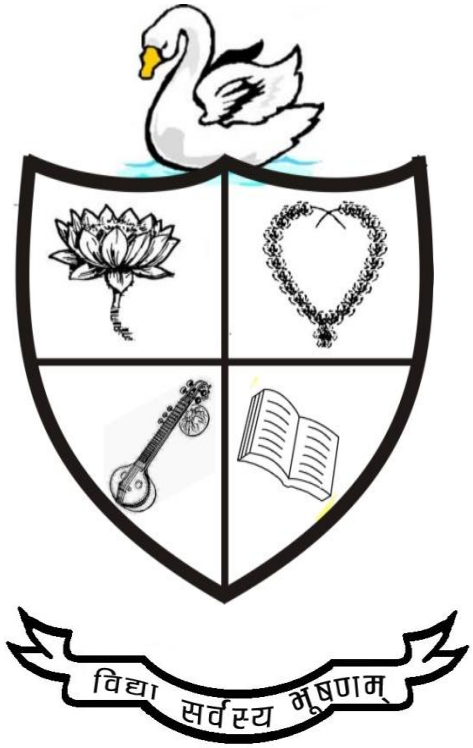
GOVT. DIGVIJAY P.G. AUTONOMOUS COLLEGE
RAJNANDGAON (C.G.)

DEPARTMENT OF ZOOLOGY



M.Sc. Zoology Semester Exam (I – IV)

Syllabus

(2025-26)

(Approved by Board of Studies)
Effective from July 2025-26

Syllabus based on Credit Based System

At post-graduate level, candidates are required to study 16 Paper in Ist, IInd, IIIrd and IVt^{h} semester examination (16 - Papers in each semester). There will be sixteen papers in each post-graduate examination in Zoology, containing 80 credits. In Ist, IInd, IIIrd and IVth semester, each paper carry 100 marks (80 marks for external examination and 20 marks for internal examination). The semester includes two practical, each practical contains 100 marks. There will be 2400 marks in M.Sc. Candidates will have to secure 36 percent marks in aggregate of all papers in order to pass the M.Sc. Examination. Semester IV has two optional Subjects, Elective A & Elective B, out of which student has to choose one option.

Semester	Title of Paper	Credits
Ist SEMESTER	I. Biosystematics and Taxonomy	4
	II. Structure and Functions in Invertebrates	4
	III. Comparative Anatomy of Vertebrates	4
	IV. Tools and Techniques in Biology	4
	Practical I- Based on Paper I & II	2
	Practical II- Based on Paper III & IV	2
		20
IInd SEMESTER	I. Molecular Cell Biology & Genetics	4
	II. General and Comparative Endocrinology	4
	III. Environmental Physiology & Ecology	4
	IV. Population Ecology and Quantitative Biology.	4
	Practical I- Based on Paper I & II	2
	Practical II- Based on Paper III & IV	2
		20

Old Syllabus: Semester III & IV

IIIrd SEMESTER	I. Population Genetics and Evolution	4
	II. Animal Behavior	4
	III. Gamete and Developmental Biology	4
	IV. Comparative Physiology of Vertebrates	4
	Practical I- Based on Paper I & II	2
	Practical II- Based on Paper III & IV	2
		20
IVth SEMESTER	**Elective A :**	
	I. Biochemistry(Compulsory)	4
	II. Limnology(Compulsory)	4
	III. Ichthyology(Optional)	4
	IV. Pisiculture and Fishery Economics (Optional)	4
	Practical I- Based on Paper I & II	2
	Practical II- Based on Paper III & IV	2
		20
IVth SEMESTER	**Elective B:**	
	I. Biochemistry(Compulsory)	4
	II. Neurophysiology(Compulsory)	4
	III. Entomology(Optional)	4
	IV. Applied Entomology(Optional)	4
	Practical I- Based on Paper I & II	2
	Practical II- Based on Paper III & IV	2
	Total Credits	**80**

GOVT. DIGVIJAY COLLEGE RAJNANDGAON (C.G.)
Department of Zoology
Syllabus of Semester System
Scheme of Semester Examination
(2025-26)

1. The Degree shell be called M.Sc. (Zoology)
2. The course is based on semester system having two semesters in each year.
3. Each semester will have 4 theory papers of 100 marks, distributed in to 80 marks for theory and 20 marks for internal assessment. (average marks should be given from internal test 20 marks + seminar 20 marks + attendance 20 marks + project 20 marks)
4. Semester IV has two optional Subjects, Elective A & Elective B, out of which student has choose to option one.
   Elective A: Ichthyology and Pisiculture.
   Elective B: Entomology & Applied Entomology.
5. There will be two practical related with course of 100 marks.

Sem.	Theory Paper	Marks Theory + Internal Assess. 80+20=100	Lab Course
Sem. I	I. Biosystematics and Taxonomy II. Structure and functions of invertebrate	100 100	Lab Course I-100
	III. Comparative anatomy of vertebrates IV. Tools and Techniques for biology	100 100	Lab Course II-100
Sem. II	I. Molecular cell biology & Genetics II. General and Comparative Endocrinology	100 100	Lab Course I-100
	III. Environmental physiology and ecology IV. Population Ecology and Quantitative Biology	100 100	Lab Course II-100
Sem. III	I. Animal behavior II. Population genetics and Evolution	100 100	Lab Course I-100
	III. Gamete and developmental Biology IV. Comparative physiology of Vertebrates	100 100	Lab Course II-100
Sem. IV	**Elective A :**		
	I. Biochemistry(Compulsory) II. Limnology(Compulsory)	100 100	Lab Course I-100
	III. Ichthyology(Optional) IV. Pisiculture and Fishery Economics (Optional)	100 100	Lab Course II-100
	Elective B:		
	I. Biochemistry(Compulsory) II. Neurophysiology(Compulsory)	100 100	Lab Course I- 100
	III. Entomology(Optional) IV. Applied Entomology(Optional)	100 100	Lab Course II- 100
		1600	**800 = 2400**

M.Sc. ZOOLOGY
(2025-26)
Semester - I
Paper –I
Biosystematics & Taxonomy M.M.-80

Session: 2025-26	**Program: M.Sc.**
Semester: I	**Paper - I**
Credit: 04+02 (L+P)	**Lecture 60 + 30**
MM: 80	**Minimum Passing Marks: 35**

Objectives	This Syllabus contains information about • Biosystematics. • Trends in Biosystematics. • Dimensions of speciation & Taxonomic characters. • Procedure keys in Taxonomy.	
Learning outcome	Students gain knowledge about • The basic taxonomy and systematics trends in biosystematics. • Taxonomic characters and different keys of taxonomy. • Procedure keys in Taxonomy and Dimensions of Speciation & Taxonomic character.	
Credit detail	**Unit**	**Syllabus**
Cradits: 4 ▪ **Max. Marks: 100** ▪ **Theory: 100 (80+20)**	I (15 Lecture)	**Biosystematics** 1. History of Systematics. 2. Importance & applications of biosystematics in biology. 3. Material basis characteristics of Biosystematics. 4. Species concept.
	II (15 Lecture)	**Trends in biosystematics** 1. Chemotaxonomy. 2. Cytotaxonomy. 3. Molecular taxonomy. 4. Immuno taxonomy.
	III (15 Lecture)	**Dimensions of Speciation & Taxonomic characters** 1. Theories of biological classification, hierarchy of categories. 2. Origin of Reproductive isolation - biological mechanism of genetic incompatibility. 3. Speciation.
	IV (15 Lecture)	**Procedure & keys in Taxonomy** 1. Types of taxonomic keys - Merits & Demerits. 2. Taxonomic procedures – Taxonomic collections, preservation, curetting process and identification. 3. International code of Zoological nomenclature (ICZN) its operative principles and application of important rules. Zoological nomenclature Formation of scientific names of various taxa.
Suggested Books:	1. Biosystematics & Taxonomy – Dr.R.C. Tripathi. 2. Theory and practice of Animal Taxonomy – V.C. Kappor. 3. Principal of Animal Taxonomy – G.G. Simpson. 4. Elements of Taxonomy – Earnst Mayer. 5. Principle of Animal Taxonomy; G.G. Simpson. Oxford IBH Publishing Company.	

M.Sc. ZOOLOGY
(2025-26)
Semester - I
Paper –II
Structure and Function of Invertebrates M.M.-80

Session: 2025-26	**Program: M.Sc.**
Semester: I	**Paper: II**
Credit: 04+02 (L+P)	**Lecture 60 + 30**
MM: 80	**Minimum Passing Marks: 35**

Objectives	This syllabus contains information about • Study of organization of Coelom & Locomotion. • Nutrition, digestion & respiration. • Excretion, nervous system, larval forms and minor phyla.	
Learning outcome	Students will acquire knowledge about • The organization of Coelom. • Nutrition, digestion & respiration. • Excretion, nervous system, larval forms and minor phyla.	
Credit detail	**Unit**	**Syllabus**
Credits: 4 ▪ Max. Marks: 100 ▪ Theory: 100 (80+20)	I (15 Lecture)	**Organization of Coelom** 1. Acoelomates. 2. Pseudoeocoelomates, Coelomates. 3. Protostomia and Deuterostomia. **Locomotion -** 1. Flagella and cillary movement in protozoa. 2. Hydrostatic movement in coelenterate, Annelida and Echinodermata.
	II (15 Lecture)	**Nutrition and Digestion** 1. Patterns of feeding and digestion in lower metazoan. (Porifera & Coelenterata) 2. Filter feeding in Polychaeta, Mollusca,Ecinodermata **Respiration** 3. Organs of respiration –Gills, Book Lungs and Trachea. 4. Respiratory Pigments. 5. Mechanism of Respiration (Arthropoda, Mollusca).
	III (15 Lecture)	**Excretion** 1. Organs of excretion – Coelom, Coelomoducts, Nephridia and Malpighian tubules. 2. Mechanism of excretion. (Annelida, Arthropoda). 3. Osmoregulation in (Aquatic & Terrestrial Invertebrates) **Nervous system** 4. Primitive Nervous system- Coelenterata and Ehinodermata. 5. Advanced nervous system- Arthropoda.(Crustacea, Insecta) and Mollusca (Cephalopoda).
	IV (15 Lecture)	**Larval forms and Minor Phyla** 1. Larval Forms of Free-Living Invertebrates. 2. Larval forms and significance of Platyhelminthies.

		3. Larval forms of Parasites (Helminths) 4. Larval forms and significance of Crustacea. 5. Larval forms and significance of Echinodermata. 6. Evolutionary Significance of Larval Forms. 7. Minor Phyla: Gastrotricha ,Rotifera, Ectoprocta, Endoprocta.(Structure and affinities)
Suggested Books:	1. Invertebrate Structure & Function: E.J.W. Barrington. 2. A Text book of zoology Invertebrate: Parker Hasvell, Marshall & Williams. 3. The Cambridge Natural History Vol 1-9; S.F. Harmer, A. E. Shipley. 4. The invertebrates. Vol.1, 2 & 8. Hyman, L.H. McGraw Hill Co., New York. 5. Invertebrate Zoology Barnes, RD. W.B.Saunders Co., Philadelphia 6. A Biology of higher invertebrates, Russel-Hunter, WD. McMillan Co. Ltd., London 7. Student Text Book of Zoology. Vol.I.II and III. Sedgwick.A. Central Book Depot, Allahabad. 8. Text book of Zoology. Parker, T.J., Haswell. W.A.Macmillan Co., London.	

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M.Sc. ZOOLOGY
(2025-26)
SEMESTER - I

Lab Course- I based on Theory Paper I & II M.M- 100

I -Biosystematics and taxonomy

1. Study of biodiversity among various invertebrates and vertebrates. (Listing of all the animals found in and around your house and also try to find out their Zoological Name.)
2. Identification of local fauna on the basis of their morphological characters (5 each)
3. Visit to local Animal Park or zoo to identify and study the captive fauna and preparation of report.
4. Construction of a dichotomous key.
5. Study of biodiversity in grassland and pond water and computation of index.
6. Study of adaptive characteristics of various invertebrates in different climate.
7. Composition assessment of the taxonomic diversity / biodiversity in a habitat (e.g. grassland, arid land, wet land, etc.).
8. Influence of climatic conditions on taxonomic diversity in a given habitat
9. Preparation of models showing the status of certain taxa or species in a particular habitat.
10. Other exercise related to theory paper.

II -Structure and Function of Invertebrates

1. Study of the museum specimens belonging to the different invertebrate phyla.
2. Study of permanent prepared slides of different Phyla. (Protozoa to Hemichortdata)
3. General Method of Microscopic Preparations (Killing and Narcotization, Fixing, Washing , Staining, Distaining, Dehydration, De alcoholization or Clearing, Mounting, Precautions and Instructions, Chart for Single Staining)
4. Culture of Protozoan's n artificial media.(Paramoicium,Vorticella, Euglena)
5. Dissection Sepia, Loligo, Octopus, Mytillus and Sea urchin. (presentation through alternative technique)
6. Permanent slides preparation of microorganisms and its Identification–mounting material preserve invertebrates.
7. Permanent preparation of different materials to be provided for study.
8. Study of life-cycle of some parasites through charts, models or live materials.
9. Collection & Identification Larval forma forms of Arthropods.(Crustacea/Insecta)

Scheme of Examination

Time – 6 hours

1. Based on paper III	-	**35**
2. Based on paper IV	-	**35**
3. Viva	-	**10**
4. Sessional(Internal)	-	**20**

Total = 100 Marks

M.Sc. ZOOLOGY
(2025-26)
Semester - I
Paper –III
Comparative Anatomy of Vertebrates M.M.-80

Session: 2025-26	**Program: M.Sc.**
Semester: I	**Paper: III**
Credit: 04+02(L+P)	**Lecture 60 + 30**
MM: 80	**Minimum Passing Marks: 35**

Objectives	This syllabus contains information about the • Origin of chordata, comparative account of blood circulation, skeletal system, Urinogenital system, Nervous system and sense organs. • Students find fundamental knowledge of comparative physiology of various systems of vertebrates.	
Learning outcome	Students will acquire knowledge about • The silent features of classifications. • The basic knowledge of evolutions of heart & Aortic arches. • Brief knowledge of chordates skeletal system & specific sense organ.	
Credit detail	**Unit**	**Syllabus**
Credits: 4 ▪ Max. Marks: 100 ▪ Theory: 100 (80+20)	I (15 Lecture)	**Origin of Chordate** 1. Protochordata salient feature. 2. Origin and classification of Amphibia. 3. Origin and classification of Reptilia and Aves. 4. Origin and classification of Mammalia. 5. Vertebrate integument and its derivatives.
	II (15 Lecture)	**General Plan of circulation in various groups** 1. Composition and function of Blood. 2. Evolution of heart. 3. Evolution of aortic arches. 4. Comparative account of respiratory organs.
	III (15 Lecture)	**Skeletal system and Urinogenital system** 1. Comparative account of jaw suspensorium, Vertebral column. 2. Comparative account of Limbs and Girdles. 3. Comparative anatomy of kidney of vertebrates. 4. Evolution of Urinogenital system in vertebrate series.
	IV (15 Lecture)	**Nervous system and Sense organs** 1. Comparative anatomy of the brain and spinal cord with relation to their functions. 2. Cranial, Peripheral and Autonomous nervous system. 3. Audio receptors. 4. Organs of olfaction, Taste & Photoreception. 5. Lateral line system.

Suggested Books:	**Suggested Reading Materials:** 1. Vertebrate Life: Willian N. Ferland, F.Harvey Pouch, Tom J Gode, John B. Helser. 2. Chordate Morphology: Malcom Jollie. 3. Chordate - Structure & Function : Arnold G. Khage, B.E. Fry Johanson. 4. Comparative Animal Phisiology: Orosser. 5. The Vertebrate Body: Alfred Sherwood Romer. 6. Comparative anatomy of vertebrate: Kent

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M.Sc. ZOOLOGY
(2025-26)
Semester - I
Paper –IV
Tools and Technique in Biology M.M. 80

Session: 2025-26	**Program: M.Sc.**
Semester: I	**Paper: IV**
Credit: 04+02(L+P)	**Lecture 60 + 30**
MM: 80	**Minimum Passing Marks: 35**

Objectives	This syllabus contains information about • Different types of tools which are used in zoology. • Students find practical information of different types of laboratory equipments and how they use different equipments like pH meter, centrifuge colorimeter etc.	
Learning outcome	Students will acquire knowledge about • The basic and fundamentals of instrumentation, different types of tools which are used in zoology. • Students find practical information of different types of laboratory equipments, they use different equipments like pH meter, centrifuge colorimeter, chromatography, electrophoresis, centrifugation, spectrophotometry etc.	
Credit detail	**Unit**	**Syllabus**
Credits: 4 ▪ Max. Marks: 100 ▪ Theory: 100 (80+20)	I (15 Lecture)	**Principles and uses of analytical instruments** Balance (Single Pan Balance), pH meter, Colorimeter, Spectrophotometer, Ultracentrifuge, ESR Spectrometers, NMR Spectrometers.
	II (15 Lecture)	**Microscopy** Principle and functioning of: of light transmission microscope, Phase contrast, Fluorescence microscopes and Electron microscopy. Cryotechniques in microscopy.
	III (15 Lecture)	**Separation Techniques in Biology** 1. Molecular separations by chromatography (Paper, thin layer, column and mono and two dimension chromatography), Electrophoresis etc. 2. Organelle separation by centrifugation. 3. Cell separation by flow cytometry, density gradient centrifugation unit –gravity centrifugation.
	IV (15 Lecture)	**Microbiology** 1. Tissue culture. 2. Animal cell culture. 3. Media preparation. 4. Sterilization.

Suggested Books:	1. Introduction to Instrumental Analysis: Robert Braun. 2. A biologist guide to principals and techniques of practical biochemistry: K Wilson and K. H. Goulding**.** 3. Instrumentations: Upadhyay and Nath. 4. Instrumentations & Techniques: R.C. Bajpayee.

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M.Sc. ZOOLOGY
(2025-26)
SEMESTER - I

A. Lab course-II Practical based on theory Paper III & IV M.M- 100

III- COMPARATIVE ANATOMY OF VERTEBRATES

1. Study of museum specimen from Protochordate to mammals.
2. Study of histological slide from Protochordates to mammals.
3. Observe and compare the inherent rhythmicity of the different parts of the heart.
4. Concentration / dispersal of pigment in isolated scales of dark / light adapted fish.
5. Study of different types of feathers in birds.
6. Study of local bird fauna and classify as per their adaptive characters like feeding, habitat etc.
7. Dissection of vertebrate's cranial nerve of Pigeon and neck nerves of Rat. (presentation through alternative technique)
8. Osteological study of Amphibia, Reptilia, Aves and Mammals.
9. Permanent slide preparation –test of Herdmania, Salpa , Doliolum. (Method only)
10. Other exercise related to theory paper.

IV- TOOLS AND TECHNIQUE IN BIOLOGY

1. Analysis of electric conduction using conductivity meter.
2. Analysis of pH of Sample by using pH Meter.
3. Analysis of chemical/Biochemical using colorimeter/spectrophotometer.
4. Separation of compound using Chromatography
5. Separation of molecules using Centrifuge.
6. Separation of DNA/Proteins using Electrophoresis.
7. Identification of Hormones or the compound using ELISA test.
8. Implication of Nucleic acid using PCR.

Scheme of Examination

Time – 6 hours

1. Based on paper III	-	**35**
2. Based on paper IV	-	**35**
3. Viva	-	**10**
4. Sessional(Internal)	-	**20**

Total = 100 Marks

M.Sc. ZOOLOGY
(2025-26)
Semester - II
Paper –I
Molecular Cell Biology & Genetics M.M.-80

Session: 2025-26	**Program: M.Sc.**
Semester: II	**Paper - I**
Credit: 04+02(L+P)	**Lecture 60 + 30**
MM: 80	**Minimum Passing Marks: 35**

Objectives	This Syllabus contains information about • Cell, Bio-membrane cytoskeleton, chromosomal morphology. • Biology of cancer, ageing mobile DNA and genetics. • Students find basic information of cell organelle and its biology. • They know also about the cancer cell biology.	
Learning outcome	Students will acquire knowledge about • Cell, Bio-membrane cytoskeleton, chromosomal morphology. • Biology of cancer, ageing mobile DNA and genetics. • Students find basic information about cell organelles and its biology Some fundamental genetics like Mendelian and Non Mendelian inheritances, linkages, mutations, sex determination of various animals, extrachromosomal inheritances, transposable genetic elements etc.	
Credit detail	**Unit**	**Syllabus**
Cradits: 4 ▪ **Max. Marks: 100** ▪ **Theory: 100 (80+20)**	I (15 Lecture)	1. Cell Membrane: Molecular composition, arrangement and its functions. 2. Structure and function of E.R., Golgi complex, , Mitochondria, Lysosome, Ribosome, Centrosome, Nucleus and Nucleolus. 3. Intercellular communication: extracellular matrix; cell-cell and cell-matrix adhesion. 4. Desmosome, tight junction, gap junctions.
	II (15 Lecture)	**Structure of Genetic Material** 1. Chromosome: structure and function. 2. Structure, types of DNA & RNA. 3. DNA Replication. 4. Protein synthesis- in Prokaryotic & Eukaryotic. 5. Genetic code.
	III (15 Lecture)	**Genetics – Basic concept of genetics & medals' law** 1. Linkage & Linkage map. 2. Interaction of Gene (Multiple alleles, Complementary, Supplementary, Epitasis, Inhibitory, duplicate, lethal and pleiotropy.). 3. Pedigree analysis. 4. Extra chromosomal inheritance.
	IV (15 Lecture)	1. Mobile DNA. 2. Biology of cancer. 3. Biology of ageing. 4. Apoptosis- definition, mechanism and

		significance. 5. Transgenic animals.
Suggested Books:	1. Molecular Cell Biology: Lodish M. Baltimore. 2. Principles of Biochemistry: Lehninger. 3. Cell & Molecular Cell Biology: Gerald Karp. 4. Cell Biology: C.B. Powar	

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M.Sc. ZOOLOGY
(2025-26)
Semester - II
Paper –II
General and Comparative Endocrinology M.M.-80

Session: 2025-26	**Program: M.Sc.**
Semester: II	**Paper - II**
Credit: 04+02(L+P)	**Lecture 60 + 30**
MM: 80	**Minimum Passing Marks: 35**

Objectives	This Syllabus contains information about • The study of endocrinology, hormones relation between hormones and animal behavior. • Students find basic information of different types of endocrine glands. • How hormones controlled animal behavior.	
Learning outcome	Students will acquire information about • Endocrinology with classification of hormones, their biosynthesis. • Receptors, and mode of molecular actions, physiological function, feedback controls and related disorders. • Hormones relation between hormones and animal behavior. • Basic information of different types of endocrine glands and hormones control animal behavior	
Credit detail	**Unit**	**Syllabus**
Cradits: 4 ▪ **Max. Marks: 100** ▪ **Theory: 100 (80+20)**	I (15 Lecture)	1. Aims and scope of endocrinology. 2. Endocrine glands their structure and functions (Pituitary,Peneal,Thyroid, Parathyroid, Thymus, Adrenal,Gonads) 3. Pancreas and other endocrine structure (mucosa of alimentary canal, Kidney,Heart, placenta).
	II (15 Lecture)	**The chemical structure and evolution of the hormones** 1. Steroid hormones. 2. Peptide hormones. 3. Neuro-hormones of hypothalamus. 4. Growth and placental hormones.
	III (15 Lecture)	**General Principle of hormones action** 1. Chemical structure, Biosynthesis and secretion of hormones (thyroid, steroid and peptide). 2. Mechanism of hormone action. 3. Hormonal regulation of Carbohydrate, Lipid and Protein metabolism. 4. Hypo & Hyper secretion of Hormones and related disorder.
	IV (15 Lecture)	1. Hormones and Homeostasis. 2. Hormones and Osmoregulation. 3. Hormones and reproduction (behavior, menstrual and estrous cycle). 4. Hormonal control of metamorphosis (Frog).

Suggested Books:	1. Comparative Vertebrate Endocrinology: Gorbman & Bern. 2. Human Physiology: Dr. C.C. Chattarjee. 3. Comparative Endocrinology: Barrington. 4. Applied Animal Endocrinology: Squires. 5. Endocrinology - Basic & Clinical Principles: Melmed & Cohn.	

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M.Sc. ZOOLOGY
(2025-26)
SEMESTER - II

A. Lab course-I Practical Based on Paper I& II M.M- 100

I- Molecular Cell Biology & Genetics

1. Isolation of DNA.
2. Study of mitochondria of Buccal epithelium by staining with supra vital stain.
3. Study of cell division mitosis, meiosis by squash & smear preparation using onion root tip and Cockroach/Grasshopper testis.
4. Study of Giant Chromosome in the salivary gland of chironomous larvae or Drosophila.
5. Preparation of slides of bar bodies by vital staining.
6. Organelles fractionation.
7. Histochemical preparation of protein, carbohydrate, lipids.

II- General and Comparative Endocrinology

1. Estimation of RBC, Hb, Heamatocrit /PVC, Blood group and Rh Factor, Clotting Time.
2. Determination of Urea, Glucose and Ketone bodies in urine.
3. Determination of Bilirubin, ALP, ALP, total protein, Globulin.
4. Determination of osmosis.
5. Study of histology of different endocrine gland.
6. Configuration of hormones by Antigen antibody test system.

Scheme of Examination

Time – 6 hours

5. Based on paper III	-	**35**
6. Based on paper IV	-	**35**
7. Viva	-	**10**
8. Sessional(Internal)	-	**20**

Total = 100 Marks

M.Sc. ZOOLOGY
(2025-26)
Semester - II
Paper –III
Environmental Physiology and Ecology M.M.-80

Session: 2025-26	**Program: M.Sc.**
Semester: II	**Paper - III**
Credit: 04+02(L+P)	**Lecture 60 + 30**
MM: 80	**Minimum Passing Marks: 35**

Objectives	This Syllabus contains information about • Ecological adaptation and physiological adaptation and stress physiology. • Students acquire basic information of which type of changes creates during the stress. • How yoga useful for the body fitness.	
Learning outcome	Students gain knowledge about • Ecological adaptation and physiological adaptation, and stress physiology. • Students acquire basic information about the type of changes stress, and also how yoga useful for the body fitness.	
Credit detail	**Unit**	**Syllabus**
Cradits: 4 ▪ **Max. Marks: 100** ▪ **Theory: 100 (80+20)**	I (15 Lecture)	**Ecology** 1. Abiotic factor (climatic and edaphic factor) and biotic factor. 2. Community ecology. 3. Ecological succession. 4. Marine and terrestrial habitat.
	II (15 Lecture)	**Adaptation** 1. Levels of adaptation. 2. Mechanism of adaptation. 3. Adoptive radiation. 4. Specific adaptation –diving, flight and autotomy.
	III (15 Lecture)	**Physiological adaptation.** 1. Aquatic adaptation- fresh water, marine, deep sea, shores and estuaries. 2. Terrestrial adaptations- cursorial, fussorial, desert. 3. Aerial adaptation. 4. Parasitic habitats.
	IV (15 Lecture)	**Stress Physiology** 1. Basic concept of environmental stress and homeostasis. 2. Mechanism of thermoregulation. 3. Osmoregulation in aqueous and terrestrial environment.

		4. Physiological response to oxygen deficient stress. 5. Physiological response to body exercise. 6. Yoga and their effects.
Suggested Books:	1. Animal Physiology, Mechanism and Adaptation: Eckert, R. 2. Biological Adaptation: Hochachka, P.W. & Somero S.N. 3. Animal Physiology, Mechanism and Environment: Schiemidt Nielson, Cambridge. 4. Environmental Physiology: Willmer, P.G. Stone & Johansan I.	

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M.Sc. ZOOLOGY
(2025-26)
Semester - II
Paper –IV
Population Ecology & Quantitative Biology M.M.-80

Session: 2025-26	**Program: M.Sc.**
Semester: II	**Paper - IV**
Credit: 04+02(L+P)	**Lecture 60 + 30**
MM: 80	**Minimum Passing Marks: 35**

Objectives	This Syllabus contains information about • Demography of population, population regulation. • Biostatics and ecological modeling. • Students acquire basic information of demography & biostatics.	
Learning outcome	Students will acquire information about • Population Dynamics'. • Biostatics and ecological modeling, demography & biostatics. • They will also understand the various aspects of biostatistics such as central tendency, t-test, chi-square, ANOVA, correlations and regression.	
Credit detail	**Unit**	**Syllabus**
Cradits: 4 ▪ **Max. Marks: 100** ▪ **Theory: 100 (80+20)**	I (15 Lecture)	**Demography and Population** 1. Gross and Net Reproductive Rate, Life table. 2. Population growth-Exponential theory and logistic theory. 3. Population density. 4. Population evolution.
	II (15 Lecture)	**Mutualism and population regulation** 1. Evolution of mutualism. 2. Plant –pollinator and animal–animal interactions. 3. Role of predation in nature. 4. Ecological Modelling –fundamentals of constructing models.
	III (15 Lecture)	**Biostatistics** 1. Distribution of data through mean, mode and median. 2. Probability, distribution and their properties. 3. Sampling theory. 4. Correlation. 5. Regression theory. 6. Bar Diagrams. - simple Bar Diagram, duo directional, bar diagram, subdivided bar diagram, Percentage subdivided, Bar diagram and compound bar diagram.

	IV (15 Lecture)	**Bio Mathematics and Mathematical Modelling** 1. General idea about Matrices. 2. General idea about mathematical modeling and their properties. 3. Cycling of nutrients in an ecosystem and Eutrophication. 4. Optimal clutch size in birds. 5. Morphogenesis.
Suggested Books:	1. Ecology With Reference To Animal & Man: S.Charles 2. Elements of Tropical Ecology: Yanney Ewusie. 3. Fundamentals of Ecology: Odum P. 4. Mahajan Biostatics.	

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SUBJECT: M.Sc. ZOOLOGY
(2025-26)
SEMESTER - II

A. Lab Course-II Practical based on paper III & IV M.M- 100

III -Environmental Physiology and Ecology

1. Study of biotic community in a pond/grassland ecosystem.
2. Study of Population growth rate (Cure) in protozoan culture.
3. Population dynamics of tribolium species.
4. Study of Biochemical cycle by way of Model.
5. Determination of Heavy metals in seavage water & Soil

IV -Population Ecology & Quantitative Biology

1. Preparation of frequency tables and graphs.
2. Calculation of standard deviation, variance and standard error of mean.
3. Calculation of probability and significance between means using t-test, Chi-square, ANOVA.
4. Calculation of correlation, regression and probability of distribution.
5. Computer software use for computational tasks, data presentation, design task and communication.
6. Problem based on Population enumeration by quadrate method.

Scheme of Examination

Time – 6 hours

9. Based on paper III	-	**35**
10. Based on paper IV	-	**35**
11. Viva	-	**10**
12. Sessional(Internal)	-	**20**

Total = 100 Marks

SUBJECT: ZOOLOGY (M.Sc.)
(2025-26)
SEMESTER - III
Paper –I
POPULATION GENETICS AND EVOLUTION M.M. 80

Objectives: - This syllabus contains information about concept of evolution, genetics of speciation and molecular evolution. Students finds basic information how molecular evolution affected by genetic variation.

Unit I-

1. Concept of evolution and theories of evolution: Lamarkism, Darwinism,Neo-Darwinism,Modern Synthetic Theory.
2. Evidences of Evolution: anatomical,embryological,palaentological,physiological & Biochemical.

Unit II -

1. Hardy Wienberg law of genetic equilibrium.
2. Detailed account of destabilizing forces- 1.Natural selection 2. Mutation 3. Genetic Drift 4. Migration.
3. Calculation of Genotype & Allelic frequency.
4. Molecular clock.

Unit III – Molecular evolution

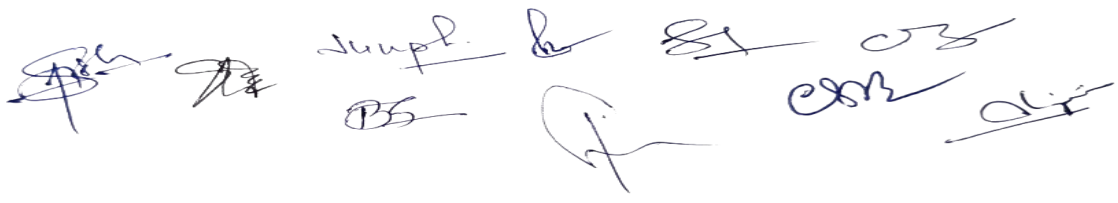
1. Pattern & mechanism of reproductive isolation.
2. Phylogenetic & biological concept of species.
3. Gene Evolution, Evolution of gene Families.
4. Genetic alternations and disorder.

UNIT IV- Evolution

5. Models of speciation (Allopatric, Sympatric and Parapatric
6. Major trends in the origin of higher categories.
1. Micro, Macro, Quantum and evolution
2. Phylogenic tree construction.
3. Phylogeny of horse,elephant,camel.
4. Phylogeny of Man.

Suggested Reading Materials:

1. Gene & Evolution: Jha A.P.
2. Evolution & Genetics: Merrel D.J.
3. The Genetics & Origin of Species: Dobzinansky,
4. Evolution: Dobzinansky, Ayala F.J., Stebbins G.L. 7 Valantine J.M
5. Species Evolution - The Role Of Chromosomal Change: King M.
6. Evolutionary Genetics: Amith J.M.
7. Evolutionary Biology: Futuyama D.J.
8. Evolution: Strikberger M.W.Jo



SUBJECT: ZOOLOGY (M.Sc.)
(2025-26)
SEMESTER - III
Paper –II
ANIMAL BEHAVIOUR M.M. 80

Objectives: - This syllabus contains information about Ethology, communication, orientation and hormonal effect on behaviour. Students gain basic information of role of hormones in animal behaviour.

UNIT - I Ethology

1. Historical perspectives of Ethology.
2. Behavioural patterns.
3. Biological rhythms
    - Types of rhythm
    - Biological Clock

Unit - II

1. Communication
    a. Auditory
    b. Visual
    c. Chemical
2. Learning and Memory
    a. Conditioning
    b. Habituation
    c. Reasoning
    d. Reproductive behaviour.

Unit III- Orientation

1. Echolocation in bats.
2. Bird Migration and Navigation.
3. Fish migration.
4. Neural and hormonal control of behaviour.

Unit IV – Hormonal effect on behavioural patterns.

1. Social behaviour.
2. Social organization in insect and primates.
3. Schooling in fishes and flocking in birds.
4. Homing, territoriality, dispersal.
5. Reproductive behaviour.

Suggested Reading Materials:

1. Animal Behavior: Mc Farland.
2. Animal Behavior: Arora M.P.
3. Animal Behavior: Reena Mathur.

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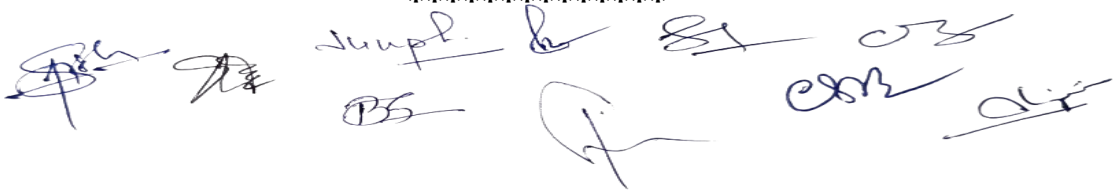

SUBJECT: ZOOLOGY (M.Sc.)
(2025-26)
SEMESTER - III
Lab Course I based on paper I and II M.M- 100

I- POPULATION GENETICS AND EVOLUTION

1. Phylogenetic tree construction.
2. Practical based on phylogeny of Man and Horse.
3. Study of model based pedigree analysis.
4. Calculation of Body mass index.
5. Morphometric analysis.

II- PRACTICAL BASED ON ANIMAL BEHAVIOR

1. To study the Photo taxis response in Earthworm or grain/pulse pest.
2. To study the geotaxis behaviour of earthworm.
3. To study the food preferences and cleaning behaviour of housefly.
4. To study the food preference in tribolium or grain/pulse pests.
5. To study the web construction and habituation in spider.
6. Estimation of body temperature and pulse rate time scale.
7. Toxicological response of fish opercular and surfacing activity.

Scheme of Examination

Time – 6 hours

13. Based on paper III	-	**35**
14. Based on paper IV	-	**35**
15. Viva	-	**10**
16. Sessional(Internal)	-	**20**

Total = 100 Marks

SUBJECT: ZOOLOGY (M.Sc.)
(2025-26)
SEMESTER - III
Paper –III

GAMETE AND DEVELOPMENTAL BIOLOGY MM- 80

Objectives: - This syllabus contains information about gamete biology. Students find basic information about embryological development in different vertebrates.

Unit I

1 Comparative account of different gonads in invertebrate and vertebrates.
2. Heterogamy in eukaryotes.
5. Leydig cells. - (a). Morphology (b) differentiation (c) functions and its regulation.

Unit II

1. Spermatogenesis in rodents and in invertebrates.
2. Oogensis and vitellogenesis (follicular growth differentiation, molecular and endocrinal aspects).
3. Fertilization - (pre and post fertilization events and biochemistry of fertilization).
6. Parthenogenesis.

Unit –III

1. Cleavage.
2. Fat map and cell lineage.
3. Gastrullation. (Frog & Chick)
4. Germinal layers and their fate. (Frog)
5. Extra Embryonic membrane.

Unit IV

1. Organogenesis - (Frog).
2. Metamorphosis.
3. Collection and Cryopreservation of gametes and embryos.
4. Transgenic animals.

Suggested Reading Materials:

1. Animal Gamete: Vishwanath.
2. Foundation of Embrology: Bradley M.
3. Fertilization in Animals: Brain Dale.
4. Developmental Biology: N.J.Berril.
5. Embryology of Vertebrates: Nelson.

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SUBJECT: ZOOLOGY (M.Sc.)
(2025-26)
SEMESTER - III
Paper –IV
COMPARATIVE PHYSIOLOGY OF VERTEBRATES M.M. 80

Objectives: - This syllabus contains information about the origin of chordate, comparative account of blood circulation, Nervous system and sense organs. Students find fundamental knowledge of comparative physiology of various systems of vertebrates.

Unit I –Aims and scope of comparative physiology

1. General physiological function and principles.
2. Respiratory organs and respiratory pigments through different phylogenic groups.
3. Feeding mechanisms and regulation.
4. Comparative physiology of digestion.

Unit II-

1. Circulation of body fluids and their regulation comparative physiology of hearts.
2. Structure and physiology of blood.
3. Patterns of nitrogen excretion among different animal groups.
4. Thermoregulation.
    a. Homoeothermic animals.
    b. Poikilotherms.
    c. Hibernation.

Unit III- Receptor Physiology – A Comparative Study

1. Mechanoreceptor.
2. Photoreception.
3. Chemoreception.
4. Phonoreception.
5. Communication among animals.
    a. Bioluminescence.
    b. Pheromones.
    c. Audio signals.

Unit IV- Contractile elements, cells and tissues among different phylogenic groups

1. Muscles structure and function.
2. Nerve conduction.
3. Specialized organs electric organs and tissues.
4. Chromatophores and regulation of their function.

Suggested Reading Materials

1. Human physiology – C.C. Chatterjee.
2. Physiology of human body – Guyton.
3. Comparative physiology- Hoor
4. Harper Biochemistry – David Motrin.
5. Principles of Biochemistry.
6.

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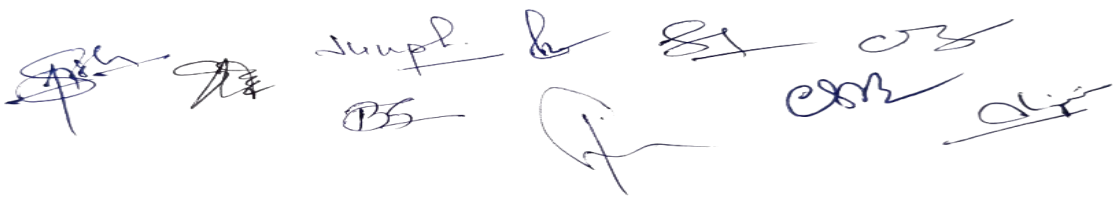

SUBJECT: ZOOLOGY (M.Sc.)
(2025-26)
SEMESTER - III

Lab course –II based on paper III & IV M.M- 100

III -GAMETE AND DEVELOPMENTAL BIOLOGY

1. Study of slides of development of frog.
2. Study of development of Hens egg by cover window method, staining and mounting of blastodisc.
3. Study of caudal regeneration in Teleost.(Meal time effect)
4. Study of embryological slides: spermatogenesis, Oogensis, histology of gonads.
5. Study of effect of thyroid hormone on metamorphosis of tadpole.
6. Preparation of whole mount of embryo and larva. (Method only)
7. Alizarin preparation of embryo. (Method only)
8. Morpho histology of gonads of frog, lizards, chicks and mouse.
9. Other exercise to theory paper.

IV -COMPARATIVE PHYSIOLOGY OF VERTEBRATES

1. Various slides of chick embryology (whole mount and T.S.).
2. Physiological experiment
    a. Detection salivary amylase.
    b. Comparative study of histology of lungs kidney gonads in vertebrates
    c. Comparative study of blood of vertebrate, blood cell, blood albumin, sugar, cholesterol).
    d. Urine analysis.
2. Hematological Experiments - Own blood.

Scheme of Examination

Time – 6 hours

17. Based on paper III	-	**35**
18. Based on paper IV	-	**35**
19. Viva	-	**10**
20. Sessional(Internal)	-	**20**

Total = 100 Marks

SUBJECT: ZOOLOGY (M.Sc.)
(2025-26)
SEMESTER - IV
Elective A: Biochemistry
Paper –I (Compulsory)
Biochemistry M.M. 80

Objectives: - This syllabus contains information of basic Biochemistry of organisms. Students find detail information of biomolecules, vitamins, enzymes and cellular metabolism of organisms.

Unit I –

1. Amino acids-structure and classification
    - Structure of proteins.
    - Biosynthesis of amino acids.
    - Catabolism's of proteins.

Unit II-

1. Structure & classification of carbohydrates.
2. Metabolisms of carbohydrates.
3. Structure & classification of lipid.
4. Biosynthesis of Fatty acid.

Unit III - Vitamins

1. Water and fat soluble vitamins.
2. Chemistry, occurrence and Physiological role.
3. Enzymes classification and nomenclature.
4. Mechanism of enzyme action.
5. Kinetics of enzymes.
6. Enzyme immobilization.

Unit IV-

1. Vitamins- structure and classification.
2. Metabolism of nucleic acid.
3. Hormonal regulation of carbohydrate metabolism.
4. Hormonal regulation of protein metabolism.
5. Hormonal regulation of lipid metabolism.

Suggested Reading Materials:

1. Hand book of Biochemistry -MA. SIDHIQI 8th edition.
2. Fundamentals of Biochemistry- J.L. Jain 2nd edition.
3. Cell physiology and biochemistry- William D. McELROY 3rd edition.
4. Introducing biochemistry - E.J. WOOD,W.R. PICKERING 1st edition.
5. Practical clinical biochemistry - HAROLD VARLEY 4th edition.

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SUBJECT: ZOOLOGY (M.Sc.)
(2025-26)
SEMESTER - IV
Elective B: Limnology
Paper –II (Compulsory)
Limnology M.M. 80

Objectives: - This syllabus contains information of limmunological study of fresh water. Students find detail information of water quality management detailed study of plankton. How water quality affected by sewage water study of different physic-chemical parameters.

Unit I –

1. Characteristics of water.
2. Lotic ecosystem.
3. Rivers and lake-forms and origin of lake.
4. Lentic ecosystem.

Unit II-

1. Pond ecosystem and communities.
2. Phytoplankton of fresh water.
3. Zooplankton of fresh water.
4. Estuaries.

Unit III -Physical condition of water

1. Light (light as a limiting factors, penetration and thermal radiation).
2. Heat (thermal stratification, flow of heat,).
3. Water (properties of water, hydrological cycle, global water balance).
4. Water movement (flow of water, motion in epilimnion, motion in thermocline, motion in hypolimnion).

Unit IV- Chemical component of fresh water

1. Oxygen (oxygen as a limiting factors, measurement in waters, pollution monitoring and productivity measurement).
2. Carbon complex (carbon as a limiting factor, productivity measurement, seasonal variations, utilization).
3. Nitrogen (cycle, forms of N_2 in lakes, seasonal distribution, nitrogen fixation and Di-nitrification).
4. Phosphorus (distribution, cycle, recycling).
5. Iron, silica and sulphur (cycle, bacterial transformation).

Suggested Reading Material

1. Fundamental of limnology. Arvind kumar ,APH Publication,2005
2. T G, Wetze Limnology, Third Edition; Lake and River Ecosystem.
3. Fresh water Ecology, Second Edition; Concept and Environmental Application of Limnology (Aquatic Ecology), Walter K. Dodds, Matt R Whiles.

SUBJECT: ZOOLOGY (M.Sc.)
(2025-26)
SEMESTER - IV
Paper –I
Elective A: Biochemistry & Limnology
LAB COURSE I BASED ON PAPER I& II **MM 100**

I- Biochemistry

1. Estimation of antioxidant enzymes.
2. Estimation of amylase, analitative of amylase.
3. Analitative study of protein.
4. Analitative study of CBH.
5. Estimation of protein by Lowery method.
6. Estimation of Oil in seeds.
7. Estimation of Carbohydrates by Anthrone reagent.
8. Other exercise related to theory paper.

II- Limnology

1. Determination of Heavy metal from water & soil, viz As, Fluoride, Cd, Cr, Fe.
2. Determination of transparency from different water body.
3. Determination different Physico-Chemical analysis of pond water (Temperature, Turbidity, pH, Conductivity, Total Hardness, Alkalinity, DO, COD, BOD etc.).

Scheme of Examination

		Time – 6 hours
21. Based on paper III	-	**35**
22. Based on paper IV	-	**35**
23. Viva	-	**10**
24. Sessional(Internal)	-	**20**

Total = 100 Marks

SUBJECT: ZOOLOGY (M.Sc.)
(2025-26)
SEMESTER - IV
Elective A: ICHTHYOLOGY
Paper –III (Optional Paper)

M.M. 80

Objectives: - This syllabus contains study of general characters, classification, anatomy and phylogeny of fishes and fish physiology.

UNIT – I - General Characteristic & Classification of Fish

1. Placoderm.
2. Chondrichthyes.
3. Osteichthyes.
4. Holocephali.
5. Dipnoi.

UNIT – II - Anatomy:-

1. Integuments (Skins and its derivatives).
2. Medium paired Fins of Fishes.
3. Food and Alimentary canal, Modification of Alimentary canal.
4. Blood Vascular System.
5. Respiration- Respiratory Organs and Mechanism, Accessory respiratory organ.

UNIT-III

1. Swim bladder- structure & functions.
2. Nervous system.
3. Sense organs (eye, membranous labyrinth, lateral line system).
4. Endocrine glands in fishes.
5. Luminous organ in fishes.

UNIT-IV

1. Excretion (structure of kidney, histology).
2. Osmoregulation – in marine and fresh water fishes.
3. Reproduction and development.
4. Hatching and post embryonic development.
5. Parental care in fishes.

Suggested reading material:

1. An introduction to Fishes S.S. Khanna.
2. Fish and Fisheries R.P.Parihar.
3. Fisheries and Aquaculture R.C. Gupta and P.K. Gupta-
4. Biology of Fishes - Jingran.

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SUBJECT: ZOOLOGY (M.Sc.)
(2022 – 2023)
SEMESTER - IV
Elective A: Pisiculture and Fishery Economics
Paper –IV (Optional Paper)

MM: 80

Objectives: - This syllabus contains study of Pisiculture, World fisheries, Cultivable fisheries and Economic importance of fishes.

UNIT –I

1. Physico-chemical and biological characteristics for Fish Farming.
2. Fish form (type of ponds, construction, maintenance and Management).
3. Aquatic weeds and their control.
4. Collection of fish seed from natural resources and their transportation.
5. Fish breeding (Bundh, Induced).

UNIT-II

1. The EEZ concept and its implementation.
2. Coastal fisheries of India.
3. Riverine fisheries.
4. Estuarine fisheries.
5. Cold water fisheries.

UNIT –III -

1. Composite fish culture.
2. Air breathing fish culture.
3. Paddy-cum fish culture.
4. Sewage-fed fisheries.
5. Open water stocking and ranching.

UNIT IV

1. Fish harvesting (Conventional & unconventional method, preservation & processing).
2. Fish Marketing.
3. Fish disease and their control.
4. Economic importance and by production of fishes.
5. Role of fisheries in rural development.

Suggested reading material:

1. Source book for the inland fishery resources of Africa. J.P.Vandan, Bossche, G.M.Bernacsek.
2. Capture based Aquaculture F.Ottolenglin, F Silvestri..
3. Technologycal trends in capture fisheries. J.W.Waled, Marsen 2001.
4. Gloom and doom the future of marine capture fisheries.S.M.Garcia and Grainger.
5. Aquaculture and fisheries. Wageningen,U.R.
6. Fish forming Aquaculture Commerrical fishing WWW.ftal.com.
7. Aquaculture fisheries and fish Science Wiley.

SUBJECT: ZOOLOGY (M.Sc.)
(2025-26)
SEMESTER - IV
Elective A

LAB COURSE II – BASED ON PAPER III & IV MM 100

III- ICHTHYOLOGY

1. Study of museum specimens of the concerned groups.
2. Study of histological permanent slides.
3. Osteology of fish.
4. Cranial nerves of teleost fishes: *Wallago, Mystus, Labeo* and other fishes by using alternate methods.
5. Study of Accessory of respiratory organ in fishes using alternate methods.
6. Other exercise related to theory paper.

IV- Pisiculture and Fishery Economics

1. Identification of fresh water Fishes with particular reference of C.G.
2. To determine the age of fish by scale/otolith reading method.
3. Pigmentary behavior of fish
4. Quantitative zooplankton analysis.
5. Nutrient analysis of water.
6. Microtomy of fish material.

Scheme of Examination

		Time – 6 hours
25. Based on paper III	-	**35**
26. Based on paper IV	-	**35**
27. Viva	-	**10**
28. Sessional(Internal)	-	**20**

Total = 100 Marks

SUBJECT: ZOOLOGY (M.Sc.)
(2025-26)
SEMESTER - IV
Elective A: Biochemistry
Paper –I (Compulsory)
Biochemistry **M.M. 80**

Objectives: - This syllabus contains information of basic Biochemistry of organisms. Students find detail information of biomolecules, vitamins, enzymes and cellular metabolism of organisms.

Unit I –

5. Amino acids-structure and classification
    - Structure of proteins.
    - Biosynthesis of amino acids.
    - Catabolism's of proteins.

Unit II-

5. Structure & classification of carbohydrates.
6. Metabolisms of carbohydrates.
7. Structure & classification of lipid.
8. Biosynthesis of Fatty acid.

Unit III - Vitamins

6. Water and fat soluble vitamins.
7. Chemistry, occurrence and Physiological role.
8. Enzymes classification and nomenclature.
9. Mechanism of enzyme action.
10. Kinetics of enzymes.
11. Enzyme immobilization.

Unit IV-

12. Vitamins- structure and classification.
13. Metabolism of nucleic acid.
14. Hormonal regulation of carbohydrate metabolism.
15. Hormonal regulation of protein metabolism.
16. Hormonal regulation of lipid metabolism.

Suggested Reading Materials:

1. Hand book of Biochemistry -MA. SIDHIQI 8th edition.
2. Fundamentals of Biochemistry- J.L. Jain 2nd edition.
3. Cell physiology and biochemistry- William D. McELROY 3rd edition.
4. Introducing biochemistry - E.J. WOOD,W.R. PICKERING 1st edition.
5. Practical clinical biochemistry - HAROLD VARLEY 4th edition.

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SUBJECT: ZOOLOGY (M.Sc.)
(2025-26)
SEMESTER - IV
Elective A: Neurophysiology
Paper –II (Compulsory)
Neurophysiology **M.M. 80**

Objectives: - This syllabus contains information of basics of nervous system, nerve conduction, brain, spinal cord and Electro encephalography. Students find detail information of Neurophysiology.

Unit I –

1. Histogenesis and types of nerve cells.
2. Histological Structure of nerves system.
3. Physiological properties of nerve fiber.
4. Synapse and synaptic transmission.

Unit II-

1. Spinal cord – arrangement of grey and white matter.
2. The spinal nerves.
3. The tract – ascending tract.
4. The tract – descending tract.

Unit III -

1. Cerebrum.
2. Brain stem- mid brain, pons variolli, medulla oblonga.
3. Cerebellum.
4. Thalamus.

Unit IV-

1. Autonomic nervous system; sympathetic and parasympathetic nervous system with Special comparison to hormonal mechanism of transmission through autonomic nervous system.
2. Reflex action; verities, characteristics, unconditional reflex, electrophysiology of Spinal reflexes.
3. Sensation.
4. Electro encephalography and its physiological basis.

Suggested readings:

- The Brain: Or Nervous system by Seymour Simon.
- Mass Action in the Nervous system by Walter J. Freeman.
- Human Anatomy and Physiology with Interactive Physiology10-
- System Suite,8th Edition by Elaine N. Marieb and Katja N. Hoehn(Jan10,20210)
- Neuroanatomy by H.G. Snell.
- Cranial Neurophysiology – Guide for Authors – Elsevier.

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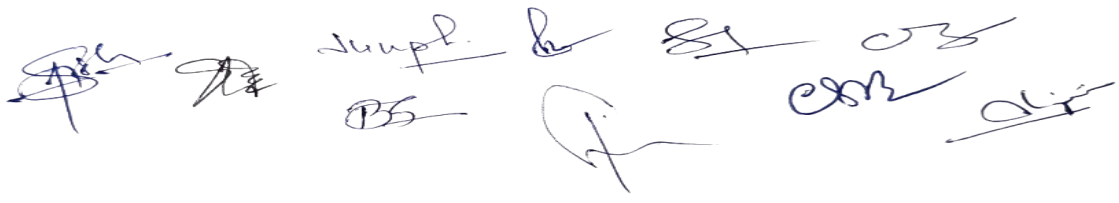

SUBJECT: ZOOLOGY (M.Sc.)
(2025-26)
SEMESTER – IV
Paper –I Elective A: Biochemistry & Neurophysiology

LAB COURSE I BASED ON PAPER I& II MM 100

I- Biochemistry

1. Estimation of antioxidant enzymes.
2. Estimation of amylase, analitative of amylase
3. Analitative study of protein.
4. Analitative study of CBH.
5. Estimation of protein by Lowery method.
6. Estimation of Oil in seeds.
7. Estimation of Carbohydrates by Anthrone reagent
8. Other exercise related to theory paper.

II- Neurophysiology

1. Study of slides of nervous system.
2. Neck nerve of /squirrel by using alternate methods like clay modeling.
3. Study of Brain through Model.
4. Study of Cranial nerve of Bird, Amphibian, Reptile and Mammals by using alternate methods like clay modeling.
5. Other exercise related to theory paper.

Scheme of Examination

Time – 6 hours

29. Based on paper III	-	**35**
30. Based on paper IV	-	**35**
31. Viva	-	**10**
32. Sessional(Internal)	-	**20**

Total = 100 Marks

SUBJECT: ZOOLOGY (M.Sc.)
(2025-26)
SEMESTER - IV
Elective B: Entomology
Paper –III (Optional Paper)
Entomology M.M 80

Objectives: - This syllabus contains study of general characters, classification,phylogeny of insects, insect biology and anatomy.

Unit-I

- Insect head types and modification as per their habit and habitat.
- Modification of mouth parts and feeding behavior.
- structure, types and function of antennae.
- Hypothetical wings venation.
- Structure of cuticle and pigment.

Unit-II

- Sclerotisation and taining of the cuticle.
- Structure of alimentary canal and physiology of digestion.
- Malpighian tubes- anatomical organization, transport mechanism.
- Structure of circulatory system.
- Cellular element in haemolymph.

Unit- III

- Structure of compound eye and physiology of vision.
- Sound production in insect.
- Structure and function of endocrine gland.
- Pheromones.

Unit – IV

- Embryonic membranous up to the formation of blastoderm.
- Metamorphosis.
- Insecticide effects on CNS.
- Important pest of soybean, concept of pest management suggested.

Suggested reading materials:

1. Insect structure and function -R.F.Chapman.
2. General and applied entomology.- Little.
3. Insect physiology- Wigglesworth.
4. Insect morphology- Matcalf and flint

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SUBJECT: ZOOLOGY (M.Sc.)
(2025-26)
SEMESTER - IV
Elective B: Applied Entomology
Paper –IV (Optional Paper)
Applied Entomology M.M.80

Objectives: - This syllabus contains study of morphology and insect anatomy.

UNIT –I

- Classification according to Imms.
- Classification of aptyrogota up to families.
- Classification of insect orders - orthoptera, hemiptera, diptera, hymenoptera. Lepidoptera, coleoptera.
- Collection and preservation of insects.

UNIT - II

- Insect pest management strategies and tools.
- Biological control, genetic control, chemical control.
- Pests of cotton, sugarcane, paddy, stored food grains.
- Pests of citrus fruits and mango.
- Pests of pulses.
- House hold insect pest.

UNIT-III-

- Insects in relation to forensic science.
- Insect migration, population, fluctuation and factors.
- Insect of medical and veterinary importance.
- Ecological factors affecting the population and development of insects.

UNIIT - IV

- Mulberry and non mulberry sericulture.
- Apiculture.
- Lac culture.
- Insects as human food for future.

Suggested Reading Material

1. An introduction to the study of insects by borer and Delong.
2. Entomology by Imms.
3. General and Applied Entomology by Nayer.
4. Entomology Text Book by Jack De Angelis.
5. applied agricultural entomology by dr. lalit kumar jha.

SUBJECT: ZOOLOGY (M.Sc.)
(2025-26)
SEMESTER - IV
Elective B: Entomology and Applied Entomology
Lab Course - (Based on paper III & IV) M M 100

III-Entomology

1. Anatomy of common grasshopper, cockroach, honeybee, wasp, and belestoma (giant water bug) by using alternate method like clay modelling.
2. Dissection by using alternate method like clay modelling.
   - Sting apparatus of honeybee and wasp.
   - Tympanal organs of grasshopper.
   - Testes of cockroach.
   - Aristae of housefly.
   - Different types of mouthparts of insect.
   - Different types of wings and antennae of insects.
   - Tentorium of grasshopper.
3. Identification and comment on insect of different orders and families.
4. Identification with the help of keys of common insect from different orders and families.
5. Other exercise related to theory paper.

IV-Applied Entomology

1. Insect collection and preservation for systematics studies
2. Identification of insect of different insect up to orders.
3. Identification of insect's up to families of economically important insects up to orders.
4. Identification of insects up to species: Mosquitoes, honeybee, stored grain beetles, aquatic insects, important crop and household pests.
5. Analysis of honey and its quality control.
6. Field studies of insects to understand their habit, habitat environment impact, beneficial and harmful activities etc.
7. Study of beneficial insects, benefits derived from them and useful products.
8. Study of destructive insects, damage caused by them and damaged products.
9. Study of insecticidal formulations and insect control appliances.
10. Experiments on insect control like LC-50,/LD-50,knock down and recovery effect, repellency/antifeedance tests, percentage damage tests for leaf eating insects and stored grain .
11. Other exercise related to theory paper.

Scheme of Examination

		Time – 6 hours
33. Based on paper III	-	**35**
34. Based on paper IV	-	**35**
35. Viva	-	**10**
36. Sessional(Internal)	-	**20**

Total = 100 Marks
