

MANONMANIAM SUNDARANAR UNIVERSITY
TIRUNELVELI
PG - COURSES – AFFILIATED COLLEGES
 Course Structure for M.Sc. Zoology
 (Choice Based Credit System)
 (with effect from the academic year 2017- 2018 onwards)

Course	Name of the course	Hrs/W		Credit
		T	P	
Core VII	3.1. Animal Physiology	6		4
Core VIII	3.2. Biotechnology	6		4
Core IX	3.3. Biostatistics & Bioinformatics	5		4
Core X	3.4. Research Methodology	5		4
Core Practical V	Practical V (3.1&3.2)		4	2
Core Practical VI	Practical VI (3.3&3.4)		4	2
	Total	22	8	20
	4.1. Immunology	4		4
Core XI	4.2. Genetics	4		4
Core XII	4.3. Aquaculture	4		4
Elective	Sericulture	3+		3
Core Practical VII	Practical VII (4.1, 4.2)		4	2
Core Practical VIII	Practical VIII (4.3& Elective)		4	2
	Project (compulsory)		7+	8
	Total	15	15	27

* Field work in any core subject

Course Component

Course Division	No. of courses	Total credits	Total marks
Core Subjects & Elective	16	63	1600
Practical	8	16	800
Field work	1	3	100
Project work	1	8	100
Total	26	90	2600

Duration of the course:

Two years (Four semesters)

Date of Effect:

For the students admitted during the academic year 2017-2018 batch and onwards.

Eligibility condition:

Those who have passed B.Sc. Zoology, B. Sc. Advanced Zoology, B.Sc. Applied Zoology, B.Sc. Animal Science and Biotechnology, B.Sc. Advanced Zoology and Biotechnology, B.Sc. Life Science and B.Sc. Biology (Hon.) from recognized university.

Theory Examination:

The M.Sc. Zoology Core theory Examination having the following marks.

Internal Marks – 25

Test = 15 marks

Assignment = 4 marks

Seminar = 6 marks

Total = 25 marks

External Marks - 75

Section A: 10x 1 = 10 marks

(Q.No. 1 to 10)

Section B: 5 x 5 = 25 marks

(Q.No. 11 to 15)

Section C: 5 x 8 = 40 marks

(Q.No. 16 to 20)

Total = 75 marks

ANIMAL PHYSIOLOGY

L T P C

6 0 2 4

Preamble : This course develop the knowledge about the functions of organs and tissues in the Animal. This study also provide the students with the basic understanding of the fundamental processes and mechanisms that serve and control the various functions of the body. The basic idea of paper were learned earlier and the detailed course structure were dealt.

Unit I : Nutrition and Digestion : Importants of Carbohydrates, Protein, Lipids. Vitamins and Minerals with regard to human health. Balanced diet, Malnutrition and BMR. Human digestive tract and functions. Role of enzymes in digestion of carbohydrates, proteins and lipids. Gastrointestinal hormones .Intestinal villi and absorption. (15L)

Unit II : Blood and Circulation : Structure of arteries and Veins. Blood Corpuscles. Haemopoiesis and formed elements. Plasma functions. Blood volume regulation. Blood groups Coagulation of blood. Structure and function of the human heart. Structure function of coronary arteries and vein. ECG, Cardiac cycle, Heart rate, Blood pressure. Neural and chemical regulation of heart. (20L)

Unit III : Respiration and Excretion : Respiration in air and water. Structure and function of human lung and the respiratory tract. Respiratory pigments. Gas transport between the lungs and tissues. Neural and chemical regulation of respiration .Human: Structure of the Kidney –Nephron Renal circulation –Urine formation. Renal disorders – Micturition and dialysis. Regulation of water and electrolytes. Hormonal control of osmo –iono regulation. (20L)

Unit IV : Nervous System and Sense Organs : Neuron –Structure and function Neuro transmitters –Synapse, Conduction of nerve impulses. Structure and function of brain and Spinal cord, EEG. Muscles –Classification – Ultra structure of skeletal muscle -Mechanism of muscular contraction –Neural control of muscles tone and function. Sense organ of vision, hearing and tactile responses. (20L)

Unit V : Endocrinology and Reproduction : Structure and function of Endocrine glands. Hormones and diseases. Basics mechanism of hormone action. Estrus and endometrial reproductive cycle's. Neuro endocrine regulation of reproduction. (15L)

Reference books :

1. General and Comparative Physiology – William S. Hoar.
2. Chordate Zoology – E. L. Jordan and P. S. Verma, S. Chand and Co., New Delhi.
3. Comparative Animal Physiology – C. D. Prosser and F. A. Brown.
4. Textbook of Animal Physiology – R. Nagabhushanam, M. S. Kodarkar and R. Sarojini.
5. Kunt Schmidt – Nicolsen Animal Physiology – Adaptation and Environment, Cambridge University Press.
6. Gayton, A. C. and Hall, J. E., A Textbook of Medical Physiology, 9th Edn., Harcourt Brace and Company Asia Pvt. Ltd., W. B. Saunders Company.

BIOTECHNOLOGY

L T P C
6 0 2 4

Preamble : This course facilitates the method of natural raw materials into useful products by the application of living organism in the industrial process. The main objectives of biotechnology is the conservation of resources via the recycling of waste material and the recoveries of more valuable products. The basics were learned and the detailed course structure is dealt.

UNIT I : Genetic engineering

Gene cloning -the basic steps, types of restriction enzymes, ligases - linkers and adaptors, C DNA, selection of recombinants. Hybridization techniques, chemical synthesis of oligonucleotides, PCR and DNA sequencing techniques.

UNIT II : Gene cloning vectors

Cloning vector based on pBR322 and bacteriophage, cloning vector for yeast. Cloning vector for Agrobacterium tumefaciens, Simian virus 40. Gene transfer technology- Particle bombardment, micro injection techniques, electrophoresis, liposome fusion.

UNIT III : Animal Biotechnology

Cell culture : Organ culture, whole embryo culture, embryo transfer - in-vitro fertilization (IVF) technology. Dolly- in vitro fertilization and embryo transfer in human. Transgenic animals. Human gene therapy. Cryobiology.

UNIT IV : Microbial Biotechnology

Fermentation: Bioreactor. Microbial products: primary and secondary metabolites. Protein engineering. Bioremediation of hydrocarbons, industrial wastes and heavy metals. Single cell protein, biopolymers, bio pesticides and bio fertilizers. Xenobiotics , bio-leaching, bio-mining and bio-fuel.

UNIT V : Medical Biotechnology

Drug development : production of pharmaceuticals by genetically engineered cells (hormones, interferons), microbial transformation for production of important pharmaceutical (steroids and semi-synthetic antibiotics), drug design and targeting. Diagnostic kit development for micro analysis.

Reference books:

Satyanarayana, U.2007. Biotechnology. Uppala author-publisher interlinks,Vijayawada, Andhra Pradesh, India. Old,R.W and Primrose, S.B.1993.Principles of Gene manipulation:

An introduction to Genetic Engineering.Blackwell Science Publication. Ignacimuthu, S.2008. Biotechnology: An introduction, Narosa Publishing house, New Delhi.

Purohit, S.S.2008. Biotechnology. Student Edition, Jodhpur. Lee and Savage, L.M. Biological Molecules in Nanotechnology.

Biological Molecules in Nanotechnology – By Ratner M and Ratner D – Nerosha Publishing house, New Delhi.

BIostatISTICS AND BIOinformatics

L T P C
5 0 2 4

- Preamble :** The objectives of biostatistics is to advance statistical science and its application. The role of biostatistics is an important one in designing studies and analyzing data from research problems. Computer study operate a variety of advanced spread sheet, operating system and word processing function.
- Unit 1 :** **Collection of Data :** Primary and Secondary data –Methods of collecting primary data – sources of secondary data. **Sampling and Sample Designs :** Essentials of sampling – Methods of sampling –Random sampling methods –Non random sampling methods – Merits and Limitations of sampling. Classification and tabulation of data –Diagrammatic and graphic presentation of data. **(10L)**
- Unit II :** **Measures of Central Tendency :** Mean- Arithmetic mean –Weighted arithmetic mean – Median – Mode. **Measures of Dispersion :** Quartile deviation – Mean deviation – Standard deviation – Lorenz curve. **Skewness Moments and Kurtosis :** Measure of skewness –Absolute measure of skewness -Relative measure of skewness -Karl Pearson’s coefficient of skewness- Bowley’s coefficient of skewness. Moments. Measures of kurtosis. **Correlation analysis :** Types of Correlation –Methods of studying correlation Karl Pearson’s coefficient of correlation –Regression Analysis –Regression line, Regression equations. **(20L)**
- Unit III :** **Probability and Expected Value :** Concepts of probability –Types of events - Theorems of probability - conditional probability –Bayes’ Theorem. **Theoretical Distribution :** Binomial distribution -Poisson distribution - Normal distribution. **Statistical Inference :** Test of hypothesis -procedure of testing hypothesis. **Estimation :** Test of significance for large sample - Test of significance for small samples –Student’s t- distribution. **(15L)**
- Unit IV :** Chi square test and a Goodness of fit –Yates correction F-Test and Analysis of Variance – one way classification and two way classification .Experimental design – Randomized block design –Latin squares – The Sign Test – A rank sum test (The Mann-Whitney U Test). **(10L)**
- Unit V :** **Bioinformatics :** Information Technology in Biology - Types of sequences used in bioinformatics – Application of Bioinformatics. **Biological Database :** Objectives – Properties of Database –database retrieval system –Symbols used in data base – Nomenclature of DNA sequences Nomenclature of protein sequences –NCBI .SWISS-PROT. **Data Base Similarity Search Tools :** BLAST –FASTA –Application of bioinformatics tools –Homology search tools –Protein functional analysis tools –Sequences analysis tools –Structural analysis tools - Molecular modeling and visualizing tools – Polygenetic analysis tools . **(20L)**

Text book

1. Gupta S.P. 2008 Statistical methods Sultan Chand & Co .New Delhi.
2. Khanum. A& I.A. Khan 2004 Fundamental of Biostatistics ,Ukazz Publication. Hyderabad.
3. Ramakrishnan P.1994 Biostatistics SARAS Publication TamilNadu
4. C.S.V.Murthy 2008 Bioinformatics Himalya Publishing House Pvt Ltd . New Delhi.
5. Sundararajan and Balaji 2007 Introduction to Bioinformatics Himalya Publishing House Pvt Ltd .Mumbai.

Reference book

1. Gerrold H Zar Fundamentals of Biostatistics 5th edition
2. Banergi,P.K. 2004Introduction to Biostatistics S Chand & company Ltd .NewDelhi.
3. Gurumani,N. 2004Introduction to Biostatistics .MJP Puplichers Chennai
4. Misra ,B.N.and Misra ,B.K.1998 Introductory Practical Biostatistics. Naya Prakash, Calcutta.
5. Pillai, RSN.and Bhavathi ,V.1989 Statistics S Chand & company Ltd .New Delhi
6. Schefler W.C.1980. Statistics for biological sciences Addison –Wesley Publishing Company, NewYork.
7. Sokal,R.R.and Rohif ,F.J. 1987 Introduction to Biostatistics .W.H.Freeman and Company New York.
8. Sundar Rao,P.S.S and Righard ,J.2002 An Introduction to Biostatistics .III edn Prentice Hall of India . NewDelhi.
9. N.J.Chikhale and V.S. Gomare 2007 Bioinformatics Theory and Practice Himalya Publishing House Pvt Ltd .Hyderabad.
10. Attwood T.K. Parry smith D.J. 2006
11. Introduction to biostatistics ,Dorling Kindersley (India) Pvt Ltd .South Asia.

RESEARCH METHODOLOGY

L T P C

5 0 2 4

Preamble : The purpose of research is to discover answers and questions through the application of scientific procedures. The main aim of research is to find out the truth which is hidden and which has not been discovered as yet. Research study has its own purpose and objectives.

Unit I : Research – Characteristics – types of research – steps in research – objectives of research – research report formatting and typing – laboratory safety – intellectual property rights. **(15L)**

Unit II : Microscopy – Principles – types of light microscopes – bright field – dark field – phase contrast – fluorescence – scanning – micrometry. Electron microscopes and types – atomic force and magnetic force microscopes. **(15L)**

Unit III : Centrifuge – types – principles and applications. pH meter – types – principles and applications. Colorimeter – principles and applications. Cryopreservation and its applications. Freezing and freeze drying microtomes. Cytotechniques. **(20L)**

Unit IV : Chromatography – paper – thin layer – column – gas liquid chromatography – affinity chromatography. Electrophoresis – paper – cellulose acetate – gel – immune electrophoresis. Blotting techniques – southern – northern – western. Radioactive counters – autoradiography – labeling studies. **(15L)**

Unit V : Spectrophotometer - Spectrofluorimeter – ESR –NMR Spectrophotometer – Flame Emission Photometry. **(10L)**

Reference Books

1. Gurumai, N., 2006. Research Methodology for Biological Sciences, MJR Publishers, Chennai.
2. Rana, S. V. S., Biotechniques, Rastogi Publications, Meerut.
3. Vijayalakshmi, G. and Sivapragasam, C., 2008. MJP Publishers, Chennai.
4. Wilson, K. and Walker, J., Practical Biochemistry, Cambridge Publications.
5. Palanivelu, R., Analytical Biochemistry and separation techniques. Tulsi Book Centre, Town Hall Road, Madurai.

Practicals

1. Estimation of haemoglobin – Any method.
2. Determination of ESR – Demonstration
3. Detection of haemin crystals in blood.
4. Estimation of salt loss in fish.
5. Estimation of salt gain in fish.
6. Opercular activity of fish in relation to salinity
7. Opercular activity of fish in relation to temperature.
8. Qualitative analysis of excretory products in ammonotelic, ureotelic and uricotelic animals.
9. ECG, EEG, conditional reflex – Chart.
10. Kymograph and Sphygmomanometer.

Practicals

1. Estimation of citric acid in citrus fruits
2. Preparation of wine - Demonstration
3. Preparation of bread - Demonstration
4. Preparation of yoghurt - Demonstration
5. Diagnosis of diseases using ELISA - Demonstration
6. Preparation of Vermicompost - Demonstration
7. Extraction of genomic DNA from bacteria - Demonstration
8. Southern and Northern blotting techniques –charts
9. Flow Charts - Bioreactor - Antibiotics production
10. Spotters
 - pBR322
 - Lambda phage
 - Dolly
 - RAPD
 - Gene cloning

Stem cells

Practical

1. Calculation of mean, median, mode, standard deviation, standard error, variance and coefficient of variation - individual observation.
2. Calculation of mean, median, mode, standard deviation, standard error, variance and coefficient of variation – continuous series.
3. Calculation of correlation coefficient – length and width of leaves.
4. Calculation of correlation coefficient – height and weight of students in the class.
5. Calculation of regression co-efficient using length and width of leaves.
6. Probability experiment with coin tossing (one coin, two coins). using chi square test
7. Test of significance for small samples – student's t test.
8. PubMed, NCBI, EMBL, SWISS-PROT – printout.

Practical

1. Centrifuge – techniques, types.
2. Phase contrast microscope – principle
3. Micrometry – measurement of cells.
4. P^H meter – principle, measurement of P^H in water and soil sample
5. Colorimeter – Verification of Beer Lambert's law
6. Microtome techniques – staining procedure
7. Chromatography principle – paper, thin layer, column and gas chromatography
8. Separation of aminoacid mixture using paper chromatography
9. Electrophoresis (demonstration only)
10. Spotters: Spectrophotometry, Flame Emission Photometry.

IMMUNOLOGY

L T P C

4 0 2 4

Preamble : The students will be able to identify the cellular and molecular basis of immune responsiveness. To describe the role of immune system in both maintaining health and contributing to diseases. The course material help to understand the ability of our immune system to defend against invading pathogens.

Unit I : Scope of Immunology. Innate Immunity : First line of defense – Second line of defense - Third line of defense. Inflammatory response. Mechanism of innate immune recognition. **Acquired immunity :** Naturally acquired passive immunity, Artificially acquired passive immunity, Naturally acquired active immunity, Artificially acquired active immunity. **Cells of immune system :** Lymphoid lineage – Myeloid lineage – **Organs of immune system :** Primary lymphoid organs - Secondary lymphoid organs. (10L)

Unit II : Antibodies (immunoglobulins) : Immunoglobulin structure and function - Immunoglobulin classes **Major histocompatibility complex (MHC) :** Structure and types. **Antigen –antibody interaction and hypersensitivity :** Types of antigen – antibody interactions Hypersensitivity - Type I, II, III, IV and V **Complement system :** Classical complement pathway, Alternative complement pathway, (15L)

Unit III : B -cell maturation, activation and differentiation : B Cell maturation, Bone marrow micro environment, Ig –gene rearrangements and formation of pre B-Cells receptor, selection of immature self reactive B Cells, B Cell activation and proliferation. **T–cell maturation activation and differentiation :** T –Cell maturation, discrete stages in early T cell development, Thymic selection of T cell repertoire, T cell activation, costimulation in T cell response, T cell clonal anergy. **Antigen processing and presentation :** Cytosolic pathway of antigen presentation, Endocytic pathway of exogenous antigen presentation. **Effectors responses of cell mediated and humoral immunity :** Cell mediated direct cytotoxic response, Natural killer cell mediated cytotoxicity, Antibody dependent cell mediated cytotoxicity, Regulation of immune effectors response, Immunological memory. (15L)

Unit IV : Immune response infectious diseases : Immune response against viral infection, bacterial infection, protozoan parasites and helminthine parasites. **Autoimmune diseases. Immuno deficiency diseases.** (10L)

Unit V : Transplantation immunology : Classification of grafts, Method of graft rejection, Graft versus host reaction, Tissue and organ transplantation, Immuno suppressive therapy during transplantation, **Immunological tolerance** –Mechanism of tolerance. **Immunology of tumors** : Tumor antigens, Immune response to tumor antigens, Immunological surveillance, Immune therapy of cancer. **Vaccines** : Vaccines from whole organisms, Polysaccharide vaccines, Outer membrane protein vaccines, Toxoid vaccines, Vaccines from recombinant vectors, DNA as vaccines, Vaccines from synthetic peptides.

(10L)

Text books:

1. C.V.Rao, An Introduction to Immunology Narosa Publishing House, 35, Greams Road, Thousand light, Chennai -600006.
2. Immunology, 2007. I.Kannan. MJP Publishers, Chennai.

Reference books:

1. Janis Kuby, Immunology W.H.Freeman and Company, New York.
2. Klans.D.Elgert, Immunology Wiley –Liss Pub. Co. U.S.A.
3. R.M.Coleman, M.F.Lomb and R.E.S.Cord Fundamental Immunology 2nd Edn. W.C.Brown Publishers U.S.A.
4. I.M.Roitt, Essential Immunology E.L.B.S.
5. Donald M.Weir and John Shewart Immunology Churchill Livingston 9th Edn.
6. Geroge Pinchuk 2004.Schum’s Outlines Immunology Tata McGraw –Hill.
7. Aruna Bhatia Manual of Practical Immunity Vikas Pub. House Ltd., New Delhi.
8. Talwar .G.P. A hand book practical immunology - Third edition ,Backwell scientific publication-ISBN 0-632-01491-1

GENETICS

L T P C

4 0 2 4

Preamble : To learn and apply concepts of modern transmission and molecular genetics. To solve transmission of genetics problem, make accurate prediction about inheritance of genetic traits and map the location of the genes. To understand the patterns of inheritance, autosomal recessive, autosomal dominant and sex linked traits.

- Unit I :** **Principles of genetic transmission:** Concepts and definitions – Mendelian principles – Allelic and non-allelic interactions – Pleiotropy – Penetrance and expressivity – Phenocopies – Multiple alleles – Polygenic inheritance – Linkage and Crossing over – tetrad analysis – CLB technique – Sex determination – Sex linked inheritance – Non-disjunction. **(10L)**
- Unit II :** **Gene Concept:** Fine Structure of gene - Simple and split genes – Intron, Cistron, muton and Recon – Chemical composition of gene - Genes and protein synthesis – Genetic code - works of Khorana and Kornberg – wobble hypothesis - Regulation of gene action – Transposable elements – IS elements – DNA replication – Chemistry of DNA – Gene action related diseases. **(10L)**
- Unit III :** Mutation and Extra chromosomal inheritance: DNA damage and repairing mechanism – Gene mutation – molecular basis of mutation – mutagens – causes of mutation – Extra chromosomal inheritance – Kappa particles in Paramecium – Shell coiling – Inbreeding, out breeding and hybrid vigour. **(10L)**
- Unit IV :** **Population Genetics:** Mendelian population – Gene pool and gene frequency – Hardy Weinberg law, Applications of Hardy-Weinberg law in calculating gene frequencies in a population – Calculation of gene frequencies for sex linked genes – Factors affecting Hardy -Weinberg equilibrium. **(15L)**
- Unit V :** **Human Genetics:** Pedigree analysis – Aminocentesis – Inborn errors metabolism – Sickle cell anemia – Karyotype – Twins – Chromosomal abnormalities – Genetic Pregnosis – Genetic Counselling – Gene Therapy – Drugs on Human heredity – simple Mendelian traits in man – genetic analysis of complex traits – Threshold traits – DNA finger printing and dermatoglyphics. Eugenics, Euthenics and Euphenics. **(15L)**

Reference books :

1. Eloe Axel Carlson, 1985. Human Genetics. Tata Mc Graw-Hill Publishing Co., New Delhi.
2. Jain, H. K., 1999. Genetics : Principles, concepts and implications, Oxford & Publishing Co., New Delhi.
3. Benjamin Lewin, 1997. Genes VI, Oxford University Press, Oxford.
4. Sandhya Mitra, 1994. Genetics – A blueprint of life. Tata Mc Graw Hill Publishing Co., New Delhi.
5. Strickberger, M. W., 1996. Genetics, 3rd Edn., Prentice Hall of India, New Delhi.
6. Gardner et al., 1991. Principles of Genetics, 8th Edn., John Wiley & sons Inc., New York.
7. Stansfield, W. D., 1991. Schaum's Outline of theory and problems of Genetics, 3rd Edn., Schaum's Outline Series, Mc Graw Hill Inc., New York.
8. Stent, G. S. and Calender, R., 1986. Molecular Genetics : An introductory narrative, 2nd Edn., CBS Publishers & Distributors, New Delhi.
9. Goodenough, U., 1984. Genetics, 3rd Edn., Saunders College Publishing, New York.
10. Miglani, G. S., Fundamentals of Genetics, Narosa Publishing House, New Delhi.
11. Lewis, Genes X – Jones and Bartlett Publishers, Oxford Publication.
12. Michael R. Commings, Genage Learning Pvt. Ltd., New Delhi.

AQUACULTURE

L T P C

4 0 2 4

Preamble : To promote, facilitate and influence the best possible standards of fisheries management. To provide the technical and general knowledge necessary for competent fisheries management. The basic ideas were studied at UG level and detailed study are carried in the present course.

Unit I : Aquaculture: history, definition, scope & importance, fishery resources of India in general & Tamil Nadu in particular, a biotic and biotic factors of water necessary for fish life, ecological characteristics of lakes & rivers, general ecological characteristics of reservoirs of India. (10L)

Unit II : Fish culture: mono, poly, mixed & composite fish culture, fresh water and marine prawn culture and its prospects in India, culture of mussels, clams, oysters and pearl culture, sewage fed fish culture, paddy cum fish culture, frog culture, sea weed culture. (15L)

Unit III : Fish breeding in natural conditions, bundh breeding, hypophysation & stripping, transport of live fish and seed, different types of crafts and gears used for fish catching, plankton – its definition, culture & identification, common weeds of fish ponds& methods of their eradication, production of mono sex and sterile fishes, transgenic fishes, hybridization , polyploidy , role of bio technology in conservation of fishes. (15L)

Unit IV : Fresh water fish farm: selection of site, construction of fish farm and soil chemistry, designing layout and construction of different types of fish ponds, setting and management of fresh water aquarium, preservation and processing of fish, fish by products industry and their utility. (10L)

Unit V : Water pollution, its effects on fisheries and methods of its abatement, common fish diseases(bacterial, viral, fungal and nutritional deficiency diseases), biochemical composition and nutritional value of fish, fisheries economics and marketing, fisheries managements and extension. (10L)

Reference Books (latest editions):

1. T.V.R.Pillay & Dill: Advances in Aquaculture
2. Agarwal & S.C.Narendra: A Hand Book of Fish Farming
3. R.K.Rath: Fresh water Aquaculture
4. Schonder: Hypophysation in Indian Major Carp
5. C.B.Hall: Ponds & Fish Culture
6. C.B.L.Srivastava: Fishes of India
7. Jhingaran: Fish and Fisheries of India

MSU / 2017-18 / PG –Colleges / M.Sc.(Zoology) / Semester -IV / Ppr.no.22 / Core-21

8. S.S. Khanna: An Introduction to Fishes
9. B.S.Rath: Fresh Water Aquaculture
10. Gopalji Srivastava: Fishes of U.P.& Bihar
11. H.D.Kumar: Sustainability & Management of Aquaculture & Fisheries
12. A.J.K.Mainan: Identification of Fishes
13. R.Sanatam: A Manual of Fresh Water Aquaculture
14. S.K.Gupta: Fish and Fisheries

SERICULTURE

L T P C

4 0 2 4

Preamble : The main objective of this course is to identify the disease and pests of the mulberry plants and also involves a through knowledge about the cultivation of mulberry, maintenance of the farm, seeds technology, silk worm rearing and silk reeling.

Unit I: Introduction- Scope and importance of sericulture –Sericulture in India. Role of Central Silk Board. Life cycle of *Bombyx mori* – morphology, egg, larva, pupa, adult, silk gland- classification based on number of larval moults and voltinism cocoon colour shape. Non mulberry silkworm. (15L)

Unit II: Morphology of mulberry plant – high yielding varieties- optimum conditions for mulberry growth- planting- irrigation- manuring- pruning- harvesting and storing of mulberry leaves- Common diseases of mulberry-causative agent, symptoms and treatment. (15L)

Unit III: Egg breeding stations procedure in grainage – silkworm rearing- rearing house – rearing appliances – rearing operations –sericulture products. (10L)

Unit IV: Diseases of silkworm – causative agents, symptoms and treatment for bacterial, fungal, viral and protozoan diseases. Genetic resistance of the silkworm – silkworm transgenesis and application. (10L)

Unit V: Silk reeling – cocoon marketing –characteristics of cocoon – cocoon stifling types and storage of stifled cocoons – reeling operations – reeling appliances – country charka, cottage basin, multi-end reeling machine – raw silk testing. (10L)

REFERENCES

1. Ganga, G and I. Sulochana Chetty. An Introduction to Sericulture. Oxford and publishing co.pvt. ltd. New Delhi. 1991 IBH
2. Hisao Aruga. Principles of Sericulture. Oxford and IBH publishing co.pvt. ltd. New Delhi. New
3. G. Rangaswamy *etal* . Mulberry cultivation – Central Sericultural Research and Training Institute. Mysore (1972)
4. Ullal, S.R and M.N. Narsimhanna –Hand Book of practical Sericulture – Central Board. Bombay. Silk

Practicals

1. ABO blood grouping by haemagglutination technique.
2. Immuno-diffusion technique.
3. Counting of white blood corpuscles and red blood corpuscles.
4. Primary and secondary lymphoid organs in man (chart).
5. Lymphoid organs in rat (chart).
6. Cells of immune system – (slides).
7. Immunoglobulin G (chart).
8. Monoclonal antibody preparation (chart).
9. Histology of lymphoid organs: Primary organs – Thymus, Bone marrow. Secondary organs – Lymph node, Spleen. (slides).

Practicals

1. Analysis of simple mendelian inheritance in a small population.
2. Breeding experiments to be demonstrated with the help of colour beads – Monohybrid cross. (using chi-square test).
3. Breeding experiments to be demonstrated with the help of colour beads – Dihybrid cross. (using chisquare test).
4. Estimation of gene and genotype frequencies in the light of Hardy-Weinberg law based on facial traits.
5. Estimation of gene and genotype frequencies in the light of Hardy – Weinberg law based on ABO blood groups.
6. Random genetic drift – using colour beads.
7. Analysis of dermatoglyphic patterns.
8. Charts, models and flash cards pertaining to theory syllabus
 - a. DNA replication
 - b. Karyotyping
 - c. Operon concept
 - d. Transposable elements.
 - e. Syndrome
 - f. Inborn errors of metabolism.
 - g. Sex-linked inheritance

Practicals

1. Morphometry of a pond
2. Estimation of fish population using mark and recapture method
3. Estimation of primary productivity of macrophyte
4. Physical chemical analysis of dissolved oxygen, salinity and alkalinity in any two water samples
5. Study of fish pathology
6. Taxonomic description of cultivable fishes(Indian major carps, 3exotic carps, *Heteropneustes fossilis*, *Oreochromis mossambicus*)
7. Morphological feature of paenaid and non paenaid prawn
8. Determination of age of fishes.

Practicals

1. Dissection : Silkworm digestive system , silk gland
2. Morphology of larva pupa and moth, sex separation in pupa and moth
3. Mouth parts of silkworm
4. Identification and study of sericulture products
5. Rearing appliances : rearing tray, leaf chamber
6. Mountage – Chandrike
7. Diseases of Silkworm –bacterial, fungal
8. Types of mulberry leaves (MR2, K2)and diseases of mulberry (fungal and nematode)

MSU / 2017-18 / PG –Colleges / M.Sc.(Zoology) / Semester -IV / Ppr.no.26 / Project

Major Project