

**SEMESTER III****M.Sc. Zoology****Paper No: IX****Title of the Paper: Comparative Anatomy****Marks: 100****Credits: 04****Marks: Semester End Examination : 70****Continuous Internal Evaluation : 30**

<b>Unit</b>	<b>Detailed Syllabus</b>	<b>Teaching Hours</b>	<b>Marks / Weight</b>
<b>Unit 1</b>	<b>Comparative account of digestive organs:</b> Stomach, intestine; liver and pancreas as associate digestive gland. Filter feeding mode of digestion in animals. <b>Nervous system:</b> Types, sympathetic and parasympathetic nervous system, spinal cord, cranial nerves.	15	18
<b>Unit 2</b>	<b>Integument:</b> structure of integument in vertebrates, types of skin derivatives in fishes, reptiles, birds and mammals. <b>Endoskeleton:</b> Comparative account of jaw suspensorium, vertebral column in birds and mammals, comparative account of girdles.	15	18
<b>Unit 3</b>	<b>Organs of respiration:</b> gills and lungs. <b>Sense Organs:</b> Comparative account of eyes and ear in vertebrates. <b>Reproductive organs:</b> Comparative account of testis and ovary.	15	17
<b>Unit 4</b>	<b>Circulatory system:</b> Evolution of heart, aortic arches, portal system <b>Excretory System:</b> Types of nephron in fish, reptiles, birds and mammals. <b>Minor Phyla:</b> Concept, Significance and general characters.	15	17

**Break up of Continuous Internal Evaluation:****Internal Test : 15 Marks****Assignment : 10 Marks****Attendance : 05 Marks****Total Marks : 30 Marks****Reference Books :**

1. Chordate Zoology by Jordan and Verma.
2. Elements of Chordate anatomy by Wrichert.
3. Invertebrata by Jordan and Verma.
4. Life of invertebrate by Russell – Hunter, Macmillan.
5. Life of Vertebrates by Young, Oxford University Press.
6. The chordates by Alexander, Cambridge University Press.

**SEMESTER III****M.Sc. Zoology****Paper No: X****Title of the Paper: Development Biology and Histology****Marks: 100****Credits: 04****Marks: Semester End Examination : 70****Continuous Internal Evaluation : 30**

<b>Unit</b>	<b>Detailed Syllabus</b>	<b>Teaching Hours</b>	<b>Marks / Weight</b>
<b>Unit 1</b>	<b>Differentiation of gonads in chick and mammals:</b> Gametogenesis, morphological basis of spermatogenesis and oogenesis, semen composition, formation and function. <b>Fertilization:</b> Pre and post fertilization events, biochemistry of fertilization. Early embryogenesis in amphibians, role of germ layer in organogenesis.	15	18
<b>Unit 2</b>	<b>Early embryogenesis.</b> In chick, development of faetal membranes, organogenesis and differentiation. Metamorphosis with reference to amphibians. <b>Regeneration:</b> In Invertebrate and vertebrate groups of animals. <b>Parthenogenesis:</b> With reference to Invertebrates and vertebrates.	15	18
<b>Unit 3</b>	<b>Histology of tissue:</b> Epithelial, connective, muscles, nervous, integument. <b>Digestive system:</b> Stomach, intestine, liver, pancreas, kidney. <b>Reproductive organs and endocrine gland:</b> Testis, ovary	15	17
<b>Unit 4</b>	<b>Histology of respiratory organs:</b> Trachea, bronchus and lungs. <b>Histology of Endocrine gland:</b> Thyroid gland, adrenal gland, pituitary gland, endocrine pancreas, thymus.	15	17

**Break up of Continuous Internal Evaluation:****Internal Test : 15 Marks****Assignment : 10 Marks****Attendance : 05 Marks****Total Marks : 30 Marks****Reference Books:**

1. Development Biology by Arumugam, Saras Publication. 2004
2. Development Biology by Berrill, Taxa McGraw Hill.
3. Histology by Bailey.
4. Histology by Gauba.
5. Histology by Hem.
6. Histology by Inderbeer Singh.
7. Introduction to embryology by Balinsky.
8. Pattern's Book of Embryology.

**SEMESTER III****M.Sc. Zoology****Paper No: XI****Title of the Paper: Entomology****Marks: 100****Credits: 04****Marks: Semester End Examination : 70****Continuous Internal Evaluation : 30**

<b>Unit</b>	<b>Detailed Syllabus</b>	<b>Teaching Hours</b>	<b>Marks / Weight</b>
<b>Unit 1</b>	<b>Taxonomy:</b> Basic concept, Historical resume of Systematics, Importance and application of Taxonomy. Characteristic and classification of insects. Insect preservation and identification	15	18
<b>Unit 2</b>	<b>Important Pests:</b> Crops, animals and human beings, chemical and biological control of insect pest. Economic importance of insects.	15	18
<b>Unit 3</b>	<b>Insect physiology :</b> Physiology of digestion, blood, excretion, Respiration and photoreception. <b>Reproduction:</b> Fertilization, growth and metamorphosis. Insect Embryo development up to germ layers. Insect endocrine organs.	15	17
<b>Unit 4</b>	Pheromones, Sonification, Bioluminescence, Behavioral study of certain insects.	15	17

**Break up of Continuous Internal Evaluation:****Internal Test : 15 Marks****Assignment : 10 Marks****Attendance : 05 Marks****Total Marks : 30 Marks****Reference Books:**

1. Entomology by Essig.
2. Entomology by Imms.
3. General Entomology by Mani, M.S.
4. Insect Morphology by Snudgrass.
5. Insect physiology by Wigglesworth.
6. A text Book of Applied Entomology by Srivastava, Kalyani publication.

**SEMESTER III****M.Sc. Zoology****Paper No: XII****Title of the Paper: Practicals (Zoology)****Marks: 100****Credits : 15**

Practical exercised based on paper IX to XI

**SEMESTER IV****M.Sc. Zoology****Paper No: XIII****Title of the Paper: Ecology and Animal Biotechnology****Marks: 100****Credits: 04****Marks: Semester End Examination : 70****Continuous Internal Evaluation : 30**

<b>Unit</b>	<b>Detailed Syllabus</b>	<b>Teaching Hours</b>	<b>Marks / Weight</b>
<b>Unit 1</b>	<b>Ecosystem:</b> Definition, types and composition, Biochemical cycles. <b>Inter relationship:</b> Mutualism, Commensalisms, proto – operation, the role of prey – predators relation in nature, parasitism, competition (inter and intra specific).	15	18
<b>Unit 2</b>	<b>Population ecology:</b> population attributes, niche - concept, food chain. <b>Adaptation:</b> aquatic, terrestrial and parasitic. <b>Wild life:</b> Conservation, sanctuaries and national parks.	15	18
<b>Unit 3</b>	<b>Animal Biotechnology:</b> An overview, definition, genetic engineering, animal tissue culture, application of animal biotechnology, gene banking and conservation. Acquired Immune deficiency syndrome (AIDS), Production of drugs from animals.	15	17
<b>Unit 4</b>	<b>Animal tissue culture:</b> Gene controlling differentiation in animals (organ regeneration in animals), transformation of animal cells, characteristics, establishment of cell line, animal tissue culture media, culture procedures. Transgenic animal, artificial animal breeding,	15	17

**Break up of Continuous Internal Evaluation:****Internal Test : 15 Marks****Assignment : 10 Marks****Attendance : 05 Marks****Total Marks : 30 Marks****Reference Books:**

1. Animal Biotechnology by M. M. Ranga, Agrobios, India.
2. Animal Tissue Culture by Cruickshank.
3. Concet of Ecology.
4. Ecology by Odum.
5. Indian Wild Life by B. K. Tikader, ZSI, Calcutta.

**SEMESTER IV****M.Sc. Zoology****Paper No: XIV****Title of the Paper: Animal physiology and Neuroendocrinology****Marks: 100****Credits: 04****Marks: Semester End Examination : 70****Continuous Internal Evaluation : 30**

<b>Unit</b>	<b>Detailed Syllabus</b>	<b>Teaching Hours</b>	<b>Marks / Weight</b>
<b>Unit 1</b>	<b>Physiology of digestion:</b> Digestive juices, bile and saliva, their regulation of secretion. Digestion and absorption of different food stuffs. <b>Physiology of blood:</b> haemopoiesis, erythropoiesis, coagulation of blood. <b>Physiology of respiration:</b> Respiratory pigments, gaseous exchange, external and internal.	15	18
<b>Unit 2</b>	<b>Physiology of heart:</b> cardiac cycle, heart beats. <b>Physiology of Excretion:</b> ultra structure of nephron, urine formation, nitrogenous waste pattern. <b>Muscle physiology:</b> muscle contraction, conduction of nerve impulses.	15	18
<b>Unit 3</b>	<b>Hormones:</b> types, neurosecretions and neurohormones, neuroendocrine integration. <b>Neuroendocrine control:</b> of minerals, reproduction and pigments. Rennin- Angiotensin system.	15	17
<b>Unit 4</b>	<b>Endocrine organs:</b> Adrenal gland, pituitary gland, ovary, testis, pancreas, their hormones and functions. Synthesis, storage and release of thyroid hormones, its function.	15	17

**Break up of Continuous Internal Evaluation:****Internal Test : 15 Marks****Assignment : 10 Marks****Attendance : 05 Marks****Total Marks : 30 Marks****Reference Books:**

1. Animal physiology by Nielsen Cambridge.
2. Comparative animal physiology by Prosser.
3. Comparative physiology by Hoar, Prentice Hall.
4. Endocrinology, Blackie.
5. Human physiology by Best and Taylor.
6. Human physiology by C.C. Chatterjee.

**SEMESTER IV****M.Sc. Zoology****Paper No: XV****Title of the Paper: Marine Zoology****Marks: 100****Credits: 04****Marks: Semester End Examination : 70****Continuous Internal Evaluation : 30**

<b>Unit</b>	<b>Detailed Syllabus</b>	<b>Teaching Hours</b>	<b>Marks / Weight</b>
<b>Unit 1</b>	<b>Marine environment:</b> history of oceanography; oceans of the world. Continental drift; sea as a biological environment, main division and zones of marine environment. <b>Physical factors:</b> temperature, light, pressure, sound velocity, sedimentation, dynamic factors, waves, tides, currents, their effects on marine flora, fauna, and microorganisms.	15	18
<b>Unit 2</b>	<b>Chemistry of sea water:</b> chemical composition, chlorinity, salinity, pH, Dissolved gases, minerals, nutrients and organic matter. <b>Pollution:</b> major pollutant (sewage, agricultural discharges, industrial wastes, dredging, oils, radioactive, elements) and their effects on marine biota, bioremediation.	15	18
<b>Unit 3</b>	<b>Marine biodiversity:</b> Zooplankton, marine invertebrates and vertebrates, marine borers and foulers, study of rocky, sandy and muddy habitats. <b>Marine ecosystem:</b> estuaries, marine wetlands, animal communities, interrelationship, food chain and food pyramids.	15	17
<b>Unit 4</b>	<b>Marine fisheries:</b> Bombay duck, pomfrets, prawn and molluscan fishery, endangered marine fauna. <b>Economic importance of marine fishes:</b> exclusive economic zone (EEZ), its significance. Nutritive value, fish by-product, Mari culture.	15	17

**Break up of Continuous Internal Evaluation:****Internal Test : 15 Marks****Assignment : 10 Marks****Attendance : 05 Marks****Total Marks : 30 Marks**



**Reference Books:**

1. A text book of fish biology and Indian fisheries by R.P Parihar,
2. Biological oceanography by Angle, H.V. Methuen, 1975.
3. Brackish water, aquaculture delopment in India by Srivastva et al.
4. Chemical oceanography (vol. 1-8) by Riley and Shirrow, Academic press.
5. Fish and Fisheries of India by Jhingran, Hindustan Pub. Co. Delhi.
6. Introduction to Marine Ecology by Bames and Highes, Blackwall, 1982.
7. Marine Ecology by Levingstone, Prentice Hall, 1982.
8. Marine Fisheries by Bal and Virbhadra.
9. Marine Fisheries (IInd ed.) by Bal and Rao, Tata McGraw Hill, New Delhi.
10. Oceanography- an introduction to marine Enviroment by Weyl, R.R, 1970.

**SEMESTER IV**

**M.Sc. Zoology**

**Paper No: XVI**

**Title of the Paper: Practicals (Zoology)**

**Marks: 100**

**Credits : 15**