

THE NEW COLLEGE (AUTONOMOUS) CHENNAI – 14
P.G & RESEARCH DEPARTMENT OF ZOOLOGY
M.Sc ZOOLOGY SYLLABUS
CBCS pattern effective from the year 2011-2012
I YEAR: I SEMESTER

COURSE	HOURS WEEK	CREDITS	T/P	EXAM DURATION	INTERNAL MARKS	EXTERNAL MARKS	TOTAL
CORE: 1 BIOLOGY OF INVERTEBRATES	5	4	T	3 HOURS	25	75	100
CORE: 2 BIOLOGY OF CHORDATES	5	4	T	3 HOURS	25	75	100
CORE: 3 CELL & MOL. BIOLOGY & GENETICS	5	4	T	3 HOURS	25	75	100
CORE: 4 PRACTICAL I INVERTEBRATES & CHORDATES PRACTICAL	5	3	P	4 HOURS	25	75	100
CORE: 5 PRACTICAL II CELL & MOL BIOLOGY & GENETICS PRACTICAL	5	3	P	4 HOURS	25	75	100
ELECTIVE – I ECONOMIC ENTOMOLOGY	3	3	T	3 HOURS	25	75	100
SOFT SKILLS – I	1		T	3 HOURS			
VALUE EDUCATION- I	1		T	3 HOURS			
TOTAL	30	21			150	450	600

I YEAR: II SEMESTER

COURSE	HOURS WEEK	CREDITS	T/P	EXAM DURATION	INTERNAL MARKS	EXTERNAL MARKS	TOTAL
CORE: 6 BIostatISTICS, COMPUTER APPLICATIONS AND BIOINFORMATICS	5	4	T	3 HOURS	25	75	100
CORE: 7 DEVELOPMENTAL BIOLOGY	5	4	T	3 HOURS	25	75	100
CORE: 8 EVOLUTION AND BEHAVIOUR	5	4	T	3 HOURS	25	75	100
CORE: 9 PRACTICAL III BIostatISTICS, COMPUTER APPLICATIONS & BIOINFORMATICS PRACTICAL	5	3	P	4 HOURS	25	75	100
CORE: 10 PRACTICAL IV DEVELOPMENTAL BIOLOGY AND EVOLUTION PRACTICAL	5	3	P	4 HOURS	25	75	100
ELECTIVE – II BIOTECHNOLOGY	3	3	T	3 HOURS	25	75	100
SOFT SKILLS - I	1	2	T	3 HOURS	25	75	100
VALUE EDUCATION – I	1	2	T	3 HOURS	25	75	100
* INTERNSHIP TRAINING		2					
TOTAL	30	27			200	600	800

II YEAR: III SEMESTER

COURSE	HOURS WEEK	CREDITS	T/P	EXAM DURATION	INTERNAL MARKS	EXTERNAL MARKS	TOTAL
CORE: 11 ENVIRONMENTAL BIOLOGY AND WILD LIFE MANAGEMENT	5	4	T	3 HOURS	25	75	100
CORE: 12 ANIMAL PHYSIOLOGY AND BIOCHEMISTRY	5	4	T	3 HOURS	25	75	100
CORE: 13 IMMUNOLOGY	5	4	T	3 HOURS	25	75	100
CORE: 14 PRACTICAL V ENVIRONMENTAL BIOLOGY AND WILD LIFE MANAGEMENT PRACTICAL	5	3	P	4 HOURS	25	75	100
CORE: 15 PRACTICAL VI ANIMAL PHYSIOLOGY, BIOCHEMISTRY AND IMMUNOLOGY PRACTICAL	5	3	P	4 HOURS	25	75	100
ELECTIVE – III CLINICAL MICROBIOLOGY AND LABORATORY TECHNOLOGY	3	2	T	3 HOURS	25	75	100
SOFT SKILLS – II	2	2	T	3 HOURS	25	75	100
TOTAL	30	22			175	525	700

II YEAR: IV SEMESTER

COURSE	HOURS WEEK	CREDITS	T/P	EXAM DURATION	INTERNAL MARKS	EXTERNAL MARKS	TOTAL
CORE: 16 FISHERY BIOLOGY AND AQUACULTURE	6	4	T	3 HOURS	25	75	100
CORE: 17 BIOPHYSICS AND BIO-INSTRUMENTATION	6	4	T	3 HOURS	25	75	100
CORE 18 PRACTICAL VII FISHERY BIOLOGY AND AQUACULTURE	6	4	T	4 HOURS	25	75	100
ELECTIVE – IV TEACHING METHODS IN ZOOLOGY	3	2	P	3 HOURS	25	75	100
PROJECT	7	4	T	4 HOURS	25	75	100
SOFT SKILLS III	2	2	T	3 HOURS	25	75	100
TOTAL	30	20			150	450	600

GRAND TOTAL 120 90 675 2025 2700

* Internship will be taken up by the student during summer vacation of semester II.

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14**Syllabus for M.Sc Zoology effective from the year 2011-2012****Year: I year****Semester: I****Title: PAPER – I BIOLOGY OF INVERTEBRATES****Sub. Code PZ101****Credits: 4****Max. Marks. 100****UNIT – 1**

PROTOZOA: Polymorphism; feeding and reproduction in Protozoa. Parasitic protozoa of man. Theories on Origin and evolution of Metazoa.

PORIFERA: Affinities, origin and systematic position of Porifera. Deep sea sponges.

COELENTERATA: Origin and evolution, Polymorphism in Coelenterata, Mesenteries in Coelenterata, Corals and theories of Coral reef formation.

CTENOPHORA: Structural peculiarities and affinities. Interrelationship between the radiate phyla.

UNIT – II

HELMINTHES: Origin and evolution of Bilateria. Platyhelminthes: Adaptations for parasitic mode of life. Helminthes and human diseases.

ANNELIDA: Theories on origin of Metamerism. Origin and evolution of Coelom. Archannelida: morphological features and affinities.

UNIT – III

ARTHROPODA: Phylogeny of Arthropoda – origin and evolution. Xiphosura – Structure and affinities. Crustacean larvae and their significance.

MOLLUSCA: Monoplacophora and origin of Mollusca. Torsion in Gastropoda. Foot in Mollusca.

ECHINODERMATA: Origin and Phylogeny of Echinoderms. Water vascular system; Evolutionary significance of Echinoderm larvae.

UNIT – IV

MINOR PHYLA: Structural peculiarities and affinities of: Rotifera – Acanthocephala – Entoprocta – Ectoprocta – Brachiopoda.

UNIT – V

FOSSIL INVERTEBRATES: Trilobites – Cephalopods – Echinoderms.

Comparative functional morphology of coelom, feeding, respiration and reproduction in invertebrates.

Reference Books

- Barnes R.D. (1982) Invertebrates Zoology 6th Edition. Toppan International Company.
- Hyman L. H. (1940 – 1959) The Invertebrata, Volume I – VI.
- Barrington, E.J.W (1969) Invertebrate Structure and Function. English Language. Book Society.
- Kotpal, R.L (1982) Protozoa to Echinodermata and Minor Phyla. Rastogi Publication.
- Moore, R.C Lalickar, C.G and Fisher, A. G (1952) Invertebrate fossils, Tata McGraw Hill Book co. New York.
- Gardiner, M.S. (1972) The Biology of Invertebrates, Mc Graw Hill Book Co. New York.

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14

Syllabus for M.Sc Zoology effective from the year 2011-2012

Year: I year

Semester: I

Title: PAPER – II BIOLOGY OF CHORDATES

Sub. Code PZ102

Credits: 4

Max. Marks. 100

UNIT - I

TAXONOMY: Principles of Taxonomy. Nomenclature: Binomial, Trinomial; taxonomic keys. Outline classification of Chordates upto order level.

UNIT – II

Prochordate phylogeny. Ostracoderms: Silurian and Devonian Ostracoderms. Evolutionary position of Ostracoderm. Placoderms; Origin of Jaws – Position of Placoderms in the evolution of the jawed vertebrates.

UNIT – III

Chondrichthyes: Fossil history of Chondrichthyes, tendencies in Elasmobranch Evolution.

Actinopterygii: Origin and evolution, Adaptive radiation of bony fishes. Amphibia: Evolution of Amphibia, Adaptive radiation in Amphibia.

UNIT – IV

Reptilia: Origin of Reptilia, Saurischian and Ornithischian Dinosaurs – Rhynchocephalia – Adaptive radiation of reptiles. Aves: Fossil history of birds. Birds as glorified reptiles, adaptive radiation in birds. Mammals: Evolution of Mammals, Structural peculiarities of Prototheria, Methatheria and Eutheria ; Aquatic Mammals.

UNIT – V

COMPARATIVE ANATOMY: Comparative anatomy of the vertebrate integumentary system, heart and brain of vertebrates. Jaw suspension in vertebrates.

Reference Books

- Young, J.Z. (1950) Life of vertebrates. Clarendo Press, Oxford
- Colbert, E. H. (1955) Evolution of the Vertebrates. John Wiley and Sons Inc. New York.
- Waterman, A.J. (1971) Chordates structure and function. Macmillan Co. London.
- Romer, A.S. (1976) Vertebrate Body.
- Kapoor, V.C (1991) Theory and practice of animal taxonomy. Oxford publishing Co. pvt. Ltd New Delhi.

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14**Syllabus for M.Sc Zoology effective from the year 2011-2012****Year: I year****Semester: I****Title: PAPER – III CELL BIOLOGY AND GENETICS Sub. Code PZ103****Credits: 4****Max. Marks. 100****CELL BIOLOGY****UNIT 1**

Structure of eukaryotic cell – Animal cell. Membrane structure and function (Structure of model membrane, osmosis, ion channels, active transport and membrane pumps).

Structural organization and function of organelles (nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, ribosomes, peroxisomes and cytoskeleton).

UNIT II

Organization of chromosomes: structure of chromatin and chromosomes, heterochromatin, euchromatin.

Cell division and cell cycle (Mitosis and meiosis, their regulation, steps in cell cycle, regulation and control of cell cycle).

GENETICS**UNIT III**

Molecular structure of DNA; DNA replication; Fine structure of gene; Operon concept; unique and repetitive DNA; transposons; RNA synthesis and processing; Protein synthesis and processing; Control of gene expression at transcription and translation level.

UNIT IV

Human genetics: Pedigree analysis, karyotypes, genetic disorders. Sex determination.

Extra chromosomal inheritance: Inheritance of Mitochondrial and chloroplast genes, maternal inheritance.

Microbial genetics: Methods of genetic transfers – transformation, conjugation, transduction and sexduction.

UNIT V

Mutation: Types – germinal and somatic mutation. Structural and numerical alterations of chromosomes: Deletion, duplication, inversion and translocation; ploidy. Population genetics – Populations, Gene pool, Gene frequency; Hardy-Weinberg Law.

CELL BIOLOGY

Reference books

De Robertis, E. D. F. and De Robertis, E. M. F. (1981) Cells and Molecular Biology, Saunder International Edition.

Verma and Agarwal, 2004. Cell and Molecular Biology. S. Chand & Co. New Delhi.

Ambrose, E. J. and Dorothy. M. E., (1979) Cell Biology. II edition. The English language. Book Society.

Albert. B and Watson. J. D., (1990) Molecular Biology of the Cell. Garland Publishing London.

GENETICS

Reference Books

Rastogi, V. B. 2002. A text book of Genetics. Kedarnath Ramnath publ., Meerut.

Gardner, (1984) Principles of Genetics, 7th edn. Wiley private Limited. New York.

Watson. J. D. (1980) Molecular Biology of Gene, W. A Benjamin and Company, New York.

Burns, G. W. (1968) The Science of Genetics, Mc Millan Company, New York.

Ayala, F. J. & Keiger, J. A. Jr. (1980) Modern Genetics, The Benjamin Publ. Co., Inc.

5. Study of the specimens to bring out the affinities:
 - a. Amphioxus
 - b. Balanoglossus
 - c. Ascidian
 - d. Petromyzon

6. Study of the specimens with reference to adaptive features for modes of life:
 - a. Echeneis
 - b. Ichthyophis
 - c. Hyla
 - d. Draco
 - e. Pigeon
 - f. Bat

7. Study of the following skull types with reference to jaw suspensions:
 - a. Fish
 - b. Frog
 - c. Calotes
 - d. Rat/Rabbit

8. Field trip to observe and study live specimens.

Practical record.

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14**Syllabus for M.Sc Zoology effective from the year 2011-2012****Year: I year****Semester: I****Title: PRACTICAL II CELL BIOLOGY AND GENETICS Sub. Code PZP12****Credits: 3****Max. Marks. 100****CELL BIOLOGY**

Microscopy – Bright field – Phase contrast – Interference, Polarization, TEM and SEM;

Micrometry – Measurements of cells using ocular and stage micrometers.

Histochemical localization of Proteins, Carbohydrates, Lipids, DNA and RNA.

Vital staining – staining of human RBC with Trypan blue.

Differential count of WBC in man.

GENETICS

Preparation of culture medium. Culture of Drosophila- Methods of maintenance. Sex identification, Study of mutant forms (Prepared slides).

Identification of blood groups-A, B, AB, O and Rh.

Mounting of salivary glands of Chironomous larva. Analysis of banding pattern.

Localization of Barr body in the Buccal smear squamous epithelial cells.

Karyotyping using human metaphase chromosome plates. Identification of syndromes (Down, Klinefelter and Turner) from karyotype photographs showing clinical features of each syndrome case.

Record

Syllabus for M.Sc Zoology effective from the year 2011-2012

Year: I year

Semester: I

Title: ELECTIVE – I ECONOMIC ENTOMOLOGY

Sub. Code PZ104

Credits: 3

Max. Marks. 100

UNIT – I

Brief account of morphology of Cockroach-Classification of insects upto major orders (Apterygota: Thysanura, Collembola, Protura, Diplura; Pterygota – Exopterygota: Odonata, Orthoptera, Hemiptera, Mallophaga, Thysanoptera; Endopterygota: Coleoptera, Lepidoptera, Hymenoptera, Diptera) and their diagnostic characters. Classification of insects based on metamorphosis.

UNIT – II

Beneficial Insects: Biology life cycle and economic importance of Honey bee and Silk worm. Insect pollinators, Scavengers – Medicinal insects

UNIT – III

Harmful Insects: Biology and life cycle of insect pests of Rice (Rice Stem Borer), Sugar cane (Sugarcane Leaf Hopper) Cotton (Spotted Boll worm), Insect vectors (Biology of Mosquito).

UNIT – IV

Methods and Principles of Pest control: Physical, Mechanical and Biological control Methods and Integrated Pest Management – Classification of insecticides based on mode of entry and mode of action – Synthetic Organic Insecticides: Organochlorine compounds (DDT) – Organophosphorous compounds (Malathion). Pesticide pollution on environment.

UNIT – V

Plant protection appliances – basic principles of insecticides formulation and their application in pest control – Precautions in handling pesticides.

Reference Books

- David, B.V. (2001). Elements of Economic Entomology. Popular Book Depot, Chennai
- Nayar, K.K., Ananthkrishnan, T.N., and David, V.D., (1990) General and applied Entomology, Tata McGraw Hill., New Delhi.
- Krishnan, N.T., (1993) Economic Entomology, J.J. Publishers Madurai
- David, B.V. (1992) Pest management and pesticides: Indian Scenario. Namrutha Publications
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THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14**Syllabus for M.Sc Zoology effective from the year 2011-2012****Year: I year****Semester: II****Title: PAPER – IV BIOSTATISTICS, COMPUTER APPLICATIONS &
BIOINFORMATICS****Sub. Code PZ205****Credits: 4****Max. Marks. 100****UNIT I****COLLECTION, CLASSIFICATION AND PRESENTATION OF DATA**

Definition of statistical population and sample in biological studies. Variables – qualitative and quantitative; discrete and continuous. Census and sampling methods. Types of classification – Qualitative, quantitative, chronological, geographical etc, and continuous frequency distributions. Diagrammatic and graphical representations of data – Bar diagram – Pie diagram. Frequency diagram: histograms, frequency polygon and frequency curve.

UNIT II**DESCRIPTIVE STATISTICS**

Measures of central tendency: Definition and computation of Arithmetic mean, median and mode (ungrouped, discrete and continuous frequency distributions).

Measures of dispersion: Definition of range, quartile deviation and mean deviation. Definition and computation of Standard deviation for different types of data (ungrouped, discrete and continuous frequency distribution). Standard error.

UNIT III

Probability; basic principles. Probability. Probability distributions – Binomial, Poisson & Normal. Test of significance: Chi-square test (problem relating to genetics), t – test. Correlation: Definition and types – Co-efficient of correlation; Regression analysis.

UNIT IV**COMPUTER APPLICATIONS**

Introduction to computers: Generations of Computers. Computer hardware: CPU and other peripheral devices such as input, output, auxiliary storage, printer etc. Computer software: Salient features and applications of MS – Word, MS – Excel, MS – Powerpoint and MS – Windows. Internet and E-mail – Definition & uses.

UNIT V**BIOINFORMATICS**

Bioinformatics – Scope, importance and applications; Bioinformatics in India – Biological databases – DNA structure, determination and sequence analysis; protein structure determination and sequence analysis – pair wise and multiple sequence alignment techniques using FASTA & BLAST – Human genome project.

BIOSTATISTICS

REFERENCE BOOKS

Gurumani, N. (2005) Biostatistics, 2nd MJP publications, India.

Snedecor, G. W and Cochran, W.G. (1967) Statistical Methods. Oxford & IBH Publication Co., New Delhi.

Sokal, R.R. and Rohlf, F.J (1969) Biometry. The principles and practice of Statistics in Biological Research. W. H. Freeman and Co., San Francisco.

COMPUTER APPLICATIONS

REFERENCE BOOKS

Kalicharan, N. (1988). An Introduction to Computer Studies. Cambridge University Press.

Atwood, T. K. and Parry – Smith, D.J., (2001). Introduction to Bioinformatics, Pearson Education Publication, Asia.

BIOINFORMATICS

REFERENCE BOOKS

Harshawardhan, P.B., 2006. Bioinformatics-Principles and Application, Tata McGraw Hill, New Delhi.

Ignachimuthu, 2005. Basic Bioinformatics, Narosa Publishing House Pvt. Ltd. New Delhi.

Attwood, T.K. & Parry-Smith, D.J., 2001. Introduction to Bioinformatics, Pearson Education Publication, Asia.

Lesk, A.M., 2003. Introduction to Bioinformatics, Oxford University Press, Oxford.

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14
Syllabus for M.Sc Zoology effective from the year 2011-2012

Year: I year

Semester: II

Title: PAPER – V DEVELOPMENTAL BIOLOGY

Sub. Code PZ206

Credits: 4

Max. Marks. 100

UNIT I

Basic concepts of development: Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; fate maps and cell lineages; cytoplasmic determinants; imprinting; mutants and transgenics in analysis of development.

UNIT II

Gametogenesis, fertilization and early development: Production of gametes, cell surface molecules in sperm-egg recognition in animals; zygote formation, cleavage, blastula formation, embryonic fields.

UNIT III

Gastrulation and organogenesis in animals: Gastrulation and formation of germ layers in Amphioxus, Frog and Chick; Organogenesis – eye lens induction, heart, brain in Frog and Chick. Placentation in mammals.

UNIT IV

Metamorphosis in insects and Frog. Limb development and regeneration in Frog; Organizers and their role in development; Parthenogenesis.

UNIT V

Assisted reproductive technologies – In vitro fertilization and Embryo Transfer (IVF and ET); Programmed cell death, aging and senescence; stem cells.

Reference books

- Verma, P.S., & V.K. Agarwal (2004). Chordata Embryology; S. Chan & Co Ltd; New Delhi
- Subramoniam. T. (2002). Developmental Biology, Narosa Publication, New Delhi.
- Balinsky, B.L., (1981). An Introduction to embryology, Saunders, Philadelphia
- Grant, P., (1978) Biology of developing system, Halt Rein Chart and Winston Inc., NY and Chicago
- Gilbert, S (1985) Developmental Biology. Sinauer Association, Inc., Publishers

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14**Syllabus for M.Sc Zoology effective from the year 2011-2012****Year: I year****Semester: II****Title: PAPER – VI EVOLUTION AND BEHAVIOUR****Sub. Code PZ207****Credits: 4****Max. Marks. 100****UNIT I**

Emergence of evolutionary thoughts:

Lamarck. Darwin–concepts of variation, struggle, fitness and natural selection, mutation theory. Theory of Special Creation. Concept of Oparin and Haldane, Experiment of Miller

UNIT II

Paleontology and Evolutionary History:

The evolutionary time scale; Eras, periods and epoch; Major events in the evolutionary time scale; Origin of unicellular and multicellular organisms; Major groups of animals; Stages in human evolution.

UNIT III

Adaptation and speciation:

Adaptive radiation; Isolating mechanisms; Speciation; Allopatricity and Sympatricity; Convergent evolution; Sexual selection; Co-evolution.

BEHAVIOUR**UNIT IV**

Brain and Behaviour

Learning, memory, cognition, sleep and arousal; Domestication and behavioral changes, Biological clocks.

UNIT V

Social Behaviour

Social communication; Social dominance; Use of space and territoriality; Parental care; Aggressive behaviour; Migration;

EVOLUTION**Reference books**

- Arumugam, N. 2004. Evolution, Saras Publication.
- Dodson E.O. (1990). Evolution. Reinhold, New York
- Moody P.A. (1978) Introduction to Evolution. Harper International
- Stebbins G.L. (1979). Processes of Organic Evolution. Prentice Hall India, New Delhi

BEHAVIOUR**Reference books**

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14**Syllabus for M.Sc Zoology effective from the year 2011-2012****Year: I year****Semester: II****Title: PRACTICAL III BIOSTATISTICS, COMPUTER APPLICATIONS AND
BIOINFORMATICS****Sub. Code PZP23****Credits: 3****Max. Marks. 100****BIOSTATISTICS**

Collection, classification and presentation of data relating to continuous and a discrete variable; obtaining descriptive measures for the collected data (each student shall collect separate primary data – a sample of at least 20 – such as length, weight etc. of fish or any other animal, classify the data – frequency distribution - Graphically represent them – and obtain descriptive measures such as mean, standard deviation, coefficient of variation for the collected data. Problems related to test of significance (Chi – square test, and t-test)
Problems related to correlation and regression

COMPUTER APPLICATIONS

Demonstration of computers and accessories.

BIOINFORMATICS

Retrieval and analysis of Gene and Protein Sequences from National Center for Biotechnology Information (NCBI) & Expert Protein Analysis System (ExPASy).

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14**Syllabus for M.Sc Zoology effective from the year 2011-2012****Year: I year****Semester: II****Title: PRACTICAL IV DEVELOPMENTAL BIOLOGY & EVOLUTION****Sub. Code PZP24****Credits: 3****Max. Marks. 100****DEVELOPMENTAL BIOLOGY**

1. Development of Chick – Mounting of Blastoderm of Chick and vital staining.
2. Slides showing stages in development of heart, brain and eye lens in chick to demonstrate induction and organization.
3. Slides showing the estrous cycles in mammals (Rat)
4. Study of larval forms – Nauplius, Zoea, Veliger, Bipinnaria and Tornaria.

EVOLUTION

1. Identification and significance of fossils: Nautiloid, Ammonoid, Living fossils – *Peripatus*, *Limulus*, *Sphenodon*.
2. Identification of various stages in the evolution of man (Pictures/Models).

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14
Syllabus for M.Sc Zoology effective from the year 2011-2012

Year: I year
Title: ELECTIVE –II BIOTECHNOLOGY
Credits: 3

Semester: I
Sub. CodePZ208
Max. Marks. 100

UNIT – I

Biotechnology – Definition – Global impact of biotechnology – Biotechnology in India – Applications of biotechnology – Human genome project – Biosafety – Bioethics – Ethical Legal Social Issues (ELSI) – Intellectual Property Rights (IPR) – Intellectual Property Protection (IPP).

UNIT – II

Gene cloning – types of restriction enzymes – ligase, linkers and adaptors. Gene probe – DNA finger printing – Restriction Fragment Length Polymorphism (RFLP) – Polymerase Chain Reaction (PCR) – Genomic library – Blotting techniques – Southern, Northern & Western. Cloning vectors – types; pBR 322 and bacteriophage. Cloning vector for *Agrobacterium tumefaciens*. Gene transfer technology – Physical, Chemical and Biological techniques.

UNIT – III

Plant tissue culture techniques and applications – protoplast fusion – Transgenic plants – Biofertilizers – Biopesticides. Genetically Modified Organisms (GMO) & Genetically Modified food.

UNIT – IV

Fermentation – bioreactor – microbial products – primary & secondary metabolites – Single Cell Protein (SCP). Bioremediation of hydrocarbons, Industrial wastes – Xenobiotics.

UNIT – V

Hybridoma technology – Monoclonal antibodies – Principles and Applications. Principles and applications of animal cell culture. Transgenic animals.

Reference books

- Purohit, S.S and S.K. Mathur (1999), Biotechnology; Fundamentals and Application. Agro Botanica. New Delhi. ISBN 81-87167-10b
- Dubey, R.C. (2001) A text book of Biotechnology, Rajendra Printer. New Delhi. ISBN – 81-219-09 16-3
- Scragg, A. (1999), Environmental Biotechnology, Long Mann Publication. ISBN 0582 276829
- Brown, T.A. (1996) Gene Cloning and DNA analysis. Blackwell Science, Oxford Publications.
- Sathyanarayana, U. (2006) Biotechnology. Books and Allied (P) Ltd. India.

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14**Syllabus for M.Sc Zoology effective from the year 2011-2012****Year: II year****Semester:III****Title: PAPER – VII ENVIRONMENTAL BIOLOGY AND WILD LIFE
MANAGEMENT****Sub. CodePZ308****Credits: 4****Max. Marks. 100****UNIT I**

The Environment: Physical environment; biotic environment; biotic and abiotic interactions.

Habitat and Niche: Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement.

UNIT II

Population Ecology: Characteristics of a population; population growth curves; population regulation; life history strategies (r and K selection); concept of metapopulation – demes and dispersal, interdemic extinctions, age structured populations.

Species Interactions: Types of interactions, interspecific competition, herbivory, carnivory, pollination, symbiosis.

UNIT III

Community Ecology: Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones.

Ecological Succession: Types; mechanisms; changes involved in succession; concept of climax.

UNIT IV

Ecosystem Ecology: Ecosystem structure; ecosystem function; energy flow and mineral cycling (C,N,P); primary production and decomposition; structure and function of some Indian ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, estuarine). Major terrestrial biomes; biogeographical zones of India.

UNIT V

Applied Ecology: Environmental pollution; global environmental change. Biodiversity and its management.

Conservation Biology: Principles of conservation and management of Indian wild life – rare and endangered species - Project Tiger, Wild life sanctuaries and Biosphere reserves in India. Red data book.

Reference books

- Odum, E.P. (1983). Basic Ecology, Saunder's Publishing, New York.
- Berwer. A. (1988). The Science of Ecology. Saunder's College Publishing.
- Bandopadhyay, J. (1985) India's Environment Crisis and response – Natraj Publishers, Dehra Dun.
- Smith, R. L. (1986). Elements of Ecology, Harper and Row Publishers, New York.
- Soli, J. Archeivala – 1988 – Wastewater treatment for pollution control – second Ed. Tata McGraw hill Publication Company Ltd., New Delhi – ISBN – 0-07-463002 – 4.
- APHA (American Public Health Association) Standard Examination of water and wastewater, 1989, Washington DC.

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14**Syllabus for M.Sc Zoology effective from the year 2011-2012****Year: II year****Semester:III****Title: PAPER – VIII ANIMAL PHYSIOLOGY AND BIOCHEMISTRY****Sub. Code PZ309****Credits: 4****Max. Marks. 100****UNIT I**

Blood and circulation – Blood corpuscles, haemopoiesis and formed elements, plasma function, blood volume, blood groups, haemoglobin, haemostasis, blood pressure and its regulation.

Cardiovascular System: Types of heart; Physiology of cardiac muscle; heart beat and its regulation.

Respiratory system – Respiratory pigments; physiology of respiration in man.

UNIT II

Digestive system – Digestion, absorption, BMR.

Nervous system – Structure and types of neurons; transmission of nerve impulse; anatomy of the brain and spinal cord, central and peripheral nervous system.

Sense organs – Vision and hearing in man.

Excretory system – Structure of kidney; physiology of excretion in man; Osmoregulation in fish and mammals.

UNIT III

Thermoregulation – Thermoregulation in poikilotherms, homeotherms and heterotherms.

Endocrinology and Reproduction – Endocrine glands, basic mechanism of hormone action, hormones and diseases; endocrine control of reproduction in man.

UNIT IV

Bioenergetics, glycolysis, oxidative phosphorylation, coupled reaction, group transfer, biological energy transducers.

Principles of catalysis, enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isozyme

UNIT V

Composition, structure, metabolism and function of biomolecules (carbohydrates, lipids, proteins, nucleic acids); vitamins.

Ramachandran plot.

ANIMAL PHYSIOLOGY

Reference books

- Hoar, W.S (1968): General and Comparative Physiology, Prentice Hall
- Prosser, C.L. (1973): Comparative Animal Physiology, 3rd edn. W.B. Saunders & Co., Philadelphia.
- Wood, D.W. (1968): Principles of Animal Physiology

BIOCHEMISTRY

Reference books

- Hames, B.D., Hooper, N.M and Houghton, J.D. (1998) Instant notes in Biochemistry. Viva Books Pvt. Ltd. New York.
- Jain, J.L (2001) Fundamentals of Biochemistry. S. Chandra & Co. Pvt. Ltd, New Delhi.
- Murray, R.K., Granner, D.K., Maynes, P.A and Rodwell, V.W (1998) Harper's Biochemistry 25th edn. MacGraw Hill, New York.
- Ambika Shanmugam (1990) Fundamentals of Biochemistry for Medical students. S. Chand & Co, New Delhi.

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14**Syllabus for M.Sc Zoology effective from the year 2011-2012****Year: II year****Semester:III****Title: PAPER – IX IMMUNOLOGY****Sub. Code PZ310****Credits: 4****Max. Marks. 100****UNIT I**

Innate and adaptive immune system Cells and molecules involved in innate and adaptive immunity. Primary and secondary lymphoid organs.

UNIT II

Antigens, antigenicity and immunogenicity. B and T cell epitopes.

UNIT III

Structure and function of antibody molecules. generation of antibody diversity, monoclonal antibodies, antibody engineering, antigen-antibody interactions.

UNIT IV

MHC molecules, antigen processing and presentation, activation and differentiation of B and T cells, B and T cell receptors, humoral and cell-mediated immune responses.

UNIT V

Primary and secondary immune modulation, the complement system, cell-mediated effector functions, inflammation, hypersensitivity and autoimmunity, immune response during bacterial, parasitic and viral infections, congenital and acquired immunodeficiencies, vaccines.

Reference books

- Roitt, I. M. (2000) Essential Immunology, Blackwell Scientific, Oxford, UK
- Coico, R., Sunshine, G & Benjamin (2003). Immunology-A short Course, Wiley-Liss Publications, USA
- Lydyard, P.M., Whelan, A & Fanger, M.W (2000) Instant notes in immunology, Viva books Pvt., LTD, New Delhi
- Playfair, J.H.L & Chain, B.M., (2001). Immunology at a Glance, Blackwell Publishing, UK
- Janus Kuby (1997). Immunology, 3rd edn., W.H.Freeman & Co., New York

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14**Syllabus for M.Sc Zoology effective from the year 2011-2012****Year: II year****Semester: III****Title: PRACTICAL V ENVIRONMENTAL BIOLOGY AND WILD LIFE
MANAGEMENT****Sub. Code PZP35****Credits: 3****Max. Marks. 100**

1. Estimation of Aquatic Primary productivity – Dark and Light bottle (Demonstration).
2. Estimation of Dissolved oxygen, salinity, CO₂, Nitrites, phosphates and calcium in water samples.
3. Analysis of Industrial effluents – TDS, TSS, BOD and COD (Demonstration)
4. Collection, Isolation and Identification of Zooplankton.
5. Study of sandy, muddy and rocky shore fauna with special reference to the adaptations.
6. Animal association – Parasitism, Mutualism and Commensalism.
7. Study of endangered fauna relevant to India.
8. Spotters – Secchi disc, pH meter, Maximum Minimum thermometer, Hygrometer, Rain gauge.
9. Field Visits
 - a. Drinking water treatment plant-Kilpauk water works.
 - b. Effluent treatment – CETP – Pallavaram.
 - c. Sewage treatment – Koyambedu.
 - d. Visit to wild life sanctuary (Guindy National Park)/biosphere reserve

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14**Syllabus for M.Sc Zoology effective from the year 2011-2012****Year: II year****Semester: III****Title: PRACTICAL VI ANIMAL PHYSIOLOGY, BIOCHEMISTRY AND
IMMUNOLOGY****Sub. Code PZP36****Credits: 3****Max. Marks. 100****ANIMAL PHYSIOLOGY**

1. Estimation of RQ in fish.
2. Oxygen Consumption in a terrestrial animal (Cockroach).
3. Salt loss and Salt gain in fish.
4. Determination of bleeding time, clotting time.
5. SPOTTERS
Sphygmomanometer, Kymograph, Haemoglobinometer, ESR.

BIOCHEMISTRY

1. Enzyme kinetics – Salivary amylase, Maltose standard, influence of enzyme concentration, time course, pH, temperature, substrate concentration.
2. Qualitative analysis of urine – protein, glucose and ketone bodies.
3. Chromatography: Determination of amino acids in body fluids and tissue of Frog.
4. Quantitative estimation of glucose, protein, cholesterol and urea (using kits).

IMMUNOLOGY

1. Anatomy of Lymphoid organs in Rat/Fish
2. Histology of lymphoid organs – Bone marrow, Thymus, Spleen, Lymph node.
3. Identification of Various immune cell types in peripheral blood smear
4. ABO and Rh blood group in man

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14
Syllabus for M.Sc Zoology effective from the year 2011-2012

Year: II year

Semester: III

**Title: ELECTIVE –III, CLINICAL MICROBIOLOGY AND LABORATORY
 TECHNOLOGY**

Sub. Code PZ311

Credits: 3

Max. Marks. 100

UNIT I

Structure of prokaryotes and Eukaryotes; ultrastructure of virus, bacteria and fungi; sterilization – types and applications; antibiotics, test for antibiotic sensitivity.

UNIT II

Culture techniques – Media preparations; aerobic and anaerobic culture; staining – simple, Grams and acid fast.

UNIT III

Clinical laboratory – functional components, basic plan, records and reports; laboratory instruments, glasswares and their maintenance.

Phlebotomy – determination of bleeding and clotting time, haemoglobin, total count of RBC and WBC, differential count of WBC.

UNIT IV

Analysis of urine, stools and semen; blood smear for identification of malarial parasites and microfilaria; serological tests – VDRL, WIDAL and pregnancy test.

UNIT V

Estimation of blood sugar, urea, total proteins and cholesterol; Laboratory safety and hygiene, first aid, disposal of biomedical wastes, Good laboratory practises.

MICROBIOLOGY

Reference books

- Pelczer M.J, Chan ECS, King N.R. (1979) Microbiology Concepts and Applications. Mc Graw – Hill, Inc, Ny.
- Atlas R.M & Bartha (1997). Principles of Microbiology, WBC Publishers.

LABORATORY TECHNOLOGY

Reference books

- Ramnik Sood (2003). Medical laboratory technology – Methods and interpretations. Jaypee Bros. Medical Publ. (P) Ltd; New Delhi.
- Kanai, L. Mukherjee (1988). Medical laboratory technology vol. I, II and III. Tata-McGraw Hill Publ. Co (Ltd).

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14**Syllabus for M.Sc Zoology effective from the year 2011-2012****Year: II year****Semester:IV****Title: PAPER – X FISHERY BIOLOGY AND AQUACULTURE Sub. Code PZ312****Credits: 4****Max. Marks. 100****UNIT I**

Classification (upto order level) and Bionomics of Indian major carps and economically important marine fishes.

UNIT II

Role of hormones in fish reproduction – maturity stages; morphological and histological observation of gonads; cryopreservation; Age determination; Length – weight relationship; Condition factor; Tagging methods; preservation and processing; fish by-products.

UNIT III

Aquaculture – types of ponds- site selection – soil quality – construction of ponds; water quality management in aquaculture; Control of predators and weeds in culture ponds; feed – types of feed, feeding methods; procurement of seed; Transport, stocking, harvesting and marketing. Fish farm implements

UNIT IV

Hatchery technology and induced breeding of major carps; culture of live feed (Artemia, Rotifers and copepods); Fish and shell fish diseases-causes ,symptoms and control.

UNIT V

Biology and culture of ornamental fishes; culture of sea weeds, pearl oyster and brackish water fish; prawn culture; activities of CIBA, CMFRI, CIFRI and CIFE.

Reference books

- Jhingran, C.G., (1981). Fish and Fisheries of India. Hindustan Publishing Co. India.
- Santhanam, R. (1990). Fisheries Science Daya Publishing House New Delhi.
- Baluyut, E.A. (1989). Aquaculture system and Practices. A selected review Publishing House, New Delhi.
- Paul Raj, S. (ed.) (1996) Aquaculture for 2000 A.D. Palani Paramount Publications, Palani, Tamil Nadu.

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14**Syllabus for M.Sc Zoology effective from the year 2011-2012****Year: II year****Semester: IV****Title: PAPER – XI BIOPHYSICS AND BIO-INSTRUMENTATION****Sub. Code PZ313****Credits: 4****Max. Marks. 100****UNIT I**

Structure of atoms, molecules and chemical bonds.

Stablizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc).

UNIT II

pH, buffer

Reaction kinetics: Exergonic and Endergonic reactions. Rate of reactions – Effect of temperature on reactions – Energy of Activation – Arrhenius expression. Oxidation and reduction reactions – redox potentials in biological system.

Thermodynamics: Laws of Thermodynamics – concepts of free energy and entropy.

BIOINSTRUMENTATION**UNIT III**

Microscopy: Resolving power; Principle and uses of Compound microscope, Phase contrast; Flourescent; scanning and transmission electron microscopes.

UNIT IV

Principles and uses of pH meter; Colorimetry; spectrophotometry: visible and ultraviolet (UV); NMR spectroscopy; MRI; ECG; CAT; PET; X-ray diffraction.

UNIT V

Radio isotopes and autoradiography.

Electrophoresis: Instrumentation and the support media; proteins separation by sodium dodecyl sulphate – polyacrylamide gel electrophoresis (SDS-PAGE); separation of DNA by Agarose gel electrophoresis.

BIOPHYSICS

Reference books

- Palanichamy, S and Shanmugavelu, M. (1991) Principles of Biophysics. Palani Paramount Publication, T.N
- Pattabhi, V and Gautham, N. (2001) Biophysics. Narosa publication, T.N.
- Bose, S. (1982) Elementary Biophysics. Jyoth Books.
- Burns, D. M. & MacDonald, S.G.G. (1979) Physics for Biology and Premedical Students. Elbs and Addisson – Wesley Publishers Ltd., London.
- Casey, E.J. (1962) Biophysics concepts and Mechanism. Affiliated East – West Press Pvt. Ltd., New Delhi.

BIOINSTRUMENTATION

Reference books

- Gurumani, N. 2006. Research methodology for biological science. MJP Publishers, Chennai.
- Jain, J.L., Jain, S. and Jain, N. 2006. Biochemistry. S. Chand & Co. Ltd, New Delhi.

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14**Syllabus for M.Sc Zoology effective from the year 2011-2012****Year: II year****Semester: IV****Title: PRACTICAL VII FISHERY BIOLOGY AND AQUACULTURE
Sub. Code PZP47****Credits: 3****Max. Marks. 100**

1. Study of Fish morphology and anatomy – Morphometric and meristic characters.
2. Identification of ten economically important fresh water, marine and brackish water species belonging to different families – use of manuals – Day's volumes.
3. Observation of gonads – morphological and histological – GSI.
4. Gut content analysis – Planktivorous, herbivorous and carnivorous fishes.
5. Fish by-products.
6. Identification of cultivable Prawns, Pearl Oyster and Sea weeds.
7. Observation of gears and crafts – models or photographs.
8. Observation of fish parasites.
9. Observation of eggs and larva of fishes and larval stages of Prawn.
10. Identification of live feed- *Artemia*, Rotifer, Copepods.
11. Visit to hatchery – aqua farms – fish landing centers – fishery institutes – report to be submitted.

THE NEW COLLEGE (AUTONOMOUS), CHENNAI – 14
Syllabus for M.Sc Zoology effective from the year 2011-2012

Year: II year

Semester: IV

Title: ELECTIVE –IV TEACHING METHODS IN ZOOLOGY Sub. Code PZ314

Credits: 3

Max. Marks. 100

UNIT I

Introduction:

Nature and Scope of Zoology, Modern times – trends in teaching life sciences – aims and objectives with reference to Bloom's taxonomy – teaching Zoology at different levels.

UNIT II

Microteaching & Lesson Planning:

Teaching skills – demonstration – explaining – Black board writing – skills of stimulus variation – questioning – uses of aids and reinforcement. Principles of lesson planning – its importance – approach to lesson plan – planning for specific behavioral changes.

UNIT III

Education Technology:

Traditional: Importance of aids in teaching – Principles and preparation of charts, pictures, models objects, specimen, transparencies, audio and video tapes – magnifying equipments like microscopes; preservation of zoological specimens – aquarium, museum – setting up a lab.

Modern Technology: Flow chart – computer aided learning – internet search – use of multimedia.

UNIT IV

Methods of teaching:

General methods of Teaching: Lecture – Lecture cum demonstration – practical project – Power Point presentation – Seminars – group discussion – field trip – organizing seminars and symposia.

UNIT V

Evaluation:

Achievement tools – Preparation of question paper – essay type, objective and short answers – blue print of question paper – construction and use of tests – statistical analysis of results and performance – diagnostic test – remedial measures – teaching and student evaluation.

Reference books

- Venugopal, G. and Nithyasri. N. 2005. Teaching of Biology, Ram publishers
- Sharma R.C. and Shukla C.S. 2003. Modern Science Teaching. Dhanpatrai Publishing Company, New Delhi.