

BHARATHIAR UNIVERSITY : COIMBATORE – 641 046



M.Phil. / Ph.D. ZOOLOGY

PART 1 – SYLLABUS
(effective from the Academic year 2008-09 onwards)

PAPER - I – TEACHING TECHNIQUES/PEDAGOGICAL METHODS IN ZOOLOGY

PAPER – II – RESEARCH METHODOLOGY AND TRENDS IN ZOOLOGY

PAPER – III - 1. Human Genetics

2. Advances in insect Biology and Pest Management

3. Pollution Biology

4. Wildlife Ecology and Management

5. Environmental Physiology

6. Insect pests control and toxicology

7. Eco Toxicology

8. Limnology

9. Crustacean Endocrinology and Reproduction

10. Aquaculture and Fisheries .

BHARATHIAR UNIVERSITY: COIMBATORE – 641 046
PART - I – SYLLABUS
(effective from the Academic year 2008-09 onwards)

PAPER- I – TEACHING TECHNIQUES/PEDAGOGICAL METHODS IN ZOOLOGY

Objectives:

At the end of the course, the scholars will be able to

1. Understand the meaning, scope and concept of Education, Educational Technology, instructional Technology and Educational Evaluation.
2. Appreciated the contributions made by philosophers and psychologists to the field of education.
3. Review the relative effectiveness among the different methods and techniques of teaching and learning in Higher Education.
4. Discriminate among different types of tests meant for students' evaluation, diagnose the learning problems of the students and take remedial measures.
5. Be aware of the web based communication strategies for professional development and be benefited of the e-resources in Education.

Unit – I – Teaching Technology: Designs.

Teaching Technology: Meaning, concept and scope. Instructional Designs: Objective based, Skilled based, Competency based, Learning style based and Model based.

Unit – II – Methods and Techniques of Teaching

Large Group Techniques: Lecture, Modified Lecture, Seminar, Symposium, Panel Discussion, Team Teaching, Project Approach and Workshop. Small Group Techniques: Group Discussion, Simulation, Role Playing, Buzz Technique, Brain Storming, Case Discussion and Assignment. Systems Approach in Education.

Unit – III – Measurement and Evaluation in Education

Educational Evaluation: A Conceptual Frame work - Methods of Evaluation - Self Evaluation and Student Evaluation in Higher Education. Question Banking. Diagnostic Testing and Remedial Teaching.

Unit – IV – Biostatistics and Computer Application.

Biostatistics: Student 'T' test, Correlation co-efficient, Regression analysis, Chi-Square, 'F' test, ANOVA, Probit analysis.

Computer Application: Software application – Word, Excel, Power Point and e-learning, e-books, e-journals, web-based learning – access and teaching.

Unit – V – Research Methods and Thesis Writing:

Identification, selection and scope of research problems methods of literature collections and review – planning and execution of investigation – Thesis writing – preparation and preservation of research paper for journals, conferences – preparation of short communications and review articles

References:

- 1. Anderson, Dunston and Polle (1970). Thesis and Assignment Writing.** Wiley Eastern Limited.
- 2. Campbej, R.C. (1975). Statistics for Biologists.** Cambridge university Press.
- 3. Kumar, K.L. (1997). Educational Technology,** New Delhi: Age International (P) Ltd.
- 4. Rajasekar, S. (2005). Computer Education and Educational Computing,** Hyderabad: Neelkamal Publications.
- 5. Sampathkumar, K., Paneerselvam, A. and Santhanam, S. (1990). Introduction to Educational Technology,** New Delhi: Sterling Publishers (Pvt.) Ltd.
- 6. Tony Bates, A.W. (2005). Technology, e-Learning and Distance Education,** New York: Routledge.
- 7. Vedanayagam, E.G. (1989) Teaching Technology for College Teachers,** New Delhi: Sterling Publishers (P) Ltd.

BHARATHIAR UNIVERSITY: COIMBATORE – 641 046
PART - I – SYLLABUS
(effective from the Academic year 2008-09 onwards)

PAPER- II – RESEARCH METHODOLOGY AND TRENDS IN ZOOLOGY

UNIT I : PRINCIPLES AND APPLICATIONS

Electron Microscopy – UV Visible Spectrophotometer – Atomic Absorption Spectrophotometer- Ultra Centrifuge.

UNIT II : SEPARATION AND ANALYTICAL TECHNIQUES

HPLC, GLC, Slab Gel Electrophoresis (SDS) PAGE – Flow Cytometer – Auto Radiography, RIA.

UNIT II : CELLULAR IDENTIFICATION

Histological and Histochemical methods – Cryostat - Photomicrography

UNIT IV : CYTOGENETIC AND MICROBIOLOGICAL TECHNIQUES

Karyotyping and Idiogram – Fermentation Techniques – Gram staining- PCR – DNA Finger Printing – Biochips , Biosensor and BioMarkers – Immuno diffusion techniques .

UNIT V : WATER QUALITY ANALYSIS

Physical - Colour, Turbidity, pH, Conductivity, Temperature, Dissolved Oxygen
Chemical – BOD, COD, Alkalinity and Hazards
Biological – Saprozoic count- Total coliform- Fecal coliform .

References

1. Ajoy Paul. 2007. Cell and Molecular Biology , Books and allied (P) Ltd., Kolkatta.
2. Anderson, Durston & Polle 1970. Thesis and Assignment Writing, Wiley Eastern Ltd.,
3. Bier, 1959. Electrophoresis, theory , methods and applications, Academic Press, London, New York.
4. Block, R. I. Durram E. K. and Eweig, G. 1956. A manual of paper chromatography and electrophoresis, Academic Press, New York.
5. Chayan J & Butcher R. G. 1973. Practical histochemistry, Willey Interscience Publication, London.
6. Haftman. E, 1967. Chromatography. Reinhold publishing corporation, New York.
7. Jones R. M. 1966. Basic microscopic techniques, University of Chicago Press, Chicago.
8. Sharma and Sharma 1999. Cytogenetic Techniques.

BHARATHIAR UNIVERSITY: COIMBATORE – 641 046
PART - I – SYLLABUS
(effective from the Academic year 2008-09 onwards)

PAPER- III – HUMAN GENETICS

UNIT – I

Identification of human chromosome – characterization. Various banding techniques (G,C,Q,R). Designating structural chromosomal abnormalities by break points and band composition and sister chromatid exchange studies.

UNIT – II

Chromosomal syndromes; Autosomal abnormalities – Down syndrome, Edward syndrome, Patau syndrome, Cri – du chat syndrome. Sex chromosomal syndrome: Klinefelter's syndrome, Turners syndrome, Multiple XXX syndrome, XYY male. Prenatal diagnosis : Buccal smear test, Amniocentesis – chronic villi and fibroblast cultures

UNIT - III

Human biochemical Genetics – Inborn errors of metabolism – Aminoacids metabolism: Phenylketoneuria. Disorders of purine metabolism : Lesch Nyhan syndrome. Disorders of Carbohydrate metabolism – Galactosemia. Immunogenetics - Introduction to immune response – the cellular basis of immune response – Immune deficiency disorders.

UNIT - IV

Endocrine Genetics – General principles of hereditary diseases: Gene action in Endocrine gland. Pituitary – Diabetes Mellitus. Parathyroid - Hyperparathyroidism. Adrenal – congenital adrenal hyperplasia. Sexual development – testicular feminization syndrome, Male hypogonadism.

UNIT - V

Mutation: Types of mutations. Molecular basis of mutations. Genetic Engineering: gene manipulation – Techniques – cutting and joining DNA molecules. Cloning in E.Coli – Plasmids as cloning vehicle for use in E.Coli of cloned DNA. Cloning in organisms other than E.Coli – cloning in yeast. Application of recombinant DNA technology in biology and medicine.

REFERENCES:

1. Text book of Endocrinology – Robert H. Willams (1974 & 1985) W.B.Saunders's Co.,
2. Duncan's disease of Metabolism–P.K.Bondy &L.E. Rosenberg (1974) W.B.Saunders's Co.,
3. Vogel R & Rohrborn C (1970): Chemical mutagens in mammals and man– Springer – Verlag, Berlin.
4. Brusick, D (1980) : Principles of genetic toxicology – Plenum press.
5. Genetic Engineering & Biotechnology – V.L. Chopra and Auswar Nasim. Oxford & IBM Publishing Co., Pvt. Ltd ., New Delhi,1990.
6. Biotechnology – Keshav Trehan, Wiley Eastern Limited.New Delhi, 1990.
7. Reproductive Genetics & Law: Sherman Elias & George J.Annas year book Medical Publishers Inc., Chicago, 1987.
8. Human chromosomes – Orlando J.Miller, Eeva Therman - Springer Pub.(2001).
9. Principles of Medical Genetics – Thomas D. Gelehrter Francis S. Collins, Williams & Wilkins's IB.

PAPER- III – ADVANCES IN INSECT BIOLOGY AND PEST MANAGEMENT

UNIT-I

Biology : Overioles and testis follicles, their number in different orders and basic histomorphology male & female accessory, gland, their secretion and modes of sperm transfer and reception (spermatophores & spermathecae) viviparity & viviparous insects –factors regulating parthenogenesis and polymorphism with special reference to homoptera: isoptera and Hymenoptera.

UNIT-II

Ecology: Abiotic & Biotic factors in biology, Abundance & distribution of insect with special reference to diapause. Interspecific and intraspecific interaction with special reference to insect migration & pest outbreak. Insect life table and its application method of assessing insect pest / populations – plant resistance.

UNIT-III

Chemical control of insect Pest: Classification of insecticides, mode of action of insecticides- Mechanism of insecticides resistance: Chitin inhibition and their efficacy in pest management : recent trends in pesticide application technology.

UNIT-IV

Non-chemical control and insect pest : Dynamics of prey-predator interaction and host-parasite/parasitoid interaction-1 genetic and semi –chemical bases of insect pest control- Neurohormone Juvenoids and Ecdysoids in insect pest management.

UNIT-V

Integrated Pest Management(IPM):Principles of IPM programme its objectives, strategy and tactics ecological basis to pesticides application . System analysis .Recent trends in IPM.

References:

1. The ecology of insect population in theory and practice–Clark,L.R.Geiger, P.W.Hughes,R.D.and Morris ,R.F.
2. The Distribution and abundance of animals-Andrewarthan,H.G.and Brioh I.C.
3. Recent advances in Entomology in India-Ed.Ananthkrishnan T.N.
4. Biological control of Insect pests and Weeds –Paul e.Bach
5. Agricultural Insect pest of the tropics and their control-Hill,D.S.
6. New technology of pest control-Ed.C.B.Huggaker
7. Pesticides application methods –Mathews,G(1979).
8. Ecological effects of pesticides –Perring, F.H AND Mellamby k,(1979)
9. Pest management-G.M.Mathews(1984)
10. Basic principles of insect suppression and Management-E.F.Kipling(1979)
11. Migration and dispersal of insects by flight-C.G.Johnson
12. Insect Ecology-peter W.Price(1975)
13. Genetic control of insect pest-G.Davidson(1974)
14. Ecology of pesticides-A.W.A.Brown(1978)

15. Breeding plants resistance to insects- (1980)F.G.Max R.B.Jennings
16. Introduction to insect pest management(1971)R.L.Metcalf and W.h.Luckman.
17. Biological insect Suppression –(1977)H.C.Copal and J.W.Mertins
18. Insect pheromones –(1972)M.Jacobson
19. Chemical control of insect behaviour-(1977)Shorey H.Hand Kchelvy,J.J.
20. Ecological methods with particular reference to the study of insect population –TRE Southwood(1975)
21. Development and Physiology of the Oocyte- Nurse cell. Syncytium- Telter W.H.1975.advance in insect physiology Vol.II.
22. Insect Hormones-V.J.A.Novak 1975 Chamoman &Hall.
23. Physiology of insect reproduction- F.Englemann Pergamon press
24. Comparative insect physiology.Biochemistry and pharmacology –Vols.1&2&12-1985 Eds. G.A.Kerkut &L.I Gillbert pergamon press.

PAPER- III – POLLUTION BIOLOGY

UNIT – I

Environmental Xenobiotics- Source – Factors responsible for distribution – Accumulation and their effects on plants and animals

UNIT – II

Effect of environmental chemicals – Species diversity – Mutagenicity – Teratogenicity– Carcinogenicity.

UNIT - III

Toxicology – Synergism and Antagonism of ions – Bioassay of using animals – Effects of ecological factors of the aquatic medium on toxicity – Toxic substances of aquatic medium.

UNIT – IV

Ecotoxicology of terrestrial organisms – Effects of ecological conditions of terrestrial environment on toxicity – Evaluation of terrestrial toxicity by using soil invertebrates.

UNIT – V

Methodological problems of aquatic and terrestrial toxicity – Toxicological statistics– Environmental risk assessment.

REFERENCES:

1. Smith, J.M.1974. Models in Ecology, The Univrsity Cambridge.
2. Pitts, J. N. Jr. and Metcalf, R. L (Eds.) 1969. Advances in environmental sciences and Technology Vol.1.Wiley - Interscience.
3. Butler, G. C (ed) 1978. Principles of Ecotoxicology John Wiley and sons NewYork.
4. Moriathy, F.1975, Pollutions and animals A factual perspective Allen and Unwin, London.
5. Warren,C.E. 1971.Biology (and water pollution control W.B.Saunders.Co.,Philadelphia,U.S.A.
6. Llevins, R.1968. Evolution in changing Environment Princeton University Press.
7. Mastumura. F, 1980. Toxicolgy of insecticides plenum press - London.
8. Edwards, C. A. (ed) 1973. Environmental pollution by pesticides plenum press- London.
9. Stewart, C. P and A. Stalman (eds.) 1961. Toxicology- Mechanisms and Analytical methods Vols. II Academic press - London.
10. Suess, M. J. (ed) 1982. Examination of water for pollution control Vol. I. II and III Pergamon Press, New York.

11. Woodward, F. I. and Shely, J. E. 1983. Principles and measurements in environmental biology
Butler Worths - London.
12. Poole, R. W. 1974. An introduction to quantitative Ecology, McGraw Hill Book Co., Tokyo.
13. Smith R. Z. 1980. Ecology and field Biology Harper and Row Publication, New York.
14. Daviss, D. E. (ed) 1974. Behaviour as an ecological factors Hutchinson and Ross Inc. U. S. A.
15. Cairns, J. (ed) 1980. The recovery process in damaged ecosystems Ann Arbor Science, Inc.
Ann. Arbor Michigan.
16. Metelva, V. V., Kanaev, A. I. and Dzasohova, N. G. 1971. Water Toxicology, Amerind
Publishing Co., New Delhi.
17. Principles of Environmental Science, (ed) William P. Cunningham, 2007. The McGraw-Hill
Companies. New York
18. Basic Toxicology by LU,

PAPER III: WILDLIFE ECOLOGY AND MANAGEMENT

UNIT-I: SYSTEMATIC BIOLOGY

Taxonomy; Species concept- theories; Speciation; New species description - assessment techniques, evaluation; Importance of taxonomy; International Code for Zoological Nomenclature (ICZN).

UNIT- II: BIODIVERSITY

Biodiversity - kinds of biodiversity; Biogeography - continental shift, zoogeography, biodiversity hot-spots, endemism; Biodiversity assessment; Endangered species - Indian Wildlife Protection Act 1972, International Red list species, IUCN criteria, concept and assessment.

UNIT- III: FIELD SAMPLING TECHNIQUES

Population estimation - concept, line transect, circular plot, quadrat sampling; Animal trapping techniques - pitfall, funnel, Sherman traps; Marking and recapture techniques; Use of indirect evidences in species inventory; Basic methods in behavioral and food habit studies; Wildlife management techniques.

UNIT- IV: ECOSYSTEM SERVICES

Animal plant interactions - pollinators, seed dispersal, biological pest control, vector; Wildlife products - food, medicine, germplasm, domestication; Ecological balance - prey predator relationship, herbivory and scavengers.

UNIT-V: MAN AND BIODIVERSITY

Development projects - River valley, mines, power projects; Impact assessment - methodology, GIS tools; Ill effects of pesticides; Bioaccumulation; biomarkers; Pollution Control Boards(PCBs), regulations, standards; Conservation laws - wildlife, forest, water and biodiversity.

References :

- 1.Andrewartha, H.G. and L.C. Brich 1984. The Ecological Web – More on the distribution and abundance of animals. The University of Chicago.506 p.
- 2.Anon, 2000. Environmental Laws of India – An Introduction. C.P.R. Environmental Education Centre, Chennai. 76p.
- 3.Anon, 2004. Indian Wildlife Protection Act 1972. Nataraj Publishers, Dehra Dhun.104 p.
- 4.Bibby, C. J., N. D. Burgess and D. A. Hill (1992). Bird census techniques. British Trust for Ornithology and the Royal Society for the Protection of Birds. Academic Press, London. pp. 66-84.
- 5.Cody, M.E. and J.M. Diamond 1975. Ecology and Evolution of Communities. Harvard University Press. Cambridge. 545p.
- 6.De, A.K.1996. Environmental Chemistry. New Age International (P) Limited, New Delhi.364P.

7. Gaston, K.J. 1996. Biodiversity – A Biology of Numbers and Difference. Blackwell Science, Oxford. 396p.
8. Giles, H. 1984. Wildlife Management Techniques. Nataraj Publishers, Dehra Dun.
9. Gopal, R. 1992. Fundamentals of Wildlife Management. Justice Home. Allahabad. 668p.
10. Handa, S.K. 1999. Principles of Pesticide Chemistry. Agrobios Publishers, Jodhpur. 309p.
11. Heyer, W.R. et al 1994. Measuring and Monitoring Biological Diversity, Standard methods for Amphibians. Smithsonian Institution Press. Washington. 364p.
12. Huffaker, C.B. AND A.P. Gutierrez 1999. Ecological Entomology. John Wiley and Sons, New York. 756p.
13. International Commission of Zoological Nomenclature 1999. International Code for Zoological Nomenclature. 4th Edition. International Trust for Zoological Nomenclature, London. 306p.
14. Kamrin, M.A. 1997. Pesticide Profiles. CRC Press. USA. 676P.
15. Kikkawa, J. and D.J. Anderson 1986. Community Ecology. Pattern and Process. Blackwell Scientific Publications, Oxford. 432p.
16. Michael, P. 1984. Ecological Methods for Field and Laboratory Investigations. Tata McGraw-Hill Publishing Co. Ltd., New Delhi. 404p.
17. Odum, E.P. 1996. Fundamentals of Ecology. Nataraj Publishers, Dehra Dun. 574p.
18. Rodgers, W.A. and H.S. Panwar 1998. Planning a Protected Area Network in India. Wildlife Institute of India, Dehra Dun.
19. Southwood, T.R.E and P.A. Henderson 2000. Ecological Methods. Blackwell Science. Oxford. 575p.

PAPER- III – ENVIRONMENTAL PHYSIOLOGY

UNIT – I : ENVIRONMENT

Major biomes with references to India – Renewable and Non renewable resources – Physico chemical aspects of rivers, estuaries and terrestrial environment – Problems of water pollution in India.

UNIT – II : ENERGETICS

Plant animal interaction and suitability of the environment – Ecological energetics : Food chain, food webs, energy transfer through trophic chains and ecological efficiencies in aquatic ecosystems. Plant microbial interaction – Physiological adaptations of animals to the limiting factors – oxygen, pressure, temperature and light.

UNIT – III : MONITORING OF POLLUTION

Solid, sewage effluents – their resources, disposals and their treatment, recycling of waste water. Toxic inorganic and other constituents affecting water quality – such as colour, turbidity, BOD, COD, alkalinity and hardness, TSS, chlorinity – their estimations and their levels on monitoring water pollution. Exposure to pollutants and risk assessment. exposure assessment, etc., assessing carcinogenic and non carcinogenic risk. Eutrophication and problems of weeds and their control.

UNIT-IV : DYNAMICS OF POLLUTANTS

Absorbtion,distribution and excretion of toxic substances. Biodegradation of organic compounds such as pesticides, heavy metals and toxic organics on biological systems. Food intoxication by pollutants and microbes; food spoilage, diseases, food preservation processes.

UNIT – V :INDUSTRIAL APPLICATIONS OF MICROBES

Microbes in the synthesis of aminoacids, organic acids & antibiotics – microbial insecticides, biopolymers and biosensors – Microbial role in bioleaching and recovery of minerals and metals. Plant biomass to fuels – Biodegradation management.

REFERENCES:

1. Alabaster and Lloyd., Water quality criteria for freshwater fish
2. Alison Leadlay Brown.,1971.Ecology of freshwater.,Heineman Educational Books Ltd ., London.
3. Allen, H. Benton and W.E. Warner ., 1976, Field Biology and Ecology,Tata Mc. Graw Hill Publi.co ., NewDelhi.
4. Bell Davidson and Emglie Smith. Text book of physiology.

5. Brown, A.W.A., Ecology of pesticides.
6. Butler,G.C (Ed.) Principles of Ecotoxicology, Johnwiley and sons, Newyork.
7. Dara, S.S., A text book of Environmental chemistry and pollution control.
8. Eckert, R., and D.Randall.,1983. Animal physiology.II Edition W.H. Freeman and co.
9. Frederic,W. Oeheme and Marcel Dekker (Ed) Toxicology of Heavy metals in the Environment. Part I & II, IVC, Newyork.
10. Goel,P.K., Water pollution,causes,effects & control.
11. Hoar,W.S.1983.General and comparative animal physiology.III.Edition., Prentice Hall IWC.
12. Hutchinson, G.E.1978. An introduction to population ecology., Yale Univ.press, New Haven.,CT.USA.
13. John Vernberg and N.Hernberg ., Pollution and Physiology of Marine organisms.
14. Kannan, K., Fundamentals of Environment pollution.
15. Matsumura, F., 1980.Toxicology of Insecticides. Plenum Press, London.
16. Monney,H.A. and M.Goddon, 1983. Disturbances and Ecosystems., Springer verlag, New york.
17. Nebel ., 1987. Environmental Sciences. The way world works: II. Ed. Prentice Hall Iunc ., Englewood, cliffs, Newjersy.
18. Philips,J.G.1975. Enviroment Sciences, The way world works: II. Ed. Prentice Hall Iunc., Englewood,Cliffs,Newjerse.
19. Prosser,C.L., (Ed) 1973, Comparative Animal Physiology,W.B.S.Aunder co.,
20. Ralph Mitchell.1972. Water pollution Microbiology,John willey & sons,INC,New York.
21. Robert Lew smith,1977. Elements of Ecology and Field Biology., Harper and Row Publ., New York., London
22. Satake, M., *et al.*, Environment Toxicology.

PAPER- III – INSECT PEST CONTROL AND TOXICOLOGY

UNIT – I

Insect pests, Types of Damage to plants y insects, pest surveillance and forecasting pest outbreak, Assessment of Insect population, Estimation of Damage Caused by insect pests to crops.

UNIT – II

Insect pest control - Natural control – Biological methods, Microbial methods, chemical methods, Chemosterilant, Insect attractants, repellents, antifeedants, Integrated pest controls.

UNIT – III

Insecticides, Insecticides formulations, Classifications, Mode of action, Inorganic insecticides, Organic Insecticides, Insecticides of plant origin.

UNIT – IV

Principles of toxicology of insecticides, General bioassay of pesticides, Insecticides residues, Resistance of Insecticides, Factors influencing effectiveness of insecticides..

UNIT – V

Statistics of Toxicology : Median Lethal Dose – Behren's methods, Graphical methods, Rapid approximate method by Huson, Finney Method, Abbott's methods.

REFERENCES:

1. Destructive and Useful Insects. Their habits and control, Metcalf, C.L. and Flint, W.P. (1967).
2. General and Applied Entomology. Nayyar, K.K. Ananthkrishnan, T.N. and David B.V (1976).
3. Pest managements, Mathews, G (1979).
4. Toxicology of Insecticides Matsumura (1985).
5. Statistics workbook for Insecticide Toxicology. Regupathy, A and Dhamu, K.P. (1990).
6. The scientific principles of crop protection. Martin, H.
7. Neem for Management of crop disease (Ed) .Mariappan, V
8. Neem and Environment ., Vol I & II (Ed) Singh, P.P. Chari, M.S ., Raheja , A.K and Kraws , W. (Year).

9. Elements of Economic Entomology. Vasantharaj David, B and Kumarasamy T (1998).
10. Agricultural Insect Pests of tropics and their control .Hill.D.S.
11. New technology of Pest control. Ed .,C.B . Huggakers.
Contd.,
12. Pesticide application methods – Matthews, G (1979).
13. New technology of Pest control. Ed .,C.B . Huggakers.
14. Pest Management. G.M Mathews (1984).

PAPER- III – ECOTOXICOLOGY

UNIT – I

Importance and scope of eco toxicology – present environment status – water, air and land pollution – Bioaccumulation – Biomagnification – Biodegradation. Bio transformations of pollutants – Environment mutagens and carcinogens – water borne pathogens and disease.

UNIT – II

Water, soil and biological analyses for pollution study – insecticides – heavy metals – industrial effluents – sewage – mode of action of xenobiotics - entry, absorption distribution excretion and metabolism.

UNIT – III

Toxicity of pollutants – safety evaluation – acute and chronic toxicity – Bioassays (LC50/LD50 determination) – selection of test animals – probit analysis – Dose response – behavioural aspects. Mouth patterns- histopathology with reference to toxicology.

UNIT- IV

Impact of pollutants on physiology of organisms – Feeding energetics (rate of food intake, digestion, absorption, assimilation and metabolism) haemopoiesis and hematology and oxygen consumption in fishes – Biochemical constituents – activity levels of different enzymes – xenobiotics and nervous systems.

UNIT- V

Environment monitoring of pollutants – Environmental pollutions with special reference to inland fisheries – techniques for residual analysis – water quality standards and recycling procedures.

PAPER- III – LIMNOLOGY

UNIT : I

- A. Origin of lakes , ponds and estuaries
- B. Classification of lentic and lotic environments.

UNIT – II

- a. Physico-Chemical characters of ponds, lakes and rivers.
- b. Characteristic of estuarine environment.

UNIT – III

- a. Productivity and energy flow in the freshwater environment
- b. Cycling of nutrients in the freshwater environment.

UNIT – IV

- C. Pollution of the Freshwater environment and its effects on organisms.
- D. Water born pathogens and diseases.

UNIT – V

- a. A general study of freshwater organisms (Plankton, Nekton, & Benthos)
- b. Freshwater fisheries of India
- c. Major carps of India and recent trends in their culture practices.

REFERENCES

1. Limnology Charles R. Goldman and Alexender J. Horns 1983, McGraw Hill International Book Co., New Delhi.
2. Elements of ecology and Field Biology, Robert Lew Smith, 1977, Harper and Row Publishers, New York, London.
3. Environmental Protection , Emil T. Chanlett, 1973, McGraw Hill Co., New Delhi.
4. Field Biology and ecology. Allend H. Benton andf Willilmn, E. Warner Jr. 1976. Tata McGraw Hill Publishing Co., New Delhi.
5. Modern concepts of ecology H.D. Kumar 1997. Vikas Publishing House Pvt. Ltd., New Delhi.
6. Ecology of Freshwater, Alison Leadlay Brown 1971. Heinemann Educational Books Ltd, London.
7. Introduction to Ecology, Papul A. Colinvaux, 1978 John Wiley and Sons, Inc. New York.
8. Environmental Pollution, Mastumura, M. 1972 Academic Press, London.
9. Sewage Pollution Microbiology, Ralph Mitchell, 1972. John Wiley & Sons, Inc, New York, London.
10. An Introduction to freshwater Organisms, A. Tonapi
11. Fish and Fisheries of India. V. G. Jhingram, 1980 Hindustan Publishing Co.,New Delhi.

Contd.,

12. Fish and Fisheries of India, Jingran, VG. (Ed.), Hindustan Publishing Corporation, New Delhi.
13. Arthropoda Crustacea, In: Reproductive Biology of Invertebrates, Adiyodi K.G & Adiyodi, R.G. (Ed.), Wiley.
14. Chemical Contamination in the Human Environment, Lippman, M & Schles Esger, R.B. (Ed.), Oxford Press.
15. Toxicology Testing Handbook, Jacobson-Kram, D & Keller, K.A. (Ed.), Dekker Inc.
16. Environmental Chemistry, 7th edition, Manahan, S.E (Ed.), Lewis Publishers
17. Handbook of Eco-toxicology, Holfman, D.J., Rattner, B.A., Burton (jr.), G.A., & Cairns (jr.), J. (Eds.), Lewis Publishers.
18. Biodiversity, Rallapalli, R & Bali, G (Ed.), APH Publishing Corporation.
19. Environmental Biotechnology: Principles and Applications, Rithmann, BE & McCarty, PL (Ed.), McGrawHill.
20. Molecular Cell Biology (5th Edn.), H. Lodish et al., 2004. W.H. Freeman and Company, New York.

Paper–III. : CRUSTACEAN ENDOCRINOLOGY and REPRODUCTION

UNIT-I: GENERAL BIOLOGY of CRUSTACEA

General characters of the phylum Arthropoda – Class Crustacea: General characters; Classification; Types – Various body systems – Osmoregulation – Feeding mechanisms – Diversity and conservation of crustacea.

UNIT-II: NEURO-ENDOCRINE SYSTEM of CRUSTACEA

Neuro-secretory system of crustacean brain – Sinus gland X-organ complex – Y-organ – Hormonal regulation in molting, growth and reproduction – Hormonal manipulation of crustacean reproduction – Mechanism of vitellogenin synthesis – Fertilization – Various types of parental care of eggs - Stages of embryonic development – Metamorphosis – Different larval forms.

UNIT-III: AQUACULTURE of CRUSTACEA

Prawn culture – Crab culture (fattening) – Lobster culture – Site selection and preparation of culture ponds – Physicochemical factors – Hatchery production of seeds – Food: Live feed; Artificial feed; Balanced diet (iso-nitrous and iso-caloric) – Predators and Parasites in aquaculture - Economics of Aquaculture.

UNIT-IV: TOXICOLOGY and PATHOLOGY of CRUSTACEA

Xenobiotic substances and their toxic effects on crustacean - Toxicity tests – Causes for different diseases - Disease causing pathogens and their preventive measures in aquaculture of crustacea – Cellular stress and Immune responses – Defense and Detoxification systems – Wound healing - Apoptosis - Probiotics in health and growth of crustacean.

UNIT-V: GENETIC ENGINEERING and BIOTECHNOLOGY of CRUSTACEA

Molecular cytogenetics of crustacea – Nanostructures and materials in crustacea - Isolation and Purification of DNA and RNA - Isolation and Purification of Enzymes and Hormones – Recombinant DNA technology – Blotting techniques – PCR techniques – Gel documentation – Proteomics, Genomics and Bioinformatics of crustacea.

Reference Books

1. Crustacean Aquaculture, Mc Vey, J (Ed.), CRC Press.
2. Disease of Cultured Penaeid Shrimp in Asia and The United States, Fulks, W & Main, K.L (Eds.), Argent Laboratories Press.
3. Intensive Shrimp Production Technology, Wyban, J.A. & Sweeney, J.N. (Eds.), Argent Laboratories Press.
4. Standard Method for the Nutrition and Feeding of Farmed Fish and Shrimp, Albert GJ Tacon (Ed.), Argent Laboratories Press.
5. Gene Expression and Manipulation in Aquatic Organisms, Ennion, S.J. & Goldspink, (Eds.), Cambridge University Press.
6. Molecular Biology and Toxicology of Metals, Rudolfs K Zalups & James Koropatnick (Eds.), Taylor and Francis

7. Crustacean Farming: Ranching and Culture, John F. Wickins & Daniel O.C. Lee (Eds.), Blackwell Science.
8. Microscopic Anatomy of Invertebrates, Vol. 10. Decapod Crustacean, Harrison, F.W. & Humes, A.G. (Eds.),
9. Advances In Molecular Ecology, Gary R Carvalho (Ed.), ISO Press, Ohmsha NATO Science Series.
10. Practical Handbook of Biochemistry and Molecular Biology, Gerald D. Fasman (Ed.), CRC Press.
11. Aquaculture Principles and Practices, Pillay, TVR (Ed.), Fishing News Books, USA.
12. Fish and Fisheries of India, Jingran, VG. (Ed.), Hindustan Publishing Corporation, New Delhi.
13. Arthropoda Crustacea, In: Reproductive Biology of Invertebrates, Adiyodi K.G & Adiyodi, R.G. (Ed.), Wiley.
14. Chemical Contamination in the Human Environment, Lippman, M & Schles Esger, R.B. (Ed.), Oxford Press.
15. Toxicology Testing Handbook, Jacobson-Kram, D & Keller, K.A. (Ed.), Dekker Inc.
16. Environmental Chemistry, 7th edition, Manahan, S.E (Ed.), Lewis Publishers
17. Handbook of Eco-toxicology, Holfman, D.J., Rattner, B.A., Burton (jr.), G.A., & Cairns (jr.), J. (Eds.), Lewis Publishers.
18. Biodiversity, Rallapalli, R & Bali, G (Ed.), APH Publishing Corporation.
19. Environmental Biotechnology: Principles and Applications, Rithmann, BE & McCarty, PL (Ed.), McGrawHill.
20. Molecular Cell Biology (5th Edn.), H. Lodish et al., 2004. W.H. Freeman and Company, New York.

PAPER- III – AQUACULTURE AND FISHERIES

UNIT- I Basics of Aquaculture

Introduction-Indian and World Aquaculture- Role, status and importance of Aquaculture.

UNIT-II - Capture fisheries

Major inland capture fishery resources in India- Lake and reservoir fisheries Nursery system in Estuaries and Brackish water and its fishery resources in India-Marine major and minor fishery resources in India and world-fin and shell fishes.

UNIT –III - Culture fisheries

Monoculture- Poly culture- Extensive, Intensive- Integrated fish farming - Paddy cum fish culture - fish and prawn culture in fresh water ponds - Fin fish and shell fish culture in Brackish water ponds - Ornamental fish culture.

UNIT-IV - Live Feed Culture

Taxonomy of Live feeds - General collecting method- Culture and Nutritional value of Rotifers, Artemia, Copepods and Daphnia - Molluscan culture and its status Culture of zooplankton.

UNIT – V - Recent Techniques in Aquaculture

Cryopreservation techniques for Live feeds - Bio-enrichment technique Applied Genetics of cultivated fishes - Regulation of vitellogenesis in shell and fin fishes.

References:

1. Fisheries research planning and Management in developing countries
V.R.P.Sinha - International Books and Periodicals services (IBS)- New Delhi.
 2. Live feeds in Marine Aquaculture - L.A.McEvoy and J.G.Stottrup-Blackwell publishing company, UK.
 3. Aquaculture principles and practices-T.V.R.Pillay, Fishing News Books, USA. 4. Fish and Fisheries of India-V.G.Jingran-Hindustan publishing Corporation, Delhi. 5. Biology of finfish and shellfish-SCSC publishers-Howrah.
-