobium.* Biological nitrogen fixation, nitrogenase enzyme, Nif gene
Biopesticide – *Bacillus thrungiensis*, Biodegradation – *Pseudomonas.*

Unit : IV Industrial Microbiology **15hrs**

Fermentation Technology – products from fermentation industries-enzymes, organic acids, biopesticides, biofuel, aroma compounds, amino acids & alcohol. Role of microbes in industrial processs.
Production of Antibiotics – Commerical production of Penicillin.

Unit : VMedical Microbiology **15hrs**

Bacterial disease – Tuberculosis and Diptheria.
Virus Disease –Hepatitis – B and measles.
Sexually Transmitted Diseases-Gonorrhoea & Syphyllis.
Fungal diseases – Mycosis.

Text Book

1. N.Arumugam *et al.*, (2011), Microbiology, Saras Publication

Reference Books

1. Dr.R.C.Dubey .Dr.D.K.Maheswari, (2010), A Text book of Microbiology, S.Chand & CO Ramnager, New Delhi.
2. Samuel Baron , Medical microbiology, II Ed., Wesley publishing company, California.

SEMESTER - VI

PRACTICAL - III

BIOLOGICAL CHEMISTRY
AND
CELL & MOLECULAR BIOLOGY

Subject Code:

Contact Hours : 3 / week
Contact Hours : 45 / semester

BIOCHEMISTRY

Enzyme Activity: Effect of Temperature on Salivary Amylase activity Q_{10} analysis.

Qualitative tests for Protein, Carbohydrate and Lipid.

Chromatography – Paper Chromatography (Demonstration only).

Principle & applications – p^H meter, Colori meter and PAGE

CELL & MOLECULAR BIOLOGY

Identification of Mitotic stages in Onion root tip

Preparation of Human Blood Smear

Spotters / Models

E.coli, Golgi bodies, Endoplasmic Reticulum,Nucleus

Mitochondria and Chromosome

Giant chromosomes in Chironomus larvae

Watson & Crick model of DNA - Model.

DNA replication - Semi conservative Replication - Model.

SEMESTER V
PART IV
ORNAMENTAL FISH CULTURE (SBC)

SUB CODE : **Contact Hours : 2 / week**

Contact Hours : 30 / semester

Objectives:

- To implement earn while you learn, subjects such as job oriented programmes are the need of the hour.
- Self reliance can be possible for the students by introducing such courses.
- Make the students to enter into the small scale industry with minimum input.

Unit : I **6 hrs**

Construction of Home Aquarium: Design and Construction of Aquarium tank, Accessories used in Aquarium tank., Aquarium plants.

Unit : II **6 hrs**

Taxonomy and Biology of Popular Ornamental fishes: Live bearers (ovo-viviparous)- Guppy and Molly. Egg layers (oviparous)- Gold fish and Angelfish.

Unit : III **6 hrs**

Nutritional requirements of Ornamental fishes- different kinds of feeds (Live food & Artificial food).

Unit : IV **6hrs**

Cleaning the Aquarium, Control of Snail and Algal growth. Common diseases of Aquarium fishes.

Unit : V **6hrs**

Commercially important Marine Ornamental fishes, Entrepreneurship Development in Ornamental Fish Culture.

Reference Book

1. J.D.Jameson and R. Santhanam. (1996). Manual of Ornamental Fishes and Farming Technologies- Fisheries College & Research Institute TANVASU, Tuticorin-628008.
2. R.Santhakumar et al., (2007). Manual on fresh water Ornamental Fish Culture, Dept.of Fisheries extension, Fisheries College and Research Institute, TANVASU, Tuticorin-628008.
3. V.K.Venkataramani et al., (2004). Biodiversity and stock assessment of Marine Ornamental fishes. Dept of Fisheries biology & Capture fisheries, Fisheries college & Research institute,TANVASU,Tuticorin-628008.

SEMESTER VI
PAPER – IX ANIMAL PHYSIOLOGY

Subject Code: **Contact Hours: 6 / week**
Contact Hours: 90 / sem

Objectives :

- To make the students to understand the fundamentals of physiology.
- To provide the knowledge of mechanism of actions of structural units of all organs.
- To know the communication of all animals with their environment through sense organs.

Unit: IHistorical background, Food & Nutrition **10hrs** Food : Balanced Diet, malnutrition

Nutrition: Types of nutrition and types of feeding

Digestion: Digestive system and digestive glands, Mechanical digestion, Chemical Digestion and Absorption

Unit : IIRespiration and Circulation **20hrs**

Respiration: Respiratory organs, Respiratory pigments, Mechanism of Respiration in Man, Transport of respiratory gases, RQ.

Circulation: Blood and blood constituents

Structure & Function of Human heart, ECG, Heart Beat,

Cardiac Cycle, origin and conduction of Heart beat and Haemodynamics

Unit : III Excretion and Osmoregulation: **20hrs**

Excretory organs, Excretory products, Ammonotelic, Ureotelic and Uricotelic animals.

Structure of Kidney and Structure and Function of Nephron, Mechanism of Urine Formation.

Osmoregulation – Poikilosmotic and Homeoosmotic animals

Osmoregulation in freshwater, marine, estuary and terrestrial animals.

Thermoregulation.

Unit : IVNervous co-ordination and Muscle **20hrs**

Structure of neuron, Types of Neuron

Nerve impulse - Conduction of Nerve impulse, Synaptic Transmission, Properties of Nerve impulse,Neuromuscular junction and Reflex action

Muscle: Types of Muscle, Ultra structure of Myofibril, Muscle Proteins. Physico-Chemical properties and Mechanism of Muscle contraction

Unit : VReceptors and Endocrine Glands **20hrs**

Receptors : Photoreceptor, Mechanoreceptor, Chemoreceptor and Thermoreceptor.

Endocrine Glands : Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal and Sex hormones.

Endocrine control on reproductive cycle :Oestrous cycle & Menstrual cycle,

Pregnancy, Parturition and Mammary glands.

Text book:

1. Verma and Agarwal – Animal physiology

Reference Books:

1. Gordon, S.Maleon *et. al* – Animal function – principles and adaptation.
2. Hoar S.William – General and Comparative physiology

SEMESTER - VI
PAPER -X
BIOTECHNOLOGY

Sub Code : **Contact Hours : 07/ Hour**
Contact Hours : 105/ Semester

Objectives :

- To know the recent trends in biotechnology
- To make the students to understand the integral application of knowledge and techniques.
- To make the students to understand the application of biotechnology in medicine and industry.

Unit I : rDNA Technology **25hrs**

Scope, trends and current scenario of Biotechnology in India, Methods of Gene cloning. Tools of gene cloning- Restriction endonucleases, DNA ligases, cloning vectors - plasmid, Ti plasmid, cosmid and Shuttle vector. rDNA protein -Interferon, Interleukins, Tissue Plasminogen Activator (tPA).

Unit II : Animal cell culture **25hrs**

Cell culture technique, Primary and Secondary culture
Stem cell Culture – Embryonic stem cell and Adult stem cell
Monoclonal antibodies - Production and applications
Intellectual property rights and patent

Unit III : Transgenesis **20hrs**

Gene transfer Methods- Microinjection,Electroporation and Retro viral method.
Transgenic animals and their applications-Fish,Mice,Goat,Cow and Cattle.
Animal cloning-Sheep.

Unit IV : Environmental Biotechnology **20hrs**

Biodegradation-Degradation of Xenobiotics, Superbug-construction of Superbug.
Bioremediation-Insitu bioremediation,composting land farming and digestion above ground reactors.
Bioleaching-Direct leachning, Indirect leaching.
Microorganism involving in Bioleaching-Heaps or Dump method, Insitu Bioleaching, Bioreactors.

Unit V : Nanotechnology **15hrs**

Drug delivery system, drug delivary technologies, adopted technology for drug delivery. DNA finger printing and its applications- Biosensors and Biochips.

Text Book:

1. V.Kumaresan, (2015), Biotechnology – Saras Publication.

Reference Books:

1. R.C Dubey, (1993), A Text book of Biotechnology. III Ed.,S.Chand & Company Ltd.
2. H.K.Das,(2004), Text book of Biotechnology.III Ed., Wiley India (P) Ltd.
3. S.C.Rastogi, (2007), Biotechnology- Principles and Applications- I Ed., Narosa Publishing house.

SEMESTER – VI

PRACTICAL IV

ANIMAL PHYSIOLOGY AND BIOTECHNOLOGY

Sub code:

Contact Hours : 3 / week
Contact Hours : 45 / semester

ANIMAL PHYSIOLOGY

1. Estimation of Rate of Oxygen consumption in fish.
2. Effect of Temperature on Ciliary activity of Fresh water mussel. (Procedure only)
3. Effect of Temperature on heartbeat of fresh water mussel. (Procedure Only)
4. Qualitative detection of Excretory products Ammonia, Urea and Uric acid

EXPERIMENTAL SET UP:

1. Kymograph
2. Sphygmomanometer
3. Haemoglobinometer
4. Haemocytometer

BIOTECHNOLOGY - (Demonstration only)

1. Extraction of DNA.
2. Extraction of RNA
3. Agarose Gel Electrophoresis.
4. Gel Documentation
5. PAGE
6. PCR
7. Transgenic Techniques – Microinjection and Electroporation

SEMESTER –VI

ELECTIVE – 3 EVOLUTION

Sub code : Contact hours: 5 / week

Contact hours: 60 / semester

Unit : I 15hrs

Evidences: Morphological – Homologus, Analogus and Vestigial Structures. Embryological, Serological & Biochemical and Palentological evidences for Evolution.

Theories: Lamarckism and Neolamarckism, Darwinism and Neodarwinism, Modern synthetic theory.

Unit : II 10hrs

Fossils: Types, Methods of Fossilization- Methods of dating the Fossils, Geological time scale.
Sources of Variation: Mutation, Genetic Recombination, Genetic drift and Hybridization.

Unit : III 15hrs

Macroevolution: Elemental Forces and Mechanism.
Hardy –Weinberg law: Factors affecting the Hardy – Weinberg Equilibrium.
Microevolution: Adaptive Coloration, Mimicry and Coevolution.

Unit : IV 10hrs

Macroevolution: Patterns: Divergent, Convergent and Parallel. Adaptive Radiation in Darwin's Finches. Simpson's adaptive grid.
Speciation: Allopartic and Sympatric, Isolating Mechanism – Prezygotic and Postzygotic isolating mechanisms. Modes of evolution.

Unit : V 10hrs

Orthogenesis.
Human Evolution: Biological and Cultural Evolution.

Text Book

1. Organic Evolution : N.Arumugam, (2005), Organic Evolution, Saras Publication.

Reference Books

1.G.L.Stebbins, (1979), Process of Organic Evolution, Prentice Hall India, New Delhi.
2. Veer Bala Rastogi, (1983), Organic Evolution, Kadarnath & Ramnath Publication, New Delhi.
3. T.K.Renganathan, (1982), Evolution, C.M.S Printing Press, Palayamkottai.

Semester VI

NON MAJOR ELECTIVE - II

HUMAN REPRODUCTVE BIOLOGY

Subject Code: **Contact Hours : 2 / week**

Contact Hours : 30 / semester

Unit : I Introduction **6hr**

Sexual cycles in Human-Puberty, Spermiation , Ovulation , Menstrual cycle , Pregnancy, Childbirth, Lactation and Menopause.

Unit : II Reproductive system **6hrs**

Male and Female Reproductive Systems-Structure of sperm, Graffian follicle and Ovum- Secondary sexual characters.

Unit: IIIHormonal control of reproductive cycle 6**hrs**

FSH , LH , Androgen , Oestrogen , Progesterone , Chorionic gonadotropin , Relaxin, Oxytocin and Prolactin.

Unit: IV Sexual diseases **6hrs**

Sexually transmitted diseases –Causes , Symptoms and Treatment of Gonorrhea and Syphilis; AIDS - Causes , Structure of HIV , Transmission , Symptoms , Diagnosis, Control and Treatment ; Counseling.

Unit : V Infertility and IVF **6hrs**

Causes of infertility ; Test tube baby – Procedure , Advantages and Disadvantages. Test tube baby centers in India. Birth control measures.

Reference Books

1 . A. Mani *et al* ., Microbiology (2011) Saras publication

2 . A. Mariakuttican and N . Arumugam , Animal physiology (2010) Saras publication