



ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Course Structure and Syllabus

M.Sc. Zoology (CBCS)

(For Admission Batch 2018-19 onwards)

FOURTH SEMESTER



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4th Semester: Course Structure

Sl. No.	Sub Code	Subject	Hrs / Week			Credit	Marks	
			L	T	P		C	CE
Theory								
1	MZY182401	Tools and Techniques, Biostatistics and Bioinformatics	3	0	0	3	30	70
2	MZY182402	Histology and Histochemistry	3	0	0	3	30	70
Practical								
1	MZY182411	Tools and Techniques, Biostatistics and Bioinformatics Lab	0	0	4	2	30	70
2	MZY182412	Histology and Histochemistry Lab	0	0	4	2	30	70
3	MZY182423	Project	0	0	10	5	30	70
Elective (Any One Paper)								
Theory								
1	MZY1824E01	Fisheries and Aquaculture	4	0	4	6	30	70
2	MZY1824E02	Entomology	6	0	0	6	30	70
Total			10/12	0	22/18	21	180	420
Total Contact Hours per Week: 32/30								
Total Credit : 21								

Detail Syllabus:

Course Code	Course Title	Hours per week L-T-P	Credit C
MZY182401	Tools and Techniques, Biostatistics and Bioinformatics	3-0-0	3

MODULE 1: Analytical instrument (12 Lectures)

Principles and uses of spectrophotometer, Mass Spectrophotometer. Working principles, applications, advantages and disadvantages of Transmission electron microscope, Scanning electron microscope, Phase contrast microscope and Fluorescence microscope.

MODULE 2: Separation techniques (12 Lectures)

Principles and techniques of Electrophoresis, SDS-PAGE, Agarose gel and 2D Gel electrophoresis, northern blotting, southern blotting, western blotting, PCR. Principles, types of Chromatography (Column, paper, TLC), HPLC, Principle of Centrifugation, differential centrifugation and density gradient centrifugation.

MODULE 3: Bioinformatics (12 Lectures)

Definition and scope of Bioinformatics, importance, application, components of bioinformatics.

Major Bioinformatics Resources: NCBI, EBI, ExPaSy. Biological databases, types of database, Nucleic acid sequence databases, Protein sequence databases. Introduction to Phylogenetic Analysis. Introduction to BLAST.

MODULE 4: Biostatistics (12 Lectures)

Statistics in biological science. Mean, median and mode. Standard deviation, standard error of mean. Graphical representation of data- bar diagram, line diagram, histogram, pie diagram. Student's t-test. Chi-square test Correlation and Regression, Chi square test and ANNOVA.

Text Books/ Reference Books:

1. Introduction to instrumental analysis-Robert Braun-McGraw Hill.
2. A biologist Guide to principles and Techniques of Practical Biochemistry- K, Wilson and K.H. Goulding EIBS Edn.
3. Clark & Swizer. Experimental Biochemistry. Freeman, 2000.
4. Locquin and Langeron. Handbook of Microscopy. Butterwaths, 1983
5. Boyer. Modern Experimental Biochemistry. Benjamin, 1993
6. Wilson and Wlaker. Practical Biochemistry. Cambridge, 2000.
7. Robert Braun. Introduction to instrumental analysis. McGraw Hill
8. Fundamental concepts of Bioinformatics. P.314, Pearson Education, Singapore

Course Code	Course Title	Hours per week L-T-P	Credit C
MZY182402	Histology and Histochemistry	3-0-0	3

MODULE 1: Tissues (7 Lectures)

Structure, location, classification and functions of epithelial tissue, connective tissue, muscular tissue and nervous tissue.

MODULE 2: Muscle (7 Lectures)

Histology of different types of muscle (skeletal muscle, smooth muscle, cardiac muscle).

MODULE 3: Organs (7 Lectures)

Histological structure of different organs of mammals (lungs, liver, kidney, intestine).

MODULE 4: Endocrine System (7 Lectures)

Histology of mammalian endocrine glands-pituitary, thyroid, parathyroid, pancreas, adrenal gland, testis, ovary.

MODULE 5: Nervous System (7 Lectures)

Types, structure and function of brain cells (CNS and PNS) and Structure of neuron. Types of synapse, Synaptic transmission.

MODULE 6: Bone and Cartilage (6 Lectures)

Histological structure and types and functions of bones and cartilages.

MODULE 7: Histological methods (7 Lectures)

Histological methods- fixation, dehydration, embedding, sectioning and spreading; factors affecting fixation, types of staining; vital staining; classification and properties of dyes; metachromatic dyes and staining.

Text Books/Reference Books:

1. Boyd,W. 1976:A text book of Pathology. Structure and function in disease, 4th edition. Lea and Fibiger, Philadelphia.
2. Pearse, A.G.E. (1980): Histochemistry, theoretical and Applied, J & A, Churchill Ltd., London.
3. Rogers, A.W.(1983): Cells and Tissues, An introduction to Histology and Cell Biology, Academic Press, NY.
4. Telford, I.R. and Bridgman,C.F.(1990). Introduction to Functional Histology, Harper and Row, NY.

Course Code	Course Title	Hours per week L-T-P	Credit C
MZY182411	Tools and Techniques, Biostatistics and Bioinformatics Lab	0-0-4	2

Sl.No.	Experiments	Hours
1.	Determination of protein (Lowry's method).	3
2.	Thin layer/paper chromatography- separation of molecules.	3
3.	Agarose Gel electrophoresis.	3
4.	Data collection and preparation of frequency distribution table.	2
5.	Measurement of central tendency-Mean, Median, Mode of a given sample.	2
6.	Use of software for statistical data processing-Mean, Median, Mode, Student's t test, Standard deviation, Standard error.	3
7.	Determine standard deviation and standard error.	2
8.	Perform student's t test.	2
9.	Download protein sequence in FASTA format from NCBI.	2
10.	Search and download scientific articles in NCBI database.	2
	Laboratory note book	
	Viva voce	
	Total	24

Course Code	Course Title	Hours per week L-T-P	Credit C
MZY182412	Histology and Histochemistry Lab	0-0-4	2

Sl.No.	Experiments	Hours
1.	Preparation of permanent histological slides (microtomy) from tissues of liver/intestine/kidney. (any one)	8
2.	Histology of gonads.	4
3.	Study of different tissues from permanent slides-Epithelial, simple, squamous, cuboidal, columnar, compound, stratified, transitional, muscular, bone, cartilage, neuron	4
4.	Nuclear and cytoplasm staining.	4
5.	Study of different blood cells from smear	2
6.	Study of bone marrow cells	2
	Laboratory note book	
	Viva voce	
	Total	24

Course Code	Course Title	Hours per week L-T-P	Credit C
MZY1824E01	Fisheries and Aquaculture	4-0-4	6

MODULE 1: Fisheries and Food habits of fishes (6 Lectures)

Indian fisheries- Inland fisheries and Marine fisheries, Food and feeding habits of fishes, Food of freshwater fishes, food of marine fishes. Determination of age and growth of fishes.

MODULE 2: Biology of cultivable organism (10 Lectures)

Biology of important cultivable organism (Fresh water prawn *Macrobrachium*, Lobster).
Biology of Indian major carps (*Catla catla*, *Labeo rohita*, *Cirrhina mrigala*).
Biology of marine fishes (*Chanos chanos*, *Mugil cephalus*, *Lates calcarifer*).

MODULE 3: Aquaculture-Principles and Practices (8 Lectures)

Aquaculture- Introduction to aquaculture, principles and main objectives of aquaculture, Types of fish culture, Construction of fish farm, Types of fish ponds, maintenance and management of fish ponds, liming of fish ponds, fertilization of fish ponds.
Eradication of algal bloom, effects of algal bloom on fish, control of aquatic weeds, control of fish predators. Induced breeding in fish, factors of induced breeding. Marketing of cultured fishes, transport of live fishes, transport of fish seed, transport of breeders. Major fish diseases-causative organisms, symptoms and treatments.

MODULE 4: Culture Methods (10 Lectures)

Culture of freshwater prawn *Macrobrachium*, Pearl Oyster, Lobster. Catfish, *Labeo rohita*.

MODULE 5: Fish Harvest Technology (8 Lectures)

Fish harvesting methods, Fishing gears, Different methods of fish preservation, Fishery byproducts, Fish marketing

MODULE 6: Aquarium keeping (6 Lectures)

Design and construction of aquarium tanks, species-wise tank size requirement, heating, Lighting, aeration and filtration arrangements, decorations used, common aquarium plants.

Text Books/Reference Books:

1. Aquaculture principles and practices ----TVR Pillay and MN Kutty
2. Encyclopedia of aquaculture ----RR Stickney
3. Hand book fisheries and aquaculture----ICAR New Delhi 2006
4. Sustainable aquaculture ---- BB Jena and Carl D.Webster

5. Hand book of fisheries and aquaculture ---- NIR Board of Consultants (Asia Pacific press)
6. Prawn and prawn fisheries of India -----Kurne and Sabestian
7. Identification of shell fishes and Molluscs --- CMRI Special publication
8. Commercial Sea fishes of India – Talwar and Kicker
9. Inland fishes (Vol 1) ----Jhingram and Talwar
10. Fresh water inland fishes of India--- K.C.Jayaraman.

LIST OF EXPERIMENTS

Sl.No.	Experiments	Hours
1.	Collection and Identification of fish parasites.	2
2.	Collection and Identification of fish predators.	2
3.	Different types of fishing gears.	2
4.	Identification and biology of important cultivable fishes.	2
5.	Dissection of fish digestive system.	2
6.	Study of morphology and morphometry of fish.	2
7.	Study the types of scales in fishes.	2
8.	Gut-content analysis in locally available freshwater fish species.	2
9.	Effects of heavy metal/pesticide toxicity on behavioral changes in fish.	4
10.	Construction of aquarium tank.	4
	Laboratory note book	
	Viva voce	
	Total	24

Course Code	Course Title	Hours per week L-T-P	Credit C
MZY1824E02	Entomology	6-0-0	6

Morphology:

External features and their articulation. Comparative study of headantennae, mouth parts; thorax – legs, wings; abdominal appendages, genitalia. Taxonomy- historical development of classification of insect, basis of insect classification; classification of insects up to sub orders and up to super families in economical important groups; fossil history, origin and evolution of insects.

Insect Society:

Group of social insects and their social life; evolution of sociality; social organization and social behaviour in honey bee, ants, termites and wasps. Insect Plant Interaction - Theory of co-evolution, role of allelochemicals in host plant mediation, tritrophic interaction, host-plant selection by phytophagous insects, establishment of insect population on a plant surface. Forensic Entomology: Introduction, forensically, important insects, collection of data from cadaver site, interpretation of data for predicting time and cause of death.

Suggested Literature:

1. A general text book of entomology, Imms , A. D., Chapman & Hall, UK
2. Introduction to the study of insects, Borror, D. J., Triplehorn, C. A., and Johnson, N. F.,M Saunders College Publication, USA
3. Principles of Insect Morphology, Snodgrass, R. E., Cornell Univ. Press, USA
4. The Insect Societies, Wilson, E. O., Harward Univ. Press, UK
5. Host Selection by Phytophagous insects, Bernays, E. A., and Chapman, R. F., Chapman and Hall, New York, USA
6. Insect Plant Biology, Schoonhoven, L. M., van Loop, J. A., & Dicke. M. Pub. Oxford Univ. Press. USA
