

YADAVA COLLEGE

(* An Autonomous Co-Educational Institution*

Accredited with "A" Grade by NAAC

Affiliated to Madurai Kamaraj University)

Govindarajan Campus, Thiruppalai, Madurai – 625014.



UNDERGRADUATE (B.Sc. Zoology)

DEPARTMENT OF ZOOLOGY

CBCS (2015-2016)

ACADEMIC COUNCIL MEETING

08.05.2015

DEPARTMENT OF ZOOLOGY

B.Sc. ZOOLOGY

COURSE CONTENT

Semester	Sub. Code	Title of the Paper	Teaching Hrs / Week	Credits	Evaluation			Examination Hours
					Internal	External	Total	
I		Paper I – Tamil	6	3	25	75	100	3
		Paper I – English	6	3	25	75	100	3
		Paper I – Invertebrata	8	7	25	75	100	3
		Paper II – Lab in Invertebrata-I	2	1	40	60	100	3
		Paper I – Chemistry	4	4	25	75	100	3
		Environmental Science	2	2	25	75	100	3
		Communicative English – I	2	2	25	75	100	3
		TOTAL	30	22				
II		Paper II – Tamil	6	3	25	75	100	3
		Paper II – English	6	3	25	75	100	3
		Paper III – Chordata	8	7	25	75	100	3
		Paper IV – Lab in Chordata- II	2	1	40	60	100	3
		Paper II – Chemistry	4	4	25	75	100	3
		Value Education	2	2	25	75	100	3
		Communicative English – II	2	2	25	75	100	3
		TOTAL	30	22				

Semester	Sub. Code	Title of the Paper	Teaching Hrs / Week	Credits	Evaluation			Examination Hours
					Internal	External	Total	
III		Paper III – Tamil	6	3	25	75	100	3
		Paper III – English	6	3	25	75	100	3
		Paper V – Cell and molecular biology	4	4	25	75	100	3
		Paper VI – Lab in Cell and molecular biology- III	2	1	40	60	100	3
		Paper III – Chemistry	4	4	25	75	100	3
		Paper I – Botany- Plant Diversity - I	4	3	25	75	100	3
		NME - Health Education	2	2	25	75	100	3
		Communicative English – III	2	2	25	75	100	3
		TOTAL	30	22				
IV		Paper IV – Tamil	6	3	25	75	100	3
		Paper IV– English	6	3	25	75	100	3
		Paper VII – Developmental biology	4	4	25	75	100	3
		Paper VIII – Lab in Developmental Biology – IV	2	1	25	75	100	3
		Paper IV – Chemistry	4	4	25	75	100	3
		Paper I – Botany- Plant Diversity – II	4	3	25	75	100	3
		NME-Apiculture	2	2	25	75	100	3
		Communicative English – IV	2	2	25	75	100	3
		TOTAL	30	22				

Semester	Sub. Code	Title of the Paper	Teaching Hrs / Week	Credits	Evaluation			Examination Hours
					Internal	External	Total	
V		Paper IX – Genetics and Evolution	6	6	25	75	100	3
		Paper X –Biotechnology	5	5	25	75	100	3
		Paper XI – Biostatistics and Computer Applications & Bioinformatics	5	6	25	75	100	3
		Paper XII – Lab in Genetics, Evolution, Biotechnology, Biostatistics and Computer Applications- V	8	4	25	75	100	3
		Paper III – Botany Taxonomy of Angiosperm	4	3	25	75	100	3
		Soft Skills – I	2	2	25	75	100	3
		TOTAL	30	26				
VI		Paper XIII – Biochemistry	5	5	25	75	100	3
		Paper XIV – Microbiology and Immunology	6	6	25	75	100	3
		Paper XV – Animal physiology	5	6	25	75	100	3
		Paper XVI – Lab in Biochemistry, Microbiology and Immunology & Animal physiology – VI	8	4	25	75	100	3
		Paper IV – Botany Applied Botany	4	3	25	75	100	3
		General Awareness and Current Affairs	2	2	25	75	100	3
		TOTAL	30	26				
		Total number of teaching hours: 180hrs Total number of credits : 140						

**Details of Addition, Deletion, Replacement, Revision
And No Change of subjects**

Semester	Sub. Code	Title of the Paper	Remarks	Action Needed
I		Paper I – Tamil		
		Paper I – English		
		Paper I – Invertebrata	Bifurcated	Allot New Code
		Paper II – Lab in Invertebrata- I	Bifurcated	-do-
		Paper I – Chemistry		
		Environmental Science	No change	Retain old code
		Communicative English – I		
II		Paper II – Tamil		
		Paper II – English		
		Paper III – Chordata	Bifurcated	Allot New Code
		Paper IV – Lab in Chordata- II	Bifurcated	-do-
		Paper II – Chemistry	No change	Retain old code
		Value Education	No change	Retain old code
		Communicative English – II		

Semester	Sub. Code	Title of the Paper	Remarks	Action Needed
III		Paper III – Tamil		
		Paper III – English		
		Paper V – Cell and molecular biology	Revised	Allot New Code
		Paper VI – Lab in Cell and molecular biology- III	Revised	-do-
		Paper III – Chemistry		
		Paper I – Botany Plant Diversity - I		
		Health Education	No change	Retain old code
		Communicative English – III		
IV		Paper IV – Tamil		
		Paper IV– English		
		Paper VII – Developmental biology	Revised	Allot New Code
		Paper VIII – Lab in Developmental biology – IV	Revised	-do-
		Paper IV – Chemistry		
		Paper I – Botany Plant Diversity – II		
		Apiculture	No change	Retain old code
		Communicative English – IV		

Semester	Sub. Code	Title of the Paper	Remarks	Action Needed
V		Paper IX – Genetics and Evolution	Revised	Allot New Code
		Paper X – Basic Biotechnology	Revised	-do-
		Paper XI – Biostatistics, Bioinformatics and Computer Applications	Revised	-do-
		Paper XII – Lab in Genetics, Evolution, Basic Biotechnology, Biostatistics, Bioinformatics and Computer Applications- V	Revised	-do-
		Paper III – Botany Taxonomy of Angiosperm		
		Soft Skills – I	No change	Retain old code
VI		Paper XIII – Biochemistry	Revised	-do-
		Paper XIV – Microbiology and Immunology	Revised	Allot New Code
		Paper XV – Animal physiology	Revised	-do-
		Paper XVI – Lab in Biochemistry, Microbiology and Immunology & Animal physiology – VI	Revised	-do-
		Paper IV – Botany Applied Botany		
		General Awareness and Current Affairs	No change	Retain old code

SELF STUDY PAPERS

Undergraduate Programme

<i>Sem.</i>	<i>Subject</i>	<i>Credits</i>	<i>Exam. Hrs.</i>	<i>Ext. Marks</i>	<i>Total Marks</i>
III	Economic Zoology	3	3	100	100
IV	Human Reproduction Conception and birth control	3	3	100	100
V	Ornamental fish culture	3	3	100	100
VI	Food and Nutrition	3	3	100	100

Postgraduate Programme

<i>Sem.</i>	<i>Subject</i>	<i>Credits</i>	<i>Exam. Hrs.</i>	<i>Ext. Marks</i>	<i>Total Marks</i>
III	Poultry	5	3	100	100
IV	Aquaculture	5	3	100	100

Certificate and Diploma course

<i>S. No.</i>	<i>Subject</i>	<i>Class</i>
I	Apiculture	Certificate course for UG
II	Vermitechnology	Diploma course for PG

PAPER - I
INVERTEBRATA

Semester: I

Hours / Week: 8

Subject Code:

Credit: 7

Objectives:

Invertebrata is a fundamental course to provide basic understanding of Biology of Invertebrates. This paper deals with diagnostic characteristics of Phylum invertebrata. It also deals with the comparative anatomy and organization of various Invertebrates.

UNIT I

A brief introduction to principles of taxonomy and nomenclature – Level's of Organization in animals.

Phylum Protozoa: General characters, Classification up to class level with examples. Type study-Paramecium-Structure and Reproduction - conjugation only.

General Topics: Nutrition in protozoa. Life cycle of Plasmodium. Protozoan Parasites- Entamoeba and Trypanosoma.

UNIT II

Phylum Porifera: General characters, Classification up to class level with examples. Type study - Sycon - Cellular structure.

Phylum Coelenterata: General characters, Classification up to class level with examples.

Type study- *Obelia medusa*- Structure & Locomotion.

General Topics: Canal system in Sponges, Polymorphism in Coelenterates, Coral and Coral reef formation.

UNIT III

Phylum Platyhelminthes: General Characters, Classification up to class level with examples. Type study - Liver fluke. Nematelminthes – Ascaris life cycle.

Pathogenic effects of - *Ancylostoma duodenale*, *Wuchereria bancrofti* and their control measures.

Phylum Annelida: General characters, Classification up to class level with examples. Type study – Earthworm - External morphology, Excretion and Reproduction.

General Topics: Parasitic adaptation of Helminthes paracites. Metamerism in annelida.

UNIT IV

Phylum Arthropoda: General characters, Classification up to class level with examples.
Type Study - Penaeus- external morphology and reproduction.

Phylum Mollusca: General characters, Classification up to class level with examples.
Type study – Fresh water mussel.

General Topics: Economic importance of insects. Torsion in Gastropoda.

UNIT V

Phylum Echinodermata: General characters, Classification up to class level with examples. Type study- Starfish (*Asterias rubens*) - External morphology. Water vascular system in Star fish.

General Topic: Larval forms of Echinoderms.

Textbook

1. Text book of Invertebrata and Chordata, 2009, Faculty members of Zoology Department, Yadava College, Brindhavan Publications.
2. N. Arumugam, N. C. Nair and S. Leelavathi (2014). Text book of Invertebrates. Saras Publications. Nagercoil

Reference Books:

1. E.L. Jordon and P.S. Verma (2005). Invertebrate Zoology –S.Chand & Co. New Delhi
2. P.S. Dhama and J.K. Dhama (2006). Invertebrate Zoology –R.Chand & Co. New Delhi.
3. R.L.Kotpal, (2005). Invertebrate Zoology. Rastogi Publications, Meerat.
4. Ekambaranatha Iyer and T.N.Ananthakrishnan (2003). A Manual of Zoology Volume I. Viswanathan Publications, Chennai.

PAPER - II
LAB IN INVERTEBRATA

Semester : I

Hours/Week : 2

Subject Code :

Credit : 1

I. MAJOR PRACTICAL

CD/Model/Chart-Anatomical observation and comment on digestive, reproductive and nervous system of Cockroach.

Web resources - <http://www.neosci.com>; <http://www.scienceclass.com>

II. MINOR PRACTICAL

Slides/Model/Chart – Identification (draw and label)

- 1.Cockroach: Mouth Parts.
- 2.Earthworm: Penial setae and body setae.
- 3.Honey bee, House fly and Mosquito-Mouth Parts.
- 4.Prawn -Appendages

III. SPOTTERS

Protozoa: Amoeba, Paramecium- Entire, Binary fission, Conjugation, Euglena and Ceratium

Porifera: Gemmule, Spicules

Coelentrata: Obelia colony, Medusa of Obelia, Physalia

Platyhelminthes: Liver fluke, Larval forms of liver fluke, Taenia solium.

Nematoda: Ascaris- Male &female.

Annelida: Nereis, Leech

Arthropoda: Prawn, Nauplius, Zoea, Mysis, centipede, millipede, Scorpion, Beneficial insects- Honey bee and Silk worm, Any two harmful insects.

Mollusca: Pila, Unio, Solen, Chiton, Dentalium, Nautilus, Octopus

Echinodermata: Star fish, Sea urchin, Sea cucumber, Echinoderm Larva – Bipinaria larva.

A visit to museum / Zoo.

Reference:

1. Jayasurya, Prasannakumar and N. Arumugam (2013). Practical Zoology (Volume I). Saras Publication. Nagercoil.
2. S. S. Lal (2010). Invertebrate Practical Zoology. Rastogi Publications, Meerut

PAPER - III
CHORDATA

Semester: II
Subject Code:

Hours / Week: 8
Credit : 7

Objectives:

Chordata is a fundamental course to provide basic understanding of biology of chordates. This paper deals with diagnostic characteristics of Phylum Chordata. It also deals with the comparative anatomy and animal organization of Chordates.

Unit-I: Introduction and Prochordates

General characters of Chordates, Outline classification of chordates (in brief).
Prochordates - General characters, Classification up to sub phylum level with examples.
Type study—Amphioxus.
General Topic: Retrogressive metamorphosis in Ascidian - Affinities of Hemichordates.

Unit-II: Pisces and Amphibia

Pisces –General characters of fishes, Classification up to sub class level with examples,
Type study – Shark, general Topic: Migration of fishes.
Amphibia – General characters of Amphibians, classification up to subclass level with examples.
Type study- Frog: external morphology, respiratory system and reproductive system only.
General Topic: Parental care in Amphibia.

Unit- III: Reptilia

General characters of reptiles, Classification up to subclass level with example.
Type study – Calotes: external morphology, circulatory system, urinogenetal system and nervous system.
General Topic: Poisonous and non-poisonous snakes-identification. Poison apparatus and biting mechanism, first aid.

Unit-IV: Aves

General characters of aves, classification up to subclass level with examples.
Type study – Pigeon: external morphology, respiratory system and reproductive system.
General Topics: Flight adaptation in birds - Migration of birds - Flightless birds.

Unit-V: Mammalia

General characters of mammals, Classification up to subclass level with examples.

Type study: Rabbit - external morphology, digestive system, nervous system and reproductive system.

General Topics: Egg laying mammals, Dentition in mammals and Aquatic mammals.

Textbook:

1. Text book of Invertebrata and Chordata, 2009, Faculty members of Zoology Department, Yadava College, Brindhavan Publications.
2. N. Arumugam, N. C. Nair and S. Leelavathi (2014). Text book of Chordates. Saras Publications. Nagercoil

Reference Books:

1. E.L. Jordon and P.S. Verma (2006). Chordate Zoology –S.Chand & Co. New Delhi
2. P.S. Dhami and J.K. Dhami (2006). Chordate Zoology –R.Chand & Co. New Delhi.
3. R.L.Kotpal, (2005). Vertebrate Zoology. Rastogi Publications, Meerat.
4. Ekambaranatha Iyer and T.N.Ananthakrishnan (2003). A Manual of Zoology-Chordate (Volume II).Viswanathan Publications, Chennai.

PAPER - IV
LAB IN CHORDATA

Semester: II

Hours/Week : 2

Subject Code:

Credit : 1

I. MAJOR PRACTICAL

CD/Model/Chart-Anatomical observation and Description on digestive system, urinogenital system, arterial and venous systems of Frog.

II. MINOR PRACTICAL

Slides/Model/Chart – Identification (draw and label)

1. Shark: Placoid Scale
2. Frog: Brain, Forelimb and Hindlimb.

III. SPOTTERS

Prochordata: Amphioxus entire and Balanoglossus.

Pisces: Echeuis, Hippocampus, Eel and any two local edible fishes.

Amphibia: Bufo, Rhacophorus, Axolotl larva.

Reptelia: Any two Poisonous and Non Poisonous snakes, Draco.

Birds: Any three local birds (Beaks and claws modifications).

Mammals: Bat

Osteology: Skull, Pectoral girdle & Pelvic girdle of Pigeon

Reference:

1. Jayasurya, Prasannakumar and N. Arumugam (2013). Practical Zoology (Volume I). Saras Publication. Nagercoil.
2. S. S. Lal (2010). Vertebrate Practical Zoology. Rastogi Publications, Meerut.
3. BIOLAB Series – Realistic lab activities – Anatomy & physiology of the frog, Corolina Biological Supply company, Leicester, UK, 2007.

4. The Digital Frog 2.5 – CDROM for Window and Mac version 2.5a, Digital frog International Leicester, UK, 2007. (www: digitalfrog.com)

PAPER - V
CELL AND MOLECULAR BIOLOGY

Semester: III

Hours/Week: 4

Subject Code:

Credits: 4

Objectives:

This paper is designed to give an understanding on Microscopy, cytological techniques and the nature of the cell. It deals with the structure, biochemistry, functions of cell organelles and nuclear components.

Unit I: Microscopy and Cytological techniques:

Microscopy – Compound microscope – Phase contrast microscope – Electron microscope; Centrifugation – Principle and types of centrifuges - Cytological techniques: fixation – Sectioning – Staining – Mounting.

Unit II: Cell membrane and Cell organelles:

Cell types – Prokaryotic – Eukaryotic – Differences. Animal cell: Structure of cell membrane (PM) – Models to explain the cell membrane - Trilaminar and Fluid mosaic model - Chemical composition. Specializations of cell membrane – Cell organelles: Ultra structure and functions of Endoplasmic reticulum, Golgi apparatus, Mitochondria, Lysosome and Ribosomes.

Unit III: Nucleus and chromosomes:

Nucleus: Ultra structure, nuclear membrane – Nucleoplasm – Nucleolus - Chemical composition and functions. Chromosome – Structure and functions. Special types of chromosomes: Polytene – Lamp brush chromosomes– Heterochromatin and euchromatin.

Unit IV: Cell division and cancer cells:

Cell division – Cell cycle – Amitosis - Mitosis – Meiosis – Stages and significance. Abnormal cell division: cancer – Characteristics – Properties – Types – Causes- Treatment.

Unit V: Nucleic acids and Protein synthesis:

Deoxyribonucleic acid (DNA) – Watson and Crick model – Chemical composition – functions.
Ribonucleic acid (RNA) – Structure, types and functions of messenger RNA – transfer RNA – ribosomal RNA – Genetic code and its properties – Protein synthesis.

Text Books:

1. N. Arumugam, N. C. Nair and S. Leelavathi (2014). Cell biology and molecular Biology, Saras publication, Nagercoil.
2. C. P. Powar (2010). Cell Biology. Himalaya Publishing House. Mumbai.

Reference Books:

1. P. S. Verma and V. K. Agarwal (2010) – Cell biology. S. Chand & Co. New Delhi.
2. M. L. Gupta and M. L. Jangir (2000). Cell Biology. Botanica. New Delhi.
3. Ajoy Paul (2011). Text book of cell and Molecular Biology. Books and Allied Ltd. Kolkata.

PAPER - VI
LAB IN CELL AND MOLECULAR BIOLOGY

Semester: III

Hour/Week: 4

Subject code:

Credit: 1

1. Microscopy - Compound microscope
2. Centrifugation – Centrifuge
3. Mitosis in Onion root tip cells
4. Polytene chromosome in chironomous larva
5. Preparation of squamous epithelium from buccal smear
6. Sketch of cell organelles:
 - a) Nucleus
 - b) Mitochondria
 - c) Endoplasmic reticulum
 - d) Golgi apparatus
 - e) Ribosome
9. Spotters:
 - Meiotic stages – microscopic slides.
 - Columnar epithelium & Ciliated epithelium (Microscopic slides)

Reference:

1. N. Arumugam, R. P. Meyyan and A. Mariakuttikan (2013). Practical Zoology. (Volume III). Saras Publications, Nagercoil.
2. S. Thiagarajan (2000). Practical Zoology. T. J. Publications. Tanjavur.

Non Major Elective
HEALTH EDUCATION

Semester: III

Hours/Week: 2

Subject Code:

Credits: 2

Objectives:

This paper is to enlighten the students in the basic aspects of maintaining good health, hygiene & sanitation; to create awareness about communicable and Non-communicable diseases and to enlighten the general public about enjoying good health which includes body and soul.

Unit I: Concepts in community health

Concepts on health and well being - Biomedical concept, ecological concept, physiological concept and holistic concept. Determinants of health, Health indicators.

Diagnosis of diseases.

Unit II: Communicable diseases – cause, symptoms & control measures

- i) Airborne infections – Tuberculosis and Asthma.
- ii) Waterborne infections –Viral Hepatitis, Cholera, Typhoid.
- iii) Vector borne infections –Malaria and Filariasis.
- iv) Contact infections – Rabies and AIDS.

Unit III: Non Communicable Diseases – cause, symptoms & prevention

Obesity, Diabetes, Myocardial infraction, Hypertension, Stroke, Blindness, and Cancer.

Unit IV: General Health Awareness

Demography, Family Planning and Genetic counseling – basic concepts only.
Importance of Nutrition on Health, Impact of Environment on Health, Importance of planning & Management.

Unit V:

Health Education and creation of health awareness, Health Planning and Management, Community health care and International Health Organizations.

Reference Books:

J. E. Park & K. Park (1989). Textbook of Prevention and Social medicine. Banarsidas Bhamot Publishers, New Delhi.

PAPER - VII
DEVELOPMENTAL BIOLOGY

Semester: IV

Hours/Week: 4

Subject code:

Credits: 4

Objectives:

This paper aims at providing students with comprehensive knowledge on the important aspects of ontogenetic development. It also includes many aspects like gametogenesis, fertilization, cleavage and fertilization.

UNIT I: Gametogenesis

Spermatogenesis – Spermiogenesis – Spermiation, structure of sperm; Oogenesis – Growth of oocyte, synthesis and storage of macromolecule in oocyte – Types of eggs on the basis of quantity and distribution of yolk.

UNIT II: Fertilization

Types of fertilization – Mechanism of fertilization – Encounter of spermatozoa and ova – Acrosome reaction and penetration – Cortical reaction – Fertilization membrane – monospermy and polyspermy. Activation of ovum – Amphimixis – Significance of fertilization – *In vitro* Fertilization (IVF) in Human – Test Tube baby.

UNIT III: Cleavage

Characteristics of cleavage – Planes and patterns of cleavage – Rates of cleavage and influence of yolk – Laws of cleavage – Physio-chemical changes during cleavage – significance of cleavage – Morula - Types of blastula - Gastrulation – Fatemap – Morphogenetic movements – Gastrulation in frog.

UNIT IV: Organogenesis

Development of brain, eye and heart in chick, embryonic induction – Development of foetal membrane in chick. Placenta in mammals – Characters, classification based on the type of foetal membranes, distribution of villi, nature, contact and types of tissue involved.

UNIT V: Metamorphosis and Regeneration

Metamorphosis in amphibia, morphological, physiological and biochemical changes during metamorphosis; Role of hormones in amphibian metamorphosis.

Regeneration – Types, mechanism and factors influencing regeneration – Wolffian regeneration.

Test Book:

1. N. Arumugam, (2014). Developmental Zoology. Saras Publication, Nagarcoil.

Refernce Books

1. B.J.Balinsky (1996). An Introduction to Embryology. W.B.Saunders company, London
2. P. S. Verma and V. K. Agarwal (2008). Chordate Embryology. S.Chand & Company Ltd, New Delhi.
3. Sastry and Shukla (2009). Developmental biology. Rastogi Publications, Meerut.
4. P. Arora (2000). Embryology. Himalayan Publishing House, Mumbai.

PAPER - VIII
LAB IN DEVELOPMENTAL BIOLOGY

Semester: IV

Hours/Week: 2

Subject Code:

Credits: 1

1. Observation of amphibian metamorphosis (Demonstration only)
2. Observation of tail regeneration of Tadpoles (Demonstration only)
3. Mounting of Chick blastoderm.
4. Observation of life stages of any one insect.

5. Spotters:

- a. Developmental stages of Frog.
- b. Developmental stages of Chick.
- c. Human sperm.
- d. Human ova.
- e. Human placenta.
- f. Types of placenta.
- g. IVF and birth control devices.

Reference Books:

1. N. Arumugam, R. P. Meyyan and A. Mariakuttikan (2013). Practical Zoology. (Volume III). Saras Publications, Nagercoil.
2. S. Thiagarajan (2000). Practical Zoology. T. J. Publications. Tanjavur.

Non Major Elective

APICULTURE

Semester: IV

Hours/Week: 2

Subject Code:

Credits: 2

Objective:

This paper gives exposure to students about the application value of apiculture and to highlight the beneficial aspects of honey bee to human welfare and also to provide knowledge about the harmful enemies and diseases that attack honeybee.

Unit I:

Introduction to Apiculture and Bee Keeping. – Types of Honey bees: - *Apis dorsata* – *Apis indica* – *Apis florea* – *Apis mellifera* – General Biology – Body structure – Mouth parts – Secretary glands – sting apparatus.

Unit II:

Social organization and division of labour – Queen – worker – Drone – Life cycle. Swarming Naupial flight – Honey bee dances: - Language dance – round dance – wag tail dance.

Unit III:

Hive or Comb – Selection of bees for apiculture – methods of bee keeping – Indigenous method and Modern method – Tools and Equipments connected with bee keeping.

Unit IV:

Products of bee keeping: - Honey- Honey extraction – Ripeing of honey – Chemical composition of honey – Economic importance of honey:-Food value, Medicinal value and other uses – By-products of honey – Bees Wax – Bee venom.

Unit V:

Pest, Parasites and Diseases of Honey bees:- Wax moth, Wax beetle, Black ants, Birds and other enemies. Nosema, Acarine, Septicemia, Fungal and other important brood diseases.

Text Book:

N. Arumugam and Jeyasurya (2013). Economic zoology. Saras Publication, Nagercoil.

Reference books:

1. Vasantharaj David and T. Kumaraswami, (2006). Elements of Economic Entomology -
2. K.R. Ravindran, (2004). A Text Book of Economic Zoology – Dominant Publishers, New Delhi.

PAPER - IX
GENETICS AND EVOLUTION

Semester: V

Hours/Week:6

Subject Code:

Credit: 6

Objectives:

This paper is designed to give an understanding of human genetics, sex determination, sex linkage, mutation and human genetics. It also aimed at evolutionary evidences, theories of evolution of horse and man.

GENETICS

Unit I: Mendelian Genetics

Mendel's experiments and laws- monohybrid and dihybrid crosses - incomplete dominance and codominance, test cross and backcross. Gene interactions – epistasis, complementary genes and supplementary factor.

Unit II: Sex determination, Sex Linkage and Crossing over

Chromosomal theory - XX – XO types; XX – XY types and genic balance theory. Environmental mechanism, hormonal mechanism and intersex. Sex limited and sex influenced traits, Sex – linkage in *Drosophila* and in human beings – Y linked genes. Mechanism of crossing over.

Unit III: Human genetics

Multiple alleles and blood group, inborn errors of metabolism, chromosomal aberrations, mutation at molecular level – spontaneous mutation – Induced mutation, ionizing radiation, mutation – repair mechanism. Mendelian traits in man, pedigree analysis, syndromes - Down's, Klinefelter's and Turner's. Applications of genetics in inbreeding and outbreeding – Eugenics and Euthenics - Human genome project.

EVOLUTION

Unit IV: Evidences and Theories of Evolution

Evidences for evolution: - Morphological: Homologous – analogous and vestigial structures; embryological, biochemical and paleontological evidences – Fossils: types, methods of fossilization – methods of dating the fossils- geological time scale.

Theories of Evolution: Lamarckism and Neo-Lamarckism, Darwinism and Neo-Darwinism – Modern synthetic theory.

Unit V: Process and Product of Evolution

Biological variations – recombination, hybridization – isolation - types and mechanism – Speciation – mimicry and colouration.

Horse evolution – trends, fossil record and orthogenesis.

Human evolution: organic and cultural evolution – future evolution of man.

Text Book:

R. P. Meyyan and N. Arumugam (2014). Genetics and Evolution. Saras Publications, Nagercoil.

Reference Books:

1. A. Gardner and T. Davies (2010). Human Genetics IInd Edition. Scion Publishing Ltd., Uk.
2. P. S. Verma and V. K. Agarwal (2010). Organic evolution. S. Chand & Co., Ltd., New Delhi.
3. M. W. Strickberger (1996). Genetics. Jones and Barlett Publishers, Sudbury, Massachusetts, Boston.
4. G. L. Stebbins (1998). Process of organic evolution. Surjeet Publications, New Delhi.
5. T.S. Gopalakrishnan, Itta Sambasivaiah and A.P. Kamalakra Rao (2000). Principles of organic evolution. Himalaya Pub. House, Bombay.

PAPER - X
BASIC BIOTECHNOLOGY

Semester: V

Hours / Week: 5

Subject Code:

Credit: 5

Objectives

To understand the principle and applications of Biotechnology. It also includes the tools and varieties of techniques involved in Biotechnology; gene cloning and manipulation of genes and its application in solving problems in relation to animal husbandry, agriculture and human welfare.

Unit I: Introduction and Molecular Tools

Definition- Scope and importance-Restriction endonucleases – types and their uses; DNA ligase, reverse transcriptase, DNA polymerase, terminal transferase; Linkers and adaptors. Vectors: pBR322, Ti plasmid, SV40, brief note on Lambda phage and Cosmid.

Unit II: rDNA Technology

Introduction to Gene cloning and Genetic Engineering–Isolation of genomic DNA- Genomic library-construction of cDNA library-Integration of DNA fragments into vector- Transfer of rDNA into bacterial cell- Screening and selection of recombinants.

Unit III: Techniques in Biotechnology

Electroporation and Microinjection; Agarose Gel Electrophoresis; Polymerase Chain Reaction (PCR); Blotting techniques-Western, Southern and Northern – a brief study; Autoradiography and DNA Finger printing.

Unit IV: Plant Genetic Engineering

Single cell culture -*Spirulina* culture and Callus culture; Protoplast culture; Tissue culture –flask and tube culture; Transgenic plants-Biocides- Bt Killer cotton – Bio fertilizers-nitrogen fixation.

Unit V: Animal cloning and applied biotechnology

Animal cloning - Dolly; transgenic animals- fish and pig; production of insulin, growth hormone, penicillin, blood factor VII, FMD vaccine.

Text book:

V. Kumaresan (2013). Biotechnology. Saras Publication, Nagercoil

Reference Books:

1. R. C Dubey (2006). A text book of Biotechnology, S.Chand &Company, New Delhi
2. S. B. Primrose (2000). Modern Biotechnology. Blackwell Scientific Publications, Oxford, London
3. P. K. Gupta (2001). Elements of Biotechnology. Rastogi Publications, Meerut.
4. M.M. Ranga (2006). Animal Biotechnology. Student Edition. Jodhpur.

PAPER - XI

BIostatistics, Bioinformatics and Computer Application

Semester: V

Hours / Week: 5

Subject Code:

Credit: 6

Objectives

This paper is to provide a content of biostatistics to the student community to facilitate them to apply statistics in biology and also to include them a skill in computer operation.

BIostatistics

Unit I:

Introduction: Collection of data – classification of data – tabulation – diagrammatic representations, bar, pie and line diagrams. Graphical representations of data: histogram - frequency polygon.

Unit II:

Measures of central tendency: mean, median and mode, measures of dispersion – range – mean deviation – co-efficient of variation – standard deviation – standard error – probability – Chi-square test – Student‘t’ test.

Unit III:

Correlation and Regression: Correlation – Introduction – types, uses and degree of correlation – graphic and mathematical methods. Regression – definition – uses; Comparison of correlation and regression – regression lines – regression equations.

Bioinformatics

Unit IV:

Definition, Scope and applications: types of sequences – DNA, RNA and Protein sequences: biological databases – Definition, objectives, Properties, database retrieval tools: Pubmed and Sequence Retrieval System (SRS); DNA, RNA and protein data bases: DDBJ – tools: BLAST, FASTA. Application of bioinformatics tools: CLUSTAL W, PROTPARAM, SCANPS, CPG plot, GOR, STRAP, 3D-

PSSM, SWISS-MODEL, MMTK, RasMol, PHYSIP, APUP, GeneScan, Genefinder and Webcutter.

COMPUTER APPLICATION

Unit V:

Introduction – components of computer – WINDOW – MS word – MS excel – MS power point – internet – e-mail – web pages – web hosting – e-journals and applications of computers in biology.

Text Books:

1. N. Arumugam, A. Gopi and V. Kumerasan (2013). Biostatistics, Computer Application, Bioinformatics and Instrumentations. Saras Publication, Nagercoil.
2. R. Sundaralingam and V. Kumaresan (2012). Bioinformatics. Saras Publications, Nagercoil.

Reference Books:

1. Gurumani (2000). An introduction to Biostatistics. MJP Publishers, Chennai.
2. B. D. Sing (2004). Biotechnology. Kalyani Publishers, Chennai.
3. S. Monoharan and S. Palanichamy (2000). Biostatistics to Biologists. Paramount Publications. Palani.
3. N. Arumugam, A. Gopi and A. Meena (2013). Saras Publication, Nagercoil.

SELF STUDY PAPER
ORNAMENTAL FISH CULTURE

Semester: V

Hours / Week: 5

Subject Code:

Credits: 3

Objective:

This paper deals with the scope, culture techniques of ornamental fishes, aquarium plants, care, maintenance, marketing and economic importance of Aquarium fishes.

Unit I: Introduction to Aquarium and ornamental fishes. World aquarium trade and present status. Accessories – Aerators, filters, lights, heaters. Water quality requirements. Different kinds of feeds. Culture of fish food organisms; preparation of dry feeds; feeding methods.

Unit II: Freshwater and Ornamental Fishes

Different varieties of Ornamental fishes – Live bearers, Gold fish and koi, Gourami, Barbs and Tetras, angel fish and cichlids. Broodstock development, breeding. Indigenous Ornamental fishes of Tamilnadu.

Unit III: Commercial Production of Freshwater Ornamental fishes and Plants

Requirments for commercial production units of Ornamental fishes. Commercial production of goldfish, live bearers, gouramies, barbasm and tetras, angel fish. Mass production of aquarium plants. Natural ponds for the mass production of Ornamental fishes.

Unit IV: Aquarium Management

Setting up of fresh water, marine and reef aquariums. Maintenance of water quality. Common diseases of aquarium fishes, their diagnosis and treatment. Handling, care and transportation of fish. Temperature acclimatization, oxygen packing.

Unit V: Marketing of Aquarium fishes

Marketing of Aquarium fishes. Whole-sale markets of aquarium fish. Design of retail outlet. Export of Ornamental fishes, procedures for export. Training and promotion schemes for Ornamental fishes breeding and marketing by governmental agencies.

- Text books:**
1. C.S. Tharadevi and K.V.Jayashree. Home aquarium. (2009).
Saras Publication, Nagercoil.
 2. N. Arumugam. Aquaculture. (2009) Saras Publication, Nagercoil.

Reference book:

S.K.Gupta and P.C.Gupta. General and applied ichthyology (fish and fisheries). (2006). S.Chand and company Ltd.

PAPER - XII

LAB IN GENETICS, EVOLUTION, BIOSTATISTICS, COMPUTER APPLICATION AND BASIC BIOTECHNOLOGY

Semester : V
Subject Code :

Hours / Week: 8
Credit : 4

GENETICS:

1. Verification of Mendelian ratios (Monohybrid and Dihybrid) using colour beads.
2. Observation of quantitative characters (Height and Weight of the students).

BIOSTATISTICS:

1. Measuring central tendency and SD of quantitative variation.
2. Verification of law of probability through coin tossing.

COMPUTER APPLICATION:

1. Hands on experience is MS-Word, MS-Excel, and MS-Power Point.

BIOTECHNOLOGY:

1. SDS – Poly acrylamide gel electrophoresis – (Demonstration only)
2. PCR (Demonstration only)
3. Two industrial visit – reports may be submitted.

EVOLUTION:

1. Homology, Analogy, Vestigial organs.
2. Fossils
3. Adaptive colouration
4. Darwin's finches
5. Peripatus and Archeopteryx

SPOTTERS:

1. Cloning vectors
2. Callus culture
3. BT –cotton
4. DNA Finger printing
5. Transgenic animals
6. Immobilization of Enzymes

7. Biosensors
8. Plant tissue culture
9. Pen Drive, CD, DVD, Computer parts.

Reference:

1. N. Arumugam, R. P. Meyyan and A. Mariakuttikan (2013). Practical Zoology. (Volume III). Saras Publications, Nagarcoil.
2. S. Thiagarajan (2000). Practical Zoology. T. J. Publications. Tanjavur
3. K. Dharmalingam (1986). Experiments with M13, Macmillan, New Delhi.

PAPER - XIII
BIOCHEMISTRY

Semester: VI

Hours / Week: 5

Subject code:

Credits: 5

Objective:

This paper gives comprehensive coverage of chemistry, structure and functions of macro molecules such as carbohydrates, proteins, amino acids, lipids, vitamins, enzymes and nucleic acids.

Unit I: Principles and Techniques

Concepts of pH and buffers and its type - Oxidation reduction - Isomerism and its types; biotechniques - Colorimeter, pH meter, Paper chromatography and paper electrophoresis.

Unit II: Carbohydrates

Carbohydrates –Structure, properties, classification and chemistry - Glycosidic linkage and biological importance of carbohydrates.

Unit III: Proteins, amino acids and nucleic acids

Proteins – Structural organization, classification of proteins. Biological significance of proteins- Myoglobin, haemoglobin and cytochromes. Amino acids – Structure, properties and classification: peptide bond. Chemistry of nucleic acids, structure, properties and composition of DNA & RNA and its biological importance.

Unit IV: Lipids

Lipid: Structure, properties, classification and chemistry of lipids, biological significance of lipids. Blood lipid – LDL and HDL.

Unit V: Vitamins, Enzymes and Hormones.

Chemical nature and biochemical functions of fat soluble and water soluble vitamins.
Enzymes: classification, properties and mechanism of enzyme action – Coenzymes.
Hormones –Insulin, glucagon, Testosterone, Oestrogen, Progesterone.

Text Books:

1. L. M. Narayanan, Dulsi Fatima and N. Aurmugam (2010). Biochemistry. Saras Publications. Nagercoil.
2. N.Arumugam, (2010). Elements of Biochemistry. Saras Puldications, Nagercoil.
3. Ambika Shanmugam (1998). Biochemistry for medical students. West CIT Nagar, Chennai.

Reference books:

1. U. Sathyanarayana and U. Chakrapani (2010). Biochemistry. Books and Allied (P) Ltd, Kolkata.
2. Lehninger, Nelson and Cox (2010). Principles of Biochemistry. W.H.Freeman & Company, New York, USA.
3. L. Stryer (2009). Biochemistry. W.H.Freeman & Company, NewYork.

PAPER - XIV

MICROBIOLOGY AND IMMUNOLOGY

Semester: VI

Hours / Week: 6

Subject code:

Credits: 6

Objectives:

This paper deals with the biology of micro organisms and their impact on human welfare and comprehensive coverage of essential concepts and current understanding of cellular and molecular events underlying immunity.

MICROBIOLOGY

Unit I: Classification and Culture techniques

Outline Classification of microbes - Five kingdom concept, Bergey's classification, methods of sterilization, culture media-Assessment of bacterial growth - Pure culture - Serial dilution techniques, Pore plate and streak plate culture – maintenance of bacterial culture (slant culture) and gram staining.

Unit II: Bacteria and Viruses

Characteristics of bacteria- structure of bacteria, ultra structure of *E.coli* - Nucleoid-plasmid. Characteristics, structure and shape of viruses - T₄ bacterio phage - Life cycle of λ phage.

Unit III: Food Microbiology

Food and dairy microbiology- preservation of milk, pasteurization of milk-grading of milk- dairy products – yoghurt and cheese - food spoilage, food poisoning and food preservation.

IMMUNOLOGY

Unit IV: Immune system and Immune organs

Types– Immunity - Innate and acquired. Lymphoid organs- Primary lymphoid organs and secondary lymphoid organs. Cells of the immune system - Stem cells, lymphocytes, plasma cells, null cells, macrophages, antigen presenting cells and mast cells.

Unit V: Antigens and Antibodies

Antigens- Epitopes, paratopes, chemical nature of antigens and antigenic determinants, Immunoglobulin - Classes, properties and functions of immunoglobulin, structure of IgG. Antigen and antibody reaction, complement systems, cytokines, hypersensitivity and transplantation immunology.

Text Books

1. A. Mani, N. Arumugam and A. M. Selvaraj (2014). Microbiology. Saras Publication, Nagercoil.
2. N. Arumugam, A. Mani and Dulsi Fatima (2014). Immunology. Saras Publication, Nagercoil

References:

1. H. G. Schelgel (1986). General Microbiology. Cambridge University Press, U.K.
2. M. J. Pelzar and R.D. Reid (1982). Microbiology. Mc Graw Hill Book Company, New York.
3. Jonathan, Abramoff, David Male, Ivan and Roitt (1994). Immunology. Karger, Barel.
4. W. K. Paul (1980). Fundamental Immunology. Raven Press, New York,

PAPER - XV

ANIMAL PHYSIOLOGY

Subject: VI
Subject Code:

Hours/Week: 5
Credits: 6

Objectives:

This paper deals with the general principles of physiology, to appreciate the mechanism of physiological systems and to focus on physiological regulatory mechanism.

UNIT I: Nutrition and Digestion:

Nutritional requirements – Protein, carbohydrates, lipid, vitamins, minerals and water. Structure of digestive system – Physiology of digestion and absorption of carbohydrates, protein and lipid in man.

UNIT II: Respiration and circulation:

Respiration: Definition, types - Aerobic and anaerobic respiration. Respiratory organ- Skin, gill, trachea and lung. Respiratory pigments. Transport of O₂ and CO₂. Circulation: composition and functions of blood, blood clotting, blood volume, types of heart, heart beat - ECG, cardiac cycle and Blood pressure.

UNIT III: Homeostasis and Osmoregulation :

Excretion, metabolic waste products in vertebrates, structure and function of mammalian kidney, physiology of urine formation, regulation of kidney function, ammonotelism, ureotelism, uricotelism and ornithine cycle. Osmoregulation of fresh water fish, marine fish and Migratory fishes.

UNIT IV: Muscular coordination and Receptors:

Types of muscle, chemical composition and properties of skeletal muscles, Ultra structure of muscle and mechanism of muscle contraction – Structure of eye and ear – Physiology of vision and hearing.

UNIT V: Nervous and chemical co-ordination:

Structure of neurons, resting and action potential, conduction and transmission of nerve impulse, neuro-muscular junction, reflex action. Chemical co-ordination –Hormonal secretion in vertebrates - Pituitary, thyroid and adrenal glands.

Text Book:

N. Arumugam (2014). Animal Physiology. Saras Publication, Nagercoil.

References:

1. K. A. Goel and K. V Sastri (2008). A text book of animal physiology. Rastogi Publications, Meerut
2. P. S. Verma, B. S. Tyagi and V. K. Agarwal (2006). Animal Physiology. S. Chand and Company Ltd, New Delhi.
3. C. L. Prosser and F, A. Brown (1998) - Comparative Animal Physiology. W. B Saunders Company, Philadelphia, London.
4. R. Nagabhushanum, M.S. Kodarkar and R. Sarojini – Text Book of Animal Physiology – Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.

PAPER - XVI

LAB IN BIOCHEMISTRY, MICROBIOLOGY AND IMMUNOLOGY & ANIMAL PHYSIOLOGY

Semester : VI

Hours / Week: 8

Subject Code :

Credit : 4

Biochemistry

1. pH measurements of various samples with the help of pH meter
2. Beer – Lambert's Law verification using colorimeter
3. Aminoacids separation using Chromatographic method.
4. Qualitative tests for Protein, Carbohydrate and Fats
5. Electrophoresis - Demonstration

Microbiology

1. Sterilization techniques – Dry, Wet, Chemical
2. Preparation of Liquid medium – Solid Medium
3. Culture techniques
4. Motility of Lactobacillus– Observation
5. Staining techniques – Gram staining

Immunology

1. ABO – Rh blood grouping
2. Haemoagglutination and Haemolysis, titration
3. Preparation of Agarose Plates and well cutting for electrophoresis
4. Immuno electrophoresis
5. Immune diffusion
6. Spotters- Nude Mouse – Electrophoretic apparatus

Animal physiology

1. Effect of temperature on the rate of salivary amylase activity in man
2. Effect of temperature on O₂ consumption in fish

3. Haemoglobin estimation (demonstration)
4. Quantitative estimation of blood sugar.
5. Blood pressure measurement

Spotters:

Nutritional Deficiency diseases

ECG

Sphygmomanometer

Haemoglobinometer

Haemocytometer

Kymograph

References :

1. P. Gunasekaran (1995). Laboratory manual in Microbiology. New Age International (P). Ltd. New Delhi.
2. N. Arumugam, R. P. Meyyan and A. Mariakuttikan (2013). Practical Zoology (Volume III). Saras Publications, Nagarcoil.

SELF STUDY PAPER
FOOD AND NUTRITION

Semester: VI

Hours/Week:

Subject code:

Credit: 3

Objectives:

This paper makes the student to understand the role of food and nutrition in maintaining good health.

Unit I: Food and Health

Food and health: Food and its relation to health, types of food

Unit II: Food Preparation

Changes occurring during the preparation of food: changes in flavor, colour and appearance with reference to rice, milk, fish and vegetables during preparation.

Unit III: Nutrition

Sources and functions of carbohydrates, proteins and lipids. Vitamins – water soluble and fat soluble vitamins – sources and functions.

Unit IV: Nutrients and Water

Minerals: Role in nutrition – calcium, phosphorus, iron, sodium and magnesium.

Water – fluid of life – functions and dehydration.

Unit V: Malnutrition and deficiency diseases

Balanced diet, Kwashiorkor – Marasmus – Obesity – Anemia – Epidemic Dropsy:

Causes, prevention & treatment.

Text book:

A.Mariakuttikan and N.Arumugam. Animal physiology (2014). Saras Publications,
Nagercoil.

Reference books:

1. Sri Lakshmi (2005). Dietics. New Age International (P) Ltd Publishers, New Delhi.

2. N. Shakuntala Mary and M. Shadaksharaswamy (2000). Foods Facts and Principles. .
New Age International (P) Ltd Publishers, New Delhi.
3. S. Shanthi, V. Jemima Florance, V. Borgia and A. Kannagi (2007). Study Materials
Prepared for Food and Nutrition.

YADAVA COLLEGE

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Govindarajan Campus, Thiruppalai, Madurai – 625014.



POSTGRADUATE (M.SC. ZOOLOGY)

**REVISED COPY AFTER THE BOARD OF STUDIES MEETING HELD ON
06.04.2015**

DEPARTMENT OF ZOOLOGY

CBCS (2015-2016)

ACADEMIC COUNCIL MEETING ON 08.05.2015

DEPARTMENT OF ZOOLOGY
M.Sc. ZOOLOGY
COURSE CONTENT

Semester	Sub. Code	Title of the Paper	Teaching Hrs / Week	Credits	Evaluation			Examination Hours
					Internal	External	Total	
I		Core I – Bio chemistry & Biophysics	8	7	25	75	100	3
		Core II – Microbiology	8	6	25	75	100	3
		Core III – Lab in Biochemistry & Biophysics – I	4	2	40	60	100	3
		Core IV – Lab in Micro Biology – II	4	2	40	60	100	3
		Elective – Biological Techniques (or) Sericulture	6	5	25	75	100	3
		TOTAL	30	22				
II		Core V – Genetics and Evolution	8	7	25	75	100	3
		Core VI – Animal Physiology and Developmental Biology	8	6	25	75	100	3
		Core VII – Lab in Genetics and Evolution-III	4	2	40	60	100	3
		Core VIII – Lab in Animal Physiology and Developmental Biology – IV	4	2	40	60	100	3
		Elective – Natural Resources and Management (or) Entomology	6	5	25	75	100	3
		TOTAL	30	22				

Semester	Sub. Code	Title of the Paper	Teaching Hrs / Week	Credits	Evaluation			Examination Hours
					Internal	External	Total	
III		Core IX – Molecular Biology and Microbial Genetics	8	7	25	75	100	3
		Core X – Biostatistics & Computer Application and Bioinformatics	8	7	25	75	100	3
		Core XI – Lab in Molecular Biology and Microbial Genetics - V	4	2	40	60	100	3
		Core XII – Lab in Biostatistics & Computer Application and Bioinformatics - VI	4	2	40	60	100	3
		Elective – Bioinformatics (or) Entrepreneurial Zoology	6	5	25	75	100	3
		TOTAL	30	23				
IV		Core XIII – Immunology	8	7	25	75	100	3
		Core XIV –Biotechnology	8	7	25	75	100	3
		Core XV – Lab in Immunology – VII	4	2	40	60	100	3
		Core XVI – Lab in Biotechnology – VIII	4	2	40	60	100	3
		Research Project	6	5	20	80	100	--
		TOTAL	30	23				
		Total number of teaching hours: 120hrs Total number of credits : 90						

Department of Zoology

**Details of Addition, Deletion, Replacement, Revision
And No Change of subjects**

Semester	Sub. Code	Title of the Paper	Remarks	Action Needed
I		Core I – Bio chemistry & Bio Physics	Revised	Allot New Code
		Core II – Micro Biology	Revised	-do-
		Core III – Lab. In Bio chemistry & Bio Physics – I	Revised	-do-
		Core IV – Lab. In Micro Biology – II	Revised	-do-
		Elective – Biological Techniques (or) Sericulture	No change	Retain old code
II		Core V – Genetics and Evolution	Revised	Allot New Code
		Core VI – Animal Physiology and Developmental Biology	Revised	-do-
		Core VII – Lab in Genetics and Evolution - III	Revised	-do-
		Core VIII – Lab. In Human Physiology and Developmental Biology – IV	Revised	-do-
		Elective – Natural Resources Management (or) Entomology	Revised	-do-

sem est	Sub.	Title of the Paper	Teaching Hrs /	Examination
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	Code		Week	Hours
III		Core IX – Molecular Biology and Microbial Genetics	No change	Retain old code
		Core X – Biostatistics & Computer Application and Bioinformatics	Revised	Allot New Code
		Core XI – Lab in Molecular Biology and Microbial Genetics -V	Revised	-do-
		Core XII – Lab in Biostatistics & Computer Application and Bioinformatics - VI	Revised	-do-
		Elective – Bioinformatics (or) Entrepreneurial Zoology	Revised	-do-
IV		Core XIII – Immunology	Revised	Allot New Code
		Core XIV –Biotechnology	Revised	-do-
		Core XV – Lab in Immunology – VII	Revised	-do-
		Core XVI – Lab in Biotechnology – VIII	Revised	-do-
		Research Project	--	--

Paper - I

BIOCHEMISTRY AND BIOPHYSICS

Semester: I

Hours/Week: 8

Subject code:

Credit: 7

Objectives:

This paper deals with the metabolism of various biomolecules such as carbohydrates, proteins, amino acids and lipids. It also elucidates the physical laws in the formation of biomolecules and production of energy in the living system.

UNIT I: Metabolism of Carbohydrate:

Metabolism of carbohydrates: glycolysis – energy yield in glycolysis – glycogenesis – glycogenolysis – hexose monophosphate shunt – TCA cycle, electron transport system, gluconeogenesis.

UNIT II: Metabolism of Protein:

Catabolism of amino acid: oxidation - deamination – transamination – decarboxylation – transmethylation. Ornithine cycle (urea cycle) – fate of amino acids: Enter the pathway of carbohydrate metabolism through Kreb's cycle – 4 Groups – amino acids entering by pyruvic acid, amino acids entering by α -Ketoglutaric acid, amino acids entering by succinyl coA and amino acids entering by oxaloacetic acid and fumaric acid.

UNIT III: Metabolism of Lipid:

Metabolism of triglyceride, glycerol and fatty acids – β -Oxidation cycle of fatty acids (Palmitic acid) – energetics of palmitic acid oxidation. Blood lipid – Metabolism of cholesterol. Ketogenesis – ketosis – ketone bodies and Ketolysis (Brief account only).

UNIT IV: p^H & Enzyme:

p^H and buffers, Henderson - Hasselbalch Equation. Enzyme – classification – properties of enzymes – mechanism of enzyme action – factors affecting enzyme activity. Michaelis - Menten derivations – co-enzymes – iso enzymes.

UNIT V: Biophysics:

Nature of energy and its measurements, chemical energy, concepts of free energy, Laws of thermodynamics – exergonic and endergonic reactions – scheme of bioenergetics – oxidation, reduction potential – ATP bioenergetics – mitochondrial bioenergetics – bioluminescence – introduction and types – physical characteristics of bioluminescence – biochemistry – mechanism of light production – control of bioluminescence – function of bioluminescence – effect of UV radiation in biological systems – mutagenesis.

Text Book:

2. L. L. Jain, S. Jain and N. Jain (2006). Fundamentals of Biochemistry. S.Chand & Company Ltd., New Delhi.
3. S. Thiraviaraj (2014). Biophysics. Saras Publication, Nagercoil.

References Books:

1. E. S. West, Todd and Masson (1998). Text book of Biochemistry. Mc Graw Hill. UK.
2. Lehninger (2010). Principles of Biochemistry. W. H. Freeman and Company, New York.
3. U. Satyanarayana and U. Chakrapani (2010). Biochemistry. Books and Allied (P) Ltd. Kolkata.
4. A. C. Deb (2010). Fundamentals of Biochemistry. New Central Book Agencies, Bihar.
5. C. Champe and A. Harvey (2006). Biochemistry IInd Edition. Lippicott – Raven Publishers, USA.

Semester: I
Subject Code:

Hours/Week: 8
Credit: 6

Objectives:

This paper deals with the biology of microorganisms and their impacts on human welfare. It includes history, systematic growth, culture methods, metabolism, reproduction and applications of microorganism. It also covers application in industrial productions.

UNIT I: Classification and bacterial growth

General characteristics and classification of bacteria, virus, fungi and algae. Whittaker five kingdom concept. Three Domain system -Bergey's manual of classification, classification of viruses. Growth curve, generation time, factors affecting growth. Culture of Bacteria – asynchronous growth – synchronous growth – continuous culture.

UNIT II: Food Microbiology

Microbiology of food – food spoilage – spoilage of fish, spoilage of egg – spoilage of meat and bread. Methods of food preservation – food poisoning.

UNIT III: Industrial and environmental microbiology

Fermentation, selection of microbes for fermentation. Production of beer and wine. Production of Organic acids: vinegar, lactic acid and citric acid. Production of antibiotics: Penicillin, tetracycline and chloramphenicol. Production of fuel: Bio gas and Bio-ethanol.

UNIT IV: Medical Microbiology

Air borne disease – Tuberculosis; food borne and water borne diseases – cholera, Botulism, typhoid fever; Soil borne diseases – tetanus, anthrax: sexually transmitted disease - Gonorrhoea and Contact diseases – Leprosy; Vector borne disease – A brief account on dengue fever, chikungunya, swine flu, Avian Influenza (AI).

UNIT V: Agricultural Microbiology

Biofertilizer – Rhizobium, Azotobacter, Azospirillum, BGA, VAM fungi, Azolla; microbial herbicides, bacterial pesticides, fungal pesticides, viral pesticides. Economic importance of *Agaricus bisporus*, yeast, *Spirulina*, Lichens.

Text Book:

1. R.C. Dubey and D.K. Maheswari (2004). A Text book of Microbiology. S.Chand & Company Ltd. New Delhi.

Reference Books:

1. H.G. Schelgel (1986). General Microbiology. Combridge University Press, U.K,
2. Bernard D.Davis, Dulbecco, R.Eisen, H.N, and H.S. Guisberg (1980), Microbiology, 3rd Edition, Harper and row Internation Publisher Inc., New York.
3. S, Bergy (2006). Manual of Determinative Bacteriology, 8th Edition, Breed EGS Murky and NR, Smith (ed) Williams and Wilkins, Baltimore.
4. P. Tauro, K.K. Kapoorand and Y.S. Yadav (1981) An introduction to Microbiology, Wiley Ltd., Madras.
5. M.J. Pelzar and Reid, R.D (1982). Microbiology. Mc Graw Hill Book Company. New York.

PRACTICAL I

LAB IN BIOCHEMISTRY AND BIOPHYSICS

Semester: I

Hours/Week: 4

Subject Code:

Credit : 2

Biochemistry

1. p^H -Acid – Base titration
2. Preparation of buffers
3. Amino acids as Zwitter ions – buffering action of an amino acid – as determined by titration.
4. Extraction of phosphatase from any animal source
5. Determination of K_m value and V_{max} of a phosphatase.
6. Effect of temperature on phosphatase activity.
7. Effect of pH on phosphatase activity.
8. Quantitative estimation of carbohydrates, proteins and lipids from fresh tissues – standard graphs.

Biophysics:

9. Haemolysis, haemin crystals / uric acid crystals.
10. Paper chromatography (Demonstration only)
11. SDS PAGE and Agarose Gel Electrophoresis.

Spotters:

p^H meter, Spectrophotometer, Centrifuge and Colorimeter

Reference Books:

1. J. Jayaraman, 1981. Laboratory manual of Biochemistry. Wiley Eastern Company, Delhi.
2. N.Arumugam, 2015. Principles and techniques of Biophysics. Saras publication, Nagercoil.

PRACTICAL II

LAB IN MICROBIOLOGY - II

Semester: I

Hour/Week: 4

Subject code:

Credits: 2

- 1.1.Preparation of glasswares, media and sterilization
- 1.2.Observation of colony morphology
- 1.3.Serial Dilution techniques – Isolation of bacteria from water and soil
- 1.4.Pure culture of micro organisms – Pour plate, Spread plate, Streak plate and Slant culture
- 1.5.Hanging drop techniques – observation of motility of *Lactobacillus*
- 1.6.Assessing the microbial quality of Milk (methylene blue reduction test and starch Hydrolysin)
- 1.7.Gram staining technique
- 1.8.Methylene blue staining technique
- 1.9.Special features of selected microorganisms:
 - a) Bacteria- *Escherichia coli*
 - b) Actinomycetes – Streptomyces, Mycoplasma and Bacteriophage-T₂.
 - c) Algae – *Spirulina*, *Oscillatoria*. Fungi – *Rhizopus*, *Aspergillus* and *Pencillium*

References:

1. Vinita Kale and Kishore Bhusari (2005). Practical Microbiology. Himalaya Publishing House, New Delhi.
2. Ritu Mahajan, Titender Sharma and R. K. Mahajan (2006). Practical Manual of Biotechnology, Vayu Education of India, New Delhi.

ELECTIVE - I

BIOLOGICAL TECHNIQUES

Semester: I

Hours/ Week: 6

Subject Code:

Credit: 5

Objectives:

This paper to make the students to understand the techniques adopted in living systems to understand it's biochemistry and physiology of life.

UNIT I: Microtomy & Microscopy

Fixatives, infiltration, embedding, sectioning, affixing and processing the section, staining, mounting and labelling. Microscopy – Compound microscope – Electron microscope, **AFM** and phase contrast microscope.

UNIT II: Colorimetry

Measurement of colours – Complementary colours – Beer's Lamberts law – absorption spectrum – Molar extinction coefficient – Spectra of mixtures.

UNIT III: p^H Meter and Centrifugation

p^H meter-measurement of pH, titration of acid, preparation of buffer – Phosphate TRIS. Centrifugation – Ordinary centrifugation, high speed centrifugation, ultra centrifugation, centrifugation – density gradient centrifugation.

UNIT IV: Instrumentation

Principle and operating system of monopan balance, working principle and applications of Bomb calorimeter, Flame photometer and Spectrophotometer.

UNIT V: Electrophoresis and Autoradiography

Kinds of electrophoresis – SDS Polyacrylamide gel electrophoresis, DNA and RNA – agarose gel electrophoresis. Immuno electrophoresis – Rocket immuno electrophoresis and immuno diffusion. Principle, working mechanism and applications of Scintillation counter and Geiger Muller counter.

Text Books:

1. L. Veerakumari (2006). Bioinstrumentation. MJP Publishers, Chennai.
2. J. Jeyaraman (1981). Laboratory Manual in Biochemistry. Willey Eastern Limited. India.

Reference Book:

1. John G. Webster (2008). Bioinstrumentation. John Wiley & Sons, Inc.
2. Harold Varley (1975). Practical clinical Biochemistry, Arnold Heinemam.
3. Frances M. Weesner (1960) – General zoological Microtechnique. The William & Wilkins Co.,
4. P. R. Yadav and R. Tyagi (2006). Biological Techniques. Discovery Publishing House, New Delhi.

ELECTIVE - I

SERICULTURE

Semester: I

Hours / Week: 6

Sub Code:

Credit: 5

Objectives:

This paper deals with the rearing of silkworms for production of silk. It provides direct as well as indirect employment to labourers. It also gives employment opportunities to the students and entrepreneurs.

Unit I Mulberry cultivation:

Morphology of mulberry plant – seedling propagations – vegetative propagation, cutting, grafting, layering and micro irrigation - Frequency of irrigation and methods of irrigation, manuring. Harvesting and nutritive value of leaves. Diseases – fungal, viral and bacterial diseases. Pest of mulberry – leaf eating pests.

Unit II Biology of *Bombyx mori*:

Taxonomic position of *Bombyx mori* – Life cycle and races. Classification based on the number of larval moults. Morphology of *Bombyx mori*: structure of egg and larva - sex differences in the larva - structure of pupa and adult - sex differentiation in adult.

Unit III Rearing Facilities:

Rearing house - rearing appliances – used for keeping the worms for feeding, for bed cleaning, used to support the spinning larva, need for disinfection and for maintaining optimum conditions.

Unit IV Rearing Operations:

Disinfection, physical methods, chemical methods. Steps: brushing, bed cleaning, spacing, mounting and harvesting. Types of rearing – rearing of young worm, floor rearing, shoot rearing. Diseases – protozoan, bacterial, viral and fungal. Pests of silk worm – uzi fly, ants, lizards, rats, squirrel and birds.

Unit V Cocoon Marketing:

Transport of cocoons, defective cocoons, cocoon markets. Silk reeling – stifling, sun-drying steam stifling, hot stifling, storage of cocoons, sorting of cocoons. Steps involving in silk reeling, brushing, and raw silk testing. Byproduct of moriculture. Animal feed, defective cocoon wastes and pupal waste.

Text books:

G. Ganga and J. Sulochana Chetty (2005). An introduction to sericulture. Second edition. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.

Reference:

1. Narasimhanna, M.N and Ullah, S.R. (1994). Handbook of practical sericulture. Central silk board, Bangalore.
2. Arumugam, T. Murugan and J. Johnson Rajeswar (2014). Applied Zoology. Saras Publication, Nagercoil.

GENETICS AND EVOLUTION

Semester: II

Hours/Week: 8

Subject Code:

Credit: 7

Objectives:

This paper is designed to give an understanding of human genetics, sex determination, sex linkage, mutation and also detailed studies on the evolutionary evidences, theories of evolution, horse evolution and human evolution.

Genetics

Unit I:

Mendelism: monohybrid cross – dihybrid cross – back cross – test cross. Gene interaction: complementary – supplementary genes – epistasis – co-dominance (sickle cell anaemia). Multiple alleles: ABO blood groups – Rh factor – erythroblastosis foetalis.

Unit II:

Linkage and crossing over in *Drosophila* – chromosomal mapping – sex determination in man and *Drosophila*. Sex-linked inheritance: colour blindness and Haemophilia. Non-disjunction – syndromes – human karyotype – gene mutation – types – mutagens.

Unit III:

Population Genetics : Gene pool – gene frequency – Hardy-Weinberg Law – explanation – significance – applications – role in evolution. Applied Genetics: inborn errors of metabolism – inbreeding, out breeding and Heterosis. Eugenics – Euthenics – Euphenics – genetic counseling.

Evolution

Unit IV:

Introduction – Origin of life and Organic evolution – Biochemical origin of life. Evidences for evolution: Morphological, embryological, biochemical and palaeontological. Theories: Lamarckism – Neo-Lamarckism – Darwinism – Variation – types and sources. Modern synthetic theory of evolution.

Unit V:

Speciation – types – mechanism – patterns of speciation. Isolating mechanisms: geographical and reproductive isolation. Patterns of evolution – salient features and mechanism. Mimicry and colouration - role in evolution- rates of evolution. Evolution of man: Organic, cultural and future evolution.

Text Books:

1. R. P. Meyyan and N. Arumugam (2015). Genetics and Evolution. Saras Publications, Nagercoil.
2. Veerbala Rastogi (2005). Organic evolution. Surjeet Publications, New Delhi.

Reference Books:

6. A. Gardner and T. Davies (2010). Human Genetics IInd Edition. Scion Publishing Ltd., Uk.
7. P. S. Verma and V. K. Agarwal (2010) Genetics. S. Chand & Co., Ltd., New Delhi.
8. M. W. Strickberger (1996). Evolution. Jones and Barlett Publishers, Sudbury, Massachusetts, Boston.
9. Stebbins (1998). Process of organic evolution. Surjeet Publications, New Delhi.
10. Gopalakrishnan, T.S. Itta Sambasivaiah, Kamalakra Rao, A.P. Principles of organic evolution. Himalaya Pub. House (2000), Bombay.

PAPER - VI
ANIMAL PHYSIOLOGY AND DEVELOPMENTAL BIOLOGY

Semester: II

Hours/Week: 8

Subject code:

Credit: 6

Objectives:

This paper is to make the learner to understand the functioning of various system of living organism, to make them understand the basic plan of development, development of various organs and to gain knowledge about role of hormones in development and birth control aspects.

Animal Physiology

UNIT I:

Digestion: Digestion in mouth, duodenum and intestine with Bile composition, functions of gastro intestinal hormones, absorption and assimilation. Role of enzymes in digestion of carbohydrates, protein and lipid

Blood and Circulation: Blood composition, blood coagulation, plasma. Types of heart – structure and working mechanism. Cardiac cycle, blood pressure and ECG.

Respiration: Inspiration, expiration, mechanism of respiration - respiratory pigments, transport of gases and oxygen dissociation curve.

UNIT II:

Muscle: Types of muscle, structure and chemistry of striated muscle- molecular basis of muscle contraction and factors influencing contractility – Receptors: structure and physiology of eye and ear.

Excretion: Structure of kidney and nephron, mechanism of urine formation.

UNIT III:

Endocrine System: Pituitary, thyroid, adrenal, pancreas, ovary and testis.

Nervous system: Structure of neurons, nerve impulse, conduction, synaptic transmission, neuromuscular junctions.

Developmental Biology

UNIT IV:

Development of eye, ear, brain and kidney - concepts of Spemann's organizer; structure, chemical nature and mechanism of inductor-experimental evidences, embryonic induction; competence and totipotency. Nucleo cytoplasmic interaction. Role of hormones in insect and amphibian metamorphosis.

UNIT V:

Sperm bank, artificial insemination, infertility - measures to overcome infertility, birth control, pregnancy test and maintenance, Invitro fertilization (IVF), embryo transfer. Prenatal diagnosis of diseases – Stem cell bank.

Text Book:

1. Nagabushanam (2005). Animal Physiology. Himalaya Publications, Mumbai.
2. N. Arumugam (2014). Embryology. Saras Publications, Nagercoil.

References:

1. S. C. Rastogi (2008). Essentials of Animal Physiology. New Age International Publishers, Mumbai.
2. S. Hoar (2005). General and Comparative Physiology. William Publication. USA.
3. Veer Bala Rastogi and M. S. Jayaraj (2008). Developmental Biology. Kendra Nath Ram Nath, Meerut.
4. T. Subramonium (2006). Developmental Biology. Narosa Publishing Housing. Kolkata.

LAB IN GENETICS AND EVOLUTION

Semester: II

Hour/Week: 4

Subject code:

Credits: 2

Genetics:

1. Verification of Mendel's Law of segregation with colour beads.
2. Coin Tossing experiment to prove Mendel's Law independent assortment
3. Verification of Hardy-Weinberg law using colour beads.
4. Sex linked inheritance in man – colour blindness (using colour chart).
5. Analysis of at least six Mendelian traits of the students.
6. Museum specimens: Albino rat, normal and mutant forms of *Drosophila*, Sinistral and Dextral shells
7. Syndromes: Klinefelter's syndrome, Turner's syndrome and Down's syndrome

Evolution:

1. Analysis of variation – Observation of types of Finger prints among the students
2. Statistical analysis of weight and height of the student
3. Homology - Forelimbs or hind limbs of vertebrates.
4. Analogy – Wings of birds and insects.
5. Serial evolution – Mouth parts of insects.
6. Fossils evidence – a) *Archeopteryx* b) Casts and moulds
7. Adaptive radiation – Beaks of birds
8. Museum specimens for adaptive ,warning and alluring colouration
9. Mimicry- Monarch and viceroy butterfly

References:

1. J. C. B. Abraham (1987). Evolution - A Laboratory Manual – Macmillan, Chennai
2. S. Thiagarajan (2000). Practical Zoology. T. J. Publicatins. Tanjavur.
3. A. J Gardner and D. P. Sustad (1984). Principles of Genetics. VII Edn. John wiley and Sond, New York.

PRACTICAL - IV
LAB IN ANIMAL PHYSIOLOGY AND DEVELOPMENTAL BIOLOGY

Semester: II

Hours / Week: 4

Subject code:

Credit: 2

Animal Physiology

1. Effect of temperature on human salivary amylase activity
2. Effect of pH on human salivary amylase activity
3. Preparation of haemin crystals
4. Estimation of haemoglobin
5. Estimation of blood sugar
6. Enumeration of red blood cells using haemocytometer (Demonstration only)
7. Enumeration of total and differential count of white blood cells (Demonstration only)
8. Analysis of urine for urea and glucose (Demonstration only)
9. Recording of blood pressure using a sphygmomanometer

Spotters:

1. E.C.G
2. Haemocytometer
3. Haemoglobinometer

Developmental Biology:

1. Mounting of chick blastoderm.

Spotters:

1. Human Sperm
2. Human Ova
3. Human Placenta
4. Contraceptive devices

References :

1. C. L., Prosser (1984). Comparative Animal Physiology. W.B. Saunders, Philadelphia.
2. V.R Muthu Karupan and R.M. Pitchappan (1979). Animal Development – A Lab guide
COSIP– ULP publication, madhoor.

ELECTIVE - II

NATURAL RESOURCES AND MANAGEMENT

Subject: II
Subject Code:

Hours/Week: 6
Credit: 5

Objectives:

This paper creates awareness about the natural resources and role in human welfare, to create awareness about their conservation and management and to create a pollution free environment for the forthcoming generation.

UNIT I Introduction:

Historic routes of nature protection, global concerns, environmental ethics and philosophy. Energy for life, terrestrial biomass, aquatic ecosystem, human disturbances.

UNIT II Natural Resources and Management:

Soil, forest and water resources, soil abuse, conservation, wasteland reclamation, deforestation, afforestation and conservation, soil and agro forestry - water cycle – fresh water, marine water and ground water. Water conservation – rain water harvesting and grey water harvesting.

UNIT III Biodiversity and Management:

Wild life of India, endemism, endangered flora and fauna, Hotspot of biodiversity, biogeography, wild life conservation – *Ex situ* and *In situ* methods. Biosphere reserve.

UNIT IV Renewable and Non – Renewable Energy Sources:

Conventional sources of energy-solar, wind and biomass and Non conventional sources of energy-fossil fuels. Energy conservation strategies.

UNIT V Pollution and Management:

Air, water and soil pollution and management. Soil waste problem and management. Environmental value education, role of NGOs on natural resource management. Global warming.

Test Book:

1. N. Arumugam (2014). Concepts of Ecology, Saras Publications, Nagercoil.

Reference:

1. Cunningham and Saigo (1999). Environmental Science McGraw- Hill Publication, New Delhi.
2. R. Gopal et al.,(2005). A text book of Environmental studies, Published by PG Dept. Of Zoology, Yadava college, Madurai – 14.
3. P. S. Verma and V. K. Agarwal (2012). Environmental Biology. S. Chand & Company Ltd, New Delhi.
4. P.D. Sharma (2006). Ecology and Environment. Himalyan Publications. New Delhi.

ELECTIVE - II ENTOMOLOGY

Semester II

Hours/Week: 6

Sub Code:

Credit : 5

OBJECTIVE:

This paper gives exposure to students about the application value of knowledge in entomology, to highlight the beneficial aspects of insect population to human welfare and provides knowledge about the harmful insects and their management.

UNIT I:

Outline classification of insect's up to order with example

Morphology of typical insect – head, thorax, abdomen, physiology – nutrition, tracheal system, circulation, excretion, endocrine system and reproduction.

UNIT II:

Biology, rearing and economic importance of honey bee, silk worm and lac insect.

UNIT III:

Nature of damage and control measures of Pests: Rice; *Leptocorisa varicornis* and *Triporeya incertulas*. Sugarcane; *Pyrilla perpusilla* and *Emmalocera depressella*. Cotton; *Earias fabia* and *Platyendra gossypiellas*. Coconut; *Oryctes rhinoceros* and *Rhynchophorus (Red palm weevil)*. Household pests; cockroach and mosquitoes.

UNIT IV:

Methods and principles of pest control- Integrated Pest Management, biological control; insects and host plant resistance, pheromones, antifeedants, insect repellents, sterility methods of pest control, plant quarantine.

UNIT V:

Insecticides and their classification- botanical insecticides, biopesticides, insect growth regulators; principles of toxicology of insecticides, pesticides and environment; handling of insecticides, plant protection appliances.

TEXT BOOK:

B.V. David and T.N. Ananthakrishnan (2006). General and Applied Entomology.
TATA McGraw Hill Publishing Company.

REFERENCE BOOKS:

1. M.S.Mani (2006). General Entomology. JJ Publication. New Delhi.
2. Dunston P. Ambrose (2008). The Insects: Structure, Functions and Biodiversity. Kalyani Publishers. New Delhi.
3. M. S. Nalina Sundari and R. Santhi (2010). Entomology. MJB Publishers, Chennai.
4. Vikas Chaudhary (2008). Entomology and Pest Management. Navyug Publishers. New Delhi.

PAPER - V
MOLECULAR BIOLOGY & MICROBIAL GENETICS

Semester: II

Hours/week: 8hrs

Sub. Code:

Credit: 7

Objectives:

This paper enriches the readers about the molecular aspects of living system, to make them understand the art of protein synthesis in a cell and to make them understand the basic aspects of microbial reproduction and mapping of their genome.

Unit I: Chemistry of Deoxyribonucleic Acid:

Nucleic acids - DNA – Molecular Structure – functions –Types of replication – Experimental proof for Semi conservative replication – Types of DNA – A, B and Z. Eukaryotic and Prokaryotic DNA - Denaturation and renaturation of DNA.

Unit II: Chemistry of Ribonucleic Acids:

RNA – Molecular structure – Types of RNA – functions. Molecular processing of RNA.

Unit III: Protein Synthesis:

Information Transfer in prokaryote and eukaryote – Genetic code – Types of Gene – transcription – mechanism – Translation – Growth of polypeptide – Post translational processing of polypeptide.

Unit IV: Gene Action:

Gene Structure – function – Regulation of gene expression – Lac-operon. Central dogma and reverse dogma. Galactose operon – Tryptophan operon models. Transformation – Griffith effect– Bacterial conjugation – Hfr cells – gene mapping. Transduction – Experimental proof – Sex duction– application of transduction in gene mapping.

Unit V: Microbial Genetics:

Genetics of Phage – Structure and life cycle of Lambda and M₁₃ – Lytic and Lysogenic – genetic mapping of phage T₄.

Text Book:

1. A. Mani and N. Arumugam (2013). Molecular Biology and Genetic Engineering. Saras Publications, Nagercoil.
2. R. Maloy and E. Cronan (2012). Microbial Genetics. Narosa Publishing House.Kolkata.

Reference:

1. P.K.Gupta (2006). Cell and Molecular Biology. Rastogi Publications, Meerut.
2. David Freifeldor (2010). Molecular Biology. Narosa Publishing House, New Delhi.
3. George M.Malacinski (2006). Essentials of Molecular Biology. Narosa Publishing House, New Delhi.
4. Verma and Agarwal (2006). Molecular Biology. S.Chand & Co., New Delhi.

BIOSTATISTICS, BIOINFORMATICS AND COMPUTER APPLICATIONS

Semester: III

Hours/Week: 8

Subject Code:

Credits: 7

Objectives

This paper enable the learners become aware of principle of statistics, understand the various tools of statistics, application of statistics through computer for project work, know the principle of thesis writing and recent trends in bioinformatics.

Unit I:

Data: Primary and secondary data – tabulation, diagrammatic presentation of data. Graphical representation of data. Measures of central tendency. Definition and problems for individual, discrete and continuous data – measures of dispersion – Standard Deviation – problems – coefficient of variation.

Unit II:

Correlation – types – problems. Regression – problems – regression analysis – linear regression – analysis – regression line – calculation – grouped and ungrouped data – multiple regression. Probability – binomial distribution – normal – poisson – Skewness and Kurtosis – Chi square test.

Unit III:

Tests of significance: Comparison of means of two samples – Student ‘t’ test – paired – unpaired – test compassion of three or more samples. Analysis of variance – one way and two way- Calculation; ANOVA table . Uses of statistical software packages -SPSS.

Unit IV:

Definition, Scope and applications: types of sequences – DNA, RNA and Protein sequences: biological databases – definition, objectives, Properties, database retrieval tools: Pubmed and Sequence Retrieval System (SRS); DNA, RNA and protein data bases: DDBJ – tools: BLAST, FASTA, application of bioinformatics tools: CLUSTAL W, PROTPARAM, SCANPS, CPG plot, GOR, STRAP, 3D-PSSM, SWISS-MODEL, MMTK, RasMol, PHYSIP, APUP, GeneScan, Genefinder and Webcutter.

Unit V:

Introduction to computer- characteristics of computer-algorithm and flow chart, Computer Arithmetic and number system- ASCII and EBCDIC codes-operating system, programming language. Computer and communication: Internet- e-mail- Web creation – hosting and medical transcription. Computer application in biostatistics – Basic concepts and application in Bioinformatics

Text Books:

1. N. Gurumani (2005). Biostatistics -An Introduction. MJP Publishers, Chennai
2. N. Sundaralingam and V. Kumaresan (2013). Bioinformatics. Saras Publications, Nagercoil.

Reference Book:

1. P. Ramakrishnan (2010). Biostatistics. Saras Publications, Nagercoil.
2. W.W., Daniel (1987). Biostatistics : A Foundation for Analysis in Health Sciences John Wiley and Sons, New York
3. E. Balagurusamy(1983). Programming in Basics. Tata McGraw Hill, New Delhi.
4. P. K. Jasra and Gurdeep Raj (2004). Biostatistics. Krishna Prakashan (P) Ltd., Meerut.
5. M. Rajadurai. Bioinformatics (A Practical Manual). PBS Book Publishers. Chennai.

LAB IN MOLECULAR BIOLOGY AND MICROBIAL GENETICS

Semester: II

Hour/Week: 4

Subject code:

Credits: 2

1. Isolation of plasmid DNA from bacterial cells
2. Isolation of RNA from bacterial cells
3. Determination of the molecular weight of DNA\plasmid DNA from Agarose gel using silica (Demonstration only).
4. Restriction Endonuclease digestion of vector DNA and samples (Demonstration only).

5. Spotters:

DNA replication model

RNA model

RNA splicing

Genetic code

Polysomes

Griffith experimental model

T₂ - Phage

Lytic and Lysogenic model

Bacterial conjugation

Reference Book:

1. A. Mani and N. Arumugam (2013). Molecular Biology and Genetic Engineering. Saras Publications, Nagercoil.
2. R. Maloy and E. Cronan (2012). Microbial Genetics. Narosa Publishing House. Kolkata.
3. David Freifeldor (2010). Molecular Biology. Narosa Publishing House, New Delhi.

PRACTICAL - VI
LAB IN BIOSTATISTICS, BIOINFORMATICS AND COMPUTER
APPLICATIONS

Semester: III
Subject code:

Hour/Week: 4
Credits: 2

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1. Text preparation through MS- word-paper setting-paragraph formation-font size, left and right margin bold/italyizing/underlining.
 2. Data entry in Excel Sheet
 3. Graph drawing using Excel sheet
 4. Statistical calculation - mean, median, mode, standard deviation, correlation, regression and 't'- test using Neem leaves.
 5. Probability using coin tossing.
 6. Power point slide preparation – prepare 20 PPT slides on any one of the desired topics in biology and present evaluation.
 7. **Spotters in computer application:**
Hardwares
Softwares
Languages
Sigma stat
Genome database –Pubmed and BLAST
 8. E-mail –id creation
 9. Data collection through E-mail
 10. Bio informatics tools (any two)

Reference Books:

1. N. Arumugam and A. Gopi (2014). Biostatistics Computer Application and Bioinformatics. Saras Publications, Nagercoil.
2. N. Sundaralingam and V. Kumaresan (2013). Bioinformatics. Saras Publications, Nagercoil.
3. P. Ramakrishnan (2010). Biostatistics. Saras Publications, Nagercoil.
4. W.W., Daniel (1987). Biostatistics : A Foundation for Analysis in Health Sciences John Wiley and Sons, New York

5. E. Balagurusamy(1983). Programming in Basics. Tata McGraw Hill, New Delhi.
6. P. K. Jasra and Gurdeep Raj (2004). Biostatistics. Krishna Prakashan (P) Ltd., Meerut.

ELECTIVE PAPER - III
BIOINFORMATICS

Semester : III

Hours/Week : 6

Objectives

This paper gives information about genome, protein and biodiversity are acquired, stored in databases for easy retrieval and analysis. It also provides essential background information on computer networking and molecular biology to understand bioinformatics.

Unit I: Introduction

Definition –information technology in biology – types of sequences used in bioinformatics: DNA and RNA sequence - application of bioinformatics – usage of World wide Web (www) through internet explorer – Internet server – URL – HTML – HTTP / FTP – Introduction to databases – databases for nucleic acids, protein and carbohydrates. Human Genome Project – International HGP –Celera Genomics HGP – Goals of HGP – Techniques of HGP – Time Schedule for HGP – Potential benefits of HGP.

Unit II: Databases

Definition- Symbols used in databases- Biological databases and its Significance. Importance of Databases – classification of Biological databases: nucleic acid sequence databases - EMPL - Gen Bank - DDPJ- GSDB. Protein sequence databases - PIR1 - PIR2 - PIR3 and PIR4. Structure databases-SCOP- CATH. Sequence Retrieval system (SRS) – Pub Med –Specialized Databases.

Unit III: Bioinformatics Tools

Uses of Bioinformatics Tools – Classification of Bioinformatics tools – Homology and Similarity tools (BLAST, FASTA, ClustalW) – Protein functional analysis tools (PFAM, SCANPS) – Sequence analysis tools – Structural Analysis tools (PROTPARAM, GOR, 3D-PSSM) – Molecular modeling and visualizing tools (MMTK, RasMol) – Phylogenetic Analysis tools.

Unit IV: Sequence Alignment, Predictive Methods using DNA & Protein Sequences

Algorithm – criteria for sequence alignment – Needs for sequence alignment – Sequence Alignment Technique – correspondence between residues – Optical Alignment – Example of Sequence Alignment – Dot Matrix method – Dynamic Programming – Multiple sequence Alignment – structural alignment – sequence comparison – PSI – BLAST & Hidden Markov Models (HMMS).

Gene Prediction strategies – Gene prediction programs – protein prediction strategies – Secondary structure prediction – Intrinsic Tendency of Amino acids to form β -turns –

Three Dimensional structure prediction – Homology modeling – Threading – protein function prediction – protein prediction programs – Molecular visualization.

Unit V: Homology, Phylogeny, Evolutionary Trees, Drug Discovery and Pharmacoinformatics

Homology and similarity – phylogeny and relationships – approaches used in phylogenetic analysis – phylogenetic trees – tree building methods – molecular approaches to phylogeny - phylogenetic analysis databases – discovering a drug – target identification and validation – identifying the lead compound – pharmacoinformatics – search programs – docking algorithms – active site analysis – QSAR.

Text Books:

1. N. Sundaralingam and V. Kumaresan (2013). Bioinformatics. Saras Publications, Nagercoil.
2. K. Mani, K. and Vijayaraj, N. 2004 Bioinformatics A practical Approach, Aparnaa Publications, Coimbatore.

Reference Book:

1. E. Balagurusamy(1983). Programming in Basics. Tata McGraw Hill, New Delhi.
2. M. Rajadurai (2006) Bioinformatics (A Practical Manual). PBS Book Publishers. Chennai.
3. I. A. Khan and Khanum, A (2003).Recent advances in Bioinformatics, Ukaaz Publications, Hyderabad.
4. A. D Baxevanis and D. F. Fancis Ouellette (2001). Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins 2nd Ed.Wiley – Interscience , New York.

ELECTIVE - III

ENTREPRENEURIAL ZOOLOGY

Semester: III

Hours/Week: 6

Objectives:

This paper to enrich the knowledge on different types of self-employment opportunities in zoology, to develop a self-employed culture among the students and to make the learner a successful entrepreneur.

Unit I: Entrepreneur and Entrepreneurship Development

Entrepreneurship preparation of model project – survey – financial mobilization – leadership – managerial skill – budget preparation – successful operation – quality check – quality improvement – problem solving procedures – statement of profit or loss – self analysis – expertise contact and further improvement (future prospect).

Unit II: Dairy and poultry

Composition of milk, milk products, cheese, ghee, ice cream. Indigenous milk products – Dahi, Khoa, Rabbri, Mallai, Kheer. Milk substitutes - marketing. Rearing and management of chicks, growers, broilers and layers - disease control and marketing of eggs and broilers. Economic importance of dairy and poultry science.

Unit III: Mushroom culture

Preparation of culture and spawn – facilities for cultivating Oyster Mushrooms – white Button Mushrooms - facilities for cultivating paddy straw Mushrooms – preservation of Mushrooms – pests and diseases – economic importance of Mushrooms.

Unit IV: Aquaculture

Characteristics of cultivable fishes – monoculture - polyculture, pond culture – physico-chemical characteristics of ponds – construction – preparation of ponds and management. Induced breeding – objective – pituitary extract preparation – selection of breeders – dosage and potency of extract – spawning – stripping, Happa and Bundh Breeding. Prawn culture: Fresh water and marine – farm management – disease control. Marketing: Criteria for market demand – marketing functions.

Unit V: Vermi technology

Introduction – morphology of earthworms - site selection – vermicomposting organisms – preparation of vermibed – management – biomanure harvest technology – vermiwash – applications in the field – limitations in vermitechnology – economic importance.

Reference:

1. N. Arumugam, T. Murugan and J. Johnson Rajeswar (2015). Applied Zoology. Saras Publication, Nagercoil.
2. G. Ganga and J. Sulochana chetty (2005). An Introduction to Sericulture. Second edition. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
3. Vijayakhader, (2005). Mushrooms for Livehood. Kalyani publishers, New Delhi.

Reference:

1. M. R. Gnanamani (2002). Profitable Poultry Farming. J. Hitone Publications. Mumbai
2. S. Sanathanakumar (1993). Aquaculture. J. J. publications. Meerut.
3. B. N. Yadav (1993). Fish and Fisheries. Daya publishing House, New Delhi.
4. S. A. Ismail (1997). Vermitechnology. Orient Longuson Ltd. Banerjee G. C. Animal Husbandary. Oxford and IBH publishing co.

**SELF STUDY PAPER
POULTRY SCIENCE**

Semester : III

Hours / Week:

Objectives:

Poultry science is an economically important and job oriented course, deals with different aspects of poultry such as the external parts of a fowl, nutritive value of broiler meat and egg. Poultry housing and infrastructure, equipment, hatchery farm, grower farm, layer farm, broiler farm, poultry feed and rearing. A short account of poultry diseases and health also dealt.

Unit I: Basic Aspects of Poultry

Commercial poultry : History and important – employment – national productivity – egg production – table bird production – byproducts – integrated farming – entrepreneurial development.

Stock bird description: Classification and breeding Indian and exotic stocks – factors in selection – external parts of a fowl – digestive and reproductive systems – Ross development – egg and meat product description – quality and preservation.

Unit II: Housing

Housing and equipment : 1 + 3 housing system – all in, all out and multiple systems – deep litter – nests – brooders – feeders – waterers – daily and weekly practices and routines.

Unit III: Nutrition and Management

Food and Nutrition: Nutritive requirement – feed stuffs – feed formulation – milling – feed grinders and mixers – budget.

Hatchery management: Incubation – candling – grower stage – caponets and capons chick development – sterilization – sexing – culling - debeaking.

Unit IV: Farming operation

Layer farming: Feeding program – space requirements – summer management – winter management – stress management – egg marketing.

Broiler Farming: Housing – optimum conditions – management strategies – forced moulting – slaughtering techniques – meat marketing.

Unit V: Poultry Health

Disease and Health : Nutritional and infectious diseases – pathogens – transmission – symptoms – treatment – antibiotics – vaccines.

Text book:

Gnanamani, R (2003). Modern aspects of commercial poultry keeping, Giri pub., Madurai.

Reference:

1. Chauhan HVS (1993) Poultry diseases, diagnosis and treatment, Wiley Eastern Ltd., New Delhi.
2. Gnanamani R (1993) Profitable poultry keeping, Hitone Pub. Co., Madurai.

PAPER – XI

Immunology

Semester: IV

Hours/Week: 8

Subject Code:

Credits : 7

Objectives

This paper deals with the basic aspects of immunology. It throws some light on immunity, immune systems, immune cells, immune response, vaccines and immunology related disease like HIV, immunodeficiency diseases, autoimmune diseases etc. Learning immunology helps each and everyone to keep his own defense system in a better working condition and this lead to disease – free life.

Unit I: Introduction, lymphoid organs, immune cells, antigens & immunoglobulin:

History & scope of immunology. Immunity – types. Lymphoid organs – primary and secondary. Cells of the immune system. Antigens - Immunoglobulin – structure – properties – functions – Classes. Biosynthesis of antibody – antibody genes – assembly of immunoglobulin - synthesis of monoclonal antibodies – polyclonal antibodies – theories of antibody biosynthesis.

Unit II: Immune response, Hypersensitivity & Complement:

Immune response – factors causing immune response - humoral & cell mediated immune response – mechanism – functions – cell co-operations in humoral and CMI – memory cells – immunological memory. Antigen processing and presentation. Cytokines - Hypersensitivity – Complement.

Unit III: Major Histocompatibility Complex, Transplantation & Tumour immunology:

MHC- functions – classes – structure – cross presentation; HLA – genetics of HLA –H-2 complex of mouse. Transplantation immunology – types of graft – graft acceptance – graft rejection; HVG – allograft rejection – mechanism of allograft rejection; GVH - mechanism. Tumour immunology – types – properties – tumour antigens – immune response to tumour – immune surveillance – factors involved is tumour immunity – immunotherapy.

Unit IV: Autoimmune diseases, Immuno deficiency disease and Immunoprophylaxis:

Autoimmune diseases -classification. Immunodeficiency diseases – primary & secondary immune deficiency diseases. Immunoprophylaxis – immunization – types; vaccines – types. Immunization schedule for children.

Unit V: Immunotechniques:

Double immunodiffusion - Radial immunodiffusion – Rocket immuno electrophoresis – RIA – Immunoflorescence – ELISA – VDRL – ABO-Rh blood typing – Widel test – Well Felix test – Coomb’s test – HLA typing.

Text Books:

1. Dulsy Fatima and Arumugam, N., 2013. Immunology, Saras Publication, Nagarcoil,
2. Rastogi, S.C., 2005. Elements of Immunology, CBS Publishers & distributors, New Delhi.

Reference Books:

1. Chakravarthy, A.K., 1996. Immunology, Tata Mc Graw Hill Publishing co., Ltd., New Delhi.
2. Stites, D.P. and Abbas, I., 1991. Basic and Clinical Immunology, Prentice Hall International Inc.
3. Ivan Roitt, 1994. Essential Immunology, 8th edition, Blackwell science Ltd., Oxford.
4. Nandhini. S., 1994. Immunology: Introductory Text Book, New Age Int. (P) Ltd. Publications, New Delhi.

BIOTECHNOLOGY

Semester: IV

Hours/Week: 8

Subject Code:

Credits : 7

Objectives

This paper to understand the gene manipulation and its application in solving pressing problems concerning human activities including agriculture, medical treatment, industry and environment.

UNIT-I: RECOMBINANT DNA TECHNOLOGY

Gene cloning - the basic steps - various types of restriction enzymes –modification system. Cloning vectors: pBR322, M13 phage, Cosmid, Tiplasmid, SV40, artificial chromosomes –YAC and BAC; linkers and adaptors-construction of cDNA and genomic libraries- Gene transfer methods in bacteria, plant and animal cells;

UNIT- II: TECHNIQUES IN BIOTECHNOLOGY

Restriction mapping of DNA fragments-Polymerase Chain Reaction (PCR)-principle, types and applications; Nucleic acid blotting techniques – Southern, Northern and Western blotting ; DNA sequencing- principle and methods; Finger printing – RFLP and RAPD

UNIT -III: ANIMAL AND PLANT BIOTECHNOLOGY

Animal cell culture –natural and defined media- development and maintenance of cell lines – cell hybridization. Stem cell isolation and culture. Transgenic methods- microinjection and electroporation. Human genom project - Human gene therapy. Plant tissue culture - callus culture - protoplast fusion technique –germplasm storage.

UNIT-IV: MICROBIAL BIOTECHNOLOGY

Fermentation - bioreactors- microbial products - primary and secondary metabolites – penicillin, protease; Downstream processing - enzyme immobilization - single cell protein (SCP). Biopolymers-bioinsecticides and biofertilizers – types and applications

UNTI-V: ENVIRONMENTAL BIOTECHNOLOGY

Bioremediation of hydrocarbons - industrial wastes - heavy metals –biodegradation of xenobiotics - bioleaching - biomining - biofuels. Genetically modified organism (GMO'S) - GM food. Intellectual Property Rights, biosafety and bioethics – biodegradation of pesticides and oil- Vermitechnology.

Text books:

1. R.C. Dubey (2009). A text book of biotechnology.S.Chand &company, New Delhi
2. B.D. Singh (1998). Biotechnology , Kalyani Publishers, Ludhiana

Reference Books:

1. R.W.Oldand and S.B. Primrose (1985). Principlesof Gene Manipulations. An Introduction to Genetic Engineering. Oxford Blackwell Publishers, London
2. T.A Brown (1995). Gene Cloning- An Introduction, Stanley Thomas Publishers, UK
3. S.S. Purohitand and Mathur, S.K (1999). Biotechnology Fundamentals and Application. Agro Botanica, New Delhi.
4. P.K. Gupta (2004). Biotechnology and Genomics. Rastogi Publications, Meerut.

PRACTICAL VII
LAB IN IMMUNOLOGY

Semester: IV

Hours/Week: 4

Subject Code:

Credits: 2

1. Histology of Primary and Secondary Lymphoid organs in man – Thymus, Spleen, Bone marrow and Lymph node.
2. Histology of Bursa Fabricius
3. Isolation and enumeration of spleenocytes of goat.
4. ABO and Rh blood group in Man
5. Haemoagglutination
6. Structure of
7. Immunodiffusion Technique - Ouchterlony technique SRID and DID.
8. **Spotters**
 - Nude mouse
 - Immunoglobulin – IgG, IgM and IgE
 - Antigen
 - Immune response curve
 - Flow chart of ELISA and Monoclonal antibodies

Reference Books:

1. S. Jutine Garvey and H. Dieter (2006). Methods in Immunology. Cummings Publishing co. USA.
2. L. Hudson and Hay F. C (1989). Practical Immunology III Edn. Blackwell scientific publication oxford, London.
3. R. L. Myers (1989). Immunology a laboratory manual. WMC. Brown Publishers Debuque Iowa, USA
4. G. P. Talwar (2009). A hand Book of Practical Immunology. Vikas Publications. House New Delhi.

PRACTICAL VIII

LAB IN BIOTECHNOLOGY

Semester: IV

Hours/Week: 4

Subject Code:

Credits: 2

- I. Isolation of genomic DNA from eukaryotic cells (Goat liver).
- II. Isolation of genomic DNA from prokaryotic cells (Bacteria).
- III. Electrophoresis-SDS PAGE (Demo only).
- IV. Vermicompost-Estimations of N,P,K and C

V. Spotters

1. Ethanol fermentation system
2. Biogas plant
3. Bio chips
4. Biosensor
5. Bioreactor
6. Field visit to vermiary

References:

1. S. Rajan and R. Selvi Christy (2011). Experimental Procedures in Life Sciences. PRS Associates, Chennai.
2. A. Dutta (2012). Experimental Biology. Narosa Publications, Chennai.

SELF STUDY PAPER
AQUACULTURE

Semester : **IV**
Sub. Code :

Credit :5

Objectives :

In this course the students will be taught to know about the culture techniques of freshwater and marine fishes and related economically important organism like oysters, prawns, seaweed. Economic importance of aquaculture, fish disease, economic loss, prevention and identification of fish diseases will also be taught.

Unit I: Culture fisheries

Introduction: Global and Indian protein crisis – resource potential (capture & culture fisheries) – nutritive value of fish – desirable characters of culturable organisms.

Identification of cultivable organisms: Fin fish, shellfish – crustaceans & mollusks, sea weeds, classification, habitat & habit.

Unit II:

Water quality & Nutrition: Physical and chemical factors of water, major nutrition – carbohydrates, proteins & lipids; minor nutrition – vitamins & minerals, feed ingredients & formulations, diet processing.

Unit III:

Edible fish culture: Culture types, site selection, construction & components of farms, nursery, rearing & stocking induced breeding, harvesting.

Ornamental fish culture: Breeding of gold fish, fighter & angel; marketing, special feed supplements.

Unit IV :

Oyster & Seaweed Culture: Pearl culture – spat collection – hanging tray culture – mother of pearl insertion, culture and harvesting. Sea weed culture – rope and raft methods, agar extraction process.

Prawn culture: Culture types, life cycle, nursery, hatchery and prawn culture and factors influencing prawn culture farms.

Unit V:

Diseases: Fish and prawn diseases, economic importance – fish, and prawn, oysters, seaweeds.

Text Book:

Bardach JE *et al.* (1972). Aquaculture: The farming and husbandry of freshwater and marine organisms. Wiley (Interscience) Wiley New York.

References :

1. B. L. Srivastava (2000). A Text Book of Fishery Science and Indian Fisheries. Kitab Mahal Publications, Allahabad. India.
2. R. K. Rath (1993). Freshwater Aquaculture. Scientific Publications, Jodhpur.
3. Pandey, Kamaleshwar and J. P Shukla (2005). Fish and Fisheries. Rastogi Publications, Meerut.

YADAVA COLLEGE

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Govindarajan Campus, Thiruppalai, Madurai – 625014.



M.PHIL. ZOOLOGY

REVISED COPY AFTER THE BOARD OF STUDIES MEETING HELD ON

06.04.2015

DEPARTMENT OF ZOOLOGY

CBCS (2015-2016)

ACADEMIC COUNCIL MEETING ON 08.05.2015

DEPARTMENT OF ZOOLOGY

M.Phil. ZOOLOGY

COURSE CONTENT

Semester	Sub. Code	Title of the Paper	Teaching Hrs / Week	Evaluation				Examination Hours
				Internal	External	Viva	Total	
I		Paper I – Research Methodology	6	100	100	--	200	3
		Paper II – Recent Trends in Zoology	6	100	100	--	200	3
II		Paper III – Entomology	6	100	100	--	200	3
		Paper IV – Project	6	50	100	50	200	--

Department of Zoology

Details of Addition, Deletion, Replacement, Revision

And No Change of subjects

Semester	Sub. Code	Title of the Paper	Remarks	Action Needed
I		Paper I – Research Methodology	No change	Retain old code
		Paper II – Recent Trends in Zoology	Revised	Allot New Code
II		Paper III – Entomology	Revised	-do-
		Paper IV – Project	-	-

PAPER I

RESEARCH METHODOLOGY

Semester: I

Hours/Week: 6

Subject Code:

Credits: 5

Objectives:

This paper aims at helping the students to have a in depth understanding to the biotechniques to apply in their future research.

Unit I: Electrophoresis

Principles and application. Polyacrylamide Gel Electrophoresis (PAGE) for protein separation, Agarose Gel Electrophoresis (Nucleic acids), Electrofocussing.

Calorimetry and Manometry

Principles and application. Direct and indirect calorimetry – Bomb calorimetry and wet combustion method. Manometry – principles and applications, derivation of flask constant, oxygen electro, Warburg's apparatus.

Estimation of Biomolecules in Tissues

Isolation, purification and assay of carbohydrates, proteins and amino acids. Nitrogen (Kjeldhal) and lipids.

Unit II: Genetic Engineering and related techniques

Principles and techniques of nucleic acid hybridization, sequencing of proteins and nucleic acids, southern, northern and Western blotting techniques. Dot and slot blots, polymerase chain reaction (PCR). DNA foot printing, screening of CDNA libraries, ultracentrifugation, plant and animal tissue culture

Unit III: Isotopic (Tracer) techniques Biophysical methods

Principles and application, Radiation dosimetry, Radioactive isotopes, half life of isotopes, autoradiography, Cerenkov radiation, G. M. and Scintillation counters – liquid scintillation. Spectrometry. X-ray diffraction, plasma emission spectroscopy, ORD/CD spectroscopy.

Immunological techniques

Immunodiffusion techniques, ELISA and monoclonal antibodies.

Unit IV: Literature collection, research papers and thesis writing

Define the research project, research design, interpretation, report writing. Literature collection – list of abstracts, reviews, journal ect. Utilization of reference cards, internal abbreviation and proof correction

Computer

Architecture, software – types; hardware, networking – internet: literature survey through internet, introduction of bioinformatics.

Unit IV: Statistical Methods

Scale of measurement, measures of central tendency and dispersion; tests of statistical significance; simple correlation and regression, analysis of variance, chi-square test, t-test.

Reference:

3. L. Veerakumari (2006). Bioinstrumentation. MJP Publishers, Chennai.

4. J. Jeyaraman (1981). Laboratory Manual in Biochemistry. Willey Eastern Limited. India.
5. John G. Webster (2008). Bioinstrumentation. John Wiley & Sons, Inc.
6. Harold Varley (1975). Practical Clinical Biochemistry, Arnold Heinemam.
7. Frances M. Weesner (1960) – General zoological Microtechnique. The William & Wilkins Co.,
8. P. R. Yadav and R. Tyagi (2006). Biological Techniques. Discovery Publishing House, New Delhi.
9. P. Ramakrishnan (2010). Biostatistics. Saras Publications, Nagercoil.
10. W.W., Daniel (1987). Biostatistics : A Foundation for Analysis in Health Sciences John Wiley and Sons, New York
11. E. Balagurusamy(1983). Programming in Basics. Tata McGraw Hill, New Delhi.
12. P. K. Jasra and Gurdeep Raj (2004). Biostatistics. Krishna Prakashan (P) Ltd., Meerut.
13. N. Gurumani (2005). An Introduction of Biostatistics. MJP Publishers, Chennai.
14. M. Rajadurai. Bioinformatics (A Practical Manual). PBS Book Publishers. Chennai.

PAPER II

RECENT TRENDS IN ZOOLOGY

Semester : I

Hours/Week : 6

Subject Code:

Credits: 5

Objectives:

This paper to make the students to understand the gravity of the problem of pollution and need for its' management, to expose them to the knowledge of Genomics, Biotechnology, Immunology for general and Human welfare.

Unit I : Pollution and Remedial measures

Environmental Pollution (air, water and soil) – Causes and remedies – Environmental Impact Assessment – Environmental laws – Risk assessment.

Environmental Education, Planning and Management – Bioremediation.

Renewable and Non – renewable sources of energy, Conventional and Non-conventional – Solar energy – Biogas production – Nuclear energy – Indian nuclear power plants.

Remote Sensing and GIS – Basic Concepts.

Unit II: Genomics and Human Welfare

DNA sequencing and Human genome project, stem cells, Detection of genetic disease using DNA recombinant technology, screening and counselling – Human gene therapy.\

Cloning techniques and its application in biology – Ethical issues, Reproductive techniques related to human in vitro fertilization.

Application of Nanotechnology in Biology.

Unit III: Biotechnology and General Welfare

Biofertilizers – Composting – Biopesticides – SCP- Production and sources,

Methods involved in the production of transgenic animals and their uses. Production of recombinant insulin and growth hormone.

Unit IV: Immunology and Human Welfare

Organization and expression of immunoglobulin gene,

Vaccine – Whole organism vaccines, subunit vaccines, recombinant vaccines, DNA vaccines, synthetic peptide vaccine, multivalent subunit vaccine – development of AIDS and malaria vaccines.

HI, A, tissue typing and monoclonal antibody.

Unit V: Aquaculture

Aquaculture: Environmental and Social issues in Coastal Aquaculture – Environmental Management of Shrimp farms – Induced breeding in fishes – Uses of pituitary, HCG, LRGH, Synthetic hormones – administration – injection – feed – implants – Hybridization – Development of polyploids Chromosome manipulation Gynogenesis and Androgenesis – Environmental and Nutritional Probiotics in the management of diseases, Cryo preservation of gametes and embryos.

Reference Books:

1. A .K. Abbaslichtman and J.S Pober (1998). Cellular and Molecular Immunology, III Edition W.B.Saunders Company, U.S.A.

2. J.S. Branden and J. Tooze (1999). Introduction to protein structure II Edition, Garland Publishing, Inc., New York
3. S.T. Desmondnicholl (1994). An Introduction to Genetic Engineering, Cambridge University Press, New York,
4. Jonathan Graves and Dungan Reavey (1996). Global Environmental Change. Plant, Animal and Communities, Long man.
5. HAWKINS. J.D., (1996) Gene Structure and expression Iii Edition Cambridge University Press, New York,
6. T. I. Hanshishodia (1998). Biodiversity Conservation and Sustainable development Pointer Publisher, Jaipur.
7. B. King (1986). Cell Biology, London. Allen and Unwin Boston, London.
8. H. D. kumar (1998). Modern concepts of Biotechnology, Vikas Publishing House Pvt. Ltd., New Delhi.
9. D. kumar and S. Kumar. (1998). Modern Concepts in Microbiology. Vikas Publishing House Pvt, Ltd., New Delhi.
10. M. Maeda (1999). Microbial Process in Aquaculture. Society for the Biological creation and Enhancement for the aquatic environment, Japan.
11. J. L. MARX (1999). A revolution in Biotechnology. Cambridge University Press, New York.

PAPER III
ENTOMOLOGY

Semester: II

Hours/Week: 6

This paper provides a basic knowledge about role of insects in Human Welfare, to provide a sound knowledge

Subject Code:

Credits: 5

Objectives: about pest and their management and to provide them knowledge about Apiculture

Unit I: Classification of Insects

Classification of insects up to orders with examples.

Unit II: Economic Entomology

Insect pests – Classification of pests – pest of cotton: *Dysdercus cingulatus* – pest of sugarcane: *Pyrrilla perpusilla* – of paddy: *Spodoptera mauritia* – pest of oil seed crops: *Achaejanatha* pests of vegetables; *Spolotera littoralis* – pests of stored grain: *Tribolium castaenum* – pests of fruit crops; *Phyllocnistis, citrella* – pests of pulses; *Thrips hawaiiensis*; Pest of coconut – *Oryctes rhinoceros*.

Unit III: Primary control measures

Mechanical measures; hand picking – hand netting – artificial barriers, physical measures; artificial cooling – super heating – radiation, culture methods: clean cultivation- tilling of soil – crop rotation – synchronization of sowing and harvesting – resistant varieties – use of manures and fertilizers. Chemical control: Insecticidal formulation – nomenclature of insecticide – mode of action of insecticides. Classification of the insecticides – inorganic insecticide – organic insecticide – drawbacks of chemical control.

Unit IV: Industrial Entomology

Silkworms – rearing of silkworms and silk production – silk reeling – honey bee – beehive – honey: - chemical composition – economic importance – lac insect – biology – lac insect culture – rearing method – shellac production.

Unit V: Modern Trend in Pest Control

Integrated pest management – biological control and autocidal control.

Text Books:

1. Vasantharaj David,B, & Jayaraj Elements of Economic Entomology, Popular Book Depot., Chennai,
2. Entomology – L.K.Jha.

Reference Books:

1. D.B.Tembhare, Modern Entomology, Himalaya publishing House, Mumbai.
2. Chappman, R.F, The Insects, Cambridge University Press, U.K.
3. Wiggles worth, Insect Physiology.

CERTIFICATE COURSE IN APICULTURE

Semester: IV

Hours/Week: 2

Subject Code:

Credits: 2

Objective:

This paper gives exposure to students about the application value of apiculture and to highlight the beneficial aspects of honey bee to human welfare and also to provide knowledge about the harmful enemies and diseases that attack honeybee.

Unit I:

Introduction to Apiculture and Bee Keeping. – Types of Honey bees: - *Apis dorsata* – *Apis indica* – *Apis florea* – *Apis mellifera* – General Biology – Body structure – Mouth parts – Secretary glands – sting apparatus.

Unit II:

Social organization and division of labour – Queen – worker – Drone – Life cycle. Swarming Nuptial flight – Honey bee dances: - Language dance – round dance – wag tail dance.

Unit III:

Hive or Comb – Selection of bees for apiculture – methods of bee keeping – Indigenous method and Modern method – Tools and Equipments connected with bee keeping.

Unit IV:

Products of bee keeping: - Honey- Honey extraction – Ripening of honey – Chemical composition of honey – Economic importance of honey:-Food value, Medicinal value and other uses – By-products of honey – Bees Wax – Bee venom.

Unit V:

Pest, Parasites and Diseases of Honey bees:- Wax moth, Wax beetle, Black ants, Birds and other enemies. Nosema, Acarine, Septicemia, Fungal and other important brood diseases.

Text Book:

N. Arumugam and Jeyasurya (2013). Economic zoology. Saras Publication, Nagercoil.

Reference books:

3. Vasantharaj David and T. Kumaraswami, (2006). Elements of Economic Entomology -
4. K.R. Ravindran, (2004). A Text Book of Economic Zoology – Dominant Publishers, New Delhi.

DIPLOMA COURSE IN VERMITECHNOLOGY

Semester: IV

Hours/Week: 2

Subject Code:

Credits: 2

Objective:

This paper gives exposure to students about the application value of vermicompost and to highlight the beneficial aspects of vermicompost bee to human welfare.

Unit I:

Earthworms: Classification – morphological and anatomical characteristics – reproduction – biology of composting earthworms *Eudrilus eugeniae* and *Lampito mauritii*

Unit II:

Ecological groups of earthworms – epigeic, endogeic, anegeic, saprophagus and geophagus worms, humus form, humus feeders – earthworm casts – an outline of earthworms importance in agriculture, fishing, therapeutics and pollution.

Unit III:

Soil physical, chemical and biological features – soil types – soil formation – soil organic matter – organic matter decomposition – humus formation.

Unit IV:

Organic wastes sources – vermicomposting definition – types – factors affecting vermicomposting: pH, moisture, temperature, nutritional value of feed and microbes and earthworms.

Unit V:

Application of vermicomposting in agricultural and horticultural practices – economic of vermiculture – NABARD – National Bank supports for vermiculture

Text Book:

1. Gupta, B. K (2008). Vermicomposting for Sustainable Agriculture. Agrobios.
2. N. Arumugam and Jeyasurya (2013). Vermitechnology. Saras Publication, Nagercoil.

