THE NEW COLLEGE (AUTONOMOUS), CHENNAI -14

PG & RESEARCH DEPARTMENT OF ZOOLOGY

B. Sc – ADVANCED ZOOLOGY AND BIOTECHNOLOGY

SYLLABUS

CBCS Pattern (Effective from the academic year 2011-2012)

SEMESTER I

SUBJECT - I: INVERTEBRATA

CODE:ZM101 CREDITS: 4

TEACHING HOURS : 5

Unit I

General characteristics and outline classification of invertebrates with examples.

Phylum: Protozoa

General characters and classification upto classes with examples.

Type study: Paramecium

Biology of parasitic protozoans – *Entamoeba histolytica and Plasmodium vivax*

Unit II

Phylum: Porifera

General characters and classification upto classes with examples.

Type study: *Sycon.*

Phylum: Coelenterata

General characters and classification upto classes with examples.

Type study: *Obelia geniculata*

Unit III

Phylum: Platyhelminthes

General characters and classification upto classes with examples.

Type study – *Taenia solium*

Phylum Aschelminthes – *Ascaris lumbricoides*

Unit IV

Phylum: Annelida

General characters and classification upto classes with examples.

Type study – *Nereis*

Metamerism in annelids

Phylum: Arthropoda

General characters and classification upto classes with examples.

Peripatus and its phylogenetic significance

Type study: Prawn (Penaeus)

Economic importance of honey bee

Unit V

Phylum: Mollusca

General characters and classification upto classes with examples.

Type study: *Pila globosa*

Torsion in Gastropoda

Phylum: Echinodermata

General characters and classification upto classes with examples.

Type study – Sea Star

Echinoderm larvae and their significance

Reference books

Jordan, E.L and P.S. Verma 1995, Invertebrate Zoology and elements of animal physiology, S. Chand and Co. Ltd. New Delhi, 1050pp.

Ayyar, E.K and T. Ananthakrishnan, 1992. Manual of Zoology Vol.1 Invertebrates Part I and II, S. Viswanathan Printers and Publishers Pvt. Ltd. Madras.

Kotpal, R.L. 1992. (All Series). Rastogi Publications, Meerut.

SEMESTER I

MAJOR PRACTICAL I – INVERTEBRATA

CODE:ZP11 CREDITS: 3

TEACHING HOURS: 2

I. Study of slides and museum specimens pertaining to:

Classification upto class level: *Paramecium*, *Sycon*, *Obelia*, *Taenia solium*, *Nereis*, *Penaeus*, *Pila*, Sea Star

Relate structure with function:

Sycon L.S/T.S; *Obelia* medusa, *Taenia* - scolex, *Nereis* – Parapodium, *Pila* – Radula, Sea urchin- pedicellaria.

Draw labeled sketch and comment on:

T.S. of Taenia, Ascaris, Nereis & Sea Star

Biological significance- Entamoeba, Plasmodium, Ascaris, Heteronereis & Sea Star

Larval forms: Trochophore, Nauplius, Zoea, Mysis & Bipinnaria.

II. Dissections

Cockroach – digestive, nervous and reproductive systems.

III. Mounting

Earthworm- body and penial setae, mouthparts of cockroach, mosquito and honey bee

Prawn appendages

IV. Record

SEMESTER II

SUBJECT: PAPER – II CHORDATA

CODE:ZM202 CREDITS: 4

TEACHING HOURS: 5

Unit I

General characters and outline classification of phylum Chordata with examples.

Prochordata: General characters of sub-phyla- Hemichordata, Cephalochordata and Urochordata with examples.

Type study – *Amphioxus*

Unit II

Agnatha - General characters and affinities

Type study – *Petromyzon*

Pisces – General characters and classification

Type study – *Scoliodon*

Unit III

Amphibia: General characters and classification upto order; type study – Frog.

Reptilia: General characters and classification upto order; type study -*Calotes*.

Unit IV

Aves: General characters and classification upto order; type study - Pigeon.

Mammalia: General characters and classification upto order; type study -Rabbit.

Unit V

Parental care in Fishes; South Indian amphibians; Poisonous and non-poisonous snakes of India; Migration in fish and birds; Monotremes.

Reference books

Jordan, E.L and P.S. Verma (1995). Chordate Zoology and Elements of Animal Physiology 10th edn. S. Chand and Co. Ltd, New Delhi.

Ayyar, E.K and T.N. Ananthakrishnan. (1992). Manual of Zoology, Vol II. (Chordata). S. Viswanathan Printers and Publishers. Ltd., Madras.

Newman, H.H. (1981). The Phylum Chordata, Sathish Book Enterprise, Agra.

Nigam, H.C. (1983). Zoology of Chordates. Vishal Publ., Jalandhar.

SEMESTER II

MAJOR PRACTICAL I – CHORDATA

CODE:ZP22 CREDITS: 3

TEACHING HOURS: 2

I. Study of slides and museum specimens pertaining to:

Classification upto order level:

Balanoglossus, Amphioxus, Petromyzon, Scoliodon, Calotes, Pigeon, Rabbit.

Draw labelled sketch and comment:

Balanoglossus T.S, *Amphioxus* T.S., *Naja naja, Bungarus*, Russel's Viper; Parrot, Wood pecker, Duck (beak and feet adaptations).

Biological significance:

Ammocoetes larva, *Ichthyophis,* Chameleon, Bat, Rat

Osteology:

Frog-Skull, pectoral and pelvic girdle, Pigeon – Synsacrum and Pectoral girdle; Dentition in Rabbit, Dog.

II. Dissection

Frog – Digestive, arterial and venous systems, urinogenital system

III. Mounting

Shark – Placoid scales.

Frog – Brain, Hyoid apparatus.

IV. Field report on a visit to a Sanctuary or National park

V. Record.

SEMESTER III

PAPER – III CELL AND MOLECULAR BIOLOGY AND BIOPHYSICS

CODE:ZM303 CREDITS: 6

TEACHING HOURS: 7

Unit I

Scope and importance of cell and molecular biology- Structure of prokaryotic and eukaryotic cell- Principles and applications of light and electron microscopes – Fundamentals of Microtechniques (fixation – sectioning – staining), homogenization, fractionation, centrifugation.

Unit II

Ultrastructure, chemical composition and functions of plasma membrane, endoplasmic reticulum, ribosomes, Golgi apparatus, lysosomes, mitochondria, nucleus and nucleolus.

Unit III

Chromosomes – molecular structure of DNA, functions- DNA replication; structure of RNA – Types of RNA — Protein synthesis – Cell division and cell cycle – Cancer biology.

Unit IV

Scope of biophysics – Chemical bonds – Covalent bond - Co-ordinate bond – Vander Wall's interactions – hydrophilic and hydrophobic molecules. Laws of thermodynamics – free energy concept – bioenergetics.

Unit V

Radioactive isotopes – half life period – Geiger-Muller and Scintillation counter – Principles and Applications: Centrifuge, Colorimeter, Spectrophotometer, Chromatography, Electrophoresis

References books

De Robertis, E.D.P and De Robertis, E.M.F. (1988). Cell and Molecular biology.

Verma, P.S. and Agarwal, V.K. (2001). Cell and Molecular Biology, 8th edition.

Biophysics – Thiravia Raj, (2001). Saras Publication

Biophysics – Palanichamy and Shanmugavelu (1996). Palani Paramount Publication.

PRACTICAL – III CELL AND MOLECULAR BIOLOGY AND BIOPHYSICS

CODE:ZP33 CREDITS: 2

TEACHING HOURS: 2

I Cell biology

Spotters- Compound, Phase-contrast, SEM, TEM and camera lucida;

Measurement of cells using Stage and Ocular micrometer

Blood smear preparation – Differential count of WBC

Mounting of buccal epithelium and observing living cells using vital staining

Squash preparation of Grass hopper testis to study meiosis

Study of prepared slides of histology:

Epithelial Tissue (Columnar, Ciliated and Squamous), Bone T.S., Cardiac muscle, Striated muscle, Non-striated muscle, Nervous tissue.

II Biophysics

Spotters: Principles and Applications of

Centrifuge, Colorimeter, Spectrophotometer, Chromatography (Paper and TLC, Electrophoresis (PAGE).

III Record

SEMESTER IV

PAPER – IV GENETICS AND EVOLUTION

CODE:ZM404 CREDITS: 6

TEACHING HOURS: 7

Unit I

Scope and Application of genetics – Mendelian Principles- interaction of genes – epistasis – Complementary, Supplementary and lethal genes. Blood group inheritance and blood grouping in Man. Mapping of chromosomes – X and Y linked inheritance in Man. Sex limited and influenced genes.

Unit II

Mutations – types, gene mutation, molecular basis of gene mutation, mutable and mutator genes. Chromosomal aberrations – types – intrachromosomal aberration (deficiency, duplications, Inversions, Shifts and Isochromosomes).Interchromosomal aberration (translocation); Inbreeding, out breeding and hybrid vigor - Nature and causes.

Unit III

Population genetics – Hardy-Weinberg law, factors affecting gene frequency. Genetic counseling, pre-natal diagnosis: Amniocentesis, Chorionic villi sampling; pedigree analysis.

Unit IV

Origin of life – theories – Abiogenesis, Cosmozoic, Special creation, Organic evolution. Evidences from Paleontology, Embryology and Anatomy.

Speciation and isolating mechanisms.

Unit V

Theories of evolution – Lamarckism - Neo-Lamarckism – Darwinism and Neo-Darwinism. De Vries theory of mutation and modern synthetic theory of evolution.

Evolution of Man – Stages and features.

Reference books

Verma, P.S and V.K. Agarwal (2002). Genetics, S. Chand and Co., New Delhi.

Friefelder, D., (1997). Microbial genetics, Narosa Publication, New Delhi.

Goodenough, U., (1997). Genetics, Saunders College Publishing International, New York.

Gardner, (1984). Principles of Genetics. Wiley Eastern Pvt. Ltd.

Colbert, E.H. (1955). Evolution of vertebrates. Wiley Eastern Pvt. Ltd.

SEMESTER IV

PRACTICAL – IV – GENETICS AND EVOLUTION

CODE:ZP44 CREDITS: 2

TEACHING HOURS: 2

I Genetics

Identification and recording of Mendelian traits in Man.

Drosophila – Collection, culture, Male and Female identification, study of mutants.

Mounting of Polytene chromosomes in *Chironomous larva*.

Identification, significance of human karyotypes – Normal, Down's ,Turner's and Klinefelter's syndrome.

II Evolution

Identification and significance of fossils: Nautiloid, Ammonoid, Living fossils – *Peripatus*, *Limulus*, *Sphenodon*.

Identification of various stages in the evolution of man (Pictures / Models).

III Record

SEMESTER V CBCS

PAPER – V ANIMAL PHYSIOLOGY & BIOCHEMISTRY

CODE: CREDITS: 5

TEACHING HOURS: 6

Unit I

Introduction and scope of physiology and Biochemistry - Nutrition – Vitamins – Classification. Water-soluble and fat-soluble vitamins and deficiency diseases- Digestion in man- Digestive enzymes, Absorption, Assimilation and Defaecation- Respiration – Respiratory organs in man – Respiratory pigments, transport of respiratory gases.

Unit II

Circulation – Circulating media in vertebrates, Composition and functions of blood and lymph, Coagulation of blood, Structure and physiology of Human heart, Blood pressure- Excretion – Types of excretory products – Formation of Ammonia, Urea and Uric acid-Mechanism of Urine formation in man.

Unit III

Osmoregulation in freshwater, brackish, Marine and terrestrial animals- Thermoregulation in homeotherms and poikilotherms- Ultrastructure of muscles, contractile proteins, Mechanism of muscle contraction- Theories; Neuron and its types, Conduction of nerve impulse, synapse- synaptic transmission; reflex action- Sense organs – Photo and Phono receptors.

Unit IV

Endocrine glands – Structure and functions of Pituitary, Thyroid, Adrenal, Islets of Langerhans and gonads. Enzymes – Classification, Mechanism of enzyme action, enzyme substrate complex, enzyme inhibition.

Unit V

Carbohydrates - Classification, structure and metabolism – Glycogenesis, .Glycogenolysis, Glycolysis, Kreb's cycle, Oxidative Phosphorylation. Gluconeogenesis; Protein - Classification – Primary, secondary, tertiary and quaternary structures of protein with suitable examples. Catabolism – Oxidative deamination, transamination and urea cycle. Lipids – general classification and structure, β – oxidation of fatty acids.

REFERENCE BOOKS

Verma, P.S., Tyagi, B.S. and Agarwal, V.K., (2002). Animal Physiology. S. Chand and Co. Ltd.

Ambhika Shanmugam. (1990). Fundamentals of Biochemistry for Medical students

Mariakuttikan, A and Arumugam, N., (1997). Animal Physiology. Saras Publication.

Knut Schmidt-Neilson, 2002. Animal Physiology – Adaptations and Environment – V ed. Cambridge University Press.

Hoar, S.W., (1976). General and Comparative Physiology. Prentice Hall of India Pvt. Ltd., New Delhi..

Jain, J.L., (1988). Fundamentals of Biochemistry. S. Chand and Co., New Delhi.

SEMESTER V CBCS

PAPER VI BIOTECHNOLOGY & BIOSTATISTICS

CODE: CREDITS: 5

TEACHING HOURS: 6

Unit 1

Biotechnology- Definitions- Indian scenario: Centres, activities and achievements of Biotech industries in India - Agriculture, food, medicine and industry - Tools of Genetic Engineering – Restriction Enzymes- Ligases, Polymerases and alkaline phosphatases ; Cloning vectors- Plasmid (pBR 322)-Bacteriophages- Cosmids- Insertion, Replacement, Shuttle and expression vectors

Unit II

Basic cloning techniques - Isolation of DNA, Restriction, Insertion of DNA into a vector- Transfer of recombinant DNA into bacteria- Selection of clones (colony hybridization, in vitro translation) and Expression analysis. Other Gene Transfer techniques: electrophoration, shotgun method, microinjection, biological methods- SV40 - Principles and applications of PCR, Southern, Northern and Western blotting - DNA sequencing (Maxam – Gilbert method)- RFLP and DNA finger printing.

UNIT III

Applications of Plant Biotechnology- Single Cell Proteins (SCP)- Biofertilizers- Biopesticides- Transgenic plants - Applications of Animal Biotechnology in Medicine, Animal Breeding and Environmental Management - Transgenic animals – Hybridoma technique and production of monoclonal antibodies- Gene therapy.

UNIT IV

Principle, techniques and applications of animal cell culture-. Environmental Biotechnology - Biofuels – Bioremediation - Genetically Modified Microorganisms; Biosafety, Intellectual Property Rights (IPR) and protection (IPP)- Bioinformatics– scope and applications – Human Genome project.

Unit V

Biostatistics – Definition and Scope- Collection of data – Primary and secondary data, census and sampling methods. Presentation of data – classification and tabulation, frequency distribution – diagrammatic and graphical representation of data –.mean, median, mode, standard deviation, Correlation.

REFERENCE BOOKS:

R.C. Dubey (2004). A text book of Biotechnology, S. Chand and Co. , New Delhi

S.S. Purohit and S.K. Mathur (1999). Biotechnology – Fundamentals and applications. Agro-Botanica, New Delhi

Arumugam, N., (2003). Basic concepts of Biostatistics. Saras Publications, Nagercoil.

Gurumani, N., (2005). An introduction to Biostatistics. MJP Publishers, Chennai.

T.A. Brown (1995). Gene Cloning, Stanley Thomas Publishers.

John R W Masters (2000). Animal Cell Culture-A Practical Approach, Oxford University Press.

B R Glick and J J Pasternak (1994). Molecular Biotechnology, ASM Press.

SEMESTER V CBCS

MBE I: CLINICAL MICROBIOLOGY & LABORATORY TECHNOLOGY

CODE: CREDITS: 5

TEACHING HOURS: 6

Unit I

Classification and diversity of microorganisms – Bacteria, Cyanobacteria, Archaebacteria, Algae, Fungi, Protozoa and Viruses. – Basic Culture techniques for identification of bacteria..Epidemiology of infectious diseases: Viral diseases – AIDS, Hepatitis B – prevention and control. Bacterial diseases – Air borne (Tuberculosis, Diphtheria), food and water borne diseases -Cholera and Typhoid.

Unit II

Sterilization – physical and chemical methods – laboratory safety and hygiene – First aid – Bio-safety and waste disposal.

Unit III

Clinical laboratory – functional components, significance in health care and Disease diagnosis – Basic clinical laboratory plan and requirements – instruments – glassware – cleaning and maintenance – Laboratory records and reports – Normal values.

Unit IV

Phlebotomy – determination of bleeding time, clotting time, Haemoglobin, Total count of RBC, WBC, Differential count of WBC, Blood smear for identification of malarial parasites and microfilaria.

Unit V

Physical, chemical and microscopic analysis of urine; stools, semen; serology – WIDAL and β – HCG Pregnancy test- Estimation of blood sugar, urea and total cholesterol.

REFERENCE BOOKS

Dubey, R.C and Maheswari, D.K., (1999). A text book of Microbiology. S. Chand and Co. Ltd, New Delhi.

Ramnik Sood (2003). Medical laboratory technology – Methods and interpretations. Jaypee Bros. Medical Publ. (P) Ltd; New Delhi.

K.M. Samuel (1999). Notes on clinical laboratory techniques, 4th edn. MKG Iyyer and Sons Publ. Chennai

Kanai, L. Mukherjee (1988). Medical laboratory techonology vol. I, II and III. Tata-McGraw Hill Publ. Co. (Ltd.).

SEMESTER V CBCS

MAJOR PRACTICAL – V ANIMAL PHYSIOLOGY & BIOCHEMISTRY

CODE: CREDITS: 4

TEACHING HOURS: 4

I Animal physiology

Human salivary amylase activity in relation to pH, temperature, substrate & enzyme concentration.

Survey of digestive enzymes in cockroach

Detection of excretory products in the samples.

Estimation of O_2 consumption in fish.

II Biochemistry

Estimation of blood glucose (O-Toluidine method),

Estimation of urea (DAM method)

Estimation of total cholesterol (Wybenga and Pillegi's method).

Estimation of total protein (Biuret method)

III Record

SEMESTER V CBCS

MAJOR PRACTICAL – VI BIOTECHNOLOGY, CLINICAL MICROBIOLOGY AND LABORATORY TECHNOLOGY

CODE: CREDITS: 4

TEACHING HOURS: 4

I Biotechnology

Observation of photographs/models pertaining to PCR, Northern, Southern, and Western blotting.

Isolation of DNA from Bovine spleen and Yeast RNA (Demonstration).

Spotters- Restriction enzymes, plasmid, bacteriophage, Agrobacterium, electrophoration, shotgun technique and microinjection.

II Microbiology

Observation and identification of prepared slides of bacteria – *E. coli*, *Streptococcus*, *Staphylococcus*; Fungi- *Rhizopus*, *Candida*, *Aspergillus*.

Spotters –Laminar air-flow cabinet, colony counter, petriplate.

Simple staining and gram staining of bacteria.

Staining and identification of bread mold / coconut mold.

Demonstration of sterilization procedures, serial dilution, pour plate method.

Preparation of culture media – nutrient Agar and Broth (Demonstration).

III Clinical laboratory technology

Determination of bleeding time

Determination of clotting time

Determination of haemoglobin,

Differential count of WBC.

Urine – Qualitative tests for sugar, albumin and ketone bodies.

Spotters – Autoclave, incubator, centrifuge, WIDAL and Pregnancy test.(Kits)

III Record.

SEMESTER VI CBCS

PAPER - VII DEVELOPMENTAL BIOLOGY & IMMUNOLOGY

CODE: CREDITS: 5

TEACHING HOURS: 6

Unit I

Introduction – scope and branches

Origin of germ cells – process of spermatogenesis and oogenesis – types of sperms – types of eggs – egg membranes – Mechanism and physiology of fertilization. General process of cleavage and gastrulation in Amphioxus and Chick – Fate maps.

Unit II

Development of brain, eye and ear in frog. Extra-embryonic membranes in chick - Placentation in mammals - Parthenogenesis – organizers- regeneration in Amphibia.

Unit III

Artificial insemination – IVF & Embryo transfer – Contraception – Ethics in assisted reproductive technology – Stem cells- origin, types and applications

Unit IV

Scope and importance- Cells and molecules of immune system - Lymphoid organs (Structure and functions of bone marrow, thymus, lymph nodes and spleen)- Types of immunity: Innate, adaptive, cell mediated and humoural immunity.

Unit V

Antigens and antibodies- Structure, types and characteristics; Immunodiagnosis- Agglutination, Precipitation, ELISA, RIA and Immunoflourescence: Vaccines- Immunisation schedule for children (Knowledge of DPT, Polio, BCG, MMR, TT, Cholera and Hepatitis B vaccines).

REFERENCE BOOKS:

Verma, P.S, Agrawal, V.K and Tyagi (1995). Chordate Embryology. S. Chand and Co, New Delhi – 110 055.

Arumugam, N. A text book of chordate embryology. Saras Publication.

Subramoniam, T. (2002). Developmental Biology. Narosa Publ. House, New Delhi.

Fathima, D and Arumugam, N (1994). Immunology, Saras Publications.

Balinsky, B.I., (1981). Introduction to Embryology. Saunders College Publishing.

Berril, N.J., (1986). Developmental Biology, Tata Mc Graw Hill Publishing C. Ltd.

Roitt, I.M (2000). Essential Immunology, Blackwell Scientific, Oxford, UK.

SEMESTER VI CBCS

PAPER VIII ENVIRONMENTAL BIOLOGY AND WILDLIFE MANAGEMENT

CODE: CREDITS: 5

TEACHING HOURS: 6

Unit I

Abiotic and biotic factors; Ecosystem concept- pond as an ecosystem- energy flow- ecological pyramids- food chain- food web; Biogeochemical cycles- Nitrogen, Phosphorus, and Carbon cycles; Ecological factors- water, pH, salinity, temperature and light.

Unit II

Population ecology- Characteristics of population-Inter and Intra specific relations among populations. Community –Characteristics- Ecological succession.

Unit III

Freshwater habitat – lotic and lentic communities – Marine habitat – Zonation - Pelagic, benthic and inter-tidal fauna and their adaptations – Biomes – Desert, tropical rainforest and grassland. Natural resources – Types and their conservation – Renewable and non-renewable energy resources – Environmental pollution and Public Health – Air, water and Soil pollution- sources, effects, prevention and control measures.

Unit IV

Wild life-importance, causes for depletion-Indian scenario- wild life diversity- endangered Indian wild life

Unit V

Conservation and Management of wild life of India – Project Tiger and Elephant

Wildlife census techniques- Important National Parks, Wild life Sanctuaries & Biosphere reserves - Laws related to wild life conservation and management.

REFERENCE BOOKS

Sharma, P.D., (1997). Environmental Biology. Rastogi Publications, Meerut.

Verma, P. S and V. K. Agarwal. (2004). Principles of Ecology. S. Chand and Co. New Delhi.

Saharia, V.B.(1976) Wild life in India. Natraj Publications

Kaushik, A., and Kaushik C.P., (2004). Perspectives in Environmental studies. New Age Intl. Publ., New Delhi.

Odum, E.P., (1984). Fundamentals of Ecology. W.B. Saunders Co.

SEMESTER VI CBCS

MBE II AQUACULTURE

CODE: CREDITS: 5

TEACHING HOURS: 6

Unit I

Aquaculture – definition – scope and importance – taxonomy and binomial nomenclature – External morphology of a teleost fish. – commercially important species of fishes, shrimps, crabs, lobsters, bivalves and cephalopods of India.

Unit II

Biology of Indian major carps: Catla, Rohu and Mrigal. Biology of Sardine, Mackerel and Pomfret. Estuarine fish culture – Mullet, milk fish and shrimp.

Unit III

Types of culture system – extensive, semi-intensive, intensive methods – merits and demerits of different systems – monoculture, composite and integrated shrimp and fish culture – Pen and Raft culture. Construction of fish farm – site selection – soil types – porosity – water column (depth, turbidity, height and light) – fertility and productivity – control of weeds.

Unit IV

Fish diseases – types of diseases (Viral, bacterial, fungal and protozoans) – crustacean parasites – prophylactic measures, treatment and control – fish processing and preservation – different methods

Unit V

Ornamental fishes - Taxonomy and biology – construction of home aquarium – nutritional requirements – maintenance of aquarium – packing and transportation of live fish.

TEXT BOOKS

Jhingran, V.G. (1985). Fish and Fisheries of India. Hindustan Publishing Co. New Delhi.

Shanmugam, K. (1990). Fishery biology and Aquaculture. Leo Pathipagam, Chennai.

SEMESTER VI CBCS

MAJOR PRACTICAL VII: DEVELOPMENTAL BIOLOGY AND IMMUNOLOGY

CODE: CREDITS: 4

TEACHING HOURS: 4

I Developmental Biology

Spotters-

Frog – egg, stages of cleavage, blastula, gastrula.

Chick – egg; chick embryo – 24 hrs, 48 hrs, 72 hrs. 96 hrs

CS of mammalian testis and ovary.

Placenta of sheep

II Immunology

Determination of blood group

Identification of various immune cell types in human blood smear

Study of slides to understand histological organization of bone marrow, thymus, spleen and lymph nodes.

Principles and applications of ELISA, RIA and Immunoflourescence and Immunoglobulins.

III RECORD

SEMESTER VI CBCS

MAJOR PRACTICAL VIII: ENVIRONMENTAL BIOLOGY, WILD LIFE MANAGEMENT AND AQUACULTURE

CODE: CREDITS: 4

TEACHING HOURS: 4

I Environmental biology and wild life management

Estimation of dissolved Oxygen

Estimation of free CO_2

Estimation of Salinity

Estimation of Alkalinity

Estimation of pH

Study of rocky and sandy shore fauna

Spotters / pictures pertaining to animal adaptation and endangered Indian wild life fauna.

Visit to Zoological park / Sanctuary and preparation of field report.

II Aquaculture

Study of external morphology of fish.

Identification of commercially important fresh water, estuarine and marine fishes, shrimp and common ornamental fishes.

Identification of common fish parasites, live feed, fish by-products.

Field trip report on visit to a fish farm to study different systems of aquaculture

Preparation of a plan for construction and maintenance of a home aquarium.

III Record

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14

Year : - I year **ALLIED ZOOLOGY & BIOTECHNOLOGY** **Semester :** I
(for B.Sc. Plant Biology & Plant Biotechnology, B.Sc. Chemistry Major students)

Title: PAPER I ANIMAL DIVERSITY, ORGANIZATION AND FUNCTIONS
Sub. Code:AZ101 **Credits: 4**
Teaching Hours: 7

Unit I

Zoology- scope, sub-disciplines and practical applications, classification of Invertebrata upto class level with diagnostic features and examples. Type study – Cockroach.

Unit II

Classification of chordates with subphyla and upto classes of vertebrates – Diagnostic features and examples. Type study – frog.

Unit III

Economic Zoology

Harmful animals – parasites – *Entamoeba histolytica, Plasmodium vivax, Ascaris,*

Beneficial animals – Sericulture, Aquaculture (Brief account).

Unit IV

Human Physiology- digestion, respiration, excretion, circulation, conduction of nerve impulse - Endocrine glands: Pituitary, Thyroid, Adrenal, Islets of Langerhans, Testis and Ovary

Unit V

Stages in development: Gametogenesis, Fertilization, Cleavage and Gastrulation in Frog.

Reference Books

Ghosh and Manna (2004). Fundamentals of Zoology. New Central book Agency (P) Ltd.

Arumugam, N. 2006. Animal Physiology. Saras Publication.

Miller and Harley (2002). Zoology, 4th Edn., Tata-McGraw Hill Publ. Co, Ltd, New Delhi.

Audesirk T and Audesirk. G (1999). Biology-Life on Earth, 5th end. Prentice Hall International Inc., UK

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14

Year : - I year **ALLIED ZOOLOGY & BIOTECHNOLOGY** **Semester :** II
(for B.Sc. Plant Biology & Plant Biotechnology, B.Sc. Chemistry Major students)

Title: PAPER II GENERAL PRINCIPLES AND BIOTECHNOLOGY
Sub. Code:AZ202 **Credits: 4**
Teaching Hours: 7

Unit I

Organisation of a eukaryotic cell, structure and functions of plasma membrane, endoplasmic reticulum, mitochondria, golgi bodies, ribosomes, nucleus, lysosomes.

Unit II

Environmental biology – scope; Pollution - Air, water, land; causes, effects, control measures, Environmental impact assessment; Biodiversity and its conservation.

Unit III

Biotechnology – definition, scope, Application in medicine, agriculture, industry, environment; Bio-informatics, Bio-ethics, Biosafety.

Unit IV

Tools and techniques in genetic engineering – Restriction enzymes, cloning vectors, cDNA and genomic library – Western, Southern and Northern blotting, PCR, DNA fingerprinting.

Unit V

Transgenic animals, Hybridoma technology, Biopesticides and Biofertilisers, Bio-remediation; Bioreactors.

Reference Books

Dubey , R.C., (2005). Biotechnology. S. Chand and Co. Ltd.

Sasidhara, R., (2006). Animal Biotechnology. MJP Publishers, Chennai.

Lohar, P.S., (2005). Biotechnology. MJP Publishers, Chennai.

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14

Year : - I year **Semester :** II

Title: PRACTICAL ALLIED ZOOLOGY AND BIOTECHNOLOGY

(for B.Sc. Plant Biology & Plant Biotechnology, B.Sc. Chemistry Major students)

Sub. Code: ZP21 **Credits: 4**

Teaching Hours: 2

Dissection: Cockroach- Digestive, Nervous & Reproductive system.
Frog- Digestive and Urinogenital system.

Mounting of Earthworm body setae, mouthparts of mosquito, honey bee, Cockroach.

Classify upto class level giving reasons: *Paramecium, Sycon, Obelia, Ascaris*, Earthworm, Prawn, *Pila*, Sea star, *Amphioxus*, Shark, Frog, Calotes, Pigeon and Rat.

Study of slides and museum specimens to understand organization and importance of *Entamoeba histolytica, Plasmodium vivax*, Silk moth, Indian major carps (Catla, Rohu, Mrigal).

Study of models / pictures pertaining to PCR, Western blot, plasmid, DNA fingerprinting, Hybridoma technique and Bioreactor.

Study of slides- frog egg, cleavage- 2, 4, 16 cells stages, blastula and gastrula.

Study of Slides CS of Pituitary, Thyroid, Adrenal, Testis and Ovary.

Field trip to study Air / water / Land pollution and its environmental impact.

Record

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14

Year : - 1 year **NON-MAJOR ELECTIVE I** **Semester :** I

Title: ORNAMENTAL FISH CULTURE

Sub. Code:OF101 **Credits: 2**

Teaching Hours: 2

Unit I

Introduction: World market, domestic market, Common Indian ornamental fish fauna; freshwater, brackish water and marine ornamental fishes.

Unit II

Water quality management- pH, total hardness, temperature, oxygen, filtration- biological and mechanical filtration

Unit III

Ornamental fish feed- feed formulation; live feed, artificial feed, feeding techniques.

Unit IV

Ornamental fish diseases; stress, ectoparasites, endoparasites, bacterial and viral infections, miscellaneous diseases- prophylaxis and treatment.

Unit V

Ornamental fish farming, Setting up of an ornamental fish unit, collection and rearing, breeding, reconditioning and export stock, packing and air transport for export, economics and profitability of an ornamental fish exporting unit.

Reference Books

Handbook on Aquafarming- Ornamental fishes by V.K. Dey, MPEDA, Kochi, India

Dick Mills, 1987. The practical encyclopedia of the Marine Aquarium.Salamander Books Limited, London.

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Year : - I year **NON-MAJOR ELECTIVE II** **Semester :** II

Title: NMSBE II VERMITECHNOLOGY

Sub. Code:VT202 **Credits: 2**

Teaching Hours: 2

Unit I

Introduction to Vermitechnology– Effects of earthworm in soil- Ecological Types- Trophic classification of earthworms - Biological effects of earth worms in the soil

Unit II

Earthworms- biology, culture and Breeding.

Unit III

Vermiculture: Preparation of Vermibeds- Vermicomposting using local and exotic species of earthworms- Vermiwash.

Unit IV

Earthworms: Their effects on plant growth, vegetables and soil quality- Impact of chemicals on earthworms

Unit V

Earthworms: Applications in organic agriculture-Cultivation of paddy and sugarcane- End uses and potential- earthworms in medicine- earthworms as feed.

Reference Books

Sultan Ahmed Ismail. 2005. The Earthworm Book. Other India Press, Mapusa, Goa.

Edwards, C.A., & Lofty, J.R. 1972. Biology of Earthworms Chapman and Hall Ltd., London., 283 pp

Epskin, E. 1997. The Science of Composting. Technomic Publishing Co., Inc. USA 487 pp.