

**BHARATHIAR UNIVERSITY: COIMBATORE**  
**B.Sc., ZOOLOGY DEGREE COURSE**  
**SCHEME OF EXAMINATION – CBCS PATTERN**  
**(For the students admitted during the academic year 2015 – 2016 batch and onwards)**

Part	Study Components	Course title	Ins. Hrs/ week	Examinations				Credit
				Dur. Hrs.	CIA	Marks	Total Marks	
<b>Semester I</b>								
I	Language – I		6	3	25	75	100	4
II	English - I		6	3	25	75	100	4
III	<b>Core paper I- Biodiversity of Invertebrates</b>		7	3	25	75	100	4
	<b>Core practical I</b>		3	-	-	-	-	-
	Allied A : Paper – I Chemistry/ Botany		4	3	20	55	75	3
	Allied Practical		2	-	-	-	-	-
IV	Environmental studies#		2	3	-	50	50	2
<b>Semester II</b>								
I	Language – II		6	3	25	75	100	4
II	English - II		6	3	25	75	100	4
III	<b>Core paper II- Biodiversity of Chordates</b>		6	3	25	75	100	4
	<b>Core practical I</b>		3	3	40	60	100	4
	Allied A : Paper – II Chemistry/ Botany		4	3	20	55	75	3
	Allied Practical							
IV	Value Education – Human Rights#		2	3	-	50	50	2
<b>Semester III</b>								
I	Language – III		6	3	25	75	100	4
II	English - II		6	3	25	75	100	4
III	<b>Core paper III- Environmental Biology &amp; Developmental Biology</b>		5	3	25	75	100	4
	<b>Core practical II</b>		2	-	-	-	-	-
	Allied B : Paper – I Botany /Chemistry		4	3	20	55	75	3
	Allied Practical		2	-	-	-	-	-
IV	Skill Based Subject I (Microbiology & Immunology Paper – I)		3	3	20	55	75	3
	Tamil @/ Advanced Tamil # (OR) Non – major elective – I (Yoga for Human Excellence)# /Women’s Rights #		2	3	50		50	2
<b>Semester IV</b>								
I	Language – IV		6	3	25	75	100	4
II	English – IV		6	3	25	75	100	4
III	<b>Core paper IV- Biostatistics, Bioinformatics &amp; Computer Application</b>		5	3	25	75	100	4
	<b>Core practical II</b>		2	3	40	60	100	4
	Allied B : Paper – I Botany /Chemistry		4	3	20	55	75	3
	Allied Practical		2	3	20	30	50	2
IV	Skill Based Subject II (Microbiology & Immunology Paper – II)		3	3	20	30	50	2

	Tamil @/ Advanced Tamil # (OR) Non – major elective – II (General Awareness#)	2	3	50	50	2	
<b>Semester – V</b>							
III	<b>Core paper V</b> - Molecular Biology, Genetics & Evolution	5	3	25	75	100	4
	<b>Core Paper VI</b> - Cell Biology, Biochemistry and Tools	5	3	25	75	100	4
	<b>Core Paper VII</b> - Biotechnology Paper – I	5	3	25	75	100	4
	<b>Core Practical III</b>	2	-	-	-	-	-
	<b>Elective I</b> (Without Practical ) Paper I	4	3	20	55	75	3
	<b>Elective II</b> (With practical) Paper I	5	3	25	75	100	4
	<b>Elective - Practical</b>	2	-	-	-	-	-
IV	Skill based subject. Paper III. (Microbiology & Immunology Paper – III)	3	3	20	55	100	3
<b>Semester - VI</b>							
III	<b>Core Paper VIII</b> - Physiology &Endocrinology	6	3	25	75	100	4
	<b>Core Paper IX</b> - Biotechnology Paper – II	6	3	25	75	100	4
	<b>Core Practical III</b> (Based on papers V, VI & VII )	2	3	40	60	100	4
	<b>Core Practical IV</b> (Based on papers VIII & IX)	2	3	40	60	100	4
	<b>Elective I</b> (without practical ) Paper II	5	3	20	55	75	3
	<b>Elective II</b> (with practical) Paper II	5	3	40	60	100	4
	<b>Elective - Practical</b>	2	3	40	60	100	4
	Skill Based Subject Paper IV – Practical (Based on Skill based subjects -Papers I, II & III)	2	3	30	45	75	3
	Extension Activities @	-	-	50	-	50	2
<b>Total</b>						<b>3500</b>	<b>140</b>

@ No University Examinations. Only Continuous Internal Assessment (CIA)

# No Continuous Internal Assessment (CIA). Only University Examinations.

<b>List of Elective papers</b>	<b>( Colleges can choose one paper from each group)</b>	
<b>Elective – I</b> Subjects without Practical	A	Human Genetic and Counseling – Paper I & II
	B	Pest and their control – Paper I & II
	C	Wild life management and conservation – Paper I & II
<b>Elective – II</b> Subjects with Practical	A	Pathology and clinical laboratory technique – Paper I & II
	B	Poultry Science & Management – Paper I & II
	C	Sericulture – Paper I & II
<b>Elective</b>	Practical for Elective II subject	

**Note : There is no change in the Elective Papers I A, IC, II A and II C.**

**Semester – I core paper – I**  
**BIODIVERSITY OF INVERTEBRATES**

- Objectives:** 1. To understand Biodiversity, Habitat, Adaptation organization and taxonomic status of invertebrates.  
2. Explaining the basic aspects of classification, structural and functional details of Invertebrates.

**Unit I:**

Whittaker's five kingdom concept – Kingdom Protista

Protozoa : Classification up to orders and their characters with suitable Indian examples

Type study : Paramecium

General topic : Protozoan diseases and their control (Plasmodium Life cycle in detail)

Kingdom : Animalia

Porifera : Classification up to orders and their characters with suitable Indian examples.

Type Study : Leucosolenia

General topic : Economic Importance of sponges.

**Unit II:**

Coelenterate : Classification up to order and their characters with suitable Indian examples.

Type Study : Obelia

General topic : Coral reefs, Polymorphism in Coelenterates.

**Unit III:**

Helminthes : Classification up to order and their characters With suitable Indian examples.

Type Study : Taenia solium

General topic : Nematode parasite and their parasitic adaptation

Annelida : Classification up to order and their characters with suitable Indian examples.

General topic: Filter feeding in polychaetes, vermiculture – life cycle and vermicompost.

**Unit IV:**

Arthropoda : Classification up to order and their distinguishing characters with suitable Indian examples.

Type Study : Cockroach

General topic : Crustacean larvae and their significance. Detailed study of peripatus and affinities, Economic importance of insects.

**Unit V:**

Mollusca : Classification up to order and their Distinguishing characters with suitable Indian examples.

Type Study : Pila globosa

General topic : torsion in Gastropoda.

Echinodermata : Classification up to order and their Distinguishing characters with suitable Indian examples.

Type Study : Star fish

General topic : Larval forms and their significance.

**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. Jordan. E.L & Verma. P.S Invertebrate zoology S.Chand & co. New Delhi.
3. Ebanasar and Sheeja 2006 outlines of five kingdoms of life, “Shine and twinkle publication”.

**Books for reference:**

1. Barnes R.D (1992) Invertebrate Zoology IV Edn. Holt saunders International Edn.
2. Barrington E.J.W (1979) Invertebrate structure and function 2<sup>nd</sup> Edition ELBS & Nelson.
3. Kotpal R.L, S.K.Agarwal, R.P.R.Khetarpal (1989) Modern text book of zoology Rastogi Publications
4. Rajesh Karyakarle and Ajit Damle – 2005 Medical Parasitology Books & Allied (P) Ltd. Kolkata.

**CORE PRACTICAL – I: BASED ON C1 AND C2**

- 1) Demonstration of dissections of any one species (Cockroach/fish/ frog) by a faculty member is allowed. (Dissection by the student is not allowed but flag labeling of the parts by the students is allowed)
- 2) Virtual dissections using computer aided programme may be followed.

**Cockroach/ Fish/ Frog**

**Objective :** To understand the organization of any species.

- 1 a) **Dissection :** Cockroach : Digestive System, Nervous system reproductive system.

**Mounting :** Cockroach : Mouth Parts (OR)

**Fish/Frog**

- 1 b) **Dissections :** Fish : Digestive System, Nervous system and circulatory system, Male and female urinogenital system.

**Mounting :** Scales

**Spotters :** Classify giving reasons : Paramecium, any coral, obelia Leech, Ascaris chiton, sea cucumber, Balanoglossus Teleost fish, Non-Poisonous snake / Poisonous snake, king fisher, bat.

**Draw labeled sketches :** T.S.of Ascaris, T.S.of Nereis T.S.of Planaria, T.S Thro Pharynx of amphioxus, skull of frog.

**Biological significance:** Gemmules in sponges, Physalia, Limulus, Hippo campus, chamelleon, axolotyl larva, Nautilus.

**Relate structure and function:** Spicules of sponges, scolex of tapeworm, Nereis parapodium, carapace and plastron, placoid scales, quill feather, Electric organ – Narcine.

**Write descriptive notes of the given specimen** (Any five invertebrates and any five chordates)

**FIELD TRIP:** Field trip should be under taken for the students and report should be submitted along with the record.

**QUESTION PAPER PATTERN:**

Flag labeling of dissected specimens and draw neat labeled sketch :	20 marks
Spotter :	5 X 4 : 20 marks
Record :	10 marks
Report of the Field Trip :	10 marks
Total :	60 marks

## **Semester – II Group A core paper – II**

### **BIO DIVERSITY OF CHORDATES**

Objective : To discuss diversity, habitat, adaptations organization and taxonomic status of chordates.

#### **Unit – I**

Prochordata : Characteristics and classification of prochordata upto order level

Type study: Amphioxus

General topic : Affinities of cyclostomata. Retrogressive metamorphosis of Ascidian

Pisces : Classification upto orderlevel

Type Study : Scoliodon

General Topic: Accessory respiratory organs in fishes, Evolutionary signifigance of dipnoi

#### **Unit – II**

Amphibia : Characteristics and classification of amphibian upto order level

Type Study : Frog

General topic: Origin of amphibian, Parental care in amphibia.

#### **Unit – III**

Reptilia : Characteristics and classification of reptilia upto order level

Type Study: Calotes

General topic : Sphenodon as living fossil, identification of poisonous and Non poisonous Snake.

#### **Unit – IV**

Aves : Characteristics and classification of Aves upto order level.

Type Study : Pigeon

General topic : Flight adaptation in birds, Migration in birds.

#### **Unit – V**

Mammalia : Characteristics and classification of mammalian upto order level

Type Study : Rabbit

General topic : dentition in mammals, Adaptation of Aquatic mammals.

#### **Text books for study :**

1. Ekambaranatha Ayyar & T.N.Ananthkrishnan (1995)Amanual of Zoology Vol – II, (part I & II)S.Viswanathan Pvt. Ltd. Chennai.
2. Jordan.E.L & P.S.Verma (2000) ‘Chordate Zoology’ S.Chand & Co New Delhi.

#### **Books for reference :**

1. New man H.H(1939)’The Phylum Chordata’ McMillan New York

2. DeBeer.G (1996) 'Vertebrate Zoology' – Sedgwick & Jackson Loudon
  3. Young J.Z (1950) 'The life of Vertebrates' oxford University Press London
- Methods & Media
1. Charts
  2. Prepared slides
  3. Preparation and staining of slides
  4. Power point presentations
  5. CDs
  6. Different channels of T.V. – Animal Planet, Discovery, National Geographic
  7. Magazines & Newspapers

**Semester – III core paper – III**  
**ENVIRONMENTAL BIOLOGY & DEVELOPMENTAL BIOLOGY**

Objective: To understand the principles and applications of environmental biology and understanding the nature.

**Unit I :** Abiotic Factors – Temperature, Water, Light, Ecosystem : Pond as an ecosystem, Food chain, Food web.

**Unit II :** Animal relationships : Interspecific – Antagonism, symbiosis, Parasitism, Mutualism, commensalisms. Environmental Pollution: Air, Water and Noise pollution.

**Unit III :** Gametogenesis – Spermatogenesis – Oogenesis – Fertilization – Types of Eggs.

**Unit IV:** Cleavage and Gastrulation and morphogenetic movements of frog and chick.

**Unit V:** Organogenesis in frog – Eye and Heart only - Regeneration in planaria. Extra embryonic membranes in Chick, Placenta in mammals.

**Environmental Biology**

**Text books for study:**

- Environmental biology by P.S.Verma, V.K. Agarwal S. Chand & Co. New Delhi.  
2. Text book of Ecology & Animal Distribution by P.S. Verma.

**Books for reference:**

- Odum E.P. Basic Ecology (1983) Saunders College Publishing's New York  
Clarke. G;L (1954) Elements of Ecology, John wiley & Son Inc. New York.  
Nanathakrishnan. T.N and S. Viswanathan Principles of Animal Ecology  
Koromondy E.J. (1976) Concepts of Ecology – Meeven.

Developmental Biology

**Books for Study:**

- Verma. S and Agarwal V.K (2000) Chordate Embryology S.Chand & Co. New Delhi.

**Books for reference:**

- Balinsky. B.I (1981) An Introduction to Embryology S, Chand & Co. New Delhi.  
Barrel. N.J., 1986 Developmental Biology Mc. Graw Hill, New Delhi.  
Patten, B.M., (1958) Foundations of Embryology Mc. Graw Hill, New Delhi.  
Saunders. J.W (1982) Developmental Biology – Pattern and Principles, Macmillan New York. Principles of Embryology – Waddington. Embryology by Brath.

**Semester – IV**  
**CORE PRACTICAL – II : BASED ON C4, C5 AND C6**

**ENVIRONMENTAL BIOLOGY**

Estimation of dissolved oxygen of river, pond, sewage and industrial effluent  
Estimation of salinity & PH and its relation to temperature  
Estimation of free Carbon-di-oxide of water samples  
Study of Intertidal, rocky, sandy and maddy shore fauna.  
Study of pond Ecosystem

**SPOTTERS**

Sea-anemone on hermit crab, sucker fish

**DEVELOPMENTAL BIOLOGY**

Slides showing gametogenesis.  
Difference types of Eggs – Slides and Specimen  
Embryology of Frog - slides  
Chick Embryo whole mount 18, 24, 33, 48, & 72 hours.  
Placenta of Mammals – Pig, sheep, Man & Rabbit

**BIostatISTICS**

Frequency distribution of given samples to find out arithmetic mean, median mode range and standard deviation for a biological data (Variation between any two parameters (Height & Weight))

**BIOINFORMATICS AND COMPUTER APPLICATION**

Computer components, usage of computer internet and E-mail Download and study atleast two samples of Genome sequences (DNA , protein).

**SPOTTERS**

Parts of Computer, Copies of Genome, Sequences DNA and Proteins.

**Semester – IV Group A. core paper – IV**  
**BIostatISTICS, BIOINFORMATICS AND COMPUTER APPLICATION**

**Objective :** To understand the basic principles and applications of Biostatistics, Bioinformatics & Computers

**Unit – I** Data : Methods of collection, Tabulation and graphic representation, Frequency distribution and frequency graph.

**Unit – II** Arithmetic mean, Median, Mode

**Unit – III** Standard deviation and standard error students ‘t’ test, chi-square test

**Unit – IV** Bioinformatics – Definition, Scope – Databases – Protein – DNA data base

**Unit – V** Definition of Computer – basic components input output devices, CPU, Memory and its types Brief account on packages – M.S.Word & M.S.Excel for data entry. Basic ideas about Internet – Website, E-mail

**Books for Study :**

**Biostatistics**

1. Ramakrishnan.P (1996) Biostatistics, Saras Publications., Nagercoil
2. Saha.T.K.(1992) Biostatistics in theory and Practice, Emkay Publications., New Delhi – 15.
3. Gupta.S.P (1984) Statistical Methods, S.Chand & Co. New Delhi.

#### **Bioinformatics and Computer Application**

1. Lodish.H.Etal 2000 Molecular cell Biology W.H.Freeman & West Company New York.
2. Leon.F.and Lean.M (2004) Fundamentals of Computer Science and communication Engineering Lean Tech World.
3. Parameswaran.R (1997) Computer application in Business, S.Chand & Co., New Delhi.
4. Rajaraman.V (1988) Fundamentals of Computer Practice Prentice Hall of India (P) Ltd. New Delhi.
5. Mittal.C (2003) Fundamentals of Information Technology Pragathi Prakasam, Meerut.

### **Semester – V core paper – V MOLECULAR BIOLOGY, GENETICS AND EVOLUTION**

**Objective :** Exploring the molecular architecture of Bimolecular and their Complex interactions. Explaining the basic principles of heredity and the mechanism of inheritance. Explaining the practical application of Genetics. Describing the various genetic disorders in man and animals. To know the diversity of animal life in earth and mechanism of their evolution.

#### **Unit – I**

Molecular structure of DNA & RNA-Types of RNA – DNA replication, role of RNA in protein synthesis.

#### **Unit – II**

Fine structure of Gene – cistron, Recon, Muton – DNA as genetic material – Genetic code. Mutation – Molecular basis – Gene Mutation (Sickle cell anemia, phenylketonuria) – Mutagen Physical and chemical.

#### **Unit – III**

Linkage and crossing over in Drosophila, sex linked Inheritance in Man, Chromosomal aberration – Klinefelter's, Turner's syndrome.

#### **Unit – IV**

Origin of life –evolution of prokaryotes and Eukaryotes – Theories of Evolution – Lamarckism – Darwinism- modern synthetic theory.

#### **Unit – V**

Fossil and Fossilization, Dating of Fossils, Geological timescale.

#### **Text books for study :**

1. Verma.P.S and Agarwal.V.K (2004) Genetics, S.Chand & Co., New Delhi
2. Dalela.R.C and Verma.S.R (1970) A Textbook of Genetics,Jaiprakash Nath and Company., Meerut
3. Arumugam.N (2002) Organic Evaluation, Saras Publication., Nagercoil.

#### **Books for reference :**

1. De. Robertis E.D.P & De. Robertis E.M.F (1998) Cell and Molecular Biology.
2. Sinnot.E.W., L.C.Dunna and T.Dobzhansky – Principles of Genetics (1983) 4th EdnTata Mc.Graw Hill Pub Co. Ltd.,
3. Winchester A.M, Genetics 3rd Edn, Oxford IBH Publications.
4. Evolution - Savage
5. Dadson – Evolution a process and product.



**Semester – V core paper – VI**  
**CELL BIOLOGY, BIOCHEMISTRY AND TOOLS**

**Objective :** Illustrating, Elucidating the basic structure and functions of cell Defining and explaining the basic principles of biochemistry and the instruments useful for biological studies.

**Unit – I** Structure and functions of Plasma membrane, Lysosomes, Golgi bodies, ribosomes, mitochondria.

**Unit – II** Structure and function of Endoplasmic reticulum, Nucleus, Chromosome type – Cell Division – Mitosis and Meiosis.

**Unit – III** Classification, Structure and functions of Carbohydrates, Protein and lipids.

**Unit – IV** Enzymes – Classification, properties, chemical Nature, Mechanism of enzyme action – factors affecting enzyme action

**Unit – V** Microscopy – Principle and working mechanism uses of light and electron Microscopy (TEM & SEM) Chromatography, PHmeter, centrifugation, Calorimeter Spectrophotometer.

**Text books for study :**

1. Vema.P.S and Agarwal.V.K (1991) Cytology, S.Chand & Co., New Delhi
2. N.Gurumani, Research methodology for Biological Science (2006) MJP Publishers Chennai.
3. L.Veerakumari, Biochemistry (2004) MJP Publishers., Chennai.
4. M.A.Subramanian, Biophysics (2005) MJP Publishers., Chennai.

**Books for reference :**

1. J.Jayaraman, Lab Manuals in Biochemistry New Age International (P) Ltd. Mumbai.
2. W.H.Freeman & Co. Lodish & Etal (1999) Molecular cell Biology, New York
3. De.Robertis E.D.P & De Robertis E.M.F (1988) Cell and Molecular Biology.
4. Hans S.S (1986) Cell Biology – Allen and Unwin.

**Core Practical III**

**Based on core Papers V, VI, and VII**

- 1) Blood grouping in man.
- 2) Squash preparation of onion root tip – observe the stages of mitosis.
- 3) Chironomous larva – Giant Chromosomes. (Drosophila / Chironomous)
- 4) Drosophila male and female.- Genetic importance
- 5) Homologous and analogous organs – Fore limbs and Hind limbs.
- 6) Fossils – Any Two
- 7) Qualitative estimation of carbohydrates, Protein and Lipids.
- 8) Quantitative estimation of Blood Glucose.
- 9) Compound microscope.
- 10) pH meter.
- 11) Centrifuge.
- 12) Colorimeter/ Spectrophotometer.
- 13) Plasmid (Any two)
- 14) Cosmid
- 15) Phagomid.
- 16) Isolation of DNA (demonstration only)

**Core practical IV**  
**(Based on core papers VIII and IX)**

**Physiology**

1. RBC and WBC count
2. Qualitative detection of human salivary amylase
3. Study of opercula movement of a fish (Q<sub>10</sub>)
4. Oxygen consumption of fresh water fish
5. Analysis of excretory products- Ammonia, urea and uric acid.
6. Haemin crystals
7. Estimation of Hemoglobin

**Spotters**

1. Kymograph
2. T.S of Pituitary, thyroid, Adrenal, Ovary and testis
3. Blood of frog
4. Haemoglobinometer
5. RBC and WBC pipette.

**Biotechnology**

1. Bio fertilizer (Vermicompost)

**Spotters**

1. Spirullina
2. Yeast
3. Penicillin
4. Autoclave
5. Pressure Cooker
6. Electrophoresis unit
7. Culture media
8. Stains
9. Azolla
10. WIDAL kit
11. VDRL kit
12. Mushroom seeds.

**Semester – V core paper – VII**  
**BIOTECHNOLOGY PAPER - I**

**Objective :** 1. Enable understanding of biodiversity as resources that could field productsuseful to man.

2. Enables understanding of principle behind techniques involved inbiotechnology.

3. Imparts awareness on intellectual property rights and safety issues involved inhandling of transgenic organisms.

**Unit – I** Definitions and landmarks in the history of Biotechnology major areas ofBiotechnology, Organisms important in Biotechnology – Bacteria, Virus.

**Unit – II** Basis of Genetic Engineering – Restriction Enzymes-Vectors-Plasmids, Phage vector insertion vector, Replacement vectors, Cosmids and Plasmids, High expressionVector.

**Unit – III** Techniques of Genetic Engineering – Gene Cloning in Prokaryotes and Eukaryotes. Application of the cloned genes with diagnosis and prevention of diseases.Monoclonal Antibodies – Production and application.

**Unit – IV** Principles and techniques of animal cell culture proplast fusion in prokaryotes andEukaryotes organisms, Importance of cell line culture.

**Unit – V** Antisense RNA Technology – Oncogene animal culture, Transgenic Technology – Transgenic Fish, Sheep and pig.

**Text books for study :**

1. V.Kumaresan – Biotechnology, Saras Publication., Nagercoil.
2. P.K.Gupta – Elements of Biotechnology
3. Lohar.P.S – Biotechnology (2005) – MJP Publishers, Chennai – 5.

**Books for reference :**

1. A Text Book of Biotechnology – R.C.Dubey S.Chand & Co. New Delhi.
2. Brown.C.H., Campbell I and Priest.F.G (1987) Introduction of Biotechnology – Blackwell Scientific Publications Oxford.
3. Higgins I.J., Best G.J., and Jones.J (1985) Biotechnology Principles and application –Black well scientific Publications, Oxford.
4. Prave.P.Faust V.Sitting W and Jones – J (1985) Biotechnology Principles and application – Black well scientific Publications Oxford.

**Semester – VI, Core Paper – VIII  
PHYSIOLOGY AND ENDOCRINOLOGY**

**Objective :** Explaining various aspects of physiological activities of animals with special reference to humans.

**Unit – I**

Nutrition : Digestion and absorption of carbohydrates proteins and lipids. Respiration – Types – Properties and functions of Respiratory pigments - exchange and transport of Gases (CO<sub>2</sub> & O<sub>2</sub>) Bohr's effect.

**Unit – II**

Circulation : Composition and function of blood – Types of Hearts – Neurogenic – Myogenic - ECG. Blood pressure Mechanism of Blood clotting Excretion – Classification of animals based on the nature of excretory products, ornithine cycle Osmo regulation in fresh water and marine animals.

**Unit – III**

Nerve Physiology : Types of Neuron – Conduction of Nerve impulse. Synapse and synaptic transmission of impulses. Muscle Physiology : Types of Muscle – Ultra structure and properties – Muscle proteins – Physiology of Muscle contraction.

**Unit – IV**

**Receptors :** Eye, ear, Thermoreceptors. Endocrinology : Structure, secretions and functions of Pituitary, Thyroid.

**Unit – V** Structure, secretions and functions of Parathyroid, adrenal, islets of langerhans, Testis ovary, placenta.

**Text books for study :**

1. Parameswaran.R.S.Viswanathan – Animal Physiology Printers & Publishers Pvt. Ltd.
2. Verma.P.S and Agarwal.V.K Animal Physiology S.Chand & Co NewDelhi.

**Books for reference :**

1. Hoar.W.S.General and comparative physiology Prentice – Hall of India Pvt. Ltd.New Delhi.
2. Prosser.C.L and Brown Fo Comparative Animal Physiology 2<sup>nd</sup> Edn. W.B.SaundersCophnadelphia Toppaa & Co. Tokyo Japan. Guyton. Medical Physiology
3. Best.C.H & Jaylor.N.B Physiology Basis of Medical Practice The Wilkins companyBaltimore.
4. Bentley.P.J Comparative Vertebrate endocrinology S.Chand & Co. New Delhi.

**Semester – VI, Group A, Core Paper – IX  
BIOTECHNOLOGY – Paper II**

**Unit – I**

Applications of genetic Engineering in Industry, Alcoholic Fermentation, Medicine (Insulin and Vaccine production) Agriculture (N<sub>2</sub> fixation agro bacterium)

**Unit – II**

Fermenter design and types Biogas production Bio-fertilizers and Bio-Insecticide –waste and sewage managements.

**Unit – III**

Production of single cell protein (SCP) and Myco proteins Production of bacterial, fungal algal and yeast biomass – Mushroom Culture.

**Unit – IV**

Sources and Production of Commercially important enzymes – Cellulase, amylase, diastase, pectinase proteinases – Immobilization of enzymes and its application.

**Unit – V**

Cryobiology – Methods cryo preservation – Human genome project – current Indian Scenario in Bio technology – centers, activities, achievements and bio-industries in India.

**Text books for study :**

1. Elements of Bio-technology – P.K.Gupta
2. A Text Book of Biotechnology – R.C.Dubey S.Chand & Co.
3. Generic Engineering – T.Nicholl
4. Alexander.N. Microbial Biotechnology Glazer and Hiroshi Nikado.
5. Methods of Gene Manipulation – Old & Prime Rose.
6. Molecular Biotechnology - Glick

**Elective I-B : PEST AND THEIR CONTROL - PAPER - I**

**UNIT – I**

Introduction, definition and causes for insect assuming pest status  
Classification of pest  
Types of damage caused by pests  
Importance of pest control  
Pest surveillance and forecasting and pest outbreak

**UNIT – II**

General characters, bionomics and control measures of following agricultural pests

**Pests of paddy:**

1. Tryporyza incertulus (Lepidoptera) 3. Orseolia oryzae (Diptera)
2. Hieroglyphus banian (Orthoptera) 4. Dicladis armigera (Coleoptera)

**Pests of Wheat:**

1. Anaphothrips sudanensis (Thysonoptera) 2. Odontodermis obesis (Isoptera)
3. Mythimana separate (Lepidoptera)

### **UNIT – III**

General characters, Bionomics and control measures of following agricultural pests

#### **Pests of sugarcane:**

1. Chilo infuscatellus (Lepidoptera)
2. Pyrilla perpusilla (Hemiptera)
3. Aleurolopus barodensis (Hemiptera)
4. Scirphophaga nivella (Lepidoptera)

#### **Pests of cotton:**

1. Pectinophora gossypiella (Lepidoptera)
2. Aphids gossypii (Hemiptera)
3. Earias vitella (Lepidoptera)
4. Dysdercus cingulatus (Hemiptera).

### **UNIT – IV**

General characters, Bionomics and control measures of following agricultural pests

#### **Pests of cereals:**

1. Chilo partellus (Lepidoptera)
2. Antherigona soccata (Diptera).

#### **Pests of Pulses:**

1. Helicoverpa armigera (Lepidoptera)
2. Melanogromyza obtuse (Diptera)

#### **Pests of vegetable:**

1. Leucinodes orbonalis (Lepidoptera)
2. Pieris brassicae (Lepidoptera)

#### **Pests of fruits:**

1. Papilio demolus (Lepidoptera)
2. Dacus cucurbitae (Diptera).

### **UNIT – V**

General characters, Bionomics and control measures of pests

#### **Stored grain pests:**

1. Tribolium castaneum (Coleoptera)
2. Sitophilus oryzae (Coleoptera)
3. Tricoderma granarium (Coleoptera).

#### **House hold pests:**

Bed bug, House fly, Human louse, Cockroach and Mosquitoes

#### **REFERENCE BOOKS:**

1. Text book of modern Entomology – Tembhare
2. Elements of economic Entomology – Dr. B. Vasantharaj David

## **Elective I-B : PEST AND THEIR CONTROL PAPER - II**

### **UNIT – I**

Principles and methods of pest control using techniques such as mechanical, biological, ecological, cultural, genetic techniques – sterile male techniques, Quarantine, legislative measures.

### **UNIT – II**

Classification of insecticides: Based on mode entry, mode of action, chemical nature-inorganic, organic compounds- DDT, Endosulfan, Fenitrothion, Malathion, Monocrotophous, OximeCarbamates.

### **UNIT – III**

Insecticide formulations and application technology: Dusting and dusters, sprayers – Manually operated – Hydraulic sprayers, Power operated – Pneumatic sprayer, Aerosols, Fumigants, Baits.

### **UNIT – IV**

Integrated Pest Management (IPM), Chemosterilants, Sex attractants, Pheromonal control.

### **UNIT – V**

Pest other than insects – Rat, Crab, Snail, Birds – Peacock, Parrot, Concept of host-pest interaction.

## **Elective II-B : Poultry Science and Management - Paper – I**

### **Unit – I**

History and importance of poultry forming role of the poultry in rural development employment potential. Economic and contributions to national protectivity egg, production. Table bird production, manure as by product. Anatomy and physiology of poultry birds with reference to digestive and reproductive system.

### **Unit – II**

Breeds of poultry birds and scientific methods of breeding, hybrid selecting and parents for production factors for selection, hatching, selecting eggs for hatching natural and artificial incubation. Types of incubators maintenance of temperature and humidity sterilization of room during hatching separation and culling.

### **Unit – III**

Poultry house and equipments, space requirements. Types of house, number of birds equipments of feeding production from enemies and adverse condition.

### **Unit – IV**

Nutrition of poultry birds: requirement according to age feed formation

Classification breeds-stuffs milling by-product, distillers and by-product.

Availability raw materials and their cost food graders and uses of antibiotic.

### **Unit – V**

Brooding and rearing: sexing, vaccination- natural and artificial brooding. Types of brooding, temperature re quirement, culling, debeaking, characters of good layers and broilers. Capunetts and capons, rearing of chick.

## **Elective II-B : Poultry Science and Management Paper – II**

### **Unit –I**

#### **Management of layers**

Changes in feeding programme - space requirements - Lighting requirements. Summer and monsoon management - Care of egg - Hen sampling –Cannibalism - Debeaking - Culling Profitability

### **Unit -II**

#### **Broiler Management**

Characteristics of the Broiler chicks - Housing of broiler chicks - Optimum Conditions Feeding and Feed formulations – Sampling - Disease and Health Management Diseases Caused by Viruses, Bacteria and Worms

### **Unit -III**

Marek's Ranikhet Diseases – Fowl pox – Coccidiosis – Worms and other Parasites. Toxicosis and an account of aspergillosis – Aflotoxicosis – Salmonella – Health Cover – Antibiotics – Vaccination and Deworming and Insecticide Treatment, Egg drop syndromme

### **Unit –IV**

Marketing, grading and preservation of egg – packing and transportation of eggs – Difference between dark and pale yellow yolk and its taste.

### **Unit –V**

Different uses of eggs in preparation of bakery products and other edible items – Nutritive values of egg – relationship between customers, maintenance of prices.

## **Practical - Poultry science and Management**

- 1) Brooding of poultry bird and their characteristic
- 2) Preparation of poultry feeds
- 3) Incubation of Eggs: Temperature and humidity control. Egg rotation –we of candles for eradication of unfertilized eggs. Transfer of chicks to pens.
- 4) Preparation of poultry pens of chicks spreading of husk in-floor location of feeders and watering equipments arrangements of electric lamps adjustment of height.
- 5) Feed rotation watering use of antibiotics poultry pens hygiene-clearing of poultry pens.
- 6) Screening of birds for foot, beak and feather cleanliness isolation of diseased/injured specimens, separation aggressive cannabolistic birds.
- 7) Sexing, debeaking. Introduction of males.
- 8) Position of nest marking layers maintains of records.
- 9) Vaccination of insecticide treatment.
- 10) Deworming and removal of faecal matter.
- 11) Biochemical estimation of nutritive contents in a hen's egg (demonstration)
- 12) Visits of poultry markets and study of specific marketing problems.

**Semester – III, Skill based subject**  
**MICROBIOLOGY AND IMMUNOLOGY PAPER - I**

Objective :

To understand the basic principles and applications of Microbiology and immunology.

**Unit – I**

History and scope of Micro biology – Contributions of Louis Pasteur, Robert Koch, Lister, Edward Jenner, Alexand Flemming – General characteristics of Bacteria, Brief Classification of Microbes – 5 kingdom concept.

**Unit – II**

Bacteria growth and culture of bacteria – Types of culture Media cultural characteristics of Bacteria – Methods – staining, maintenance of culture.

**Unit – III**

Reproduction in Bacteria – Conjugation – Transformation - Transduction – control of Bacteria – Sterilization by Heat radiation and Air-filter, Disinfectants and Antibiotics (Three each)

**Unit – IV**

Study of common bacterial diseases in man, Causative organism, mode of transmission, Pathogenicity Symptoms and their preventive measures – Cholera, Typhoid, Tuberculosis, Leprosy, Syphilis.

**Unit – V**

Cells of Immune system – Primary and Secondary lymphoid organs – a brief survey. GALT & MALT

**Text books for study :**

1. Mani.A.Selvaraj.A.M, Narayanan.L.M & Arumugam.N (1999) ‘Microbiology’ – General and Applied, Saras Publications., Nagercoil.
2. Dulsy Fatima & Arumugam.N (2000) ‘Immunology Saras Publications., Nagercoil.

**Books for reference :**

1. Anantha Narayanan & Jayaram Panicker – Medical Microbiology.
2. A Text Book of Microbiology – Dubey – S.Chand & Co.
3. Pelezas Jr.M.J., Chan, E.C.S and Kreig.N.R (1993) Microbiology – Concepts & Applications, Mc.Graw Hill New York ISBN.
4. Kuby.J (1999) Immunology, W.G.Freeman & Co., New York
5. Roitt.I.M (1988) Essentials of Immunology ElBS Edn. London.



**Semester – IV, Skill based subject II**  
**MICROBIOLOGY AND IMMUNOLOGY PAPER -II**

**Unit – I**

General characteristics of viruses – Structure of phytophage (TMV) Zoophage (HIV) and Bacteriophage (T4) Lytic and Lysogenic cycle of T4 phage.

**Unit – II**

Culture of virus (Animal) – Primary culture – Diploid cell culture – Continuous cell lines – Viral genetics-Study of Viral RNA and DNA.

**Unit – III**

Viral diseases : Causative organisms, Mode of transmission pathogenicity, symptoms and their preventive measures cold, Poxviruses (Chicken pox) Hepatitis-B, Polio – Rabies – Viral cancer.

**Unit – IV**

Protozoan microbiology: A brief survey of protozoan diseases – Plasmodium and Malaria in detail salient features of Actinomyces – superficial mycosis and dermatophytes.

**Unit – V**

Lymphocytes – Subpopulation of T & B cells – Antigens and Antibody reaction – Immunoglobins structure and types (A basic study).

**Text books for study :**

1. Mani.A.Selvaraj.A.M, Narayanan.L.M & Arumugam.N (1999) 'Microbiology' – General and Applied, Saras Publications., Nagercoil.
2. Dulsy Fatima & Arumugam.N (2000) 'Immunology Saras Publications., Nagercoil.

**Books for reference :**

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2. A Text Book of Microbiology – Dubey – S.Chand & Co.
3. Pelezas Jr.M.J., Chan, E.C.S and Kreig.N.R (1993) Microbiology – Concepts & Applications, Mc.Graw Hill New York ISBN.
4. Kuby.J (1999) Immunology, W.G.Freeman & Co., New York
5. Roitt.I.M (1988) Essentials of Immunology ELBS Edn. London.

**Semester – V, Skill based subject III**  
**MICROBIOLOGY AND IMMUNOLOGY PAPER - III**

**Unit – I**

Dairy Microbiology : Pasteurization of Milk other products curd, butter, cheese – Microbial quality of Milk – MBR test - food spoilage – Food Poisoning – Physico – Chemical methods in food preservation.

**Unit – II**

Soil Microbiology : Common soil bacteria's, Symbiotic - Asymbiotic organisms – Economic importance of Algae & Fungi. Domestic Water Microbiology : Coliform bacteria & MPN Estimation of total plate count, Index, Faecal streptococci.

**Unit – III**

Water purification – Flocculation, Filtration and chlorination, Fermentation process of alcohol and penicillin.

**Unit – IV**

Immune response – Humoral – cell mediated immunity – complements – components – Modes of activation – immuno deficiency disease - AIDS

**Unit – V**

MHC and HLA structure and functions – Transplantation immunology – Types of grafts – Graft rejection prevention of graft rejection – Immune Techniques – VDRL test – Double Immuno diffusion – ELISA - Radio Immuno Assay.

**Text books for study :**

1. Mani.A.Selvaraj.A.M, Narayanan.L.M & Arumugam.N (1999) 'Microbiology' – General and Applied, Saras Publications., Nagercoil.
2. Dulsy Fatima & Arumugam.N (2000) 'Immunology Saras Publications., Nagercoil.

**Books for reference :**

1. Anantha Narayanan & Jayaram Panicker – Medical Microbiology.
2. A Text Book of Microbiology – Dubey – S.Chand & Co.
3. Pelezas Jr.M.J., Chan, E.C.S and Kreig.N.R (1993) Microbiology – Concepts & Applications, Mc.Graw Hill New York ISBN.
4. Kuby.J (1999) Immunology, W.G.Freeman & Co., New York
5. Roitt.I.M (1988) Essentials of Immunology ElBS Edn. London.

**REFERENCE BOOKS:**

1. Text book of modern Entomology – Dr. D.B. Tembhare
2. Elements of economic Entomology – Dr. B. Vasantharaj David

**Semester – VI, Skill Based Paper IV**  
**(Based on Skill based papers I, II & III)**

**PRACTICALS**

1. Technique of sterilization using Autoclave / pressure cooker
  2. Preparation of Nutrient Agar broth
  3. Enumeration of Microbes in soil, air & water (Individual practical)
  4. Determination of microbiological quality of milk raw and pasteurized milk samples – using MBR test (Methylene blue reduction)
  5. Hanging drop technique
  6. Gram's staining
  7. Mounting of Algal filament
- A visit to Industry / laboratory – A report to be submitted.

**SPOTTERS**

1. Spirulina (2) Spic Bt bio-pesticide (3) Penicillin
2. Antibiotic disc (5) Yeast (6) Thymus gland
3. Autoclave (8) Pressure cooker (9) VDRL test hit (10) Air fitter (11) Media