Darrang College (Autonomous), Tezpur-784001

Syllabus
M.Sc. 3rd Semester
(CBCS)

Subject: Zoology

Approved by :

Board of Studies meeting held on 19-12-2025
&
Academic Council vide Resolution no. 2, dated 29-12-2025

M.SC. Semester-3 Syllabus

Code	Course	Credit	Contact hour	Total marks	Type
ZOO-3014	**Cell Biology**	4	54	40+10	Core (Theory)
ZOO-3024	**Immunology, Microbiology and Parasitology**	4	54	40+10	Core (Theory)
ZOO-3034	**Reproductive Biology**	4	54	40+10	Core (Theory)
ZOO-3044	**Entomology and Aquatic Biology**	4	54	40+10	Core (Theory)
ZOO-3056 (OpenI)	**Integrative Biology**	6	81	60+10	Open
ZOO-3063	**Cell Biology, Histology, Histochemistry, Immunology and Reproductive Biology**	3	54	30+7.5	Practical
ZOO-3073	**Aquatic Biology, Fishery, Entomology, Parasitology**	3	54	30+7.5	Practical

Total-28 credits

M.Sc.3rdSEMESTER
Paper-ZOO-3014 (CELLBIOLOGY)
(Marks40+10)Theory credit: 4 Credits

UNIT I

1. Chemical complexity and organization : distinctive structural and molecular features of prokaryotic and eukaryotic cells
2. Models of plasma membrane structure , membrane lipids, proteins and carbohydrates, organizational and functional features of plasma membrane
3. Cytoskeleton, microfilament, microtubules and intermediate filaments–structure and dynamics
4. Cell movement, intracellular transport, role of kinesin and dyenin, cilia and flagella-structure and function
5. Cell to cell adhesion: Ca++ dependent and CA++ independent hemophilic cell-cell adhesion, Gap junctions and connexins, cell matrix adhesion – intrigrins, collagen
6. Cell cycle : cyclins and cyclin dependent kinases; regulation of cdk-cyclin activity, cell cycle checkpoints.

UNIT II

1. Biogenesis of membrane bound organelle: Mitochondria and nucleus.
2. Protein import and mitochondrial assembly.
3. Peroxisomes, functions of peroxisomes. Peroxisome assembly.
4. Regulation of gene expression in prokaryotes and Eukaryotes, and RNA editing
5. Intracellular protein traffic: Protein synthesis on bound and free polysomes, membrane proteins, golgi sorting uptake into ER; Post-transcriptional modifications and trafficking mechanism.
6. Apoptosis: definition, mechanism and significance

Book recommended

1. Alberts et al.: *Molecular Biology of the Cell* (4th Ed.), Garland, 2002
2. Lodish et al.: *Molecular Cell Biology* (5th Ed.), Freeman, 2004
3. DeRobertis & DeRobertis: *Cell & Molecular Biology*, Lea & Febriger, 1987
4. Berg et al.: *Biochemistry* (5th Ed.), Freeman, 2002
5. Karp: *Cell and Molecular Biology* (John Wiley & Sons, 2002)
6. Lewin: *Genes VIII* (Wiley, 2004)
7. Lodish et al.: *Molecular Cell Biology* (Freeman, 2000)

8. Pollard & Earnshaw: *Cell Biology* (Saunders, 2002)

M.Sc. 3rd SEMESTER
Paper-ZOO-3024 (IMMUNOLGY, MICROBIOLOGY AND PARASITOLOGY)
(Marks40+10) Theory credit: 4 Credits

UNIT-1

1. Innate and acquired immunity – components and characteristic features, primary and secondary responses
2. Cells of the immune system : Types of cells and their subsets responsible for immune response- WBC, macrophages, dendritic cells, B,T and NK cells; Basic concept of B and T cell antigen receptors and CD markers, Cell cooperation in immune response
3. Lymphoid organs – primary and secondary lymphoid organs and their functions, theirmicro and macro structures, vascular and lymphatic connections.
4. Immunoglobulins : Structure and domain of Ig molecule, Ig classes, subclasses and types; Myelema protein, monoclonal antibody, Ig superfamily
5. Antigen-antibody reaction: antibody affinity and avidity cross reactivity, agglutination reaction, precipitation reaction.

UNIT-2

a. Microbial diversity: Prokaryotic microbes-Bacterial and archea; Eukaryotic microbes-Anaerobic and aerobic Protozoa.
b. Microbial pathogenesis: Invasiveness and Toxigenicity; pure culture techniques of microbes.
c. Applied microbiology: Microbial products; Food microbiology; Biocontrol; Biological weapons; Wastewater treatment.
d. Parasitism: General consideration, Types of parasites, Types of Hosts, symbiosis and Commensalism
e. Distribution, habit and habitat, structure and life cycle of economically important helminth parasites of man and domesticated animals: *Echinococcus granulosus, Hymenolepis nana,, Scistosoma haematobium, Trichinella spiralis* and *Wuchereria bancrofti*

BOOKS RECOMMENDED

1. **Michael, J. R. (1993). *Microbiology*. Tata McGraw-Hill.**
2. Chatterjee, K. D. (1981). *Parasitology*. Chatterjee Medical Publishers.
3. Chandler, A. C., & Read, C. P. (1970). *Introduction to parasitology*. Wiley.
4. Noble, E. R., & Noble, G. A. (1973). *Parasitology*. Lea & Febiger.
5. Smith, J. E. (1996). *Animal parasitology*. Cambridge University Press.
6. Prescott, L. M., Harley, J. P., & Klein, D. A. (latest ed.). *Microbiology*. McGraw-Hill. *(If you want a specific edition, I can update.)*
7. Roitt, I. M., Brostoff, J., & Male, D. (2000). *Immunology*. Mosby.
8. Kindt, T. J., Goldsby, R. A., Osborne, B. A., & Kuby, J. (2003). *Kuby immunology* (5th ed.). W. H. Freeman.

9. Abbas, A. K., Lichtman, A. H., & Pillai, S. (latest ed.). *Cellular and molecular immunology*. Elsevier. *(Specify edition if needed.)*
10. Roberts, L. S., & Janovy, J. (latest ed.). *Foundations of parasitology*. McGraw-Hill.
11. Cox, F. E. G. (1993/modern ed.). *Modern parasitology: A textbook of parasitology*. Wiley-Blackwell.

M.Sc.3rdSEMESTER
Paper-ZOO-3034 (REPRODUCTIVE BIOLOGY)
(Marks40+10)Theorycredit:4 Credits

UNIT I

1. Development of gonads and Disorder of gonadal development
2. Sexual differentiation within the gonads
   Anatomical organization of male and female reproductive system
3. Puberty and adolocence, role of hormones
4. Reproductive cycles in animals and human: Estrous and menstrual cycle
5. Ovarian Follicular development: Folliculogenesis, mechanism of ovulation in mammals
6. Testicular organization, seminiferous epithelium cycle, Spermatogenesis

UNIT II

7. Role of hormones in Reproduction
8. Placenta and Placental hormones
9. Implantation and role of hormones
10. Pregnancy and hormones of pregnancy.
11. Development of breast, Lactation and hormonal regulation
12. Parturition in mammals
13. Assisted reproductive Techniques: IVF-ET
14. Environmental endocrine issue: environmental estrogens, endocrine disruptors

RECOMMENDED BOOKS

1. *The Physiology of Reproduction*, Vol. 1 and 2, Ernst Knobil and Jimmy D. Neil, (ed.), Raven Press.
2. *Male Reproductive Function*, Christina Wang, (ed.), Kluwer Academic Publishers.
3. *The Ovary*, (ed), Solly Zuckerman Zuckerman, Barbara J. Weir, T. G. Baker. Academic Press.
4. *The Ovary*, Peter C. K. Leung and Eli Y. Adashi, (ed.), Elsevier (Academic Press), 2004.
5. *Cell and Molecular Biology of Testis*, (ed.), Claude Desjardins and Larry L. Ewing, Oxford University Press, USA.

6. *Essential of Reproduction*, Martin H. Johnson.

M.Sc.3rdSEMESTER
Paper-ZOO-3044 (AQUATIC BIOLOGY AND FISHERIES)
(Marks40+10) Theory credit: 4Credits

UNIT1

1. Classification of class of Insects upto Orders with salient features and common example.
2. Useful insects: Insects and Insect products, Pollinating insects, insect used as food and medicine.
3. Harmful insects: Insect as pests, vectors of diseases.
4. Role of insects in ecosystem and nutrient cycling.
5. Insects as environmental indicator.
6. Concept of Pest management: IPM concept, Biological Pest Control, Organic pesticides

UNIT II

7. Limnology: Introduction, Definition of limnology, Essential nature of limnology.
8. Aquatic Resources: Characteristic features of freshwater, brackishwater and marine water environment.
9. Freshwater Environment: Extent and distribution of freshwater. Lotic environments, ideological classification of fresh water biota. Freshwater communities.
10. Rivers: Origin and characteristics of Rivers, Function and Biological productivity
11. Major threats to freshwater ecosystem including pollution and sand mining, impact of large dams.
12. Fish germplasm diversity of North East India—their prospects, problems & conservation strategy.
13. Ornamental fishes of North East India and exotic ornamental fishes: their culture & breeding techniques.

RECOMMENDED BOOKS

1. **Atwal:** *Agricultural pests of India and South East Asia,* Kalyani Publishers, 1986
2. **Chapman:** *The Insects: Structure and Function*, 4th Ed., ELBS, 1998
3. **Klowden:** *Physiological Systems in Insects*, Academic Press 2002
4. **McGavin:** *Essentials* of *Entomology*, Oxford Univ. Press 2001 New Delhi
5. **Srivastava:** *A text book of applied entomology.* Vol. I & II, Kalyani Publishers, New Delhi, 1998. 1993
6. **Wigglesworth:** *Principles of Insect Physiology*, ELBS, 1972
7. **Tembhare, D.B.:** *Modern Entomology*, Himalaya Publishing House, 1995
8. **Wetzel, R.G.** *Limnology: Lake and River Ecosystems*, 3rd Ed., 2001

9. **Welch, P.S.:** *Limnology*, 1951
10. **Jhingran, V.G.:** *Fish and Fisheries of India*, Hindustan Publishing Corporation, New Delhi, 1985

M.Sc 3rd SEMESTER
PAPER Z-3056 (OPEN II): 6credits INTEGRATIVE BIOLOGY

UNIT I

1. Molecules and their interactions: Structures of atoms, molecules and chemical bonds, Stabilizing interactions (van der waal's, Electrostatic, Hydrogen bonding, Hydrophobic interactions, etc)
2. Growth, yield and Principles of catalysis, enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isozymes.
3. Conformation of Nucleic acids (A-,B-,Z-DNA), t-RNA and microRNA.
4. Microbial Physiology: Growth, yield and characteristic, strategies of cell division, Stress response.
5. Cell signaling: Hormones and their receptors, signaling through G protein coupled receptors, signal transduction pathways, second messengers, and regulation of signaling pathways, bacterial chemotaxis and quorum sensing.

UNIT II

6. Cellular communication: Regulation of haematopoeisis, neurotransmission and its regulation
7. Gene mapping methods: Linkage maps, tetrad analysis, Mapping by using somatic somatic cell hybrids
8. Human genetics: Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders.
9. Quantitative genetics: Polygenic inheritance, heritability and its measurements.QTL mapping.
10. Recombination: Homologous and non-homologous recombination including transposition, site specific recombination.
11. Population genetics- population, gene pool, gene frequency; concepts and rate of change in gene frequency through natural selection.

M.Sc.3rd SEMESTER

Paper-ZOO-3063 (CELL BIOLOGY, HISTOLOGY, HISTOCHEMISTRY, IMMUNOLOGY AND REPRODUCTIVE BIOLOGY)

PRACTICAL (3Credits) (Marks 20+5)

1. Observation of mitochondria using vital stain.
2. Dissection and histological study of lymphoid organs in rat/mouse.
3. Differential WBC count in mammalian blood.
4. Metachromatic staining of pituitary
5. Detection of DNA, glycogen, and protein using cytochemical techniques.
6. Preparation of histological slides from testis and ovary.
7. Preparation and study of phagocytosis by splenic/peritoneal macrophages.
8. Study of the estrous cycle.

M.Sc.3rdSEMESTER
Paper-ZOO-3073 (AQUATIC BIOLOGY & FISHERIES, ENTOMOLOGY AND PARASITOLOGY)
(Marks20+5) Credit: PRACTICAL

1. Estimation of soil parameters: pH, organic carbon, and phosphate.
2. Estimation of primary productivity by the Light and Dark Bottle (L–D–B) method.
3. Collection and identification of plankton, aquatic insects, and aquatic macrophytes.
4. Estimation of turbidity using the Secchi disc method.
5. Identification of indigenous and exotic ornamental fishes under different families.
6. Identification of insects belonging to different orders.
7. Identification of different types of insect mouthparts, antennae, and legs.
8. Dissection and temporary mounting of the salivary gland of honeybee/cockroach.
9. Dissection of the sting apparatus in honeybee/wasp.
10. Study of prepared slides and museum specimens of selected parasites representing protozoans, helminths, and arthropods.
11. Preparation and identification of permanent slides of rectal ciliates in frog.