

ETHIRAJ COLLEGE FOR WOMEN (AUTONOMOUS)

CHENNAI – 600 008

**Re-accredited with “A” Grade Status by NAAC
College with Potential for Excellence by the UGC**

UG

REVISED SYLLABUS 2018-2019

CHOICE BASED CREDIT SYSTEM

B.Sc., ADVANCED ZOOLOGY AND BIOTECHNOLOGY

SYLLABUS 2018 - 2019



**POST GRADUATE AND RESEARCH DEPARTMENT OF ZOOLOGY
BRANCH VI A –ADVANCED ZOOLOGY AND BIOTECHNOLOGY**

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 2018

Department of Zoology syllabi has been revised with effect from the academic year 2018 – 2019, 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 analytical 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) with Biology/Botany/Zoology as core subjects 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.

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

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Study Components	Semester	No. of Courses x Credits	Total Credits
Part I Tamil /Other languages	I-IV	4 x 3	12
Part II English	I-IV	4 x 3	12
Part III Allied Subjects			
Theory	I-IV	4 x 4	16
Practical	I-IV	2 x 2	04
Core Subjects			
Theory	I-IV	4 x 5	20
Practical	I-IV	2 x 4	08
Core Subjects			
Theory	V-VI	8 x 4	32
Practical	V-VI	2 x 4	08
Elective	V-VI	3 x 2	06
Part IV			
1. NME	I	1 x 3	03
2. NME	II	1 x 2	02
3. Soft Skill	I-IV	4 x 3	12
4. Environmental Studies	III	1 x 2	02
5. Value Education	IV	1 x 2	02
Part – V			
Extension Activities		1 x 1	01
	Total		140

NOTE: [For Part IV (1)]

- (a) Those who have not studied Tamil upto XII std and taken a non-Tamil language under Part – I shall take Tamil comprising of two courses (level will be at 6th standard)
- (b) Those who have studied Tamil upto XII std and taken a non – Tamil language under Part – I shall take Advanced Tamil comprising of two courses
- (c) Others who do not come under a+b can choose non-major elective comprising of two courses.

4. PASSING MINIMUM

A candidate shall be declared to have passed in each paper / practical where ever prescribed if she secures not less than 40% of the marks prescribed for the examination. She shall be declared to have passed the whole examinations. (She shall also fulfill the compulsory extension services to qualify for the degree).

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.

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 (Part I, II, III & IV) 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. ZB18/1N/AQU Aquaculture - Semester – I. (Offered to Other Department Students).
- b. ZB18/2N/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	ZB18/1C/1NV	PAPER-I –Invertebrata	8	5	40	60	100
II	ZB18/2C/CHO	PAPER-II-Chordata	8	5	40	60	100
I &II	ZB18/2C/PR1	PRACTICAL-I Invertebrata and Chordata	2	4	40	60	100
III	ZB18/3C/CBY	PAPER-III -Cell Biology	8	5	40	60	100
IV	ZB18/4C/GEN	PAPER-IV –Genetics	8	5	40	60	100
III& IV	ZB18/4C/PR2	PRACTICAL- II- Cell Biology and Genetics	2	4	40	60	100
V	ZB18/5C/APY	PAPER-V -Animal Physiology	5	4	40	60	100
V	ZB18/5C/DBY	PAPER-VI – Developmental Biology	4	4	40	60	100
V	ZB18/5C/EBY	PAPER-VII - Environmental Biology	4	4	40	60	100
V	ZB18/5C/BIO	PAPER-VIII – Biotechnology	5	4	40	60	100
V	ZB18/5C/EZY	PAPER-IX -Economic Zoology	4	4	40	60	100
V	ZB18/5E/BIN	ELECTIVE-I-Bio- Instrumentation	4	2	40	60	100
VI	ZB18/6C/IMY	PAPER-X –Immunology	5	4	40	60	100
VI	ZB18/6C/EVO	PAPER-XI –Evolution	5	4	40	60	100
VI	ZB18/6C/MIC	PAPER-XII – Microbiology	5	4	40	60	100
VI	ZB18/6E/MLT	ELECTIVE-II-Medical Laboratory Techniques	5	2	40	60	100
VI	ZB18/6E/ENT	ELECTIVE-III- Entomology	5	2	40	60	100
V & VI	ZB18/6C/PR3	PRACTICAL III- Developmental Biology, Environmental Biology, Evolution, Medical Laboratory Techniques and Bio-Instrumentation.	2	4	40	60	100
V & VI	ZB18/6C/PR4	PRACTICAL IV- Animal Physiology, Microbiology, Immunology Biotechnology and Economic Zoology.	2	4	40	60	100

COURSE PROFILE- PART III- ALLIED

Sem	Course code	Course title	Hrs /wk	Credits	CA marks	End semester marks	Total
I	ZB18/1A/ZO1	Allied Zoology Paper I (for PBPB students)	4	4	40	60	100
II	ZB18/2A/ZO2	Allied Zoology Paper II (for PBPB students)	4	4	40	60	100
II	ZB18/2A/AZO	Allied Zoology Practical (for PBPB students)	2	2	40	60	100
III	ZB18/3A/BC1	Allied Biochemistry Paper I (for Batch I students)	4	4	40	60	100
IV	ZB18/4A/BC2	Allied Biochemistry Paper II (for Batch-I students)	4	4	40	60	100
IV	ZB18/4A/ABC	Allied Biochemistry Practical (for Batch-I students)	2	2	40	60	100

COURSE PROFILE- PART IV NON MAJOR ELECTIVE

Sem	Course code	Course title	Hrs /wk	Credits	CA marks	End semester marks	Total
I	ZB18/1N/AQU	Aquaculture	2	3	-	50	50
II	ZB18/2N/VER	Vermitechnology	2	3	-	50	50

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	ZB18/1C/INV	PAPER-I – Invertebrata	2	20	2	10	10	40	60	100
II	ZB18/2C/CHO	PAPER-II- Chordata	2	20	2	10	10	40	60	100
III	ZB18/3C/CBY	PAPER-III -Cell Biology	2	20	2	10	10	40	60	100
IV	ZB18/4C/GEN	PAPER-IV – Genetics	2	20	2	10	10	40	60	100
V	ZB18/5C/APY	PAPER-V - Animal Physiology	2	20	2	10	10	40	60	100
V	ZB18/5C/DBY	PAPER-VI – Developmental Biology	2	20	2	10	10	40	60	100
V	ZB18/5C/EBY	PAPER-VII - Environmental Biology	2	20	2	10	10	40	60	100
V	ZB18/5C/BTY	PAPER-VIII – Biotechnology	2	20	2	10	10	40	60	100
V	ZB18/5C/EZY	PAPER-IX - Economic Zoology	2	20	2	10	10	40	60	100
V	ZB18/5E/BIN	ELECTIVE-I- Bio-Instrumentation	2	20	2	10	10	40	60	100
VI	ZB18/6C/IMY	PAPER-X – Immunology	2	20	2	10	10	40	60	100
VI	ZB18/6C/EVO	PAPER-XI – Evolution	2	20	2	10	10	40	60	100
VI	ZB18/6C/MIC	PAPER-XII – Microbiology	2	20	2	10	10	40	60	100
VI	ZB18/6E/MLT	ELECTIVE-II- Medical Laboratory Techniques	2	20	2	10	10	40	60	100
VI	ZB18/6E/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	ZB18/2C/PR1	PRACTICAL-I Invertebrata and Chordata	20	10	10	40	60	100
IV	ZB18/ 4C/ PR2	PRACTICAL-II Cell Biology and Genetics	20	10	10	40	60	100
VI	ZB18/6C/PR3	PRACTICAL III- Developmental Biology, Environmental Biology, Evolution, Medical Laboratory Techniques and Bio-Instrumentation.	20	10	10	40	60	100
VI	ZB18/6C/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	ZB18/1A/ZO1	Allied Zoology paper I (for PBPB students)	2	20	2	10	10	40	60	100
II	ZB18/2A/ZO2	Allied Zoology paper II (for PBPB students)	2	20	2	10	10	40	60	100
II	ZB18/2A/AZO	Allied Zoology Practical	2	20	2	10	10	40	60	100
III	ZB18/4A/BCI	Allied Biochemistry paper I (for Batch I)	2	20	2	10	10	40	60	100
IV	ZB18/4A/BC2	Allied Biochemistry paper II (for Batch I)	2	20	2	10	10	40	60	100
IV	ZB18/4A/ABC	Allied Biochemistry Practical	2	20	2	10	10	40	60	100

SEMESTER I

PAPER - I - INVERTEBRATA

TEACHING HOURS -120 Hrs

CREDITS- 5

COURSE CODE-ZB18/1C/INV

L T P: 6 2 0

Objectives:

- Understand the morphology with special emphasis on their adaptation.
- Understand the issues related to their phylogenetic and evolutionary significance.

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 of Nutrition in Invertebrates, Locomotion in Invertebrates

Phylum: Protozoa

General Characters, Classification with Examples, Type study – *Paramecium*, Parasitic Protozoan – *Plasmodium vivax* (24 Hrs)

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. (24 Hrs)

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, Classification, Type Study: *Neanthes* (Nereis), Metamerism, Nephridia and coelomoducts. (24 Hrs)

UNIT – IV:

Phylum: Arthropoda

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

Phylum: Mollusca

General Characters, Classification, Type Study: *Pila*, Economic Importance of Mollusca. (24 Hrs)

UNIT – V

Phylum: Echinodermata

General Characters, Classification, Type Study: *Asterias* (star fish), Echinoderm Larvae and their Significance, Water Vascular System. (24 Hrs)

PRESCRIBED TEXTBOOK:

1. Invertebrate EL Jordan & P.S. Verma, S. Chand Publishers.

SUGGESTED BOOKS:

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>.

QUESTION PAPER TEMPLATE

COMPONENTS	NATURE OF QUESTION	MAXIMUM MARKS
PART - A	Definition – 10 Questions – Two from each unit	10 x 2 = 20
PART - B	Description – 8 Questions are to be given covering all units – 5 out of 8 should be answered	5 x 8 = 40
PART - C	Application / Analysis/ Synthesis – 4 Questions are to be given out of which 2 are to be answered	2 x 20 =40

SEMESTER II

PAPER - II CHORDATA

TEACHING HOURS – 120Hrs

CREDITS: 5

COURSECODE–ZB18/2C/CHO

LTP: 6 2 0

Objectives

- To enable the students to understand the morphology of chordates with special emphasis on their adaptation.
- Analyse the advances in their complexity with reference to their habitat

UNIT- I

General characters and Classification of Prochordata, Cephalochordata, Hemichordata, Urochordata Affinities of Prochordata. (24 Hrs)

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*, Brief description of five common Fishes found in India- Sardinella, Mackerel, Catla, Rohu, Mrigal. Accessory Respiratory Organs, Parental Care in Fishes, Migration in Fishes. (24 Hrs)

UNIT- III

Amphibia– General characters and Classification up to order, Type Study – *Rana tigrina* (Frog), Parental care and Paedogenesis in Amphibia, Brief description of five common Amphibians found in India- Bufo, Hyla, Rhacophorus, Ichthyophis, Ambystoma.

Reptilia – General characters and Classification based on skull, Type Study – *Calotes versicolor* (Garden lizard), Brief description of five common Reptiles found in India- Hemidactylus, Chameleon, Varanus, Turtle, Tortoise. Identification of Poisonous and Non-Poisonous Snakes, Poison Apparatus. (24 Hrs)

UNIT- IV

Aves - General characters and Classification up to order, Type Study – *Columba livia*, Brief description of five common Birds found in India- Crow, Sparrow, Peacock, Mynah, Indian Parrot, Flightless Birds, Flight Adaptations in Birds, Migration in Birds. (24 Hrs)

UNIT- V

Mammals - General characters and Classification up to order, Type Study – *Oryctolagus cuniculus* (Rabbit), Brief description of five common Mammals found in India- Lion, Elephant, Cow, Horse, Cat, Brief description of Egg Laying Mammals, Marsupials, Placental mammals, Dentition in Mammals, Aquatic Adaptations in Mammals. (24 Hrs)

PRESCRIBED TEXTBOOK:

1. Chordata EL Jordan & P.S. Verma, S. Chand Publishers.

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 Hallgrimsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers, Inc.

Web link : www.ucmp.berkeley.edu/chordata/chordata.html

QUESTION PAPER TEMPLATE

COMPONENTS	NATURE OF QUESTION	MAXIMUM MARKS
PART - A	Definition – 10 Questions – Two from each unit	10 x 2 = 20
PART - B	Description – 8 Questions are to be given covering all units – 5 out of 8 should be answered	5 x 8 = 40
PART - C	Application / Analysis/ Synthesis – 4 Questions are to be given out of which 2 are to be answered	2 x 20 = 40

SEMESTER-II

PRACTICAL I: INVERTEBRATA AND CHORDATA

TEACHING HOURS-60 Hrs

CREDIT: 4

COURSE CODE- ZB18/2C/PR1

L T P : 0 0 2

I. DISSECTION

A. COCKROACH/ PRAWN

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

B. Any bony fish:

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

II. MOUNTING

Mouth parts of

1. Cockroach
2. Mosquito
3. Shark: Placoid-Carp-Cycloid

III. SPOTTERS

A. Classify giving reasons up to order:

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

B. Draw labeled sketches:

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

C. Comment on biological significance:

22. *Entamoeba*
23. *Paramecium*-conjugation
24. *Plasmodium*
25. *Ascaris*
26. *Heteronereis*
27. *Peripatus*
28. Nauplius larva
29. *Sacculina* on crab
30. Sea anemone on hermit crab
31. *Vipera russelli*
32. Bat

D- Relate structure and function:

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

E. Types of fins:

Homocercal fin, Heterocercal fin, Diphyrcercal fin

F. 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

CREDITS: 5

COURSE CODE: ZB18/3C/CBY

L T P: 6 2 0

Objectives:

To enable students to :

- Understand the structural and functional details of the cell
- Understand the role of nucleic acids and structural changes in cancer cells.

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. **(18 hrs)**

UNIT- II

Cell organelles - structure and functions of Endoplasmic reticulum, Golgi apparatus, ribosomes, Structure and functions of lysosomes, polymorphism- structure and functions of mitochondria, cellular respiration – centrioles. **(30 hrs)**

UNIT- III

Nucleus, nucleolus - structure and functions. Chromosome - structure, classification. Euchromatin, heterochromatin, Sat chromosomes, Karyotype, chromosomal banding. Special chromosomes – Polytene and Lampbrush. **(30 hrs)**

UNIT- IV

Cell cycle and stages- cell division and significance – amitosis, mitosis, meiosis- Cancer biology – characteristics of cancer cells – Types of cancer– Differences between normal and cancerous cell – theories on carcinogenesis. **(24 hrs)**

UNIT V

Cytological techniques – cell fractionation – fixation, staining - principles of light microscopy, Phase contrast microscopy, electron microscopy (18 hrs)

PRESCRIBED TEXT BOOK

1. Verma P.S. and Agarwal V.K., Cell and Molecular Biology 8th edition. S.Chand and Co. NewDelhi.

SUGGESTED READING

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 8th edition, International edition.
4. Lodish, Berk, Zipursky Matsudaria Baltimore Darnell, Molecular Cell Biology 4th edition.
5. David Friefielder, Essentials of Molecular Biology.

QUESTION PAPER TEMPLATE

COMPONENTS	NATURE OF QUESTION	MAXIMUM MARKS
PART - A	Definition – 10 Questions – Two from each unit	10 x 2 = 20
PART - B	Description – 8 Questions are to be given covering all units – 5 out of 8 should be answered	5 x 8 = 40
PART - C	Application / Analysis/ Synthesis – 4 Questions are to be given out of which 2 are to be answered	2 x 20 =40

SEMESTER – IV
PAPER IV- GENETICS

TEACHING HOURS: 120 Hrs

CREDITS: 5

COURSE CODE: ZB18/4C/GEN

LTP: 6 2 0

Objectives:

To enable the learners to

- Understand the concept of classical genetics
- Understand the inheritance of human traits
- Understand the structure and functions of chromosomes

UNIT- I

Mendelian inheritance- Laws of inheritance. Mendelian traits in man. Gene interaction - codominance, incomplete dominance, epistasis. – Multiple alleles (Blood group inheritance in human) – crossing over – cytological proof for crossing over – significance of crossing over - chromosome mapping. **(28hrs)**

UNIT- II

Sex determination – Heterogametic theory of sex determination – Geneic balance mechanism – Hormonal control of sex determination – Environmentally controlled sex determining mechanism, 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. **(20hrs)**

UNIT- III

Structure and functions of DNA — Watson & Crick model of DNA – Polymorphic forms of DNA – Mechanism of DNA replication - steps in prokaryotic replication – enzymes involved in DNA replication. RNA structure , types and functions – Genetic code - Protein synthesis (prokaryotes). Transcriptional control – Lac Operon. **(28hrs)**

UNIT- IV

Gene – Gene concept-cistron, muton, recon. Molecular basis of gene mutations – mutable and mutator genes. Chromosomal aberration types – intrachromosomal and interchromosomal. Human syndromes (21 trisomy , 18 trisomy, 47XXY, 45 XO). Non disjunction. **(24hrs)**

UNIT- V

Cytoplasmic inheritance, mitochondrial DNA. Genetic counselling, Eugenics, Euthenics, Euphenics – Inborn errors of metabolism. (20hrs)

PRESCRIBED TEXT BOOK

1. Verma .P.S. and Agarwal, V.K., 1995, Genetics, 8th edition, S. Chand and Co. New Delhi – 110 055. 580pp.

SUGGESTED READING

1. Gopalakrishnan T.S., Itta Sambasiviah and Kamalakara Rao, A.P., Genetics 1995- 96. Himalaya Publishing House, Bombay - 400 004, 250 pp.
2. Gardner, 1972, Principles of Genetics, Wiley Eastern Pvt .Ltd. 590 pp.
3. Sinott, Dunn and Dobzhansky – Principles of Genetics, Mc Graw Hill Book Company.

QUESTION PAPER TEMPLATE

COMPONENTS	NATURE OF QUESTION	MAXIMUM MARKS
PART - A	Definition – 10 Questions – Two from each unit	10 x 2 = 20
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SEMESTER –IV
PRACTICAL –II CELL BIOLOGY AND GENETICS

TEACHING HOURS- 60 Hrs

CREDITS: 4

COURSE CODE: ZB18/4C/ PR2

L T P: 0 0 2

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. Widow'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: 75 Hrs

CREDITS : 4

COURSE CODE: ZB18/5C/APY

L T P:3 1 0

Objectives:

To enable the students

- To understand the functional aspects of organ systems in animals and humans.
- To understand the life style disorders and diseases in humans.

UNIT- I

Definition and Scope of Animal Physiology.– Nutrition- Types of nutrition – balanced diet-Biological function of vitamins -Digestion- Mechanical and Chemical changes of food in the alimentary canal- Digestive enzymes- Digestion of carbohydrates, Proteins and Lipids. Nutritional disorders – PEM , vitamin deficiencies , deficiency of iron, iodine and calcium. Gastro intestinal disorders- Ulcer, Gastritis, GERD. . (15 Hrs)

UNIT- II

Circulation- Types of circulation – Types of heart – structure of human heart - – Cardiac cycle – ECG, Pacemaker , Blood pressure and pulse pressure.- heart beat. Composition of blood and their functions – Blood clotting mechanism, Lymph and lymphatic system. Heart diseases - atherosclerosis, myocardial infarction, Rheumatic heart diseases, Stroke - Arterial block - angiogram, angioplasty. (15 Hrs)

UNIT- III

Respiration–Respiratory Quotient -.Respiratory pigments – structure of haemoglobin. Exchange and transport of gases –Transport of O₂- oxyhaemoglobin curve, Bohr effect-Transport of CO₂ -carbonic acid, carbaminohaemoglobin, bicarbonate and chloride shift. Respiratory disorders- Hypoxia, hypo and hypercapnia, asphyxia, carbon monoxide poisoning, bronchitis, asthma -physiological effects of smoking. (15 Hrs)

UNIT- IV

Excretion – Types of excretory products- Urea cycle –Structure and functions of nephron , Mechanism of urine formation - composition of urine - Renal disorders – nephritis, haematuria, renal calculi, acidosis and alkalosis- dialysis and kidney transplantation. Osmo regulation –Osmoregulators and Osmoconformers - Mechanism of osmoregulation in fresh water and marine fishes (15 Hrs).

UNIT- V

Nervous system –Types and structure of neuron – Conduction of nerve impulse– Nervous disorders – Epilepsy, Alzheimer’s disease, Parkinson’s disease. Muscle physiology- Types of muscles – Ultrastructure of skeletal muscle, Properties of muscle- Tetanus, Fatigue and Rigor mortis - Physiological and Biochemical events in muscle contraction.

Sensory receptors- Structure of human eye and ear -physiology of vision and hearing. (15 Hrs)

PRESCRIBED TEXT BOOK

1. Eckert, R. And D. Randell. (1987). Animal Physiology, Cbs Publishers And Distributors N. Delhi

SUGGESTED READING

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

QUESTION PAPER TEMPLATE

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SEMESTER- V

PAPER VI- DEVELOPMENTAL BIOLOGY

TEACHING HOURS: 60 Hrs

CREDITS : 4

COURSE CODE: ZB18/5C/DBY

L T P: 3 1 0

Objectives:

- To enable the students to understand the basic pattern of development in animals.
- To explore the recent advances and application in developmental sciences.

UNIT – I

Basic concepts of developmental biology – Theories- Gametogenesis - Types of sperm - structure of human sperm - Spermatogenesis - Types of eggs - Structure of mammalian egg- classification of eggs based on yolk content distribution - classification of eggs based on cleavage - Egg membranes- Oogenesis . (12 Hrs)

UNIT – II

Fertilization – mechanism and significance - theories of fertilization- parthenogenesis. Cleavage - Patterns of cleavage, Factors controlling cleavage- fate map- blastulation and gastrulation in frog and chick. (12 Hrs)

UNIT - III

Organogenesis – Development of brain, eye and ear in frog. Organizer concept – mechanism of induction- Teratogenesis- Regeneration. (12 Hrs)

UNIT – IV

Extra embryonic membranes in chick - Foetal membranes in mammals- Placentation in mammals – Types and Functions. (12 Hrs)

UNIT – V

Human reproduction – Puberty- Menstrual cycle and Menopause - Pregnancy – Trimesters – Development- Parturition – Lactation- Twins – Types- Infertility – Causes- Test tube baby and ART. (12 Hrs)

PRESCRIBED TEXT BOOK

1. Chordate Embryology by P.S. Varma V.K. Agarwal. Chand Publishers

SUGGESTED READING

1. Principles Of Development (iii Edition) Lewis Wolpert Oxford University Press UK. 2007.
2. An Introduction To Embryology (V Edition). B. I. Balinsky. Thomas Asia Pvt. Ltd. Singapore.
3. Developmental Biology: R. M. Twyman. Bios Scientific Publishers Ltd. New Delhi (2001)

QUESTION PAPER TEMPLATE

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SEMESTER- V

PAPER VII- ENVIRONMENTAL BIOLOGY

TEACHING HOURS : 60 Hrs

CREDITS : 4

COURSE CODE: ZB18/5C/EBY

L T P: 3 1 0

Objectives:

- To analyse the interactions of the living organisms.
- To study the importance of environmental biotechnology and its applications.

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. **(12 Hrs)**

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. **(12 Hrs)**

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.

Estuarine Ecology – Characteristics – Biotic communities and their adaptations.

Importance of mangroves in coastal ecosystems- conservation and management. **(12 Hrs)**

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 .

Pollution – Types of pollution and pollutants – Air pollution and water pollution their biological effect and control. **(12 Hrs)**

UNIT - V:

Environmental Biotechnology -Biotechnological methods of Pollution detection- Pollution abatement – Bioremediation- Genetically engineered microbes in Bio-Treatment of waste water - Eco-Friendly Bioproducts for Environmental Health - Bio-Piracy.

Wildlife management – Preservation of wild life – wild life laws enforced- sanctuaries and national parks.- significance, causes of extinction, concepts of threatened species - red data book- IUCN, WWF - protected areas, biosphere reserves **(12 Hrs)**

PRESCRIBED TEXT BOOK

1. Environmental Biology (Principles of Ecology) by Dr. P.S. Verma and Dr. V.K. Agarwal S. Chand (Publisher) Edition.
2. Ecology, Micro Biology, Animal Behaviour, Pollution and Toxicology for B.Sc., Dr. Veera Bala Rastogi (KNRN) Publishers.

SUGGESTED READING

1. Colinvax, P. A. (1993). Ecology. Ii Edition. Wiley, John And Sons, Inc.
3. Krebs, C. J. (2001). Ecology. Vi Edition. Benjamin Cummings.
4. Ricklefs, R.E., (2000). Ecology. V Edition. Chiron Press

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SEMESTER – V
PAPER VIII- BIOTECHNOLOGY

TEACHING HOURS: 75 Hrs

CREDITS: 4

COURSE CODE: ZB18/5C/BTY

L T P: 3 1 0

Objectives

- To enable students towards the understanding of the basic concepts and applications of biotechnology
- To induct students with knowledge about the emerging trends in biotechnology

UNIT- I

Biotechnology and Gene cloning – definition, scope, centers in Tamil Nadu and India. Recombinant DNA technology - steps involved in gene cloning – cloning vectors – plasmid (pBR 322, pBR 327), Cosmids, Phagemids, Phage vectors (lambda and M13) enzymes in gene cloning - gene isolation – automated gene synthesis, PCR. **(15 Hrs)**

UNIT- II

Gene manipulation- gene transfer methods - selection and isolation of recombinants - direct and indirect methods. Expression of cloned genes in Prokaryotes. Construction of genomic libraries and screening methods. **(15 Hrs)**

UNIT- III

Molecular markers – RAPD, SNPS, RFLP and DNA finger printing. Nucleic acid hybridization - blotting types and applications. FISH. DNA sequencing – Maxam & Gilbert, Sanger & Coulson method and automated DNA sequencing. **(15 Hrs)**

UNIT- IV

Applications of biotechnology in agriculture -Terminator gene technology, Bio pesticides (*Bacillus thuringiensis*). Biofertilizers – *Rhizobium* and *Azotobacter*. Single Cell Protein (SCP). Applications of Biotechnology in medicine and human health – gene therapy. **(15 Hrs)**

UNIT- V

Current issues in biotechnology- GMO and Transgenic Animals. IPR - Patent, Copyright and Trade mark, TRIPS and GATT, Ethical issues related to Biotechnology. **(15 Hrs)**

PRESCRIBED TEXT BOOK

1. Kumaresan, V., Biotechnology, (2005) Saras Publications.

SUGGESTED READING:

2. T.A.Brown, Gene Cloning an Introduction, 3rd Edition, Stanley Thomas Publication.
3. Old R.W. and S.B.Primrose. Principles of Gene Manipulation, 5th edition, Oxford University Press.
4. Glick .B.R and Jack.J. Pasternak 1994, Molecular Biotechnology, ASM Press.

Question Paper Template:

COMPONENTS	NATURE OF QUESTION	MAXIMUM MARKS
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SEMESTER V

PAPER IX- ECONOMIC ZOOLOGY

TEACHING HOURS: 60 Hrs

CREDITS: 4

COURSE CODE: ZB18/5C/EZY

LTP: 3 1 0

Objectives:

- To gain knowledge on various aspects of applied zoology.

UNIT- I

Vermiculture – Selection of species for vermiculture – Vermicomposting- Organic resources for vermiculture - Vermicomposting methods - Pit Method , Heap Method and Windrow method -Harvesting of Compost - Factors affecting vermicomposting- Vermiwash - Advantages of vermicompost.. **(12 Hrs)**

UNIT- II

Introduction to aquaculture -. Different culture practices - Extensive, semi intensive, intensive. Types of aquaculture – Culture of Indian major carps – Induced breeding technique – Fresh water and marine prawn culture – Pearl oyster and edible oyster culture – Seaweed culture.

Fish processing and preservation – Principles of fish preservation – Methods of fish preservation. **(12 Hrs)**

UNIT- III

Ornamental fisheries – Freshwater ornamental fishes – Egg layers and live bearers - Setting up of an aquarium tank – Safety measures and devices for aquarium maintenance – Marine ornamental fishes - Prospects of ornamental fisheries – Export potential – Role of women in ornamental fish culture. **(12 Hrs)**

UNIT- IV

Economic importance of Fowl – Different breeds of fowl – Rearing methods – Management of modern poultry farm – Diseases affecting poultry - Prevention of poultry diseases. **(12 Hrs)**

UNIT- V

Economic importance of Mammals – Dairy, Sheep, economically important breeds for wool and meat. Piggery farming – economic importance and scope-indirect and direct value. (12 Hrs)

PRESCRIBED TEXT BOOK

1. Ismail M.S- Vermitechnology.
2. A Text book of Aquaculture – Rao KRSS. Reddy MS, Discovery publication, Delhi.
3. Jhingaran : Fish and fisheries of India

SUGGESTED BOOKS

1. Shukla, G.S and V.B. Upadhyay, 2010. Economic Zoology, Rastogi Publications
2. C.B.L. Shrivastava : Fishes of India

1.

QUESTION PAPER TEMPLATE

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SEMESTER-V

ELECTIVE I- BIO INSTRUMENTATION

TEACHING HOURS- 60 Hrs

CREDITS- 2

COURSE CODE: ZB18/5E/BIN

L T P : 3 1 0

Objectives:

- To understand the principles of biophysical components
- To study the working mechanism and applications of instruments

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). **(14 Hrs)**

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. **(14 Hrs)**

UNIT – III

Cryotechniques- cryopreservation of cells , tissues, organs and organisms, cryotomy; radio isotopic technique – radio immuno assay- applications of radio isotopes. **(12 Hrs)**

UNIT – IV

Biosensors- principle, types (enzyme, bacterial electrodes, environmental bio sensors & bio reporters) , applications. **(10 Hrs)**

UNIT – V

DNA and RNA sequencing methods - PCR – principle and application - DNA micro array and applications. **(10 Hrs)**

PRESCRIBED TEXT BOOK

1. Veerakumari, L. 2015. Bioinstrumentation, MJP Publishers, Chennai.

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.

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SEMESTER- VI
PAPER X- IMMUNOLOGY

TEACHING HOURS: 75 Hrs

CREDITS: 4

COURSE CODE: ZB18/6C/IMY

L T P: 3 1 0

Objectives:

- To introduce the students to the basic concepts of Immunology.
- To understand the working of defense mechanism.
- To understand the application of immunology in treatment of diseases.

UNIT – I

Definition and concepts - types of innate immunity- acquired immunity - components of immune system - organs involved in immune system -cells involved in immune response. **(15 Hrs)**

UNIT – II

Antigens - antigen response- hapten, adjuvant, frossman antigen. Immunoglobulins - types, structure, characteristics- interaction between Ag and Ab - cell mediated immunity- humoral immunity. Brief introduction to complementary system. **(20 Hrs)**

UNIT –III

Chemokines- chemicals involved in immune response - Interleukin, Interferon, TNF. Transplantation immunology - MHC – HLA - tissue typing and match, graft management. **(15 Hrs)**

UNIT – IV

Hyper sensitivity –types and treatment. Auto immune disorders . Tumour immunology - Immunotherapy. **(15 Hrs)**

UNIT- V

Vaccines – types, immunization schedule for children. Monoclonal antibodies. ELISA. Immuno electrophoresis – rocket immuno electrophoresis, RIA. **(10 Hrs)**

PRESCRIBED TEXT BOOK

1. Kannan. I, Immunology. MJP Publishers.

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

QUESTION PAPER TEMPLATE

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SEMESTER-VI

CORE PAPER XI- EVOLUTION

TEACHING HOURS: 75 Hrs

CREDITS: 4

COURSE CODE: ZB18/6C/EVO

LTP: 3 1 0

Objectives:

- To understand the principles of organic evolution based on common ancestry.
- Analyse the evolutionary trends as descent with modifications.

UNIT – I

Historical aspects of evolutionary concepts - Origin of life- chemical and biological evolution - Urey & Miller Experiment. Evidences in favour of evolution – comparative - morphology and anatomy – embryology – physiology and Biochemistry. **(15 Hrs)**

UNIT – II

Palaentological evidence – fossilization – dating of fossils. Geological time scale. Fossils in India - Zoogeographical realms. Micro and macro evolution . Evolutionary trends. Orthogenesis and ortho selection. **(15 Hrs)**

UNIT – III

Theories of Evolution - Lamarckism, Neo - Lamarckism, Darwinism, Neo - Darwinism, mutation theory - Modern synthetic theory – genetic basis of evolution.**(15 Hrs)**

UNIT – IV

Modes of evolution- Speciation- Types- Isolating mechanisms – Geographic and reproductive isolation – adaptive radiation- convergent and Parallel evolution- Mimicry and colouration – living fossil – Insular fauna. **(15 Hrs)**

UNIT – V

Evolution of vertebrate groups- fishes, amphibians, reptiles, birds and mammals Evolution of Horse and Man - Biological & Cultural evolution. **(15 Hrs)**

PRESCRIBED TEXTBOOK:

1. Veer Bala Rastogi, Organic Evolution; Pub: Kedal mathramnath – Mohan Print Media (P) Ltd.

SUGGESTED BOOKS:

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

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SEMESTER- VI

PAPER XII- MICROBIOLOGY

TEACHING HOURS: 75 Hrs

CREDITS: 4

COURSE CODE: ZB18/6C/MIC

L T P: 3 1 0

Objectives:

- To understand the taxonomic procedures in characterization and identification.
- To understand the process of sterilization and microbial culture techniques.
- To analyse the role of microbes in food production and industry.

UNIT-I

History and scope of Microbiology. Contributions of Anton Von Leuwenhoek, Edward Jenner, Robert Koch, Louis Pasteur. R.H. Whittaker 5 kingdom classification. Brief classification of Viruses Bacteria, Fungi and Protozoa. Sterilization-Physical Methods - Heat, Filtration, Chemical Methods - Alcohols, Phenols, Radiation - UV and Gamma Rays. **(15 Hrs)**

UNIT-II

Structure of Bacteria – Shape and size, Cell wall (Gram Positive and Gram Negative), Cell membrane, Flagellum, Pilus, Endospores and Inclusion bodies. Culture techniques – Media and its types, Pure Culture – Pour Plate, Spread Plate and Streak Plate techniques. Staining-Gram and Acid fast. Methods of preservation of cultures. **(15 Hrs)**

UNIT-III

Virus – Salient features -Structure and Life cycle of T₄ Bacteriophage. Life cycle, Pathogenesis, Diagnosis, Prevention and Treatment of AIDS and Hepatitis, General Characteristics of Poliomyelitis, Measles, Mumps, Rubella and their medical relevance.(Vaccination) - Fungi – *Candida*, and Protozoan *Entamoeba*. **(15 Hrs)**

UNIT-IV

Soil Microbiology - Microbes in Soil - Bacteria, Fungi, Actinomycetes, Algae and Viruses, Rhizosphere. Nitrogen Cycle, Carbon Cycle. Biofertilizers – *Rhizobium*. Water Microbiology- Sources of Water, Potable Water, Municipal Purification of Water. Air Microbiology - Composition of Air, Microbes in Air. (15 Hrs)

UNIT-V

Application of Microbes in Industrial Products -Ethanol,Wine, Beer,Vinegar preparation. Dairy products - Cheese, Curd, Bread and Butter. Preservation of food – Physical and chemical methods. (15 Hrs)

PRESCRIBED TEXTBOOK:

1. Mani. A., Selvaraj A. M. Narayanan L.M & Arumugam .N. 1996 : Microbiology – Saras Publication – Nagercoil – India.

SUGGESTED BOOKS:

1. Pelczar M.J., Chan E.C.S. and Kreig N.R. (2010). Microbiology 5th edn, McGraw- Hill, New York Publications.
2. Prescott L.M, Harley J.P and Klein D.A. (2005).Microbiology 6th edn, McGraw- Hill Publications.
3. R.C.Dubey , D.K.Maheshwari,(2010) Microbiology 2nd edn , S.Chand and Company Ltd. New Delhi.

Question Paper Template:

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SEMESTER-VI
ELECTIVE II- MEDICAL LABORATORY TECHNIQUES

TEACHING HOURS: 75 Hrs

CREDITS: 2

COURSE CODE: ZB18/6E/MLT

L T P: 3 1 0

Objectives:

- To understand the principle of Medical laboratory instruments and techniques.
- To diagnose various pathogens and their characterization.

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. **(15 Hrs)**

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. **(15 Hrs)**

UNIT – III

Urine – collection – physical and chemical parameters routinely analyzed – pregnancy test –analysis of stool. **(15 Hrs)**

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. **(15 Hrs)**

UNIT – V

Tests for life style disease - cardiac disorders – diabetes I & II –obesity –allergy – tests for auto immune disease – SLE, MG, RA, autoimmune hepatitis. (15 Hrs)

PRESCRIBED TEXTBOOK:

1. Mukherjee K.L. 2003. Medical Laboratory Technology – A Procedure Manual for Routine Diagnostic Tests, Vol. I, II & III. Jaypee Brothers, New Delhi.

SUGGESTED READING:

1. Baker F.J. And Silvertown R.E 1998. Introduction to Medical Laboratory Technology. Hodder Arnold Publication.

Question Paper Template

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SEMESTER-VI

ELECTIVE III –ENTOMOLOGY

TEACHING HOURS: 75 Hrs

CREDITS: 2

COURSE CODE: ZB18/6E/ENT

LTP: 3 1 0

Objectives:

- To identify the various pests and affected plants.
- To administer prescribed dosage of pesticides and management of pest population.

UNIT- I

General Characters of Class Insecta. Classification- Study of the following Insect Orders with salient features and suitable examples: Thysanura, Orthoptera, Odonata, Hymenoptera, Lepidoptera and Coleoptera.

Insect Biology- External Characters, Digestive System, Respiratory System, Nervous System and Reproductive System. Insect Mouth Parts: Biting and Chewing, Piercing and Sucking, Sponging and Siphoning.

Methods of insect Collections and Preservation **(15 Hrs)**

UNIT- II

Beneficial insects and their culture - Apiculture - Species of honey bee - Methods of Bee keeping - Bee products -uses- diseases and enemies of honey bee.

Sericulture- different types of silkworm- Types of silk- rearing methods - silk extraction and reeling- diseases of silkworm – lac insect- economic importance of lac. **(15 Hrs)**

UNIT- III

Human Insect Pest- Insect vectors- Binomics, Diseases caused and Control Measures with reference to Housefly, Mosquito, Rat Fleas and Bed Bug. Household insect pests- Ants, Termites, Silver fish and cockroaches. **(15 Hrs)**

UNIT-IV

Definition of Pest – Insect pests - Reasons for Insect attaining the Pest status – 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. Pest of sugarcane – shoot borer, stem borer, top borer, control measures (15 Hrs)

UNIT- V

Factors affecting Insect life - Effect of Light, Temperature, Humidity and Food – Pest Control Methods - Physical, Mechanical, Chemical and Biological methods of control. Recent trends in pest control, Transgenic control of insects. Integrated pest management. (15 Hrs)

PRESCRIBED TEXTBOOK:

1. Vasantharaj David, B. 2011. Elements of Economic Entomology, Namrutha publications.
2. 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.

SUGGESTED READING

1. Hemsing Pruthi : A Text Book of Agricultural Entomology.
2. Wigglesworth: Principles of Insect Physiology.
3. Metcalf, C.L. and W.P. Flint, 1973. Destructive and Useful Insects. 4th Ed., Tata McGraw Hill Publishing Co., Ltd., New Delhi – 110 051.

QUESTION PAPER TEMPLATE

COMPONENTS	NATURE OF QUESTION	MAXIMUM MARKS
PART - A	Definition – 10 Questions – Two from each unit	10 x 2 = 20
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PART - C	Application / Analysis/ Synthesis – 4 Questions are to be given out of which 2 are to be answered	2 x 20 =40

SEMESTER VI

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

TEACHING HOURS: 60Hrs

CREDITS: 4

COURSE CODE :ZB18/6C/PR3

L T P : 0 0 2

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. 24 hrs chick embryo
 - b. 48 hrs chick embryo
 - c. 72 hrs chick embryo
 - d. 96 hrs chick embryo
- 3
 - a. Placenta of sheep
 - b. Placenta of human

ENVIRONMENTAL BIOLOGY

- 1 Estimation of carbonates and bicarbonates in tap and sea water.
2. Estimation of Carbondioxide in tap and sea water
3. 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

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, IMMUNOLOGY, BIOTECHNOLOGY AND ECONOMIC ZOOLOGY

TEACHING HOURS: 60Hrs

CREDITS: 4

COURSE CODE: ZB18/6C/PR4

L T P: 0 0 2

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, 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 IMMUNOLOGY:

1. ABO Blood Grouping
2. Lymphoid organs – Prepared slides- Thymus, Bone marrow , Lymph node and Spleen
3. Immunoelectrophoresis-Demonstration

IV BIOTECHNOLOGY:

1. 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

V 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: ZB18/1A/ZO1

CREDITS: 4
L T P: 3 1 0

Objectives:

- To understand the organization of invertebrates
- To impart knowledge on cell biology and classical genetics

UNIT I

Study of types including life cycles-Protozoa-*Paramecium*-Porifera-Sycon -
Coelenterata-*Obelia*. (12 Hrs)

UNIT II

Platyhelminthes-*Taenia solium*-Annelida-*Hirudinaria granulosa* (Leech)-
Arthropoda-*Penaeus indicus* (Prawn). (12 Hrs)

UNIT III

Mollusca-*Lamellidens marginalis* (Freshwater Mussel) - Echinodermata-*Asterias*
(Star fish). (12 Hrs)

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. (12 Hrs)

UNIT V

Genetics-Laws of Mendelism-Sex determination and sex linked inheritance. (12 Hrs)

PRESCRIBED TEXT BOOKS

- 1.Arumugam,N.2004.Cell Biology,Genetics and Evolution.Saras Publication.
- 2.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.

SUGGESTED READING

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

QUESTION PAPER TEMPLATE

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PART - C	Application / Analysis/ Synthesis – 4 Questions are to be given out of which 2 are to be answered	2 x 20 =40

SEMESTER II
ALLIED ZOOLOGY PAPER II (For PBPB Students)

TEACHING HOURS: 60 Hrs
COURSE CODE: ZB18/2A/ZO2

CREDITS: 4
L T P : 3 1 0

Objectives:

- To understand the organization of chordates
- To analyse the basic concepts of physiology, and ecology
- To throw lights on the concepts of evolution

UNIT I

Study of Vertebrate types – Pisces-*Scoliodon sorrakowah* (Shark) - Amphibia-*Rana hexadactyla* (Frog) – Reptilia - *Calotes versicolor*. with reference to . External characters , digestive system , respiratory system , Structure of heart and brain, Urinogenital system
(12 Hrs)

UNIT II

Study of Aves-*Columba livia* (Pigeon) – Mammals - *Rattus rattus* (Rat) with reference to External characters , digestive system , respiratory system , Structure of heart and brain, Urinogenital system
(12 Hrs)

UNIT III

Physiology - Digestion, Respiration and Excretion in Mammals – Developmental Biology-Types of eggs – Cleavage - Blastulation and Gastrulation in Frog. **(12 Hrs)**

UNIT IV

Ecology-Temperature, Light and Water as abiotic factors – Animal associations (Commensalism, Mutualism and Parasitism). **(12 Hrs)**

UNIT V

Evolution - Origin of life – Lamarckism - Neo Lamarckism – Darwinism – NeoDarwinism - Mutation Thoery of De Vries. **(12 Hrs)**

PRESCRIBED 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.

SUGGESTED READING

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.

QUESTION PAPER TEMPLATE

COMPONENTS	NATURE OF QUESTION	MAXIMUM MARKS
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SEMESTER- II
ALLIED ZOOLOGY PRACTICAL (FOR PBPB STUDENTS)

TEACHING HOURS: 60 Hrs

CREDITS: 2

COURSE CODE: ZB18/2A/AZO

L T P: 0 0 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 (Law of dominance, Law of independent assortment) **NORMAL AND MUTANT Drosophila** (Vestigial wing, Rotated abdomen, Barr eye).

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 II B.Sc batch I)

TEACHING HOURS: 60 Hrs

CREDITS: 4

COURSE CODE: ZB18/3A/ BC1

LTP : 3 1 0

Objectives:

- To understand the principles of biochemistry
- To understand the biological phenomena of metabolism
- To analyse the significance of pH and buffer in blood

UNIT - I

Definition, scope and significance of Biochemistry – Important discoveries in biochemistry. Water – Molecular structure and its physical properties. **(12 Hrs)**

UNIT – II

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. **(12 Hrs)**

UNIT – III

Carbohydrates: Structure, reactions of mono, di and oligosaccharides. Polysaccharides in plants - cellulose, starch and pectins.: Carbohydrate metabolism- Glycolysis, Kreb's tricarboxylic acid cycle, Glucogenesis, Gluconeogenesis ,Glcogenolysis and pentose pathway. Maintenance of blood glucose. **(12 Hrs)**

UNIT – IV

Lipids: Classification of lipids, saturated and unsaturated fatty acids, cholesterol, bile acids, fatty acid break down and acetate release. **(12 Hrs)**

UNIT – V

Protein – Classification according to solubility, shape, composition and function, functional groups of aminoacids, peptide bond, primary, secondary and tertiary and quaternary structure of proteins, Ramachandran plot, protein breakdown, transamination, oxidative deamination and urea cycle. Interrelationship of Protein, Lipid and Carbohydrate metabolism. (12 Hrs)

PRESCRIBED TEXT BOOKS

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

SUGGESTED READING

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.

Question Paper Template:

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SEMESTER-IV

II B.Sc. ADVANCED ZOOLOGY AND BIOTECHNOLOGY

ALLIED BIOCHEMISTRY PAPER – II (for II B.Sc Batch I)

TEACHING HOURS: 60 Hrs

CREDITS: 4

COURSE CODE: ZB18/4A/ BC2

LTP : 3 1 0

Objectives:

- To understand the principles of biochemistry
- To understand the biological phenomena of enzymes, nucleic acids and vitamins
- To study the role of hormones

UNIT - I

Enzymes: Definition, Classification based on their function, apoenzyme, isoenzyme and coenzymes, mechanism of enzyme action – enzyme substrate complex, properties of enzymes, enzyme inhibition – enzyme kinetics. **(12 Hrs)**

UNIT - II

Bioenergetics: oxidative phosphorylation, electron transport chain, high energy compounds. **(12 Hrs)**

UNIT - III

Vitamins: Definition and classification- Water Soluble vitamins- thiamine, riboflavin, panthothenic acid, ascorbic acid, pyridoxine, Vitamin – B12 - Fat Soluble Vitamins – A, D, E and K with reference to the occurrence, deficiency and biochemical function. **(12 Hrs)**

UNIT – IV

Hormones: Definition, Endocrine glands and its secretion - Biological functions of pituitary hormones, thyroid hormones, parathormone, insulin, glucagon , adrenal hormones and sex hormones. **(12 Hrs)**

UNIT - V

Nucleic acids – Nucleosides, Nucleotides, DNA and RNA (occurrence & structure) and protein biosynthesis. **(12 Hrs)**

PRESCRIBED TEXT BOOK

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

SUGGESTED READING

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.

Question Paper Template:

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IV SEMESTER

ALLIED BIOCHEMISTRY PRACTICAL (For Students of II B.Sc., Batch-I)

TEACHING HOURS: 60 Hrs

CREDITS : 2

COURSE CODE: ZB18/4A/ABC

LTP: 0 0 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 casein 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 –ZB18/1N/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: ZB18/2N/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

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