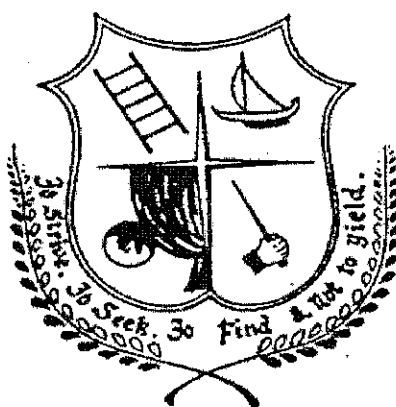


**ETHIRAJ COLLEGE FOR WOMEN  
(AUTONOMOUS)  
CHENNAI – 600 008**



**POST GRADUATE AND RESEARCH DEPARTMENT OF ZOOLOGY  
BRANCH VI A –ADVANCED ZOOLOGY AND BIOTECHNOLOGY  
REVISED SYLLABUS FOLLOWING CHOICE BASED CREDITSYSTEM (CBCS)  
B.Sc., ADVANCED ZOOLOGY AND BIOTECHNOLOGY SYLLABUS 2015 - 2016**

**ETHIRAJ COLLEGE FOR WOMEN**  
**POST GRADUATE AND RESEARCH DEPARTMENT OF ZOOLOGY**  
**DEGREE OF BACHELOR OF SCIENCE**  
**B.Sc., Branch – VI A ADVANCED ZOOLOGY AND BIOTECHNOLOGY**  
**REVISED SYLLABUS FOLLOWING CBCS OF JUNE 2015**

Department of Zoology syllabi has been revised with effect from the academic year 2015 – 2016, by introducing CBCS and Part IV and Part V components as specified by the Government of Tamil Nadu. Part IV and Part V components will seek to build the capacity of the students and provide inputs for her social service and social analysis capabilities.

Every academic year is divided into two semester sessions. Each semester will have a minimum of 90 working days following the day order system. Teaching is organized into a modular pattern of credit courses. Credit is normally related to the number of hours a teacher teaches a particular subject. It is also related to the number of hours a student spends learning a subject or carrying out an activity.

**REGULATIONS**

**1. ELIGIBILITY FOR ADMISSION**

Candidates for admission to the first year of the Degree of Bachelor of Science shall be required to have passed the Higher Secondary Examination (Academic Stream) conducted by the Government of Tamil Nadu or an Examination accepted as equivalent thereto by the Syndicate of the University of Madras.

**2. ELIGIBILITY FOR THE AWARD OF DEGREE**

A candidate shall be eligible for the award of the Degree only if she has undergone the prescribed course of study for a period of not less than three academic years, passed the examinations of all the Six Semesters prescribed.

**3. COURSE OF STUDY**

The main subject of study for Bachelor Degree shall consist of the following.

<b>PART – I</b>	<b>:</b>	<b>Foundation Courses exclusive for languages</b>
<b>PART – II</b>	<b>:</b>	<b>English</b>
<b>PART – III</b>	<b>:</b>	<b>Core Courses</b>
<b>PART – III</b>	<b>:</b>	<b>Allied Subjects I and II</b>
<b>PART - IV</b>	<b>:</b>	<b>Non major electives and skill based subjects</b>
<b>PART - V</b>	<b>:</b>	<b>Extension activities / Sports / NCC</b>



## 5. CLASSIFICATION OF SUCCESSFUL CANDIDATES

### Part I, II, III, & IV.

Successful candidates passing the examination and securing the marks (i) 60 percent and above and (ii) 50 percent and above but below 60 percent in the aggregate shall be declared to have passed the examination in the FIRST and SECOND classes respectively. All other successful candidates shall be declared to have passed the examination in the THIRD class.

Candidates who pass all the examinations (Part I, II, III & IV) prescribed for the course in the FIRST APPEARANCE ITSELF ALONE are eligible for ranking.

## 6. QUESTION PAPER PATTERN

Unless and otherwise specified in the syllabus for each paper, the pattern of question paper shall be as follows:

COMPONENT	NATURE OF THE QUESTION	MAXIMUM MARKS
Part A	Answer/Definition	10 x 2 = 20
Part B	Description	5 x 8 = 40
Part C	Application/Analysis/synthesis	2 x 20 = 40

**Part A :** Answer/Definition – 10 questions – two from each unit

**Part B :** 5 questions are to be answered out of 8 covering all 5 units

**Part C :** 2 questions are to be answered out of 4 questions covering all the 5 units.

## 7. RANKING

Candidates who pass all the examinations prescribed for the course in the first appearance only are eligible for ranking.

## 8. CORE COURSE CONSISTS OF

### PART III – 1. MAIN SUBJECTS

- PAPER – I - Invertebrata
- PAPER – II - Chordata
- PAPER – III - Cell Biology
- PAPER – IV - Genetics
- PAPER – V - Animal Physiology
- PAPER – VI - Developmental Biology
- PAPER – VII - Environmental Biology
- PAPER – VIII - Biotechnology
- PAPER – IX - Economic Zoology
- PAPER – X - Immunology
- PAPER – XI - Evolution

- PAPER –XII - Microbiology
- PRACTICAL – I - Invertebrata and Chordata
- PRACTICAL – II - Cell Biology and Genetics
- PRACTICAL –III - Developmental Biology, Environmental Biology, Evolution, Medical Laboratory Techniques and Bio-Instrumentation.
- PRACTICAL –IV - Animal Physiology, Microbiology, Immunology Biotechnology and Economic Zoology
- PART III – 2. ELECTIVES
- ELECTIVE – I - Bioinstrumentation
- ELECTIVE – II - Medical Laboratory Techniques
- ELECTIVE – III - Entomology.

**PART - III 3. ALLIED SUBJECTS**

**ALLIED I – FOR BATCHES: I & II**

**(Offered by Plant Biology and Plant Biotechnology Department)**

- a. Allied Botany Theory Paper – I
- b. Allied Botany Theory Paper – II
- c. Allied Botany Practical

**ALLIED II – FOR BATCH : I**

**(Offered by Zoology Department)**

- d. Allied Biochemistry Paper – I
- e. Allied Biochemistry Paper – II
- f. Allied Biochemistry Practical

**ALLIED II – FOR BATCH : II**

**(Offered by Chemistry Department)**

- d. Allied Paper I General Chemistry
- e. Allied Paper II Bio-organic chemistry
- f. Allied Chemistry Practical

**PART – IV NON MAJOR ELECTIVES**

- a. ZB15/1N/AQU Aquaculture - Semester – I. (Offered to Other Department Students).
- b. ZB15/2N/VER Vermitechnology – Semester – II (Offered to Other Department Students).

**COURSE PROFILE  
PART-III CORE PAPER**

SEM	COURSE CODE	COURSE TITLE	HRS /WK	CREDITS	CA MARKS	END SEMESTER MARKS	TOTAL
I	ZB15/1C/INV	PAPER-I –Invertebrata	8	5	40	60	100
II	ZB15/2C/CHO	PAPER-II-Chordata	8	5	40	60	100
I & II	ZB15/2C/PR1	PRACTICAL-I Invertebrata and Chordata	2	4	40	60	100
III	ZB15/3C/CBY	PAPER-III -Cell Biology	8	5	40	60	100
IV	ZB15/4C/GEN	PAPER-IV –Genetics	8	5	40	60	100
III& IV	ZB15/4C/PR2	PRACTICAL- II- Cell Biology and Genetics	2	4	40	60	100
V	ZB15/5C/APY	PAPER-V -Animal Physiology	4	4	40	60	100
V	ZB15/5C/DBY	PAPER-VI – Developmental Biology	4	4	40	60	100
V	ZB15/5C/EBY	PAPER-VII - Environmental Biology	4	4	40	60	100
V	ZB15/5C/BIO	PAPER-VIII – Biotechnology	4	4	40	60	100
V	ZB15/5C/EZY	PAPER-IX -Economic Zoology	4	4	40	60	100
V	ZB15/5E/BIN	ELECTIVE-I-Bio- Instrumentation	4	2	40	60	100
VI	ZB15/6C/IMM	PAPER-X – Immunology	4	4	40	60	100
VI	ZB15/6C/EVO	PAPER-XI –Evolution	4	4	40	60	100
VI	ZB15/6C/MIC	PAPER-XII – Microbiology	3	4	40	60	100
VI	ZB15/6E/MLT	ELECTIVE-II-Medical Laboratory Techniques	4	2	40	60	100
VI	ZB15/6E/ENT	ELECTIVE-III- Entomology	4	1	40	60	100
V & VI	ZB15/6C/PR3	PRACTICAL III- Developmental Biology, Environmental Biology, Evolution, Medical Laboratory Techniques and Bio- Instrumentation.	2	4	40	60	100
V & VI	ZB15/6C/PR4	PRACTICAL IV- Animal Physiology, Microbiology, Immunology Biotechnology and Economic Zoology.	2	4	40	60	100

Part III ALLIED

2015-2016

SEM	COURSE CODE	TITLE OF THE PAPER	HOURS/ WEEK	CREDIT	CA	SE	TOTAL
I	ZB15/1A/ZO1	Allied Zoology paper I (for PBPB students)	4	4	40	60	100
II	ZB15/2A/ZO2	Allied Zoology PAPER-II (for PBPB students)	4	4	40	60	100
II	ZB15/2A/AZO	Allied Zoology Practical (for PBPB students)	2	2	40	60	100
III	ZB15/3A/BC1	Allied biochemistry PAPER-I (for Batch I Students)	4	4	40	60	100
IV	ZB15/4A/BC2	Allied Biochemistry paper II (for batch I Students)	4	4	40	60	100
IV	ZB15/4A/ABC	Allied Biochemistry Practical( for Batch I students)	2	2	40	60	100

Part IV Non-Major Elective

2015-2016

SEM	COURSE CODE	TITLE OF THE PAPER	HOURS/ WEEK	CREDIT	SE	TOTAL
I	ZB15/1N/AQU	Aquaculture	2	3	50	50
II	ZB15/2N/VER	Vermitechnology	2	3	50	50

Course evaluation

10 questions out of 12 = Maximum marks 10 X 5 = 50

(Short answers in 300 words)

The above highlighted courses of UG programme enrich the skills in employability/skill development/Entreneurship which caters to the needs of the students.

**EVALUATION PATTERN**  
**PART III : CORE SUBJECTS**

Sem	Course Code	Course Title	CA					Total	End Semester Marks	Total
			Test		Assignment		Participation			
			No	Mark	No	Mark				
I	ZB15/1C/INV	PAPER-I – Invertebrata	2	20	2	10	10	40	60	100
II	ZB15/2C/CHO	PAPER-II-Chordata	2	20	2	10	10	40	60	100
III	ZB15/3C/CBY	PAPER-III -Cell Biology	2	20	2	10	10	40	60	100
IV	ZB15/4C/GEN	PAPER-IV –Genetics	2	20	2	10	10	40	60	100
V	ZB15/5C/APY	PAPER-V -Animal Physiology	2	20	2	10	10	40	60	100
V	ZB15/5C/DBY	PAPER-VI – Developmental Biology	2	20	2	10	10	40	60	100
V	ZB15/5C/EBY	PAPER-VII - Environmental Biology	2	20	2	10	10	40	60	100
V	ZB15/5C/BIO	PAPER-VIII – Biotechnology	2	20	2	10	10	40	60	100
V	ZB15/5C/EZY	PAPER-IX -Economic Zoology	2	20	2	10	10	40	60	100
V	ZB15/5E/BIN	ELECTIVE-I- Bio-Instrumentation	2	20	2	10	10	40	60	100
VI	ZB15/6C/IMM	PAPER-X – Immunology	2	20	2	10	10	40	60	100
VI	ZB15/6C/EVO	PAPER-XI –Evolution	2	20	2	10	10	40	60	100
VI	ZB15/6C/MIC	PAPER-XII – Microbiology	2	20	2	10	10	40	60	100
VI	ZB15/6E/MLT	ELECTIVE-II- Medical Laboratory Techniques	2	20	2	10	10	40	60	100
VI	ZB15/6E/ENT	ELECTIVE-III- Entomology	2	20	2	10	10	40	60	100



**EVALUATION PATTERN**

**PART III : CORE SUBJECTS**

Sem	Course Code	Course Title	CA				End Semester Marks	Total
			Test	Observation	Model	Total		
II	ZB15/2C/PR1	PRACTICAL-I Invertebrata and Chordata	20	10	10	40	60	100
IV	ZB15/4C/PR2	PRACTICAL-II Cell Biology and Genetics	20	10	10	40	60	100
VI	ZB15/6C/PR3	PRACTICAL III- Developmental Biology, Environmental Biology, Evolution, Medical Laboratory Techniques and Bio- Instrumentation.	20	10	10	40	60	100
VI	ZB15/6C/PR 4	PRACTICAL IV- Animal Physiology, Microbiology, Immunology Biotechnology and Economic Zoology.	20	10	10	40	60	100

**EVALUATION PATTERN  
PART III : ALLIED SUBJECTS**

Sem	Course code	Course title	CA					Total	End semester marks	Total
			Test Assignment Participation							
			No	Mark	No	Mark				
I	ZB15/1A/ZO1	Allied Zoology paper I (for PBPB students)	2	20	2	10	10	40	60	100
II	ZB15/2A/ZO2	Allied Zoology paper II (for PBPB students)	2	20	2	10	10	40	60	100
II	ZB15/2A/AZO	Allied Zoology Practical	2	20	2	10	10	40	60	100
III	ZB15/4A/BCI	Allied Biochemistry paper I (for Batch I)	2	20	2	10	10	40	60	100
IV	ZB15/4A/BC2	Allied Biochemistry paper II (for Batch I)	2	20	2	10	10	40	60	100
IV	ZB15/4A/ABC	Allied Biochemistry Practical	2	20	2	10	10	40	60	100

## SEMESTER I

### PAPER - I INVERTEBRATA

TEACHING HOURS -120Hrs

COURSE CODE-ZB15/IC/INV  
CREDITS- 5

#### UNIT – I:

Introduction to animal kingdom-general characters and classification of Invertebrata up to class - levels of organization -unicellularity vs multicellularity -organization of germ layers (upto triploblastic) Development of coelom- acoelomate, pseudocoelomate and eucoelomate organization-symmetry – types.

#### Phylum : Protozoa

General Characters, Classification with Examples Type study – *Paramecium*, Parasitic Protozoans – *Plasmodium vivax*

#### UNIT – II:

##### Phylum: Porifera

General Characters Classification, Type study –*Scypha* ( Sycon), Canal System in Sponges

##### Phylum: Coelenterata

General Characters, Classification, Type study – *Obelia geniculata*, Polymorphism Coral Reefs

#### UNIT – III :

##### Phylum: Helminthes

General Characters, Classification, Type Study – *Taenia solium*

Nematode Parasites In Man-

-*Ascaris lumbricoides*

-*Ancylostoma duodenale*

-*Wuchereria bancrofti*

-*Enterobius vermicularis*

-*Trichuris trichiura*

Parasitic Adaptations and Disease Control

##### Phylum: Annelida

General Characters and Classification, Type Study: *Neanthes* ( Nereis ), Metamerism, Nephridia and coelomoducts

#### UNIT – IV:

##### Phylum: Arthropoda

General Characters and Classification, Type Study: Prawn- *Penaeus indicus*, Crustacean Larvae and their Significance, Peripatus and its affinities -Economic Importance and Social Life of Insects

##### Phylum: Mollusca

General Characters and Classification, Type Study: *Pila*, Economic Importance of Mollusca

#### UNIT – V

##### Phylum: Echinodermata

General Characters and Classification, Type Study: *Asterias* (star fish), Echinoderm Larvae and their Significance, Water Vascular System, Nutrition in Invertebrates, Locomotion in Invertebrates

#### SUGGESTED BOOKS:

1. Ayyar E.K and T. N . Ananthakrishnan 1992. Manual of Zoology Vol. I Invertebrate, Part I & II, S. Viswanathan Printers and Publishers Pvt Ltd., Madras
2. Barnes, R.D. Invertebrate Zoology (1982) VI Edition. Holt Saunders International Edition.
3. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. & J.I., Spicer (2002) The Invertebrates: A New Synthesis. III Edition. Blackwell Science.

4. Barrington, E.J.W. (1979) Invertebrate Structure And Functions. II Edition. E.L.B.S. and Nelson.
5. Boradale, L.A. and Potts, E.A. (1961) Invertebrates: A Manual for the Use of Students. Asia Publishing Home.
6. Bushbaum, R. (1964) Animals Without Backbones. University of Chicago Press.
7. T.C. Majpuria. 1990- Invertebrate Zoology. Pradeep Pub. Kitab Mahal.  
Web Link : <https://archive.org/details/zoologyofinverte00ship>

## SEMESTER II

### PAPER - II CHORDATA

TEACHING HOURS – 120Hrs

CODE – ZB15/2C/CHO

CREDITS- 5

#### UNIT- I

General Characters and Classification of Prochordata, Cephalochordata, Hemichordata, Urochordata Affinities of Prochordata.

#### UNIT- II.

Agnatha : General Characters and Classification up to order, Cyclostomata – General Characters and Classification Type Study – *Petromyzon*

Pisces – General Characters and Classification up to order, Type Study – *Scoliodon sorrakowah*, Accessory Respiratory Organs, Parental Care in Fishes, Migration in Fishes.

#### UNIT- III

Amphibia– General Characters and Classification up to order, Type Study – *Rana hexadactyla* Parental care in Amphibia, Brief description of Apoda, Urodela and Gymnophia.

Reptilia – General Characters and Classification based on skull, Type Study – *Calotes versicolor*, Identification of Poisonous and Non-Poisonous Snakes, Poison Apparatus.

#### UNIT- IV

Aves - General characters and Classification up to order, Type Study – *Columba livia*, Flightless Birds Flight Adaptation in Birds, Migration in Birds.

#### UNIT- V

Mammals - General Characters and Classification up to order, Type Study – *Oryctolagus cuniculus* (Rabbit), Brief description of Egg Laying Mammals Marsupials, Placental Mammals, Dentition in Mammals, Aquatic Adaptations in Mammals.

#### Suggested Books:

1. Ekambaranatha Ayyar, M. and T.N. Ananthakrishnan. 1992. Manual of Zoology Vol. I Invertebrata. Part I and II, Viswanathan Printers and Publishers Pvt., Ltd. Madras.
2. Kardong, K.V. (2005) Vertebrates Comparative Anatomy, Function and Evolution. IV Edition. Mc Grawhill Higher Education.
3. Kent, G.C. And Carr R.K. (2000). Comparative Anatomy of the Vertebrates. IX Edition. The McGraw-Hill Companies.
4. Young, J.Z. (2004). The Life of Vertebrates. III Edition. Oxford University Press.
5. Hall B.K. and Hallgrímsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers, Inc.

Web link : [www.ucmp.berkeley.edu/chordata/chordata.html](http://www.ucmp.berkeley.edu/chordata/chordata.html)

## SEMESTER-II

### PRACTICAL I: INVERTEBRATA AND CHORDATA

TEACHING HOURS-60Hrs

COURSE CODE- ZB15/2C/PRI  
CREDIT- 4

#### I. DISSECTION

##### A. COCKROACH/ PRAWN

1. External characters
2. Digestive system
3. Nervous system

##### B. Any bony fish:

4. External characters
5. Digestive system
6. Urinogenital system

#### II. MOUNTING

Mouth parts of

1. Cockroach
2. Mosquito
3. Shark: Placoid-Carp-Cycloid
4. Types of fins-Homocercal, Heterocercal, Diphyrcercal

#### III. SPOTTERS

##### A. Classify giving reasons up to order:

1. *Paramecium*
2. *Scypha*
3. *Obelia*
4. *Taneaia solium*
5. *Ascaris*
6. *Neanthes*
7. *Penaeus*
8. *Asterias*
9. *Balanoglossus*
10. *Amphioxus*
11. *Scoliodon sorrakowah*
12. *Rana hexadactyla*
13. *Calotes versicolor*
14. *Columba livia*
15. *Oryctolagus cuniculus*

##### B- Draw labeled sketches:

16. *Obelia* medusa
17. *Nereis* T.S
18. Bipinnaria larva
19. *Amphioxus* T.S
20. Quill feather

##### C. Comment on biological significance:

21. *Entamoeba*
22. *Paramecium*-conjugation
23. *Plasmodium*
24. *Ascaris*
25. *Heteronereis*
26. *Peripatus*
27. Nauplius larva

28. *Sacculina* on crab
29. Sea anemone on hermit crab
30. *Vipera russelli*
31. Bat

**D- Relate structure and function:**

32. Sponge-spicules
33. Sponge-gemmule
34. *Taenia-scolex*
35. *Neanthes*-parapodium
36. *Penaeus*-petasma
37. Starfish-tubefoot
38. Snake-poison apparatus
39. Quill feather

**E. Osteology/palate in Birds/Dentition**

**Osteology**

**FROG**

40. Skull and lower jaw
41. Vertebral column
42. Pectoral girdle
43. Pelvic girdle
44. Forelimb
45. Hindlimb

**Palate in Birds**

46. Pigeon-palate
47. Crow-palate
48. Duck-palate

**Dentition**

49. Rabbit-dentition
50. Dog-dentition



## SEMESTER – III

### PAPER III- CELL BIOLOGY

TEACHING HOURS: 120 Hrs

COURSE CODE: ZB15/3C/CBY

CREDITS: 5

#### UNIT- I

Brief history of cell biology- cell theory-detailed account of prokaryotic and Eukaryotic cell-plasma membrane – structure and functions. Cytoplasm-Physical,Biological properties and functions

#### UNIT- II

Cytological techniques – cell fractionation – fixation, staining - principles of light microscopy, Phase contrast microscopy, electron microscopy

#### UNIT- III

Cell organelles- structure and functions of Endoplasmic reticulum, golgi apparatus, ribosomes. Structure and functions of lysosomes, polymorphism- structure and functions of mitochondria, cellular respiration – centriole.

#### UNIT- IV

Nucleus, nucleolus structure and functions. Chromosome structure, classification. Euchromatin, heterochromatin, sat chromosomes, Karyotype, chromosomal banding. Special chromosomes – Polytene and Lampbrush.

#### UNIT- V

Cell cycle and stages- cell division and significance – amitosis, mitosis, meiosis- cell ageing, apoptosis, cancer biology

#### SUGGESTED READING

1. Verma P.S. and Agarwal V.K., Cell and Molecular Biology 8<sup>th</sup> edition. S.Chand and Co. NewDelhi.
2. Powar C.B. 1989. Essentials of Cytology, Himalaya Publishing House, Bombay.
3. De Robertis E.D.P and De Robertis, E.M.P. 1988. Cell and Molecular Biology 8<sup>th</sup> edition, International edition.
4. Lodish, Berk, Zipursky Matsudaria Baltimore Darnell, Molecular Cell Biology 4<sup>th</sup> edition.
5. David Friefelder, Essentials of Molecular Biology.



## SEMESTER – IV

### PAPER IV- GENETICS

TEACHING HOURS: 120 Hrs

COURSE CODE: ZB15/4C/GEN  
CREDITS: 5

#### UNIT- I

Gene – Gene concept-cistron, muton, recon. Mendelian inheritance- Laws of inheritance. Mendelian traits in man. Gene interaction co - dominance, incomplete dominance, epistasis. Linkage and repulsion – chromosome mapping.

#### UNIT- II

Multiple alleles, polygenes and Polygenic Inheritance. Sex determination, X- Linked inheritance in Drosophila, Chicken and man. Y – Linked inheritance in Drosophila, and Man. X-Y linked inheritance in Drosophila, and man. Sex limited and sex – influenced genes.

#### UNIT- III

Structure, types and functions of DNA and RNA, DNA replication. Protein synthesis and regulation. Regulation of gene- Operon concept.

#### UNIT- IV

Molecular basis of gene mutations – mutable and mutator genes. Chromosomal aberration types – intrachromosomal and interchromosomal. Human syndromes with examples. Non disjunction.

#### UNIT- V

Cytoplasmic inheritance, mitochondrial DNA. Genetic counseling, Eugenics, Euthenics, Euphenics - inborn errors in metabolism.

#### SUGGESTED READING

1. Verma .P.S. and Agarwal, V.K., 1995, Genetics, 8th edition, S. Chand and Co. New Delhi – 110 055. 580pp.
2. Gopalakrishnan T.S., Itta Sambasiviah and Kamalakara Rao, A.P., Genetics 1995- 96. Himalaya Publishing House, Bombay - 400 004, 250 pp.
3. Gardner, 1972, Principles of Genetics, Wiley Eastern Pvt .Ltd. 590 pp.
4. Sinott, Dunn and Dobzhansky – Principles of Genetics, Mc Graw Hill Book Company.

## SEMESTER –IV

### PRACTICAL –II CELL BIOLOGY AND GENETICS

TEACHING HOURS- 60 Hrs

COURSE CODE: ZB15/4C/PR2

CREDITS: 4

1. Use of microscopes – stage and ocular micrometer and cell measurements
2. Counting of RBC using haemocytometer
3. Counting of WBC using haemocytometer
4. Blood smear preparation – Differential count of WBC
5. Study of mitotic division using onion root tip
6. Observation of epithelial cell of human buccal smear
7. Mounting of salivary glands of chironomous larva (giant chromosome).
8. STUDY OF PREPARED SLIDES OF DIFFERENT TISSUES
  - A. Hyaline cartilage
  - B. Squamous epithelium
  - C. Bone tissue
  - D. Cardiac muscle
  - E. Involuntary muscle
  - F. Voluntary muscle
9. MENDELIAN INHERITANCE
  - A. Monohybrid cross
  - B. Dihybrid cross
10. MENDELIAN TRAITS
  - A. Rolling/folding of tongue
  - B. Window's peak
  - C. Crooked little finger
  - D. Mid digital hair
11. INTERACTION OF GENES
  - A. Incomplete dominance (straight hair & curly hair)
  - B. Codominance (Sickle cell anaemia)
  - C. Polygenic Inheritance (skin colour in man)

## SEMESTER V

### PAPER- V ANIMAL PHYSIOLOGY

TEACHING HOURS: 60Hrs

COURSE CODE: ZB15/5C/APY

CREDITS : 4

#### UNIT- I

Definition – Scope – types of nutrition -mechanical and chemical changes of food in the alimentary canal- balanced diet, nutritional disorders – PEM , vitamin deficiency , deficiency of iron, iodine and calcium role of fibres,- lifestyle diseases- Digestive enzymes, nervous and hormonal control of digestion. Digestion of carbohydrates, Proteins and lipids – Importance of water, vitamins and minerals .

#### UNIT- II

Composition of blood and their functions – Coagulation mechanism , mechanism of blood clotting, intrinsic and extrinsic pathways, anticoagulants, disorders of blood clotting -heartbeat, conducting system -pulse and blood pressure, clinical significance, control of cardiac activity - arteriosclerosis, atherosclerosis, myocardial infarction electrocardiogram, angiogram, angioplasty- Types of circulation – Types of heart – Pacemaker – Cardiac cycle - lymph and lymphatic system.

#### UNIT- III

Respiration – Exchange and transport of gases – Respiratory pigments – respiratory pigments-structure of haemoglobin, transport of O<sub>2</sub>- oxyhaemoglobin curve, Bohr effect- transport of CO<sub>2</sub> -carbonic acid, carbaminohaemoglobin, bicarbonate and chloride shift- regulation of respiration – neural and chemical - apnea, dyspnea, hypoxia, hypo and hyper capnia, asphyxia, carbon monoxide poisoning, bronchitis, asthma -physiological effects of smoking –Respiratory disorders – Respiratory quotient.

#### UNIT- IV

Excretory structures – Types of Nephridia – nephron structure, urine formation, composition of urine - counter-current multiplier system, role of kidney In osmoregulation, regulation of kidney functions - abnormal constituents of urine, renal disorders – nephritis, haematuria, renal calculi, acidosis and alkalosis- dialysis and kidney transplantation. Excretory products – Ornithine cycle – Osmo regulation – Bioluminescence , Biological rhythm.

#### UNIT- V

Nervous system – Structure of neuron – Functions – Conduction of impulse, Types of ganglia – Brain, spinal cord, sensory receptors – electro , encephalogram - nerve disorders – epilepsy, Alzheimer's disease, Parkinson's disease Endocrine, system – Glands, Secretions – Regulation (feedback mechanism) – Pheromones; Muscle physiology- Types of muscles – Contraction, Tetanus, Fatigue and summation - physiological and biochemical events in muscle contraction.

#### SUGGESTED READING

1. Best And Taylor. (1990). Physiological Basis Of Medical Practice. Wilkins Co.
2. Eckert, R. And D. Randell. (1987). Animal Physiology, Cbs Publishers And Distributors N. Delhi.
3. Ganong, W.F. (2003), Review Of Medical Physiology, Mcgraw Hill, New Delhi.
4. Guyton, A.C. (1981). Text Book Of Medical Physiology, W.B. Saunders Co.
5. Hoar, W.S.(1975). General And Comparative Physiology, Prentice Hall.
6. Mac. Eleroy, W.D. (1971). Cell Physiology And Biochemistry. Prentice Hall Of India Ltd.
7. Nagabhushanan, R., Kaobarkar M.S. And Sarojini, R. (1983). A Text Book Of Animal Physiology, Oxford Ibh Publishing Co., New Delhi.
8. Prosser, C.L. (1978). Comparative Animal Physiology. W.B.Saunders Co.
9. Rama Rao, V., First Aid In Accidents, Srikrishnan Brothers, Thambuchetty Street, Madras.
- Schmidt-Nielson K. (2002). Animal Physiology, Prentice Hall India Ltd



## SEMESTER- V

### PAPER VI- DEVELOPMENTAL BIOLOGY

TEACHING HOURS: 60Hrs

COURSE CODE: ZB15/5C/DBY

CREDITS : 4

#### UNIT – I

Basic concepts of developmental biology – Theories- Gametogenesis - Spermatogenesis -Types of sperm in organisms- structure of sperm in man- Structure of mammalian egg- Oogenesis - types of eggs- egg membranes- classification of eggs based on yolk content distribution - classification of eggs based on cleavage.

#### UNIT – II

Fertilization – mechanism and significance - theories on fertilization- parthenogenesis- cleavage , Planes of cleavage-Patterns of cleavage- Factors controlling cleavage- fate map- blastulation and Gastrulation in amphioxus / frog / chick .

#### UNIT - III

Organogenesis – development of brain, eye and ear in frog / chick / mammals- organizer concept – mechanism of induction- Teratogenesis- Regeneration

#### UNIT – IV

Extra embryonic membranes in chick - Foetal membranes in mammals - Placentation in mammals – Types and Functions.

#### UNIT – V

Human reproduction – Puberty- Menstrual cycle and Menopause - Pregnancy – Trimesters – Development- Parturition – Lactation- Twins – Types- Infertility – Causes- Test tube baby and ART

#### SUGGESTED READING

1. Developmental Biology (Viii Edition) S. F. Gilbert. Sinauer Associates Inc. Usa. 2006.
2. Principles Of Development (Iii Edition) Lewis Wolpert Oxford University Press • Uk. 2007.
3. An Introduction To Embryology (V Edition). B. I. Balinsky. Thomas Asia Pvt. Ltd. Singapore.
4. Developmental Biology: R. M. Twyman. Bios Scientific Publishers Ltd. New Delhi (2001)

## SEMESTER- V

### PAPER VII- ENVIRONMENTAL BIOLOGY

TEACHING HOURS : 60 Hrs

COURSE CODE: ZB15/5C/EBY

CREDITS : 4

#### UNIT - I :

Scope – Concept – Branches in Ecology – Autoecology and Synecology- Micro and Macro environment- Types of media and substratum- their influence on animals.

**Biosphere** – Hydrosphere, Lithosphere, Stratosphere – Biocoenosis (Community) and Biogeocoenosis (Ecosystem)

**Abiotic factors**- Water, soil, light and Temperature

**Biotic factors** – Animal relationships – Symbiosis, Commensalism, Mutualism, Antagonism, Predation, Parasitism and Competition.

#### UNIT - II :

**Biogeochemical cycles** – Nitrogen, Carbon and Oxygen – Sedimentary cycles (P and S) limiting factors- basic concepts -Leibig's law of minimum- Shelford's law of tolerance

**Ecosystem** – Pond ecosystem – Primary and Secondary production – Food chain – Food Web- Trophic levels – Energy flow- Ecological pyramids- Pyramid of Biomass, Number and Energy.

**Terrestrial Ecology** – Biomes- Characters- tundra, grassland, forest and desert biomes- Types of forests in India- Adaptations of animals inhabiting deserts.

#### UNIT - III :

**Fresh Water Ecology** – Physico chemical nature of fresh water – Biotic communities – lentic (lakes and ponds) and lotic( river) environment- Stratification of ponds and lakes

**Marine Ecology** – Characteristics- salinity, temperature, pressure, zonation and stratification – Biotic communities of pelagic, benthic, intertidal (rocky shore, sandy shore and muddy shore) and sublittoral zones- Coral reefs- soil profile, rocks, paedogenesis

**Estuarine Ecology** – Characteristics – Biotic communities and their adaptations.

#### UNIT - IV :

**Population Ecology** – Population – definition – characteristics- Natality, Mortality, Population density- Density dependent factors- Population fluctuations- Age pyramids- Population growth, estimation, equilibrium and regulation – J and S shaped curves, emigration, immigration and migration

**Community Ecology** – Types of communities – characteristics of community- Stratification- Ecotone- Edge effect- Ecological niche- ecological succession - community periodicity- anthropogenic impact on ecosystem

**Pollution** – Types – Creators of pollution ( pollutants) – Air pollution and water pollution – their biological effect and control - ionizing radiation, disposal and human health- pesticides - ddt, endosulphan, furadan, insect repellants -heavy metals-chromium, cadmium, mercury, arsenic, lead -e-waste - monitoring of pollutants – physical, chemical and biological

#### UNIT - V:

**Environmental Biotechnology** -Biotechnological methods of Pollution detection- Biotechnological methods in -Pollution abatement – Bioremediation- Biotechnology and Biodegradation - Genetically engineered microbes in Bio-Treatment of waste - Eco-Friendly Bioproducts for Environmental Health - Bio-Piracy - Bio-Pesticides and Bio-Fertilizers- Organic Farming and Its Merits

**Wildlife management** – Preservation – laws enforced- sanctuaries and national parks- natural resources management- renewable ( forest, fishes and crops) and non renewable ( fossil fuels, metals and minerals) - significance, causes of extinction, concepts of threatened species - red data book- IUCN, WWF - protected areas, biosphere reserves, national parks and sanctuaries in India -forests in India – desertification- deforestation - carbon dating - Importance of mangroves in coastal ecosystems- conservation and management

#### SUGGESTED READING

1. Colinvaux, P. A. (1993). Ecology. II Edition. Wiley, John And Sons, Inc.
2. Krebs, C. J. (2001). Ecology. VI Edition. Benjamin Cummings.
3. Odum, E.P., (2008). Fundamentals Of Ecology. Indian Edition. Brooks/Cole
4. Ricklefs, R.E., (2000). Ecology. V Edition. Chiron Press



**SEMESTER – V**  
**PAPER VIII- BIOTECHNOLOGY**

TEACHING HOURS: 60 Hrs

COURSE CODE: **ZB15/5C/BIO**  
CREDITS: **4**

**UNIT- I**

Basic concepts of Biotechnology-RDNA technology-Enzymes in RDNA technology – cloning vectors- gene isolation

**UNIT- II**

Gene manipulation- gene transfer - direct and indirect methods- selection and isolation of recombinants - expression of cloned genes

**UNIT- III**

HYBRIDIZATION-Blotting types and applications. PCR types and applications. RAPD, SNPS, FISH, RFLP AND DNA Finger printing.

**UNIT- IV**

Terminator gene technology- Biotechnology in food and Agriculture –Fermentation-food and alcoholic beverages. Applications of Biotechnology in Environmental management-Effluent management and Bioremediation. . Applications of Biotechnology in Medicine and Human Health – diagnosis and treatment-gene therapy

**UNIT- V**

Current issues in biotechnology- GMO and Transgenic Animals. IPR-Patent, copyright and Trade mark, TRIPS and GATT, Ethical issues related to Biotechnology.

**SUGGESTED READING:**

1. Kumaresan, V., Biotechnology, (2005) Saras Publications.
2. T.A.Brown, Gene Cloning an Introduction, 3<sup>rd</sup> Edition, Stanley Thomas Publication.
3. Old R.W. and S.B.Primrose. Principles of Gene Manipulation, 5<sup>th</sup> edition, Oxford University Press.
4. Glick .B.R and Jack.J. Pasternak 1994, Molecular Biotechnology, ASM Press.



**SEMESTER V**  
**PAPER IX- ECONOMIC ZOOLOGY**

**TEACHING HOURS: 60 Hrs**

**COURSE CODE: ZB15/5C/EZY**  
**CREDITS: 4**

**UNIT- I**

Definition –Pest – Insect pests- Reasons for Insect attaining the Pest status- Pests of any four food grains – Pest of rice- rice stem borer- rice gall midge- rice hopper- rice bug. Pest of cotton – hopper- boll worms- cotton aphids. Pest of coconut – rhinoceros beetle- weevil – caterpillar- control measures- Intergrated pest management.

**UNIT- II**

Beneficial insects and their culture-Apiculture- Different species-Bee keeping-Bee products-uses- diseases and enemies of bees. Sericulture- different types of silkworm-rearing-silk extraction and reeling- diseases of silkworm - lac insect- economic importance of lac

**UNIT- III**

Aquaculture- kinds of Aquaculture-oyster culture, culture of major carps-recent- development in aquaculture-Fish parasite and diseases (any five).Preservation and processing of fish, fish byproducts - marketing potential of aquaculture products- crustacean, oyster and other molluscans , mariculture, seaweeds.

**UNIT- IV**

Economic importance of Fowl – Different breeds of fowl – Rearing – Prevention of poultry diseases – Management of modern poultry farm.

**UNIT- V**

Economic importance of Mammals – Dairy, Sheep , economically important breeds for wool and meat and Piggery farming – economic importance and scope-Indirect and Direct value

**SUGGESTED BOOKS**

- 1) Nayar, K.K., T.N. Ananthkrishnan and B.V.David. 1992. General and Applied Entomology. Tata McGraw Hill Publishing Co., Ltd., New Delhi – 110 051.
- 2) Metcalf, C.L. and W.P. Flint, 1973. Destructive and Useful Insects. 4<sup>th</sup> Ed., Tata McGraw Hill Publishing Co., Ltd., New Delhi – 110 051.

## SEMESTER-V

### ELECTIVE I- BIO INSTRUMENTATION

TEACHING HOURS- 60 Hrs

COURSE CODE: ZB15/5E/BIN  
CREDITS- 2

#### UNIT – I

Units of measurements – metric system, conversion of units, microscopy – principles , types (simple, light, phase contrast,) autoclave – principle , applications and types - centrifuge – principles , types (clinical, ultra centrifuges)

#### UNIT – II

pH - Sorenson's pH scale, pH meter-principle and applications- manometry - warburg manometer – principle and working - chromatography – principles, types (paper, TLC, column) and applications; electrophoresis-principle, types-paper and gel (AGE & PAGE), applications.

#### UNIT – III

Cryotechniques- cryopreservation of cells , tissues, organs and organisms, cryotomy; radio isotopic technique – radio immuno assay- applications of radio isotopes.

#### UNIT – IV

Biosensors- principle, types (enzyme, bacterial electrodes, environmental bio sensors & bio reporters) , applications.

#### UNIT – V

DNA and RNA sequencing methods - PCR – principle and application - DNA micro array and applications.

#### SUGGESTED BOOKS:

1. W.W. Unbriet, Z.H. Burri And Stamffier J.F. Manometric And Biochemical Techniques, 5th Ed. Burges Pub. Co. Minneapolis 1972
2. Biophysics : Ani-Introduction, R.M.J Cottenill John Wiley & Sons Ltd., England 2002.
3. M.A. Subramanian 2005, Biophysics (Principles And Techniques) Mjp Publishers, Chennai
4. A. Upadhyaya, K. Upathyaya And N. Nath, (2003) Biophysical Chemistry, Principles And Techniques, 3rd Ed, Himalaya Publishing House.
5. H.B. Bull, F.H. Davis, An Introduction To Physical Biochemisty 2nd Ed, Philadelphia 1971
6. Gurumani.N. 2006. Reasearch Methodology For Biological Sciences Mjp Publ. Chennai.

## SEMESTER- VI

### PAPER X- IMMUNOLOGY

TEACHING HOURS: 60 Hrs

COURSE CODE: ZB15/6C/IMM

CREDITS: 4

#### UNIT – I

Definition and concepts components of immune system- natural barriers - organs involved in Immunology- cells involved in immune response- chemicals involved in immune response.

#### UNIT – II

MHC – HLA - tissue typing and match, graft management - types of innate immunity- acquired immunity- antigen response- cell mediated immunity- humoral immunity.

#### UNIT –III

Immunoglobulins types, structure, characteristics- interaction between Ag and Ab - brief introduction to complementary system- Interleukin, Interferon, TNF, Chemokines- haptens, adjuvant, crossman antigen.

#### UNIT – IV

Hyper sensitivity, auto immune disorders.

#### UNIT- V

Vaccines – types, immunization schedule - application – antibodies, monoclonal antibodies- ELISA – Immunotherapy.

#### SUGGESTED READING:

1. Kindt, T. J., Goldsby, R. A., Osborne, B. A., Kuby, J. (2006). Vi Edition. Immunology. W.H. Freeman And Company.
2. Delves, P. J., Martin, S. J., Burton, D. R., Roitt, I.M. (2006). Xi Edition. Roitt's Essential Immunology, Blackwell Publishing

## SEMESTER-VI

### CORE PAPER XI- EVOLUTION

TEACHING HOURS: 60 Hrs

COURSE CODE: ZB15/6C/EVO  
CREDITS: 4

#### UNIT – I

Origin of life- Urey & Miller Experiment. Biogenesis and Abiogenesis, Evidence in favour of evolution- (Homologous and Analogous). Comparative morphology, anatomy, physiology, biochemistry and embryology in brief. Genetic basis of evolution.

#### UNIT – II

Geological time scale- Fossils & Fossilization- Types, Dating of fossils, Living fossils, Fossils in India - palaeontological evidences. Insular fauna, Animal distribution- zoogeographic realms.

#### UNIT – III

Theories of Evolution – Lamarckism, Neo Lamarckism, Darwinism, Neo- Darwinism, Modern synthetic theory, Mutation Theory.

#### UNIT – IV

Modes of evolution Speciation , Isolation – Types – Mechanism – Isolation : Geographic & Reproductive - Convergent & Parallel evolution, preadaptation - Adaptive radiation microevolution and macroevolution.

#### UNIT – V

Evolution of vertebrate groups- fishes, amphibians, reptiles, birds, mammals Evolution of Horse and Man - Biological & Cultural evolution.

#### SUGGESTED BOOKS:

1. Darwin, C. The Origin Of Species, 6e. Oup. Desmond Morris, 1990. Animal Watching (Field Guide), Crown Pub Co., London.
2. Dobzhansky, Th.: Genetics And The Origin Of Species 1951, Columbia Uty. Press.
3. Dobzhansky, Th. Et Al: Evolution, Surjeet Pubn., Delhi. Prakash M. Et Al.



**SEMESTER- VI**  
**PAPER XII- MICROBIOLOGY**

**TEACHING HOURS: 45 Hrs**

**COURSE CODE: ZB15/6C/MIC**  
**CREDITS: 4**

**UNIT-I**

History and scope of microbiology, R.H. Whittaker 5 kingdom classification.

**UNIT-II**

Virus – salient features, classification, structure, culture, medical relevance, economic importance, phages, viroids, prions. Nature and Significance- Pathogenic virus – Oncovirus.

**UNIT-III**

Bacteria – salient features, classification, structure, reproduction, brief idea of culture methods and maintenance of culture media, disease caused and medical relevance, economic importance

**UNIT-IV**

Salient features, economic and medical relevance of fungi, actinomycetes and protozoans.

**UNIT-V**

Application of microbiology in- i) different industries, ii) dairy and food iii) biotechnology iv) defense

**SUGESSTED BOOKS**

1. Mani A., Selvaraj, A.M. Narayanan L.M & Arumugam, N. 1996: Microbiology- Saras Publication- Nagerkoil- India.
2. Sharma, P.D., 1998: Microbiology- Rastogi Publ. Meerut, India.

**SEMESTER-VI**  
**ELECTIVE II- MEDICAL LABORATORY TECHNIQUES**

**TEACHING HOURS: 60Hrs**

**COURSE CODE: ZB15/6E/MLT**  
**CREDITS: 2**

**UNIT – I**

Introduction and scope–records and preparation of reports – cleaning, maintenance and care of glassware- sterilization – physical and chemical method –disposal of specimens and infected materials – safety precautions and first aid treatment for superficial wounds, burns, chemical poisoning, handling pathogens microbes microbiological and electric shock

**UNIT – II**

Haematology – collection of blood sample – smear preparation –blood cells – enumeration of RBC and WBC- packed cell volume – erythrocyte sedimentation rate – MCV – MCH – MCHC – platelet count bleeding time – clotting time- prothrombin time – haemoglobin estimation – blood pressure- Liver function tests – enzymes SGOT, SGPT, liver pigments

**UNIT – III**

Urine – collection – physical and chemical parameters routinely analyzed –pregnancy test – analysis of stool.

**UNIT – IV**

Analysis of semen and cerebrospinal fluid. Pathology – tests for viral diseases – poliomyelitis, hepatitis, HIV –tests for bacterial diseases – tuberculosis and cholera – tests for protozoans – amoebic dysentery, malaria - tests for helminthes – filariasis.

**UNIT – V**

Tests for life style disease - cardiac disorders – diabetes I & II –obesity –allergy –tests for auto immune disease – SLE, MG, RA, autoimmune hepatitis.

SUGGESTED READING

1. Baker F.J. And Silverton R.E 1998. Introduction To Medical L Laboratory Technology. Hodder Arnold Publication.
2. Mukherjee K.L. 2003. Medical Laboratory Technology – A Procedure Manual For Routine Diagnostic Tests, Vol. I, Ii & Ii I. Jaypee Brothers, New Delhi.

**SEMESTER-VI**  
**ELECTIVE III –ENTOMOLOGY**

**TEACHING HOURS: 60 Hrs**

**COURSE CODE: ZB15/6E/ENT**  
**CREDITS: 1**

**UNIT- I**

General Characters of Class Insecta., Methods of Collections, Preservation and Study of Insects. Insect Mouth Parts: Biting and Chewing, Piercing and Sucking, Sponging and Siphoning Insect Biology- External Characters, Digestive System, Respiratory System, Nervous System, Reproductive System.

**UNIT- II**

Study of Insect Orders, Hormonal and Pheromonal Regulation of Metamorphosis in Insect. Beneficial Insects: (Classification-Salient Features with Suitable Examples of Following Orders: Thysanura, Orthoptera, Odonata, Hymenoptera, Lepidoptera Coleoptera.

**UNIT- III**

Silkworm and Sericulture, Lac Insect and Lac-Culture, Household and Human Insect Pest: Structure, Binomics and Control Measures of Housefly, Mosquito, Rat Flea, Bed Bug, Study of Non-Insect Animal Pests and Their Control. Ex. Rat, Pig, Monkey, Birds, Ticks

**UNIT-IV**

Agriculture Pests from Tamil Nadu: Classification Bionomics Insect Pest- Life Cycle and Control Measures of any one Cash Crops of Tamil Nadu any one Vegetables/Fruits of Tamil Nadu, any one Cereals of Tamil Nadu

**UNIT- V**

Insect Control Methods, Chemical Control and Safe Handling of Pesticides, Physical and Mechanical Control, Hormone and Pheromone as a Control Agents, Integrated Pest Control of Insects, Transgenic Control of Insects, Effect of Light Temperature, Humidity and Food on Insect Life

**SUGGESTED READING**

1. K. K. Nayar, Tnant Kirshnanand B.W. David- General and Applied Entomology.
2. C.L. Metcalf and W.P. Fling- Destructive and Useful Inset.
3. Hensing Pruthi : A Text Book of Agricultural Entomology
4. Wigglesworth: Principles of Insect Physiology.

## SEMESTER VI

### **PRACTICAL III- DEVELOPMENTAL BIOLOGY, ENVIRONMENTAL BIOLOGY, EVOLUTION, MEDICAL LABORATORY TECHNIQUES AND BIOINSTRUMENTATION**

TEACHING HOURS: 60Hrs

COURSE CODE :ZB15/6C/PR3  
CREDITS: 4

#### **DEVELOPMENTAL BIOLOGY**

Study of the following prepared slides

- I. Study of cleavage stages in frog
  - a. 2 cell stage
  - b. 4 cell stage
  - c. 8 cell stage
  - d. Blastula of frog
  - e. Gastrula of frog
2. Study of different stages of chick embryo.
  - a. 18 hrs chick embryo
  - b. 24 hrs chick embryo
  - c. 48 hrs chick embryo
  - d. 72 hrs chick embryo
- 3 a. Placenta of sheep  
b. Placenta of human

#### **ENVIRONMENTAL BIOLOGY**

Estimation of carbonates and bicarbonates in tap and sea water.

1. Estimation of Carbondioxide in tap and sea water
2. Estimation of pH in tap and sea water.
4. Adaptation of rocky shore animals.
5. Adaptation of sandy shore animals
6. Usage of maximum and minimum thermometer
  - b. Hygrometer
  - c. Sacchi's disc
  - d. pH meter
  - e. Rain gauge
7. Study of natural ecosystem and field report of the visit

#### **EVOLUTION**

1. Morphological evidences
  - a. Forelimb of Amphibian
  - b. Forelimb of Reptile
  - c. Forelimb of Birds
2. Mimicry and colouration
  - a. Stick insect
  - b. leaf insect
3. Adaptation pattern
  - a. Echenies
  - b. Draco



- c. Chameleon
- d. Bat
- 4. Fossils
  - a. Limulus
  - b. Peripatus (connecting link)
  - c. Archaeopteryx (connecting link)

#### **MEDICAL LABORATORY TECHNIQUES**

- 1. Estimation of haemoglobin
- 2. estimation of urine sugar

#### **STUDY OF**

- a. Blood pressure apparatus
- b. Centrifuge
- c. Hot air oven

#### **BIO INSTRUMENTATION**

- 1. Horizontal gel electrophoresis
- 2. Deep freezer
- 3. Autoclave

## SEMESTER VI

### PRACTICAL IV : ANIMAL PHYSIOLOGY, MICROBIOLOGY, BIOTECHNOLOGY AND ECONOMIC ZOOLOGY

TEACHING HOURS : 60Hrs

COURSE CODE : ZB/6C/PR4

CREDITS : 4

#### I ANIMAL PHYSIOLOGY

1. Estimation of Oxygen consumption in a fish with reference to body weight.
2. Detection of nitrogenous waste products in fish tank water, frog tank water, bird excreta and mammalian kidney
3. Survey of Digestive enzymes in cockroach
4. Use of Kymograph unit, Respirometer.

#### II MICROBIOLOGY

1. MEDIA preparation- broth, Agar, slants , plating
2. Spotters; *Staphylococcus aureus*, *E.coli*, *Rhizopus*, *Aspergillus flavus*, *A.niger*, *Penicillium*, *Candida albicans*
3. Instruments- autoclave, culture plate, inoculation chamber
4. Staining: simple and differential staining- gram staining
5. Antibiotic sensitivity test – classification and collection of antibiotics, based on origin, mode of action and application
6. Isolation of bacteria by pure culture- streak plate – pour plate method
7. Examination of milk- methyl blue- reduction test

#### III BIOTECHNOLOGY

5. Demonstration of PCR techniques
2. Blotting techniques [ a] Southern blot (b) Northern blot (c) Western blot
3. Paper chromatography (Demonstration)
4. Instrumentation- components and application of instruments-Centrifuge- Electrophoresis – colorimeter- spectrophotometer
5. Visit to industries , laboratory- report to be submitted

#### IV ECONOMIC ZOOLOGY

1. Mounting of sting apparatus of honey bee
2. Study of life cycle of hemimetabolus, holometabolus and ametabolus insects
3. Study of parasitic and predatory insects
4. Identification of breeds of fowls-Rhode Island, White Leghorn
5. Identification of members of bee colony
6. Identification of silkworm types

## SEMESTER I

### ALLIED ZOOLOGY PAPER –I (For PBPB Students)

TEACHING HOURS: 60Hrs

COURSE CODE: ZB15/1A/ZO1

CREDITS: 4

#### UNIT I

Study of types including life cycles-Protozoa-*Paramecium*-Porifera-Sycon(Simple sponge)-*Coelenterata-Obelia*.

#### UNIT II

Platyhelminthes-*Taenia solium*-Annelida-*Hirudinaria granulose* (Leech)-Arthropoda-*Penaeus indicus* (Prawn)

#### UNIT III

Mollusca-*Lamellidens marginalis*(Freshwater Mussel)-Echinodermata-*Asterias* (Star fish)

#### UNIT IV

Cell Biology-Structure of animal cell-brief account of the structure and functions of cell organelles-Endoplasmic reticulum, Golgi complex, Mitochondria, Lysosomes, cell divisions-Amitosis-Mitosis-Meiosis

#### UNIT V

Genetics-Laws of Mendelism-Sex determination and sex linked inheritance

#### RECOMMENDED TEXT BOOKS

- 1.Arumugam,N.2004.Cell Biology,Genetics and Evolution.Saras Publication.
- 2.Ekambaranatha Ayyar,M. and T.N.Ananthkrishnan.1992.Manual of Zoology Vol.I Invertebrata.Part I and II,Viswanathan Printers and Publishers Pvt.,Ltd.Madras.

#### REFERENCE BOOKS

- 1.Verma,P.S and V.K.Agarwal,1995.Genetics.8<sup>th</sup> edition,S.Chand and Co.New Delhi
- 2.Verma ,P.S. and V.K.Agarwal,2007.Cell and Molecular Biology 8<sup>th</sup> edition. S.Chand and Co.New Delhi.

**SEMESTER II**  
**ALLIED ZOOLOGY PAPER II (For PBPB Students)**

**TEACHING HOURS:60 Hrs**

**COURSE CODE: ZB15/2A/ZO2**

**CREDITS: 4**

**UNIT I**

Study of Vertebrate types – Pisces-*Scoliodon sorrakowah*(Shark)-Amphibia-*Rana hexadactyla*(Frog)-Reptilia-*Calotes versicolor*. Structure and function of different systems like digestive, cardiovascular, nervous and urinogenital.

**UNIT II**

Aves-*Columba livia* (Pigeon)-Mammals-*Rattus rattus*(Rat).

**UNIT III**

Physiology-Digestion, Respiration and Excretion in Mammals – Developmental Biology-Types of eggs-Cleavage-Blastulation and Gastrulation in Frog

**UNIT IV**

Ecology-Temperature, Light and Water as abiotic factors – Animal associations(Commensalism, Mutualism and Parasitism).

**UNIT V**

Evolution-Origin of life-Lamarckism-Neo Lamarckism-Darwinism-NeoDarwinism-Mutation Theory of De Vries

**RECOMMENDED TEXT BOOKS**

1. Arumugam, N. 2004. Physiology, Ecology and Embryology. Saras Publication.
2. Ekambaranatha Ayyar, M. and T. N. Ananthakrishnan. 1992. Manual of Zoology Vol. II Chordata. Part I and II, Viswanathan Printers and Publishers Pvt., Ltd. Madras.

**REFERENCE BOOKS**

1. Erlich, P. R. and Richard, W. Holm, 1963. The Process of Evolution, McGraw Hill., New York
2. Verma, P. S. and V. K. Agarwal, 2007. Principles of Ecology, S. Chand and Co. Ltd. Ram Nagar, New Delhi.

**SEMESTER- II**  
**ALLIED ZOOLOGY PRACTICAL (FOR PBPB STUDENTS)**

TEACHING HOURS: 60 Hrs

COURSE CODE: ZB15/2A/AZO

CREDITS: 2

**I DISSECTIONS**

1. Cockroach- digestive, nervous and reproductive system.
2. Fish- digestive and urinogenital system.
3. Calotes- digestive and urinogenital system.

**II MOUNTING**

1. Mouth parts of Mosquito, Honey bee and Cockroach.
2. Placoid scale.
3. Fowl brain.

**III DEMONSTRATION OF MENDELIAN LAWS, NORMAL AND MUTANTS- DROSOPHILA.**

**IV PHYSIOLOGY- RESPIROMETER AND BP APPARATUS.**

**V SPOTTERS**

- a) Amoeba, Paramecium, Sycon, Obelia colony, Obelia Medusa, Fasciola, Taenia, Ascaris, Hirudinaria, Penaeus, Unio, Asterias, Scoliodon, Rana, Calotes, Rattus.
- b) Ecology-Animal association (Mutualism, Parasitism Commensalism),
- c) Embryology- Egg, Sperm, and Cleavage 2,4,8,16,32 cell stage, blastula and gastrula of frog.
- d) Evolution- Adaptation- Stick insect, leaf insect and Chameleon.



### SEMESTER-III

## II B.Sc. ADVANCED ZOOLOGY AND BIOTECHNOLOGY ALLIED BIOCHEMISTRY PAPER I (for batch I)

COURSE CODE: ZB15/3A/ BC1

TEACHING HOURS: 60Hrs

CREDITS: 4

#### UNIT - I

Biochemistry – Definition, Importance of study as an independent discipline.

#### UNIT - II

Physico-chemical forces acting on the living body - Definition of pH, its determination, maintenance of pH in blood - Buffers and electrolytes in the body and their functions. Fractionation of biological material by chromatography and electrophoresis.

#### UNIT - III

Carbohydrates: Structure, reactions of mono, di and oligosaccharides. Polysaccharides in plants cellulose, starch and pectins. Carbohydrates: Maintenance of glucose in blood, Elementary treatment of glucose degradation – Kreb’s tricarboxylic acid cycle, glycolysis, Glucogenesis, Gluconeogenesis and pentose pathway.

#### UNIT - IV

Lipids: Classification of lipids, saturated and unsaturated fatty acids, cholesterol, bile acids, fatty acid break down and acetate release.

#### UNIT - V

Protein – Classification according to solubility, shape, composition and function, functional groups of aminoacids, peptide bond, primary, secondary and tertiary structure of proteins, protein breakdown, transamination, oxidative deamination and urea cycle interrelationship of protein, Lipid and Carbohydrate metabolism.

#### TEXT BOOK

1. Ambika Shanmugam: Fundamentals of Biochemistry for Medical Students.

#### REFERENCE BOOKS

1. Lehninger, A.L. Biochemistry, Worth Publishing Co., New York.
2. D.W.Martin, P.A.Mayer and V.W.Redwell, Harper’s Review of Biochemistry. Maruya Asian Edition.
3. Lubert Stryer, Biochemistry, Freeman and Co.
4. J.L.Jain, Fundamentals of Biochemistry.
5. E.E. Conn and P.K.Stumps, Outlines of Biochemistry, John Wiley and Sons.

SEMESTER-IV

II B.Sc. ADVANCED ZOOLOGY AND BIOTECHNOLOGY

ALLIED BIOCHEMISTRY PAPER – II

TEACHING HOURS: 60Hrs

COURSE CODE: ZB15/4A/BC2

CREDITS: 4

UNIT - I

Enzymes: Definition, Classification based on their function, apoenzyme, isoenzyme and coenzymes, mechanism of enzyme action – enzyme substrate complex, enzyme inhibitors – enzyme kinetics.

UNIT - II

Bioenergetics: oxidative phosphorylation, electron transport chain, high energy compounds.

UNIT - III

Vitamins: Definition and classification, Elementary treatment of Vitamin – A, thiamine, riboflavin, panthothenic acid, ascorbic acid, pyridoxine, Vitamin – B<sub>12</sub>, Vitamin – D, E and K with reference to the occurrence, deficiency and biochemical function.

UNIT - IV

Hormones: Definition, names of endocrine glands, elementary study of the biological functions: pituitary hormones, thyroxin, insulin, adrenaline and sex hormones.

UNIT - V

Nucleic acids – nucleosides, nucleotides, DNA and RNA (elementary treatment of structure and occurrence) and protein biosynthesis.

TEXT BOOK

1. Ambika Shanmugam, Fundamentals of Biochemistry for Medical Students.

REFERENCE BOOKS

1. Lehninger, A.L. Biochemistry, Worth Publishing Co., New York.
2. D.W.Martin, P.A.Mayer and V.W.Redwell, Harper's Review of Biochemistry, Maruya Asian Edition.
3. Lubert Stryer, Biochemistry, Freeman and Co.
4. J.L.Jain, Fundamentals of Biochemistry,
5. E.E. Conn and P.K.Stumps, Outlines of Biochemistry, John Wiley and Sons.

## IV SEMESTER

### ALLIED BIOCHEMISTRY PRACTICAL (For students of Batch-I)

TEACHING HOURS : 60Hrs

COURSE CODE: ZB15/4A/ABC

CREDITS : 2

- I. Qualitative analysis of carbohydrates-Glucose, fructose, lactose,xylose and starch.
- II. Qualitative analysis of aminoacids –tryptophan, tyrosine, arginine and cysteine.
- III. Preparation of starch from potato.
- IV. Preparation of caesin from milk.
- V. Preparation of gluten wheat flour.
- VI. Volumetric analysis
  - i.Estimation of oxalate.
  - ii.Estimation of glycine.
- VIII. Chromatography- Demonstration



## SEMESTER-I

B.A/ B.Sc / B.Com.,

NON MAJOR ELECTIVE (Offered to students of other departments)

### AQUACULTURE

TEACHING HOURS- 30 Hrs

COURSE CODE -ZB15/1N/AQU

CREDITS- 3

#### UNIT I

Introduction to aquaculture, Scope and importance of aquaculture, Concepts of extensive and intensive culture, Pisciculture.

Types- Monoculture, Poly culture, Integrated fish farming- Paddy cum Fish culture

#### UNIT II

Culture methods, Pen culture, Sewage Fed culture, Aquarium setting and maintenance, Ornamental Fishes Molluscan Oyster culture – Edible molluscs and pearl oyster culture. Crustacean culture- Prawn culture

#### UNIT III

Problems associated with aquaculture, Manmade hazards affecting aquaculture, Economic factors in aquaculture, Organizations involved in aquaculture

#### Suggested Books

1. Fisheries Global Perspective- Cherunilam
2. Fish and fish product- Winton A.L
3. Pond & Fish culture-Hall C.B.18.Fishes- Chand Mary
4. Fishery Management- Agarwal
5. Costal Aquaculture in India-Santhanam R.
6. Marine Fisheries of India -Virbhadrarao And bal.
7. Introduction to Fish technology- Regensteen.
8. Fresh water fish culture- Wankhede and Deshmukh.
9. Aquaculture Development- Amit AbhPatel,S.N.Pathak.
10. A Text book of Aqua culture- RaoKRSS.Reddy Ms,Discovery publication , Delhi.
11. A Manual of fresh water Aquaculture- R.Sonthanam,N.Sukumaran and P.Niligajan.

#### QUESTION PAPER TEMPLATE

- 10 Questions out of 12
- Max Marks 10 x 5 = 50  
(Short Answers in 300 words)

## SEMESTER-II

B.A/ B.Sc/ B.Com.,

NON MAJOR ELECTIVE (Offered to students of other departments)

### VERMITECHNOLOGY

TEACHING HOURS: 30HRS

CREDITS: 3

COURSE CODE: ZB15/2N/VER

#### UNIT-I

**Earthworm:** Ecological classification of Earthworms- epigeic, anecic and endogeic species – Vermiculture definition - Physical, chemical and biological requirements of earthworm culture. Earthworms as indicators of soil fertility.

#### UNIT-II

**Vermicomposting** - Types – Suitable species of earthworm for vermicomposting – Requirements of vermicomposting – Precautions to be taken – Enemies of earthworm – Harvesting the worms and vermicompost – Uses of vermi-wash - Advantages of vermicomposting – Nutrient content of vermicompost – Changes in soil due to vermicompost.

#### UNIT-III

**Economics of vermicomposting** - Applications of vermicomposting in Agricultural and Horticultural practices-Economics of running a small scale vermicomposting unit.

#### REFERENCE BOOKS:

1. Edwards C.A and Bother, Biology of Earthworm (1996).
2. Lee.G., Earthworm Ecology.
3. Ismail M.S., Vermitechnology
4. P.K.Gupta, Vermicomposting for Sustainable Agriculture Agrobics (India) (2004).
5. G.Tripathi, Vermiresource Technology (2003).
6. Ranganathan I.S., Vermicomposting Technology from Soil Health to Human Health (2006).

#### QUESTION PAPER TEMPLATE

- o 10 Questions out of 12
- o Max Marks 10 x 5 = 50  
(Short Answers in 300 words)