

**ALAGAPPA UNIVERSITY, KARAIKUDI.**  
**NEW SYLLABUS UNDER CBCS PATTERN (w.e.f.2014-15)**

**B.Sc., ZOOLOGY with Specialization in BIOTECHNOLOGY**  
**PROGRAMME STRUCTURE**

**Allied Subjects: (1) Chemistry and  
(2) Botany**

Sem	Course			Cr.	Hrs./ Week	Marks		Total	
	Part	Subject code	Name			Int.	Ext.		
I	I	411T	<b>Tamil / Other Languages – I</b>	3	6	25	75	100	
	II	412E	<b>English – I</b>	3	6	25	75	100	
	III		4BZO1C1	<b>Core – I – Biodiversity of Invertebrates – I</b>	4	5	25	75	100
			4BZO1C2	<b>Core – II – Biodiversity of Invertebrates – II</b>	4	5	25	75	100
			---	<b>Core – III – Practical – I – Biodiversity of Invertebrates I&amp;II and Biodiversity of Chordates</b>	-	2*	--	--	---
				<b>Allied–I–(Theory cum Practical)</b>	4	3	15	60	75
			<b>Allied Practical – I</b>	-	2**	--	--	---	
IV	4NME1A / 4NME1B / 4NME1C	<b>(1) Non-Major Elective –I –</b> (a)தமிழ்மொழியின் அடிப்படைகள் /(b) இக்கால இலக்கியம் / (c) Communicative English	2	1	25	75	100		
<b>Total</b>				<b>20</b>	<b>30</b>	<b>--</b>	<b>--</b>	<b>575</b>	
II	I	421T	<b>Tamil / Other Languages – II</b>	3	6	25	75	100	
	II	422E	<b>English – II</b>	3	6	25	75	100	
	III		4BZO2P1	<b>Core – III – Practical – I – Biodiversity of Invertebrates I&amp;II and Biodiversity of Chordates</b>	4	2*	40	60	100
			4BZO2C1	<b>Core – IV – Biodiversity of Chordates</b>	4	4	25	75	100
			4BZO2C2	<b>Core – V – Cell Biology And Instrumentation</b>	4	5	25	75	100
				<b>Allied–II–(Theory cum Practical)</b>	4	3	15	60	75
			<b>Allied Practical – I</b>	2	2**	20	30	50	
IV	4BES2	<b>(3) Environmental Studies</b>	2	2	25	75	100		
<b>Total</b>				<b>26</b>	<b>30</b>	<b>--</b>	<b>--</b>	<b>725</b>	
III	I	431T	<b>Tamil /Other languages – III</b>	3	6	25	75	100	
	II	432E	<b>English – III</b>	3	6	25	75	100	
	III		4BZO3C1	<b>Core – VI – Developmental Biology &amp; Evolution</b>	4	6	25	75	100
			4BZO3P1	<b>Core – VII – Practical – II – Cell Biology &amp;Developmental Biology</b>	4	4	40	60	100
				<b>Allied–III–(Theory cum Practical)</b>	4	3	15	60	75
		<b>Allied Practical – II</b>	-	2**	--	--	---		

	IV	4NME3A/ 4NME3B/ 4NME3C	<b>(1) Non-major Elective–II–(a)</b> இலக்கியமும் மொழிப்பயன்பாடும் / (b) பழந்தமிழ் இலக்கியங்களும் இலக்கிய வரலாறும்/ (c) Effective Employability Skills	2	1	25	75	100
		4SBS3A1/ 4SBS3A2	<b>(2) Skill Based Subjects – I</b>	2	2	25	75	100
	V	4BEA3	<b>Extension activities</b>	1	--	100	--	100
<b>Total</b>				<b>23</b>	<b>30</b>	<b>--</b>	<b>--</b>	<b>775</b>
IV	I	441T	<b>Tamil /other language – IV</b>	3	6	25	75	100
	II	42E	<b>English – IV</b>	3	6	25	75	100
	III	4BZO4C1	<b>Core – VIII – Genetics &amp; Molecular Biology</b>	4	5	25	75	100
		4BZO4P1	<b>Core – IX – Practical – III – Evolution, Genetics &amp; Molecular Biology</b>	4	4	40	60	100
			<b>Allied–IV–(Theory cum Practical)</b>	4	3	15	60	75
			<b>Allied Practical – II</b>	2	2**	20	30	50
	IV	4SBS4B1/ 4SBS4B2	<b>(2) Skill Based Subjects – II</b>	2	2	25	75	100
		4BVE4/ 4BMY4/ 4BWS4	<b>(4) Value Education / Manavalakalai Yoga / Women’s Studies</b>	2	2	25	75	100
<b>Total</b>				<b>24</b>	<b>30</b>	<b>--</b>	<b>--</b>	<b>725</b>
V	III	4BZO5C1	<b>Core – X – Animal Physiology</b>	4	5	25	75	100
		4BZO5C2	<b>Core – XI - Biochemistry</b>	4	5	25	75	100
		4BZOE1A / 4BZOE1B/ 4BZOE1C	<b>Elective–I- Fisheries Biology (or) Vermiculture (or) Mushroom Culture</b>	5	5	25	75	100
		4BZOE2A / 4BZOE2B/ 4BZOE2C	<b>Elective – II - Fundamentals of Microbiology (or)Poultry Science (or) Sericulture</b>	5	5	25	75	100
		4BZO5P1	<b>Core – XII– Practical – IV Animal Physiology , Biochemistry and Elective I&amp; II</b>	4	6	40	60	100
	IV	4SBS5A3/ 4SBS5A4/ 4SBS5A5	<b>(2) Skill Based Subjects – I</b> <b>(2) Skill Based Subjects – I</b>	2	2	25	75	100
				2	2	25	75	100
<b>Total</b>				<b>26</b>	<b>30</b>	<b>--</b>	<b>--</b>	<b>700</b>
VI	III	4BZO6C1	<b>Core – XIII – Fundamentals of Biotechnology</b>	4	7	25	75	100
		4BZO6C2	<b>Core – XIV – Environmental Biology &amp; Biostatistics</b>	4	7	25	75	100
		4BZOE3A / 4BZOE3B/ 4BZOE3C	<b>Elective – III-Recombinant DNA Technology (or) Biology of cloning vectors (or) Fermentation Technology</b>	5	6	25	75	100

		4BZO6P1	<b>Core – XV – Practical – V – Fundamentals of Biotechnology, Environmental Biology &amp; Biostatistics and Elective III</b>	4	6	40	60	100
	IV	4SBS6B3/ 4SBS6B4/ 4SBS6B5	<b>(2) Skill Based Subjects – II</b>	2	2	25	75	100
			<b>(2) Skill Based Subjects – II</b>	2	2	25	75	100
<b>Total</b>				<b>21</b>	<b>30</b>	<b>--</b>	<b>--</b>	<b>600</b>
<b>Grand Total</b>				<b>140</b>	<b>180</b>	<b>--</b>	<b>--</b>	<b>4100</b>

\* **Core III – Practical I University Practical Examination at the end of Second semester.**

\*\* **External practical exam for the allied subjects is scheduled at the end of the even semester of the said subject.**

**I YEAR – I SEMESTER  
COURSE CODE: 4BZO1C1**

**CORE COURSE I – BIODIVERSITY OF INVERTEBRATES – I**

**Unit I           Protozoa**

Introduction to the principles of taxonomy – Protozoa \ Metazoa – Radiata \ Bilateria – Acoelomata \ Pseudocoelomata \ Coelomata

Classification upto classes and their characters with suitable examples

Type study: *Paramecium*

General topic: *Plasmodium*, *Entamoeba* and *Trypanosoma*.

**Unit II           Porifera**

Classification upto classes and their characters with suitable examples

Type study - *Leucosolenia*

General topic: Canal system in sponges

**Unit III          Coelenterata**

Classification upto classes and their characters with suitable examples

Type study – *Obelia* colony

General topic: Coral reefs

**Unit IV          Helminthes**

Classification upto classes and their characters with suitable examples

Type Study: *Taenia solium*

General topic: *Ascaris lumbricoides*, *Enterobius vermicularis*, *Dracunculus medinensis*, *Ancylostoma duodenale* and *Wuchereria bancrofti*

**Unit V           Annelida**

Classification upto classes and their characters with suitable examples

Type Study: *Megascolex*

General topic: Metamerism in Annelida.

**Text books for study**

1. Ekambaranatha Ayyar & T.N.Ananthkrishnan (1992) Manual of Zoology Vol – I, part I & II S.Viswanathan Pvt. Ltd. Chennai.
2. Janakiraman.N. & PatchiRajan.G. “Biodiversity of Invertebrates”, Seetha Lakshmi Ganesan Publishers, Shri Shanmuga Lakshmi Nilayam, Annamalaiyar Street, Vivekanandhapuram North, Devakottai – 630 303
3. Jordan.E.L & Verma.P.S. “Invertebrate Zoology” S.Chand & Co. New Delhi.
4. Arumugam.N “Text book of Invertebrates” Saras Publication.

**Books for reference**

1. Barnes R.D (1982) “Invertebrate Zoology” IV Edn. Holt saunders International Edn.
2. Barrington E.J.W (1979) “Invertebrate structure and function” 2nd Edition ELBS & Nelson
3. Kotpal R.L, S.K.Agarwal, R.P.R.Khetarpal (1989) “Modern text book of Zoology” Rastogi Publications



**I YEAR – I SEMESTER  
COURSE CODE: 4BZO1C2**

**CORE COURSE II – BIODIVERSITY OF INVERTEBRATES – II**

**Unit I            Arthropoda**

Classification upto classes and their characters with suitable examples

Type study: Prawn

General topic: Crustacean larval forms.

**Unit II            Arthropoda**

General topic: Social life in insects,

Economic importance of insects:- Beneficial (Honey bee, Silkworm) and Harmful (*Tryporyza, Amsecta*)

Metamorphosis in insects Evolutionary significance of Peripatus

**Unit III          Mollusca**

Classification upto classes and their characters with suitable examples

Type Study: *Pila*

General topic: Torsion in Gastropods.

**Unit IV          Mollusca**

General topic: Cephalopod as an advanced Mollusc.

Economic importance of Mollusca – Pearl oyster

**Unit V            Echinodermata**

Classification upto classes and their characters with suitable examples

Type Study: Starfish

General topic: Larval forms of Echinodermates

**Text books for study**

1. Ekambaranatha Ayyar & T.N.Ananthakrishnan (1992) Manual of Zoology Vol – I, part I & II S.Viswanathan Pvt. Ltd. Chennai.
2. Janakiraman.N. & PatchiRajan.G. “Biodiversity of Invertebrates”, Seetha Lakshmi Ganesan Publishers, Shri Shanmuga Lakshmi Nilayam, Annamalaiyar Street, Vivekanandhapuram North, Devakottai-630 303
3. Jordan.E.L & Verma.P.S. “Invertebrate Zoology” S.Chand & Co. New Delhi.
4. Arumugam.N “Text book of Invertebrates” Saras Publication.

**Books for reference**

1. Barnes R.D (1982) “Invertebrate Zoology” IV Edn. Holt saunders International Edn.
2. Barrington E.J.W (1979) “Invertebrate structure and function” 2nd Edition ELBS & Nelson
3. Kotpal R.L, S.K.Agarwal, R.P.R.Khetarpal (1989) “Modern text book of Zoology” Rastogi Publications



**I YEAR – I / II SEMESTER  
COURSE CODE: 4BZO2P1**

**CORE COURSE III – PRACTICAL - I  
BIODIVERSITY OF INVERTEBRATES I & II AND BIODIVERSITY OF CHORDATES**  
[Practical Examination at the end of the second Semester]

**A) Dissection**

1. Institutional Animal Ethical Committee (IAEC) constitution
2. Earth worm – Digestive system, Nervous system.
3. Frog – Anatomy, Digestive system, Circulatory system and Urino-genital system.  
[Demonstration using Video clippings or CD / DVD].

**Mountings**

1. **Earth worm** – Body setae, Penial setae.
2. **Prawn** appendages, **Honey bee**, Sting apparatus
3. **Shark** – Placoid scales.

**B). Museum specimens, slides, models and charts**

**Invertebrata**

*Paramecium, Noctiluca, Plasmodium, Leucosolenia, Obelia* colony, Any one Coral, *Fasciola, Ascaris* – male and female, Neries, Prawn, Nauplius, Zoea, Mysis larva, Octopus, Star fish, Bipinnaria larva.

**Chordata**

Balanoglossus Tornaria larva, Ascidian Amphioxus, Petromyzon, Narcine, Sucker fish, Hippocampus, Rhacoporus, Chamaeleon, any two poisonous and non-poisonous snakes, Kingfisher, bat, Ant eater.

**Osteology**

Rabit skull, Girdles, Vertebrae (atlas, cervical and sacral), fore limb and hind limb skeleton. Bonafide Record of the work done in laboratory must be submitted while attending the examination.

**Scheme of Examination**

- |   |   |          |
|---|---|----------|
| 1. Dissect and display the nervous system in Earthworm<br>[Or] digestive system in Earthworm      | – | 15 marks |
| 2. Mounting of Body setae [Or] Placoid scales (or)Sting apparatus<br>[Sketch and label the parts] | – | 10 marks |
| 3. Comment on the Rabbit Skull / Girdles / Limb skeleton  | – | 05 marks |
| 4. Five spotters (Two from invertebrata and three from Chordata)                                  |   | 15 marks |
| 5. Observation note book  | – | 15 marks |



**I YEAR – II SEMESTER  
COURSE CODE: 4BZO2C1**

**CORE COURSE IV – BIODIVERSITY OF CHORDATES**

**Unit I Prochordata & Agnatha**

1. Chordate characters and outline classification up to class level with examples.
2. Type study:- Amphioxus
3. Affinities of Hemichordata
4. Retrogressive metamorphosis in Ascidian
5. Petromyzon – Salient features

**Unit II Pisces & Amphibia**

1. Migration in Fishes.
2. Accessory respiratory organs in fishes.
3. Type study:- Frog (excluding osteology)
4. Parental care in amphibia

**Unit III Reptilia & Aves**

1. Mesozoic Reptiles
2. Identification of south Indian poisonous snakes, Poison apparatus of snake, Biting mechanism in snake, First aid to snake bite
3. Flight adaptation in birds
4. Migration in birds

**Unit IV Mammalia**

1. Type Study: Rabbit
2. Egg laying mammals
3. Dentition in mammals

**Unit V Osteology**

Axial Skeletal system in a Chordate

1. Skull
2. Vertebral Column
3. Types of Vertebrae

Appendicular Skeletal system in a Chordate

1. Girdles – Pectoral & Pelvic
2. Limbs – Fore & Hind limbs

**Text books for study**

1. Ekambaranatha Ayyar & T.N.Ananthakrishnan (1992) Manual of Zoology Vol – I, part I & II S.Viswanathan Pvt. Ltd. Chennai.
2. Janakiraman.N. & PatchiRajan.G. “Biodiversity of Chordates”, Seetha Lakshmi Ganesan Publishers, Shri Shanmuga Lakshmi Nilayam, Annamalaiyar Street, Vivekanandhapuram North, Devakottai – 630 303
3. Jordan.E.L & Verma.P.S. “Chordate Zoology” S.Chand & Co. New Delhi
4. Arumugam.N Text book of chordates Saras Publication.

**Books for reference**

1. Barnes R.D (1982) “Chordate Zoology” IV Edn. Holt saunders International Edn.
2. Kotpal R.L, S.K.Agarwal, R.P.R.Khetarpal (1989) “Modern text book of Zoology” Rastogi Publications



**I YEAR – II SEMESTER  
COURSE CODE: 4BZO2C2**

**CORE COURSE V – CELL BIOLOGY AND INSTRUMENTATION**

**Unit I**

Microscopy – Principle, Instrumentation and Working mechanism of

1. Compound and
2. Electron microscopes

Cytological techniques

1. Fixatives and fixation techniques.
2. Stains and staining techniques.

**Unit II**

Comparison of Prokaryotic and eukaryotic cells.

Ultra structure and functions of

1. Mesosome
2. Plasma Membrane
3. Golgi complex
4. Endoplasmic Reticulum
5. Ribosomes and
6. Lysosomes

**Unit III**

Mitochondria – ultrastructure, chemistry, glycolysis, kreb's cycle, electron transport system, energy generation summary.

**Unit IV**

1. Ultra structure and functions of Nucleus and nucleolus.
2. Chromosomes: Structure & types and Giant Chromosomes.
3. Cell division: Mitosis, Meiosis & its their significance.

**Unit V**

1. Cancer: Types, properties, causes, treatment and Oncogenes and tumour suppressor genes.
2. Instrumentation: Principle and working mechanism of pH meter, Centrifuge, Chromatography and Electrophoresis.

**Text Books**

1. Verma and Agarwal 2010 "Cytology", S.Chand and Co.Ltd., Ramanagar, New Delhi.
2. Rastogi, V.B., 2010, "Introductory Cytology", IX Editison, Kedarnath Ramnath Publications, New Delhi
3. Gupta, P.K.,2010 "Cell and Molecular Biology", Rastogi Publications, Meerut
4. Arumugam.N 2013 "Cell biology" Saras publications.
5. Wilson.K and Walker J.M 2013 'Biomolecular techniques.' ELBS Publication,London

**Reference Books**

1. DeRobertis and DeRobertis, 1999. "Cell and Molecular Biology", W.B. Saunders Co., Philadelphia.
2. Giese, A.C: 1979. Cell physiology – V Edn. WB. Saunders Company, Philadelphia





**II YEAR – III SEMESTER  
COURSE CODE: 4BZO3C1**

**CORE COURSE VI – DEVELOPMENTAL BIOLOGY AND EVOLUTION**

**Unit I**

Gametogenesis – Spermatogenesis and Oogenesis.  
Fertilization, cleavage and gastrulation

**Unit II**

Development of Eye, Ear, Brain and Heart in frog  
Extra embryonic membranes in chick,  
Placenta in mammals.

**Unit III**

Organizer concept  
Amphibian metamorphosis – Biochemical changes and hormonal control  
Regeneration – Types and regeneration in Salamander limbs  
Test tube baby

**Unit IV**

Lamarckism, Neo Lamarckism, Darwinism, Neo Darwinism and Modern Synthetic Theory  
Fossil and Fossilization, Dating of Fossils.

**Unit V**

Mimicry and colouration.  
Species concept; Isolating mechanisms.  
Hardy Weinberg Principle: Gene, Gene pool, Gene and genotypic frequencies and factors affecting H.W.Equilibrium.  
Evolution of man.

**Text Books**

1. Arumugam.N 2013 “ Developmental zoology” Saras publications
2. Patchirajan, G., “Introduction to Developmental Biology” Seetha Lakshmi Ganesan Publishers, Shri Shanmuga Lakshmi Nilayam, Annamalaiyar Street, Vivekanandapuram North, Devakottai
3. P.S. Verma, V.K.Agarwal and B.S. Tyagi, "Chordate Embryology", S.Chand and Company Ltd., Ram Nagar, New Delhi – 110 055.
4. Janakiraman.N., "Evolution", Text Book Publishers, 11, Subramaniapuram First St., Karaikudi 630 001.

**Reference books**

1. Balinsky, B. (1981) "An introduction to Embryology", Saunders, Philadelphia Weiss. PA 1988,
2. Muthukaruppan, VR. and Pichappan, RM.1975. "A Laboratory Guide – Animal development"
3. Deleta and verma, "Text book of chordate Embryology", Jai Praksh Math & Co., Meerut.



**II YEAR – III SEMESTER  
COURSE CODE: 4BZO3P1**

**CORE COURSE VII – PRACTICAL - II  
CELL BIOLOGY & DEVELOPMENTAL BIOLOGY**  
[Practical Examination at the end of the third Semester]

**CELL BIOLOGY**

1. Principle, working mechanism and care of compound microscope.
2. Observation of Mitotic stages in the onion root tip
3. Meiotic stages from the testis squash of grasshopper.
4. Mounting of Giant Chromosomes in Chironomous larva
5. Mounting of Squamous epithelial cells from the oral mucosa
6. Observation of blood cells in man / frog.
7. Determination of Rf values of aminoacids – paper chromatography
8. Ultra microscopic sketches of the following cell organelles:
  - a) Nucleus
  - b) Mitochondria
  - c) Endoplasmic Reticulum
  - d) Golgi Apparatus
  - e) Ribosomes

**DEVELOPMENTAL BIOLOGY**

1. Mounting of live sperms of a vertebrate
2. Observation of eggs – Chick
3. Sketches – Cleavage, Blastula, Gastrula stages of Frog
4. Whole mounting of Chick blastoderm
5. Sketches – 18, 24, 33, 48 & 72 hours chick embryo.
6. Placenta of Mammals – Pig, sheep, Man & Rabbit

Bonafide Record of the work done in laboratory must be submitted while attending the examination.

**Scheme of Examination**

- |  |            |
|--|------------|
| 1. Mounting of Mitotic/Meiotic stage [or] Giant chromosomes<br>[or] Live Sperm of a vertebrate<br>[or] Determination of Rf values for given aminoacids | – 15 marks |
| 2. Mounting of Squamous epithelial cells [OR] Blood cells.<br>Sketch and label the parts   | – 10 marks |
| 3. Identify & comment on the chick embryo stage  | – 05 marks |
| 4. Five Spotters [2 from Cell Biology & 3 from Devt. Biology]  | – 15 marks |
| 5. Observation note book   | – 15 marks |



**II YEAR – IV SEMESTER  
COURSE CODE: 4BZO4C1**

**CORE COURSE VIII – GENETICS & MOLECULAR BIOLOGY**

**GENETICS**

**Unit I CLASSICAL GENETICS**

Mendelian Genetics: Monohybrid – laws of dominance & segregation; Dihybrid cross – law of independent assortment – simple mendelian traits in man. Simple problems  
Interaction of Genes: Complementary, Epistasis – Dominant & Recessive  
Polygenic Inheritance: Skin colour in man  
Multiple Alleles: Blood groups in man – Rh factor & incompatibility – Simple problems.

**Unit II FUNCTIONAL GENETICS**

Linkage & Crossing-over – in Drosophila – Chromosome mapping Non-disjunction Sex-linked inheritance in man – Colour blindness and Haemophilia Sex Determination – Types, intersexes, Gynandromorph and sex-mosaics

**Unit III APPLIED GENETICS**

Inborn Errors of metabolism – Syndromes – Down, Turner, Klinefelter, Cri-du-chart  
Eugenics and Euthenics – Genetic Counselling – Pedigree analysis Inbreeding and Outbreeding

**MOLECULAR BIOLOGY**

**Unit IV NUCLEIC ACIDS**

DNA – Watson-Crick model and types of DNA  
DNA – Replication.  
RNA – Structure and types  
DNA as the Genetic material (Transformation, Transduction & Conjugation Experiments)

**Unit V GENE EXPRESSION**

Gene regulation – Lac - Operon model, Types of regulation.  
Genetic Code – Characters  
Protein Synthesis – Central dogma, Transcription & Translation.

**Text Books**

1. Patchirajan, G., "Genetics and Molecular Biology" Seetha Lakshmi Ganesan Publishers, Shri Shanmuga Lakshmi Nilayam, Annamalaiyar Street, Vivekanandhapuram North, Devakottai – 630 303.
2. Agarwal, V.K., "Genetics", S.Chand & Company Ltd., 7361 RamNagar, New Delhi– 55.
3. Meyyan R.P. 2013 "Genetics" Saras publications
4. Rastogi. V.B. 2013 Principles of Genetics Rastogi publications.

**Reference Books**

1. Gardner, Eeden J., "Principles of Genetics, Wiley Eastern Private Limited, New Delhi.
2. Sinnod, Edward W. Dunn, L.C., and dolzhansky, Theodosins, "Principles of Genetics", McGraw-Hill, New York.
3. Winchster, A.M. "Genetics", Oxford IBH Publishing Co., New Delhi.



**II YEAR – IV SEMESTER  
COURSE CODE: 4BZO4P1**

**CORE COURSE IX – PRACTICAL – III -  
EVOLUTION, GENETICS AND MOLECULAR BIOLOGY**

**[Practical Examination at the end of the Fourth Semester]**

**GENETICS & MOLECULAR BIOLOGY**

1. Experiments to study Mendel's law.
2. Observation of minimum 20 Mendelian characters for self & class students.
3. Observation of Blood group for self & class students
4. Preparation of Pedigree chart for any two known visible characters for self.
5. Study of phenotypic characters of Drosophila
6. Extraction of DNA – **Demonstration Only**
7. Spotters :
  - a) Drosophila.
  - b) Cis-Trans linkage types
  - c) Gynandromorph
  - d) Human Karyotypes & Syndromes –Down, Turner, Klinefelter & Cri-du-Chart
  - e) Bacteriophage
  - f) E.coli.
  - g) DNA
  - h) Base pairs
  - i) Replication
  - j) tRNA
  - k) Protein synthesis

**EVOLUTION**

1. Fossils: Trilobite, Nautilus
2. Animals of evolutionary importance: Peripatus, Limulus, Archaeopteryx.
3. Darwin's finches
4. Mimicry: Leaf insects, Stick insects, Monarch and Viceroy butterfly.
5. Adaptive colouration: Chamaeleon, Lycodon

Bonafide Record of the work done in laboratory must be submitted while attending the examination.

**Scheme of Examination**

- |  |          |
|--|----------|
| 1. Finding out the Blood group of unknown individuals or Monohybrid or Dihybrid experiments  | 15 marks |
| 2. Finding out the trait type of the given Mendelian traits in man [For any two characters like eye colour, ear lobe, chin, widow's peak, hair colour, handedness, etc.,](Reasons should be given) | 05 marks |
| 3. Identify & comment on the living fossil   | 10 marks |
| 4. Five Spotters [3 from Evolution and 2 from Genetics]  | 15 marks |
| 5. Observation note book   | 15 marks |



**III YEAR – V SEMESTER  
COURSE CODE: 4BZO5C1**

**CORE COURSE X – ANIMAL PHYSIOLOGY**

**Unit I**

- Food : Composition, Classification  
Digestion : Types and mechanisms, Absorption and assimilation

**Unit II**

- Respiration : Types, Respiratory organs in animals, Mechanism of respiration, -  
Transportation of gases.  
Excretion : Types of nitrogenous wastes – Ammonotelism, Uretotelism and  
Uricotelism Structure of nephron: Urine formation and composition.

**Unit III**

- Circulation : Types, structure and functions of Human heart –Electrocardiograph  
Blood : Composition, Functions and coagulation, Blood sugar, Blood  
pressure and Blood cholesterol.

**Unit IV**

- Osmoregulation : Osmoregulation in fishes.  
Nervous System : Structure, types and functions of neurons and Synapses –  
Mechanism and conduction of nerve impulses – Neuro –  
Muscular junction – Reflexes & types  
Muscle Physiology : Ultrastructure and properties of skeletal muscles Mechanism &  
theories of muscle contraction – Kymograph.

**Unit – V**

- Chemical co- ordination : 1. Endocrine systems of insects and their significance.  
2. Endocrine physiology of man:– Pituitary, Thyroid,  
Parathyroid Adrenals, Islets of Langerhans and gonads.  
Reproduction : Menstrual Cycle in man and contraceptive devices in man.

**Text books**

1. Patchirajan, G., “Animal Physiology” Seetha Lakshmi Ganesan Publishers, Shri Shanmuga Lakshmi Nilayam, Annamalaiyar Street, Vivekanandapuram North, Devakottai 630303.
2. Ananthakrishnan T.N. Ananthasubramanian and Parameswaran, “Animal Physiology”, Viswanathan & Co. Chennai.
3. Verma & Agarwal, “Animal Physiology” S. Chand & Co, New Delhi.
4. Arumugam.N 2013 “Animal Physiology” Saras publication

**Reference Books**

1. Gurdon.H” Text book of Animal Physiology”
2. Hoar S. William, “General and comparataive Physiology “, Prentice Hall of India Private Limited., New Delhi



**III YEAR - V SEMESTER  
COURSE CODE: 4BZO5C2**

**CORE COURSE XI – BIOCHEMISTRY**

**Unit I**

Bio - Macromolecules as an energy source – Handerson and Hasselbalch equation – Acid base maintenance and their significance. Chemical bonds and their significance. Thermodynamics – laws and their significance.

**Unit II**

Carbohydrates:

Monosaccharides – Definition, classification, structure and properties.

Disaccharides – Definition, types, structure and biological importance.

Polysaccharides – types and properties.

**Unit III**

Lipids: Definition, Classification and properties of lipids

Types of fatty acids – saturated, unsaturated and essential fatty acids. Classification and significance of lipoproteins and phospholipids

Importance of steroids, structure and biological significance of cholesterol

**Unit IV**

Amino acids: Classification of amino acids, essential amino acids, reactions of amino and carboxyl groups of amino acids

Proteins: Definition, classification and function of Proteins, structural levels of organization (Preliminary treatment). Denaturation and isoelectric point of Proteins.

**Unit V**

Enzymes and Vitamins:- Classification of enzymes with examples, coenzymes and cofactors (structures not needed). Active site: Lock and Key model, Induced fit hypothesis. Factors affecting enzyme activity. Types of inhibition of enzyme action. Chemical and industrial applications of enzymes. Vitamins - types, structure and biological significance.

**Reference Books**

1. Murray R.K., D.K. Granner and V.M Rodwell., 2006. **Harpers Illustrated Biochemistry**, 28<sup>th</sup> edition, The McGraw-Hill companies, Inc.
2. Thomas M. Devlin., 2006. **Textbook of Biochemistry with Clinical Correlations**, 6<sup>th</sup> edition, John Wiley & Sons Inc., Publications.
3. Lehninger., 2006. **Principles of Biochemistry**, 4<sup>th</sup> edition, D.L. Nelson and M.M. Cox, Macmillan worth Publishers.
4. Donald Voet and Judith G. Voet., 2004. **Biochemistry**, 3<sup>rd</sup> edition, John Wiley and Sons, USA.
5. Jeremy M.Berg, John L. Tymoczke and Lubert Stryer., 2007. **Biochemistry**, 5<sup>th</sup> edition, W.H. Freeman and Company, USA.
6. Trevor Palmer., 2004. **Enzymes- Biochemistry, Biotechnology and Clinical Chemistry**, by Affiliated East – West Press Pvt. Ltd, India.



**III YEAR – V SEMESTER  
COURSE CODE: 4BZOE1A**

**ELECTIVE COURSE I (A) – FISHERIES BIOLOGY**

**Unit I            Importance of Fisheries**

Classification of fisheries – Marine fisheries (Coastal, Offshore and deep sea fisheries), inland fisheries, Crustacean fisheries (Prawn, shrimp, lobster and crab fisheries); Molluscan fisheries (Edible Oyster, pearl oyster, Cephalopod and lime fisheries).

**Unit II            South Indian fisheries and its management**

Fishing craft and gear in India, Fisheries Management. Parasites and diseases of fishes –Fish in relation to public health.

**Unit III            Physiology and Ecology of fishes**

Food and feeding habits –locomotion by fins and Body form – Respiration – Accessory respiratory organs – Airbladder – reproduction – Ecological factors influencing spawning in carps, parental care, Migration.

**Unit IV            Fish Culture**

Types – Hybridization – Induced spawning of Indian carps – Paddy cum fish culture, Monoculture, Composite fish culture, sewage – fed fisheries, cage fish culture – culture of Prawn, pearl – Oyster and Catla – Catla (Common carp).

**Unit V            Fish processing and preservation**

Drying, Salting Smoking, Canning, Frog legs and Prawns – Fishery by products .

**Practical**

1. Identification of commercially important fishes – Larvivorous and Air breathing. (Two insect) South Indian examples)
2. Determinations of fish age with scales otolith (frequency distribution method), Length and weight relationship in freshwater and marine fish.
3. Growing of fishes in aquaria under experimental conditions – abundance and shortage of food.
4. Identification of fish parasites and diseases
5. Study of scales of temporary mounting.
6. Oxygen consumption of fishes under different situations.
7. Practical knowledge of preservation and processing, preparation of shark liver oil, fish meal, fish flour.
8. Maintenance of aquaria to observe feeding, breeding and behaviour
9. Identification of commonly available ornamental fishes.
10. Visit of fish farms fisheries related institutions.

**Reference Books**

1. N. Chandy, “Fishes”, National Book Trust.
2. V.G.Jhingran, ‘Fish and Fisheries of India’, Hindustan Publishing Corp. Delhi.
3. J.R. Norman, ‘A History of Fishes’ Earnest Benn Limited, London.
4. N.B. Marshall, ‘The life of Fishes’ Weidnefeld & Nicholson, London.



**III YEAR – V SEMESTER  
COURSE CODE: 4BZOE1B**

**ELECTIVE COURSE I (B) – VERMICULTURE**

**Unit I**

Classification – different species of earth worms.  
Morphology, anatomy and Physiology of earthworms.

**Unit II**

Types of Vermicomposting – Roll of earth worms in soil fertility – vermiculture – vermi-cast – vermi-technology and applications – Physical, chemical and biological properties of vermi-compost.

**Unit III**

Raw materials for composting – requirements of vermicomposting. Maintenance of composting – Collection of vermicompost – Efficiency of vermicomposting – General problems in production of vermi-composting.

**Unit IV**

Advantage of vermicomposting – Applications of vermicomposting – Vermicomposting of Agricultural and Urban Solid Wastes – Recycling of wastes through vermicomposting.

**Unit V**

Small Scale or Indoor vermicomposting – Large scale or outdoor vermicomposting. Effects of vermicompost on soil properties.  
Vermicompost Quality & Economics. Prospects of vermi-culture as self employment venture.

**Practical**

1. Morphological features of composting earthworms *Lampito mauritii* and *Eudrilus lugenae*.
2. Identification of earthworm cocoons and vermi casts.
3. Dissection of earthworm digestive system.
4. Vermicomposting - Demonstration of preparation pit method, heap and window method.
5. Estimation of digestive enzymes – amylase
6. Visit to agricultural farms to identify earthworm burrows, vermicomposting units

**Reference Books**

1. R.K. Bhatnagar & R.K. Palta, “Earthworm Vermiculture and Vermicomposting”, Kalyani Publishers, No. 1, Mahalakshmi Street, T. Nagar, Chennai -600 017.
2. P.K. Gupta, “Vermi Composting for Sustainable Agriculture“, AGROBIOS (India), Agro House, Behind Nasrani Cinema, Chopasani Road, Jodhpur – 342 002.





**III YEAR – V SEMESTER  
COURSE CODE: 4BZOE1C**

**ELECTIVE COURSE I (C) – MUSHROOM CULTURE**

**Unit I**

Introduction to mushroom – Importance of mushroom and nutritive value – Lifecycle of mushroom

**Unit II**

Identification of mushroom – Edible and poisonous mushrooms – Mushroom growth and Environment – Types of Mushrooms

**Unit III**

Mushroom cultivation techniques: Culture media preparation – Selection of mushrooms to be cultivated – Production of the culture or starter – Preparation of spawn – preparation of the compost – Spawning, harvesting, post harvesting technology.

**Unit IV**

Major pests: Insect Pests, Mite Pests, Viral, Bacterial, fungal.  
Mushroom insects diseases – Prevention and Control measures.

**Unit V**

Preservation: Short term storage & Long term storage.  
Marketing.  
Economics of Mushroom culture.

**Practical**

1. Edible and poisonous mushrooms.
2. Culture media preparation.
3. Major pests.
4. Small scale mushroom production.

**Reference Books**

1. V.N.Pathak, Nagendra Yadav & Maneesha Gaur, "Mushroom Production and Processing Technology", Published by Agrobios (India), Chopasani Road, Jodhpur – 342 002.
2. Bahl N., (1984), "Handbook of Mushroom", Oxford IBH, New Delhi 123p.
3. Garcha H.S. (1984), "A manual of Mushroom Growing", PAU Publications, Ludhiana, 54p.
4. Marimuthu, T. Krishnamoorthy, A.S., and Jeyarajan, R., (1991), "Oyster Mushroom Production", Glimpses of Mushroom Research in Tamilnadu Agricultural University, TNAU Publishers, Coimbatore.
5. Kapoor, J.N. (1989), "Mushroom Cultivation", ICAR Publication, New Delhi



**III YEAR – V SEMESTER  
COURSE CODE: 4BZOE2A**

**ELECTIVE COURSE II (A) – FUNDAMENTALS OF MICROBIOLOGY**

**Unit I**

History and Scope of Microbiology – Spontaneous generation theory – conflict – Contribution of Leuwenhoek, Louis Pasteur, Robert Koch, Edward Jenner, Joseph Lister, Winogradsky, Waksman John Tyndall. Microbes in our lives. Methods of classifying and identifying.

**Unit II**

Microscopy and Staining – Microscopy – Principles and application – Bright field, SEM & TEMS – Specimen preparation of electron microscopy – freeze etching – Staining – Stains and Staining reactions – Types of staining – Simple, Differential (Gram's, Spore, AFB), Capsule staining, Nuclear and Flagella staining – Albert.

**Unit III**

Sterilization and Disinfection – Principles – Methods of Sterilization – Physical methods – Dry heat – Moist heat, Filtration (Membrane & HEPA) – Radiation – Chemical Sterilization – Chemical agents Mode of action – Phenol coefficient test – Sterility testing.

**Unit IV**

Prokaryotic cell: Classification of Bacteria and Virus. Size, shape, arrangement, flagella, fimbriae, cell wall of Gram Positive and Gram Negative, cell membrane, nuclear material and spores. Eukaryote: Structural organization of yeasts and molds (fungi).

**Unit V**

Micro organisms: Morphological characteristics, differential staining and biochemical tests. Culture techniques – Media preparation – Solid and Liquid – Types of Media – Crude, Semi Synthetic, Synthetic, Enriched, Enrichment, Selective, Differential and Special Purpose Media (one eg for each type). Anaerobic culture technique – Wright's tube, Roll tube, McIntost fildes jar method – Pure culture technique – Tube dilution, Pour, Spread, Streak and Micromanipulator.

**Practical**

1. Laboratory safety and sterilization techniques
2. Preparation of culture media – nutrient broth and nutrient agar
3. Culturing of microorganisms – in broth and in plates (pour plates, streak plates, isolation and preservation of bacterial cultures)
4. Determination of microbiological quality of milk raw and pasteurized milk samples –using MBR test (Methylene blue reduction).
5. Hanging drop technique

**References**

1. Prescott, L.M J.P. Harley & C.A. Klein 1995. Microbiology 2<sup>nd</sup> edn Wm, C. Brown publishers.
2. Salle A.J.: Fundamental Principles of Bacteriology 7<sup>th</sup> edition, Tata Mc Hill Publishing Company Ltd.,
3. William claus. G.W. 1989. Understanding Microbes – A Laboratory textbook for Microbiology, W.H. Freeman and Co., New York.
4. Wilson. K and Goulding. K.H. 1986. A Biologist's Guide to Principles and Techniques of Practical Biochemistry, ELBS, London. B.Sc., Microbiology (Colleges-revised) 2008-09 Annexure No. 33 A

**III YEAR – V SEMESTER  
COURSE CODE: 4BZOE2B**

**ELECTIVE COURSE II (B) – POULTRY SCIENCE**

**Unit I            General**

- a) Poultry Industry in India, a survey – progress through I to VII five year plans.
- b) Choosing commercial laying stock: Pure lines, commercial chicks, sexing in day old chicks.
- c) Poultry housing – General principles of building poultry house.
- d) Economic Importance of Poultry.

**Unit II            Management**

- a) Practical aspects of chick rearing: Brooding equipment, Brooder temperature, feeder and water space allowance, vaccination.
- b) Management of growers, layers and broilers (Cage House and deep litter syleing).
- c) Summer and Winter management.
- d) Lighting for chicks, growers and layers.
- e) Debeaking.

**Unit III          Poultry Nutrition**

- a) Energy: Gross energy, digestible energy, metabolizable energy and net energy, Energy requirements for chicks, growers, layers and broilers.
- b) Proteins, amino acids, Vitamins and Inorganic elements: Requirements for chicks, growers and layers – fat soluble and water soluble vitamins – supplementation of vitamins and minerals in poultry feeds.

**Unit IV          Non Nutritive**

- a) Non Nutritive food additive: Names and their allowances in the poultry feed, merits and demerits in the usage of feed additives.
- b) Feed formulation for chicks, growers, layers and Broilers. Make note on the overcoming of environmental temperature by changing feed formulate.

**Unit V            Diseases**

Short account of Cause, symptoms, prevention, control and treatment of the following diseases:

- a) Virus diseases: New Castle disease, fowl plague, infectious bronchitis, Laryngotracheitis, fowl pox and Avian Leucosis complex & Gumboro disease.
- b) Bacterial Diseases: Pullorum, salmonellosis, fowl cholera, coryza, botulism, mycoplasmosis and spirochaetosis.
- c) Fungal Diseases: Aspergillosis & Afatoxicosis.
- d) Parastic Disease: Coccidiosis, Nematode infection, Tapeworm infections, ticks, mites and Lice.

**Practical**

1. Identification of Parasites.
2. Observation of feeding, debeaking, deworming and vaccination.
3. Diseases

**Reference Books**

1. David J.Lobo, (Editor) "Deejay Technical Bulletin", Deejay Hatcheries, Banglore – 77
2. P. Senevirrantna, "Diseases of Poultry", Published by Bristol, John Wright & Sons Ltd.,



**III YEAR – V SEMESTER  
COURSE CODE: 4BZOE2C**

**ELECTIVE COURSE II (C) – SERICULTURE**

**Unit I           General**

History in India, promoting organizations (CSB, NSSP, SSTC, CSTRI, NSP) future scope. Mulberry silkworm (*Bombyx mori*): Taxonomy, Morphological sex differences in larva and adult, silk gland. Non –Mulberry silkworm: Tasar, Muga & Eri – brief accounts only.

**Unit II           Moriculture**

Cultivation: varieties, land preparation, planting system, propagation, irrigation, manuring, pruning, harvesting and storing. Diseases: Fungal, Bacterial and Viral. Pests: Leaf eating pests.

**Unit III**

Methods of industrial egg production. Rearing: House appliances, Operation-disinfection, feeding, cleaning, moulting, maintenance of temperature and humidity.

**Unit IV**

Diseases: Protozoan, bacterial, fungal & viral. Pests: Uzifly, beetles, mites, ants, nematodes, lizards, birds, squirrels & rats.

**Unit V**

Physical characters of marketable cocoons, defective cocoons, the markets, transport. Stifling, cooking, reeling – operations & appliances

**Practical**

1. Identification of Mulberry and Non-Mulberry Silk worms.
2. Collection of different types of Mulberry leaves.
3. Spotters on various parts of Mulberry.
4. Insects box preparation of the Life Cycle of *Bombyx mori*.
5. Identification of eggs, pupa, cocoon and adults.
6. Dissection of Silk gland.
7. Mounting of mouth parts of Silk worm.
8. Silk worm seeds collection.
9. Spotters – Defective cocoons, Byproducts of silk worm rearing and Reeling.
10. Field visit to Sericulture house, rearing house, Cocoon markets, reeling and weaving cent.

**Text Books**

1. Ullal, SR., & Narasimhanna, Dr.M.N. "Handbook of practical Sericulture", published by the central silk board, 39, M.G. Road, Bangalore-560 001.
2. Ganga, G., & Sulochana chetty, J. "An Introduction to Sericulture", Oxford & IBH Publishing Co. Pvt., Ltd., 66, Janpath, New Delhi-110 001.



**III YEAR – V SEMESTER  
COURSE CODE: 4BZO5P1**

**CORE COURSE XII – PRACTICAL - IV  
ANIMAL PHYSIOLOGY, BIOCHEMISTRY AND ELECTIVE COURSE I & II**

**ANIMAL PHYSIOLOGY**

1. Qualitative analysis of carbohydrates:
  - a. Monosaccharides – Pentose – Arabinose. Hexoses – Glucose, Fructose,
  - b. Disaccharides – Sucrose, Maltose and Lactose
  - c. Polysaccharide – Starch.
2. Qualitative analysis of proteins to detect albumin, casein.
3. Qualitative analysis of lipids.
4. Action of enzyme on starch
5. Action of salivary amylase of man in relation to the temperature.
6. Oxygen consumption by a fish.
7. Study of ciliary activity / heart beat of F W Mussel in relation to the temperature.
8. Observation of blood cells.
9. Preparation of haemin crystals.
10. Qualitative analysis of excretory products, blood sugar & cholesterol.
11. Osmoregulation – Salt loss & gain in Tilapia fish.
12. Instrumentation:  
A] Haemoglobinometer B] Haemocytometer C] Sphygnomanometer D] Kymograph

Practicals for Elective Course I & II may be designed on their own while deciding the subjects by the respective colleges themselves considering the source of availability in their department.

Bonafide Record of the work done in laboratory must be submitted while attending the examination.

**Scheme of Examination**

- |   |          |
|---|----------|
| 1. Estimation of oxygen consumption by a fish [or]<br>Rate of activity in salivary amylase action in man [or]<br>Estimation of Salt loss / salt gain in Tilapia fish. | 15 marks |
| 2. Mounting of Blood cells / Haemin crystals  | 05 marks |
| 3. Find out the presence or absence of carbohydrates/<br>protein/lipid/nitrogenous waste products in the sample   | 05 marks |
| 4. Comment on Haemoglobinometer/Haemocytometer/<br>Sphygnomanometer/Kymograph/Elective Course   | 05 marks |
| 5. Five Spotters [All from Elective Course]   | 15marks  |
| 6. Observation note book  | 15marks  |



**III YEAR – VI SEMESTER  
COURSE CODE: 4BZO6C1**

**CORE COURSE XIII – FUNDAMENTALS OF BIOTECHNOLOGY**

**Unit I**

Definitions and landmarks in the history of Biotechnology, major areas of Biotechnology. Gene transfer techniques and their applications.

**Unit II**

Gene cloning – Restriction Enzymes and its types – endonucleases & ligases. Vectors – Plasmids (pBR 322), Phagemid(M13 phage) Cosmids (pLFR5) and animal viral vector (SV 40 and Retro viruses).

**Unit III**

Recombinant DNA (rDNA) technology, methods of integration of DNA fragments into the vector – methods of introduction of rDNA into host cells. In vitro fertilization and embryo transfer Blotting techniques – Southern, Western and Northern.

**Unit IV**

Principles and applications of DNA finger printing, DNA sequencing, and DNA micro array. Gene therapy. Stem cells – types applications

**Unit V**

Concepts of transgenic animal technology; strategies for the production of transgenic animals and their importance in biotechnology – Transgenic Fish, Sheep and Pig. RNA i – Technology and Biosensors and their applications.

**Text books**

1. Smith 2012 Introduction to Biotechnology ELBS publication
2. Patchirajan, G., “Basics of Genetic Engineering and Fundamentals of Biotechnology” Seetha Lakshmi Ganesan Publishers, Shri Shanmuga Lakshmi Nilayam, Annamalaiyar Street, Vivekanandhapuram North, Devakottai 630303.
3. V.Kumaresan – “Biotechnology”, Saras Publication., Nagercoil.
4. Lohar.P.S – “Biotechnology”, MJP Publishers, Chennai – 5.
5. Brown T.A 2013 Basics of Gene Cloning University press USA

**Reference**

1. Watson JD, Hopkins WH, Roberts JW, Steitz JA, Weiner AM, “Molecular Biology of the Gene”.
2. Benjamin Lewin, “Gene VII”, Oxford University Press. 2000
3. “A Text Book of Biotechnology” – R.C.Dubey S.Chand & Co. New Delhi.
4. Brown.C.H., Campbell I and Priost.F.G (1987) “Introduction of Biotechnology” Blackwell Scientific Publications Oxford.



**III YEAR – VI SEMESTER  
COURSE CODE: 4BZO6C2**

**CORE COURSE XIV – ENVIRONMENTAL BIOLOGY AND BIOSTATISTICS**

**ENVIRONMENTAL BIOLOGY**

**Unit I**

Temperature, Light and their Biological effects. Biogeochemical cycle – Carbon, Nitrogen and Phosphorus cycle. Animal associations – Inter and intra specific relationship

**Unit II**

Population Ecology: Types – Density and Estimation – Natality – Mortality – Age distribution – Growth pattern – fluctuation and equilibrium – Biotic potential – Dispersal and distribution – Population Explosion – Regulation of population.

Community – Structure. Characteristics – Ecotone and Edge effect, Ecological Niche, Ecological succession.

Ecosystem: Structure and components. Dynamics of ecosystem – food chain and its types – food web; Ecological pyramids – Energy flow and productivity. Pond as an ecosystem.

**Unit III**

Habitat ecology - Fresh water, Marine, Terrestrial. Desert, and Cave.

Pollution - Air, Water and Noise– sources, hazards and impact. Bio remediation.

**BIOSTATISTICS**

**Unit IV**

Collection of data, Classification, Tabulation, Diagrammatic & Graphic representation  
Measures of Central Tendency – Mean, Median and Mode.

**Unit V**

Measures of Dispersion – Range, Standard Deviation, Standard error & Coefficient of variation. Probability – Product rule, Sum rule & Combination rule. Chi Square Test.

**Text Books**

1. Verma & Agarwal – “Principles of Ecology” second edition 1985. S.Chand & Company Ltd., Ramnagar, New Delhi.
2. Janakiraman.N., ”Environmental Biology”, Text Book Publishers, 11, Subramaniapuram First St., Karaikudi 630 001.
3. Patchi Rajan, G. & Siva Rama Krishnan.G., ”Biostatistics and Computer applications”, Seetha Lakshmi Ganesan Publishers, Shri Shanmuga Lakshmi Nilayam, Annamalaiyar Street, Vivekanandhapuram North, Devakottai – 630 303.
4. Pranab Kumar Banerjee, 2004,”Introduction to Biostatistics”, S, Chand & Company Ltd., 7361, Ram Nagar New Delhi 110 055.
5. Veer Bala Rastogi & M.S. Jayaraj “Animal Ecology and Distribution of animals” 6<sup>th</sup> revised Edition., Kedar Nath & Ram Nath, Meerut Delhi.

**References**

1. Clarke “Ecology”
2. Saha, T.K., 1992, ”Biostatistics in theory and Practice” Emkay Publications, PB No.941 Delhi 110 051



**III YEAR – VI SEMESTER  
COURSE CODE: 4BZOE3A**

**ELECTIVE COURSE III (A) – RECOMBINANT DNA TECHNOLOGY**

**Unit I**

Restriction and Modification systems of Bacteria. Restriction enzyme: DNA Polymerases, DNA Ligase, methylase, Taq polymerase, polynucleotide kinase, alkaline phosphatase, reverse transcriptase, DNase, S1nuclease, RnaseH, terminal deoxynucleotidyl transferase, RNA polymerase.

**Unit II**

Types and methods in probe construction, methods of labeling gene probes, identification of recombinant DNA. Construction of DNA libraries and genomic libraries, protein engineering.

**Unit III**

Introduction of cloned genes into the host cells: Transformation, transduction, Particle gun, electroporation, liposome mediated and agro packed co-cultivation.

**Unit IV**

Recombinant DNA techniques: Anti sense technology, terminator gene technology, site directed mutagenesis, hybridization techniques – southern, Western and Northern blotting

**Unit V**

Human genome project.  
Chromosome walking. PCR, RFLP, RAPD, DNA finger printing,  
Micro array and sequencing, gene therapy, DNA sequencing.

**References**

1. Ernst.L.Winnacker, (2003) from genes to clones, 2nd edition, Panima publishing corporation, New Delhi.
2. James.D.Watson (2001) Recombinant DNA technology, 2nd edition, WH Freeman and company, New York.
3. Glick and Pasternak, (1996), Molecular biotechnology, Panima publishing corporation, New Delhi.
4. Brown T.A., (1998) Introduction to gene cloning, 3rd edition, Stanley Thomas Publishing Ltd, London.
5. Primrose S.B., (2003) Principles of gene manipulation, 6th edition, Blackwell Science Ltd, Germany.
6. Cartagena Protocol on Biosafety, January 2000.
7. Biological Warfare in the 21st century, by M.R. Dano, Brassies London, 1994.
8. Safety Considerations for Biotechnology, Paris, OECD, 1992 and latest publications





**III YEAR – VI SEMESTER  
COURSE CODE: 4BZOE3B**

**ELECTIVE COURSE III (B) – BIOLOGY OF CLONING VECTORS**

**Unit I**

Introduction to cloning vectors: Plasmid Biology. *E.coli* vector; properties of plasmid (plasmids in gene transfer) plasmid compatibility, copy number control, PBR322, BAC and expression vectors in prokaryotes.

**Unit II**

Molecular biology of lambda, Lambda vectors; cosmid, phagemid. *in-vitro* packaging, M13 and other viral vectors of prokaryotes.  
Laboratory and industrial applications of prokaryotes.

**Unit III**

Cloning in Yeast: genetics of *S.cerevisiae*, identification of Yeast genes, Yeast vectors, YAC.  
Cloning in Bacillus. Plasmids and vectors, inducible promoters.  
Cloning in Streptomyces.

**Unit IV**

Animal vectors; Selectable markers, SV40 Vectors, papilloma virus, Retero virus, Vaccinia virus. Bacculo virus  
Ti plasmid as gene vector, Caulimo viruses, Gemini viruses, Transposable elements, RNA viruses, viroids

**Unit V**

m RNA isolation, cDNA synthesis.  
Genomic and cDNA liobraries.  
Site – directed mutagenesis

**References**

1. Ernst.L.Winnacker, (2003) from genes to clones, 2nd edition, Panima publishing corporation, New Delhi.
2. Benjamin Lewin (2004) Genes VIII, Pearson Education corporation, New Jersey
3. Alberts B, (1994) molecular biology of the cell, Garland publishing Inc New York
4. Friedfielder.D, (2002), Molecular biology II Ed., Narosa publishing house, New Delhi.
5. J.d.Watson (2001) Recombinant DNA technology, 2nd Ed WH Freeman and Company, NY.
6. Brown T.A (1998) Introduction to gene cloning 3rd ED Stanley Thomas Pub ltd, Germany
7. Primrose S.B (2003) Principles of gene manipulation 6th Ed Black well Sci ltd, Germany.



**III YEAR – VI SEMESTER  
COURSE CODE: 4BZOE3C**

**ELECTIVE COURSE III (C) – FERMENTATION TECHNOLOGY**

**Unit I**

Industrially important strains – Screening methods – Strain development for Improved yield – Mutation, Recombination and protoplasmic fusion.

**Unit II**

Fermentation – submerged and solid state – component parts of a CSTR – types of Fermentors (Tower, cylindroconical & airlift) – batch fermentation – continuous Fermentation.

**Unit III**

Production of beverages – beer and wine – vitamin B12 and Riboflavin – Antibiotics – penicillin and streptomycin – production of enzymes – Amylases and Proteases – methods of immobilization.

**Unit IV**

Single cell protein – Bakers yeast, spirulina – Details of mushroom development – Oyster (Pleurotus) and Button (Agaricus) mushroom.

**Unit V**

Downstream process – Intercellular and extracellular – Centrifugation, filtration, Floatation – solvent extraction, precipitation – Breakage of cells – physical and chemical methods

**References**

1. Stanbury P T and Whitaker 1984, Principles of Fermentation Technology, Pergamon Press. NY
2. Casida, L E JR 1968 Industrial Microbiology. New Age International Publishers.
3. Prescott and Rehm 1979. Industrial Microbiology. Wiley and Sons.



**III YEAR – VI SEMESTER  
COURSE CODE: 4BZO6P1**

**CORE COURSE XV – PRACTICAL – V**

**FUNDAMENTALS OF BIOTECHNOLOGY, ENVIRONMENTAL BIOLOGY &  
BIOSTATISTICS AND ELECTIVE COURSE III**

**FUNDAMENTALS OF BIOTECHNOLOGY**

1. Techniques of sterilization using autoclave/pressure cooker
2. Blotting techniques – observation of photograph
3. Extraction of DNA from Onion – Demonstration Only
4. Differentiation of haemolymph and blood
5. Isolation of DNA from blood – Demonstration only.
6. **Recommended** to visit a Biotech Industry / Biotech Laboratory – A report may be submitted along with Observation record
7. Spotters:  
(1) Spirulina (2) Mushroom seed (3) Penicillin (4) Yeast (5) Autoclave (6) Pressure cooker (7) Media (8) Azolla (9) Air-filter

**ENVIRONMENTAL BIOLOGY**

1. Analysis of fresh water and marine planktons and mounting of planktons.
2. Detection of transparency of water by Secchi disc
3. Estimation of dissolved Oxygen of river, pond and sewage water
4. Estimation of Salinity
5. Estimation of Calcium.
6. Observation of animal associations, symbiosis, parasitism, predation and commensalism
7. Study of pond Ecosystem.
8. Field visit to expose the students to various ecological habitats, pollution affected areas and Study of Intertidal, rocky, sandy and muddy shore fauna. (**Compulsory**)

**BIOSTATISTICS**

1. Data collection and Diagrammatic representations – Construction of graphs, bar and pie diagram.
2. Calculation of mean, median, mode and dispersion values for different types of data collected from neem leaves, etc.,
3. Calculation of probability using coin toss method.

Practical for Elective Course III may be designed on their own while deciding the subjects by the respective colleges themselves considering the source of availability in their department.

Bonafide Record of the work done in laboratory must be submitted while attending the examination.

## Scheme of Examination

1. Estimation of oxygen in the given sample  
[Pond water / Ditch water / Tap water] /  
Estimation of measures of central tendency/dispersion [or]  
Probability experiment using coins to prove  
Chi square method. Procedure needed. 15 marks
2. Mounting of any one plankton. Sketch and label the parts 05 marks
3. Comment on the Blotting technique [OR]  
Sterilization apparatus [OR]Pie chart[OR]  
Bar diagram [OR] from the elective subject 05 marks
4. Five Spotters [2 from Biotech., 1 from Env't.Biol.,  
& 2 from Elective Course] 15 marks
5. Field visit report [**Compulsory**] & Observation note book 20 marks

