

**Madras Christian College(Autonomous)
East Tambaram, Chennai 600059
Department of Zoology
M.Phil. ZOOLOGY - Syllabus**

**CBCS Curriculum for students admitted from 2008- 2009
onwards)**

MADRAS CHRISTIAN COLLEGE
(Autonomous) DEPARTMENT OF ZOOLOGY
M.Phil. CURRICULUM
(for students admitted from 2008-'09 onwards)

Papers	Title
1.	Research Methodology
2.	Recent Advances in Zoology
3.	Optional: 1. Bioinformatics
	2. Reproductive Endocrinology
	3. Entomology
	4. Invertebrate Reproduction
	5. Animal Behaviour
	6. Fish Biology

(vi) - SEMESTER I – PAPER-1: MAJOR

RESEARCH METHODOLOGY

1. RESEARCH :
Writing a research paper – style of scientific writing – Bibliography
2. CHROMATOGRAPHY:
Principles and procedures – Unidimensional and two dimensional - paper , thin layer and gas chromatograph
3. HISTOCHEMISTRY:
Micro techniques, identification of carbohydrates, fats and proteins
4. ELECTROPHORESIS:
Principles – buffers – preparation of materials. Types of electrophoresis and two dimensional electrophoresis
5. BIostatistics :
Frequency distribution – class intervals - class limits. General rule for forming frequency distribution. Histogram – frequency, Relative frequency distribution, Cumulative frequency distribution, Types of frequency curves. Statistics vs Biology Population and sample, continuous discontinuous variables, Scientific notation, graphic representation of data. Mean mode and median – other measures of central tendency Standard deviation and related measures. Coefficient elements of probability. Tests of hypothesis and significance. Chi square test, t-test, Regression and correlation ANOVA, Analysis of variance – parametric and non-parametric.
6. MICROSCOPY AND PHOTOMICROGRAPHY :
Types of microscope – Fluorescent and Electron microscopy – Micrometer – Camera lucida – elements of photography and microphotography
7. COLORIMETRY AND SPECTROPHOTOMETRY:
General consideration – quantitative estimation of biological compounds in body fluids and tissues
8. RADIOISOTOPES:
Tracer experiments – Autoradiography – different forms of Counters and laboratory safety.

Reference Books:

1. Anderson ,J.B.H.,Durstun and M.Poole 1970.Thesis and Assignment writing.Wiley Eastern Pvt.Ltd.,New Delhi.
2. Atkins.H.J.B.,1960.Tools of biological research (Second Series).Blackwell Scientific Pub.,oxford.
3. Bradshaw,L.J.,1966.Introduction to molecular biological techniques.Prentice Hall Inc., New Jersey.Casartelli.,1965.Microscopy for students.McGraw Hill,New Delhi.
4. Hawk,P.B.,B.C.Oset and W.H.Sommerson,1954,Practical Physiological Chemistry.Mc Graw Hill,New York.
5. Homason,G.L.,1967 Animal Tissue Techniques.W.H.Freeman and Company,London.
6. Newman,D.W.(Ed.),1964.Instrumental Methods of Experimental Biology.MacMillan Co.,New York.
7. Pearse,A.C.E.,1974.Histochemistry,Theoretical and applied .Vol I&II. J.& A .C hurchill Ltd.,London.Scheffler,W.C.,1969.Statistics for the Biological Sciences.
8. Smith,R.C.,1962.Guide to the Literature to the Zoological Sciences.Burgan Publishing Co.,Minnesota.
9. Whitnay,F.L.,1950.The Elements of Research.

**M.Phil (vi) - SEMESTER I – PAPER-2: MAJOR
RECENT ADVANCES IN ZOOLOGY**

1. Conservation of natural resources
2. Energy of Biological origin and energy Crisis.
3. Population problem and control.
4. Pollution and control measures
- 5 GENETIC ENGINEERING: techniques and implications
6. HUMAN GENETICS Non-disjunction and its effect – Structural variation and its effects
7. INTEGRATED PEST CONTROL PROGRAMMES for paddy and sugar cane
8. CELL AND TISSUE CULTURE
9. Numerical Taxonomy and principles
10. Biochemical Taxonomy – Trends
11. Aquaculture – Cultivable organisms in India – technology adopted
12. Recent advances in Carcinogenesis

Bioinformatics

Introduction to Bioinformatics. Aims and Tasks. Applications and Research, Information Retrieval System.

I. Molecular Biology

Introduction. Gene structure Central Dogma hypothesis. Protein structure and Functions. Recombinant DNA technology. Molecular Biology Techniques: Gel Electrophoresis, DNA Sequencing. Protein Sequencing.

II. Bioinformatics Tools and Databases

Genomics and Proteomics Sequence Alignment and Analysis. Nucleic acid and Protein Sequence Databases: Structure Databases. Enzyme, Metabolic Pathway Databases. Literature Databases Data submission Tools, Data Analysis and Prediction Tools

III Homology, Phylogeny and Evolutionary Trees

Homology and similarity, Phylogeny and relationships, Approaches used in Phylogenetic analysis, Molecular approaches to Phylogeny, Phylogenetic analysis databases, Hidden Markov Models for homology modeling.

IV. Microarray Technology

Basic concepts- concept of gene expression. Making Microarray- sample preparation, hybridization Image acquisition. Prediction of cross hybridization, Image processing. Measuring and quantifying Microarray variability.

V. Drug Discovery and Pharmacoinformatics

Review of basic biological concepts, Characteristics of a drug compound. Discovering a drug. Target identification and validation. Identifying the lead Compound. Optimization of Lead compound. Structure based drug design. Molecular docking

Reference Books:

1. Basic Bioinformatics 2005, S.Ignacimuthu, s.j.
Narosa Publishing House
2. Introduction to Bioinformatics (Fourth Edition) - 2003
T.K. Attwood & D.J. Parry- Smith, Pearson Education (Singapore) Pvt. Ltd.
3. Introduction to Bioinformatics 2003
Arthur M. Lesk , Oxford University Press
4. Bioinformatics- Methods and Applications- Genomics, Proteomics & Drug Discovery- 2005
S.C. Rastogi, N. Mendiratta & P. Rastogi , Prentice Hall of India Private Ltd.
5. Bioinformatics- Databases and Algorithms - 2006
N. Gautham - Narosa Publishing House
6. Discovering Genomics, Proteomics & Bioinformatics- 2003
A. Malcolm Campbell & Laurie J. Heyer, Pearson Education (Singapore) Pvt. Ltd.
7. Bioinformatics- Managing Scientific Data- 2003
Zoe Lacroix & Terence Critchlow, Morgan Kaufmann Publishers.

1. Nature of hormones and hormone action
2. Genetic control of synthesis of hormones.
3. Hypothalamus-hypophysial axis and regulatory mechanism
4. Hypophysial and gonadal interrelationship
5. Gonadal development and sexual differentiation
6. Assay of hormones
7. Regulation of fertility
8. Pregnancy and lactation and its impact on endocrine function
9. Disorders of gonadal function
10. Metabolism in relation to reproduction role of adrenal and thyroid glands in reproduction.

I.PHYSIOLOGY:

Insectan integument –hormones and metamorphosis,insect digestion,circulation
respiration ,excretion,co-ordination and reproduction.

II FORENSIC ENTOMOLOGY:

Scope and Applications.

III.BIOCHEMICAL ANALYSIS:

Involving insect host –plant relationship.

IV.INSECT POPULATION ANALYSIS:

In various habitats .impact of host plants on the reproductive efficiency of the insects. Insect life tables. Modern control measures. Hazards of insecticides-resurgence and secondary outbreak. Biology –nature, extent of damage and control of pests of rice, sugarcane, cotton, fruit trees like mango, orange, banana, grapes-vegetables like brinjal, ladies finger ,etc., groundnut, coconut, -plantation crops like tea and coffee. Host –Parasite-Predator interactions-dynamics-impact on population –Biological control.

Reference Books:

1. Fauna of british India Volumes on insects.
2. Geological history and evolution of insects-1953 Scientific American 41,carpenter.
3. Annual Review of entomology Vol 1 to 20
4. Physiology of insect reproduction-Engelmann.
5. Insect endocrinology- K.K.Nayyar.
6. Insect Physiology- Wigglesworth.
7. Introduction to the study of insects- Borror and Delong.
8. Indian Insect Life-Lefroy.
9. Destructive and useful insects- Borror and Delong.
10. Economic entomology-David and Kumarasamy.
11. Insect structure and function-Chapman.
12. General and applied entomology-Nayyar,Ananthakrishnan,David.
13. General Text Book of Entomology-A.D.Imms
14. General Text Book of Entomology – M.S.Mani
15. Ecology of insects-P.W.Price.
16. Annual review of Entomology-1985.

M.Phil (vi) - SEMESTER I – OPTIONAL

INVERTEBRATE REPRODUCTION

1. Introduction to reproductive biology
2. Reproductive organs in invertebrates.
3. Spermatogenesis and oogenesis.
4. Methods of sperm discharge and insemination, fertilization
5. Patterns of reproduction:
Parthenogenesis, asexual reproduction, sexual reproduction, hermaphroditism and sex reversal.
6. Environmental factors and reproduction
Salinity, humidity, temperature, photoperiod, oxygen and diapause
7. Endocrine control of production
8. Pheromones and reproduction
9. Invertebrate larvae
10. Metamorphosis
11. Sexual behaviour.

Reference Books:

1. K.K.Nayar, 1977. Invertebrate reproduction. Oxford & IBH Publishing Co.
2. Giese, A.C and Pearse, J.S., 1974. Reproduction of marine Invertebrates Vols. I, II, III. Academic Press Inc., New York.
3. Wigglesworth, V.B., 1954. The Biochemistry of Development . Pergamon Press, Oxford.
4. Danilevski, A.S., Photoperiodism and Sexual Development in insects. Oliver and Boyd, Edinburgh.
5. Counce, S.J., 1972. In Development Systems: Insects. Academic Press, Oxford.
6. Engleman, F., 1970. The Physiology of insect Reproduction. Pergamon Press, Oxford.
7. Jacobson, M., 1972. Insect Sex Pheromones. Academic Press, New York.
8. Fischer, A and Pfannenstiel, H.D., 1984. Polychaete Reproduction . Gustav F. Verlag, New York.
9. Dorothy E. Bliss, 1983. The Biology of Crustacea. Academic Press.
10. J.M.B.A India . Proceedings of the symposium on Mollusca Part I
11. J.M.B.A India . Proceedings of the symposium on Mollusca Part II.

M.Phil (vi) - SEMESTER I – OPTIONAL

ANIMAL BEHAVIOUR

I.SOCIAL BEHAVIOUR PATTERNS:

1. Means of communication-sound-odour-vision
2. Colonial life –groups-among invertebrates-vertebrates
3. Aggressive behaviour
4. Courtship behaviour
5. Orientation-tropisms-kinesis-taxes-homing
6. Human behaviour –action-gestures.
7. Brain and behaviour

II.RHYTHMIC BEHAVIOURAL PATTERNS:

1. Various categories of rhythms in nature-plant examples-animals-human.
2. Endogenous nature of rhythms-terminology used-zeitgeber-Entrainment and free run features.
3. Daily and circadian rhythms-their features-significance.
4. Lunar –tidal rhythms-rhythm in marine animals-characteristics-significance.
5. Annual rhythms-protoperiodicity-circannual rhythms-migration-hibernation.
6. Biological clocks-biochemical and physiological aspects –significance of endocrine hormones-location of the clocks.
7. Human rhythm-shift working –time zone transition-astronautics-applied aspects in psychiatry, pharmacology, medicine, surgery.

M.Phil (vi) - SEMESTER I – OPTIONAL

FISH BIOLOGY

1. Adaptive radiation in Chondrichthyes and Osteichthyes
2. Morphology and anatomy(all systems)
3. Food and feeding habits
4. Age and growth with special reference to Indian fishes.
5. Spawning and breeding with special reference to Indian fishes.
6. Parasites and diseases.
7. Hill stream fishes.
8. Exotic fishes
9. Larvicidal fishes.
10. Fish in nutrition
11. By –products
12. Taxonomy of commercial important freshwater, estuarine and marine fishes of india.
13. Bionomics of carps ,murrels,pearl spots,mulletts,milk fish,sharks and rays,sardines,mackerels,silver bellies,pomfrets and tunas.

Reference Books:

1. Bagenal, T.B., 1979. The Ageing of fish. Unwin Brothers Ltd., Gresham Press, England.
2. Colbert, E.C., 1969. Evolution of the Vertebrates. Wiley Eastern Ltd. New Delhi.
3. Holden, H.T and D.F.S. Rait, 1974. Manual of fisheries Science .Part I FAO Technical Paper No.115.
4. Jhingran, V.G., 1982 Fish and Fisheries of India. Hindustan Publishing Corporation (India), Delhi.
5. Lagler, K.F., J.E., Bordach and R.R. Miller, 1962. Ichthyology, the study of fishes. John Wiley and Sons Inc., USA.
6. Marshall, N.B., 1965. The Life of Fishes. Wiedenfield and Nicolson. London.
7. Norman, J.R., 1963 .History of Fishes Ernest Benn Ltd., London.
8. Pillay, T.V.R (Ed.), 1972. Coastal aquaculture in the Indo-Pacific Region. FAO, Rome, Italy.
9. Qasim, S.Z., 1973. Some Complication of the problem of age and growth in marine fishes from the Indian Waters. Indian J.Fish., 20(27): 351-371.