



BAGALKOT UNIVERSITY

Mudhol Road, Jamkhandi-587301 Dist.: Bagalkot

PROGRAM /COURSE STRUCTURE AND SYLLABUS FOR ZOOLOGY

as per the Choice Based Credit System (CBCS) designed in
accordance with Learning Outcomes-Based Curriculum
Framework (LOCF)

For
Bachelor of Science with ZOOLOGY
(General Degree)
I and II Semester

w.e.f.

Academic Year 2024-25

Bagalkot University, Jamkhandi
Program Outcomes (PO), Program Specific Outcomes (PSO) and Course
Outcomes (CO) of B.Sc. Zoology (CBCS)

I. Program Outcomes (PO)

After successfully completing of B. Sc. Zoology program, the students will be able to:

- Develop passion towards the Zoology subject.
- Establish self-entrepreneurship based on the knowledge gained in applied zoological aspects.
- Become successful professionals in academia and research in Universities and other premier Institutions.
- Develop scientific skills and innovative ideas in the field of Zoology.
- Students gain knowledge and skill in the fundamentals of animal sciences, understands the complex interactions among various living organisms.
- Analyze complex concepts of genetics and its importance in human health.
- Apply ethical principles and commit to professional ethics and responsibilities in delivering his duties.
- Apply the knowledge and understanding of Zoology to one's own life and work.
- Develop empathy, Ethics and love towards the animals.

II. Program Specific Outcomes (PSO)

After successfully completing of B. Sc. Zoology Program, the students will be able to:

- Develop in-depth knowledge about the concepts of Zoology from the organism level to the molecular level. Understand the significance of animal taxonomy and systematics.
- Comprehend and interpret the evolutionary relationships among different animal groups.
- Learn the skills of handling various scientific equipment's and perform the experiments.
- Explore various applied fields with the knowledge of sericulture, apiculture, fisheries, poultry, vermiculture and dairy farms etc.
- Communicate the importance of ecosystem, biodiversity its conservation and awareness about pollution control to the society.
- To acquire knowledge on the various aspects of Zoology including Animal Diversity, Cell Biology, Histology, Immunology, Physiology, Biochemistry, Genetics, Evolutionary Biology, Developmental Biology, Reproductive Biology, and Insect Vectors and Diseases, Ecology, Wildlife Management, Entomology and Parasitology, Applied Zoology Biotechnology and Ethology etc.
- Develop theoretical and practical knowledge in handling the animals and using them as model organisms.
- Develop skill in effective data presentation and dissertation writing.

PROGRAM STRUCTURE

Syllabus and Credits Structure under Choice Based Credit System [CBCS] General Degree for the Three Years B.Sc. with Zoology Undergraduate Programme with effect from 2024-25

First Semester B.Sc. (Zoology) Scheme

SEMESTER-I											
Category	Course code	Title of the Paper	Marks			Teaching hours/ week			Credits	Duration of Exam (Hrs)	Teaching Department
			IA	SEE	Total	L	T	P			
L1	-----	Language 1	20	80	100	3	-	-	3	3	-----
L2	-----	Language 2	20	80	100	3	-	-	3	3	-----
Major	2A1ZOOM01T	Non-chordates and Chordates	20	80	100	4	-	-	3	3	Zoology
	2A1ZOOM01L	Non-chordates and Chordates	10	40	50	-	-	4	2	3	Zoology
Major	-----	Major Subject 2	20	80	100	4	-	-	3	3	---
	-----	Practical	10	40	50	-	-	4	2	3	---
Major	-----	Major Subject 3	20	80	100	4	-	-	3	3	---
		Practical	10	40	50	-	-	4	2	3	---
Constitutional Moral Values	2S1XXXC01T	Constitutional Values/	10	40	50	2	-	-	2	2	Constitutional Values: Political Science
	2S1XXXC02T	Environment studies									Environmental Studies: Chemistry/ /Geography/ Botany
Total Marks					700	Semester Credits			23		

Second Semester B.Sc. (Zoology) Scheme

SEMESTER-II												
Category	Course code	Title of the Paper	Marks			Teaching hours/ week			Credits	Duration of exams (Hrs)	Teaching Department	
			IA	SEE	Total	L	T	P				
L3	-----	Language 3	20	80	100	3	-	-	3	3	-----	
L4	-----	Language 4	20	80	100	3	-	-	3	3	-----	
Major	2A2ZOOM02T	Cell Biology, Histology and Immunology	20	80	100	4	-	-	3	3	Zoology	
	2A2ZOOM02L	Cell Biology, Histology and Immunology	10	40	50	-	-	4	2	3	Zoology	
Major	-----	Major Subject 2	20	80	100	4	-	-	3	3	----	
	-----	Practical	10	40	50	-	-	4	2	3	----	
Major		Major Subject 3	20	80	100	4	-	-	3	3	----	
		Practical	10	40	50	-	-	4	2	3	----	
Constitutional Moral Values	2S1XXXC01T	Constitutional Values/	10	40	50	2	-	-	2	2	Constitutional Values: Political Science	
	2S1XXXC02T	Environment Studies									Environmental Studies: Chemistry/Geography/Botany	
Total Marks					700	Semester Credits			23			

B.Sc. I- Semester ZOOLOGY (Theory)

Course Code: 2A1ZOOM01T
Teaching Hours / Week: 4
Total Teaching Hours: 52

Paper Title: Non-chordates and Chordates
Total Marks: Th- 80 + IA- 20 = 100
Credits: 3

Course Outcomes (CO's): At the end of the course students will be able to

- Understand basics of classification of non-chordates.
- Learn and understand the internal systems of non-chordates.
- Understand the external morphology of proto-chordates and chordates
- Understand the systematic position and classification of Chordates
- Study the internal systems of chordates

(Course Content)

	Contents	Hours
Unit-I	<p>I. NON-CHORDATES: Protista: General characteristics and Classification up to classes. Life cycle and pathogenicity of <i>Plasmodium vivax</i>. Locomotion and Reproduction in Protista. Porifera: General characteristics and Classification up to classes, Canal system in sponges. Cnidaria: General characteristics and Classification up to classes, Metagenesis in Obelia, Polymorphism in Cnidaria. Ctenophora: General characteristics and evolutionary significance of Ctenophora. Platyhelminthes: General characteristics and Classification up to classes. Life cycle and pathogenicity of <i>Taenia solium</i>. Nemathelminthes: General characteristics and Classification up to classes. Life cycle, and pathogenicity of <i>Ascaris lumbricoides</i>.</p>	13
Unit-II	<p>Annelids: General characteristics and Classification up to classes; Metamerism and Excretion in Annelida. Arthropoda: General characteristics and Classification up to classes. Metamorphosis in Insects. Onychophora: General characteristics and evolutionary significance. Mollusca: General characteristics and Classification up to classes. Significance of trochophore larva. Echinodermata: General characteristics and Classification up to classes. Water-vascular system in Asteroidea, Larval forms in Echinodermata, Hemichordata: General characteristics of Hemichordata</p>	13

Unit-III	<p>II. CHORDATES: General characteristics and outline classification Chordata. Protochordata: General characteristics of Urochordata and Cephalochordata; Retrogressive metamorphosis in Urochordata. Agnantha, Pisces and Amphibia: Cyclostomata (Agnatha): General characteristics and classification up to order. Pisces: Migration in fishes, Evolutionary significance of Dipnoi. Amphibia: General characteristics and classification up to order. Parental care in Amphibia.</p>	13
Unit-IV	<p>Reptilia: General characteristics and classification up to order; Difference between Poisonous and Non-poisonous snakes. Aves: General characteristics and classification up to order. Flight adaptations and Migration in birds. Mammalia: General characters and classification up to order; Adaptive radiation in mammals.</p>	13

SUGGESTED READINGS:

1. Agarwal V. P. and Dalela R. C. (1975): Textbook of Vertebrate Zoology. Jai Prakashnath Co.
2. Barnes, R.D. (1982): Invertebrate Zoology. Fifth edition
3. Barnes, R.D. (1982): Vertebrate Zoology. Fifth edition
4. Barnes, R.S.K., Calow, P., Olive, P.J.W Golding, D.W. and Spicer, J.I. (2002): The Invertebrates: A
5. New Synthesis, III Edition, Blackwell Science
6. Barrington E. J. W. (1981): Invertebrate structure and Function. ELBS. Dhama P.S. and Dhama J. K.
7. (2000): Chordate Zoology. S. Chand & Co. Dhama P.S. and Dhama J. K. (2000): Invertebrate Zoology. S. Chand & Co.
8. Ekambaranatha Iyer M. and Anantkrishnan T. N. (1990): A manual of Zoology. Vol. I. Invertebrata (Part 1 & 2). S. Vishwanathan Pvt. Ltd.
9. Ekambaranatha Iyer M. and Anantkrishnan T. N. (1990): A manual of Zoology. Vol. II. Chordata S. Vishwanathan Pvt. Ltd.
10. Jordan E. L. and Verma P.S. (1976): Chordate Zoology. S. Chand & Co. Jordan E. L. and Verma
11. P.S. (1976): Invertebrate Zoology. S. Chand & Co.
12. Kotpal R. L. (1993): Protozoa- Echinodermata (all volumes). Rastogi Publ. Pough H (2004): Vertebrate life, VIII Edition, Pearson International.
13. Ruppert and Barnes, R.D. (2006): Invertebrate Zoology, VIII Edition. Holt Saunders International Edition.

B.Sc. I- Semester ZOOLOGY (Practical)

Course Code: 2A1ZOOM01L

Paper Title Non-chordates and Chordates

Teaching Hours / Week: 4

Total Marks: Th- 40 + IA- 10 = 50

Total Teaching Hours: 40

Credits: 2

Course Outcomes (CO's): At the end of the course students will be able to

- Develop the skills to identify different classes and species of animals.
- Know uniqueness of a particular animal and economic importance of non-chordates.
- Enhancement of basic laboratory skill such as keen observation and drawing.
- Study the useful and harmful non-chordates
- Understand the external morphology of proto-chordates and chordates
- Study the cartilaginous, bony and ornamental fishes
- Understand the beak and foot modifications in birds.

(Course Content)

Contents	Hours
PRACTICALS (Non-chordates) 1. Study of whole mount of Euglena, Amoeba and Paramecium, 2. Study of Sycon , Hyalonema, Euplectella, Spongilla. 3. Study of Obelia, Physalia, Aurelia, Gorgonia, Metridium, Pennatula. 4. One specimen/slide of any ctenophore. 5. Study of adult <i>Fasciola hepatica</i> , <i>Taenia solium</i> and their life cycles (Slides/microphotographs). 6. Study of adult <i>Ascaris lumbricoides</i> and its life stages (Slides/microphotographs).	10
7. Study of following specimens: i. Annelids - Nereis, Sabella, Chaetopterus, Pheretima, Hirudinaria ii. Arthropods – Palamnaeus, Palaemon, Daphnia, Balanus, Sacculina, Cancer, Scolopendra, Julus, Periplaneta, Peripatus. iii. Molluscs - Chiton, Dentalium, Pila, Unio, Sepia, Octopus, Nautilus iv. Echinodermates - Pentaceros/Asterias, Ophiura, Echinus, Cucumaria and Antedon v. Balanoglossus 8. Study of nervous system and mounting of nephridia, ovary of earthworm (Virtual). 9. Mounting of mouth parts and dissection of digestive system and nervous system of Periplaneta.	10

<p>PRACTICALS (Chordates)</p> <p>10. Protochordata: Herdmania, Branchiostoma, (Amphioxus).</p> <p>11. Agnatha: Petromyzon and Myxine.</p> <p>12. Fishes: Scoliodon, Pristis, Torpedo, Heteropneustes, Labeo, Exocoetus, Echeneis, Anguilla, Hippocampus, Tetrodon/ Diodon, Anabas.</p> <p>13. Amphibia: Ichthyophis/Ureotyphlus, Necturus, Hyla, Salamander, Axolotl larva.</p> <p>14. Reptilia: Chelone, Hemidactylus, Varanus, Chamaeleon, Ophiosaurus, Draco, Bungarus, Viper, Hydrophis, Crocodylus.</p>	10
<p>15. Key for Identification of poisonous and non-poisonous snakes</p> <p>16. Aves: Study of six common birds from different orders. Types of beaks and feet.</p> <p>17. Mammalia: Bat (Insectivorous and Frugivorous), Loris, Herpestes.</p> <p>18. Submission of album of local species of non-chordates and chordates.</p> <p>19. Any other practical depending on feasibility.</p>	10

SUGGESTED READINGS:

1. Ruppert and Barnes, R.D. (2006): Invertebrate Zoology, VIII Edition. Holt Saunders International Edition.
2. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002): The Invertebrates: A New Synthesis, III Edition, Blackwell Science
3. Young, J. Z. (2004): The Life of Vertebrates. III Edition. Oxford University Press.
4. Pough H (2006): Vertebrate life, VIII Edition, Pearson International.
5. Hall B.K. and Hallgrímsson B. (2008): Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.
6. P. S. Dhami and J. K Dhami (2000): Practical Zoology S. Chand and Co, New Delhi

B.Sc. II- Semester ZOOLOGY (Theory)

Course Code: **2A2ZOOM02T**

Paper Title: Cell Biology, Histology and Immunology

Teaching Hours / Week: 4

Total Marks: Th- 80 + IA- 20 = 100

Total Teaching Hours: 52

Credits: 3

Course Outcomes (CO's): At the end of the course, students will be able to

- Understands the structure and functions of animal cell, cell organelles, cell- cell interactions, process of reproduction leading to new organisms.
- The chromatin structure, function and its location in the cell.
- To gain basic understanding of cellular processes, pathways, cell cycle and cytoskeleton organization.
- Get knowledge of structure of basic tissues, their arrangement and functions.
- Identify the histological structure, location and function of various organs.
- To acquire a fundamental working knowledge of the basic principles of immunology.
- Understanding of types of immunity and their importance
- Imparts in depth knowledge of tissues, cells and molecules involved in host defense mechanisms
- Interactions of antigens, antibodies, complements and other immune components

(Course Content)

	Contents	Hours
Unit-I	I. CELL BIOLOGY: Introduction: Cell theory, Differences of Prokaryotic and Eukaryotic cells. Ultra-structure of animal cell. Plasma membrane: Structure and functions of Plasma membrane, Cytoskeleton: Structure and Functions: Microtubules, Microfilaments. Structure and functions of cell organelles:–Endoplasmic reticulum, Golgi body, Ribosomes, Lysosomes, Mitochondria and Peroxisomes.	13
Unit-II	Nucleus: Structure of Nucleus: Nuclear envelope, Nuclear pore complex, Nucleolus. Chromatin: Euchromatin and Hetrochromatin. Chromosomes – Structure, types, abnormalities, Giant chromosomes Cell cycle: Cell cycle and its regulation. Cancer Biology: Characteristics and properties of cancer; Development and causes of cancer; Diagnosis and treatment of cancer	13

Unit-III	II. HISTOLOGY: Histological techniques: Tissue fixation: methods, embedding, microtomy, staining and mounting of histological tissues; Dyes– Classification of dyes/stains Study of Functional Morphology and Histological organization of mammalian organs: GI tract- stomach and intestine, Pancreas, Adrenal, Liver, Kidney, Testis and Ovary.	13
Unit-IV	III. IMMUNOLOGY: Introduction to Immunology. Principles of innate and adaptive immune system; Cells and organs of immune system. Basic properties of antigens; B and T lymphocytes; Structure, classes and function of antibodies/immunoglobulins, Antigen antibody interactions Structure and functions of MHC; Basic properties of Cytokines	13

SUGGESTED READINGS:

I. Cell Biology:

- 1.Karp, G. (2010). *Cell and Molecular Biology: Concepts and Experiments*. VI Edition. John Wiley and Sons. Inc. □
- 2.De Robertis, E.D.P. and De Robertis, E.M.F. (2006). *Cell and Molecular Biology*. VIII Edition.Lippincott Williams and Wilkins, Philadelphia. □
- 3.Cooper, G.M. and Hausman, R.E. (2009). *The Cell: A Molecular Approach*. V Edition. ASM Press and Sunderland, Washington, D.C.; Sinauer Associates, MA. □
- 4.Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). *The World of the Cell*. VII Edition. Pearson Benjamin Cummings Publishing, San Francisco. □
- 5.Bruce Albert, Bray Dennis, Levis Julian, Raff Martin, Roberts Keith and Watson James (2008).*Molecular Biology of the Cell*, V Edition, Garland publishing Inc., New York and London.

II. Histology:

1. Boyd,W. 1976:A text book of Pathology. Structure and function in disease, 4 th 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.

Immunology:

5. Male, D., Brostoff, J., Roth, D. and Roitt, I. Saunders “Immunology”
6. Delves, P. J., Martin, S. J., Burton, D. R. and Roitt, I. M. ‘Roitt’s Essential Immunology’
7. Sharma, P. and Kumar, P ‘Basics of Immunology” by. IP Innovative Publication Pvt. Ltd. 2021
8. Richard Coico & Geofferey Sunshine “Immunology”

B.Sc. II- Semester ZOOLOGY (Practical)

Course Code: 2A2ZOOM02L Paper Title: Cell Biology, Histology and Immunology

Teaching Hours / Week: 4

Total Marks: Th- 40 + IA- 10 = 50

Total Teaching Hours: 40

Credits: 2

Course Outcomes (CO's): At the end of the course students will be able to

- Understand how these cellular components are to generate and utilize energy in cells
- Understand the cellular components underlying mitotic cell division.
- Apply their knowledge of cell biology to selected examples of changes or losses in cell function.
- Explaining the relationship between structure and function of tissues according to each organ system of the body
- Performing accurately sampling techniques and animal histological specimen-making procedures; observing, reading, and analyzing the contents of the specimen under the microscope
- Get broad knowledge of central processes in innate and adaptive immunity and immune cells and tissues

(Course Content)

Contents	Hours
I. Cell Biology 1. Observation of prokaryotes and eukaryote cells 2. Study of different types of tissue and their mounting 3. Study of various stages of mitosis and meiosis. 4. Preparation of temporary stained squash of any suitable material to study various stages of Mitosis and meiosis.	10
5. Preparation of permanent slide to show the presence of Barr body in human female blood cells/cheek cells. 6. Localization of mitochondrial DNA by using Janus green stain 7. Study of Polytene chromosomes from Chironomous / Drosophila larvae.	10
II. Histology 8. Preparation of fixatives and stains 9. Preparation of permanent histological slides 10. Observations of permanent slides of mammalian organs – Pancreas, Thyroid, parathyroid, pituitary adrenal spleen, liver, kidney, testis and ovary. 11. Study of permanent slides of stomach, duodenum, ileum	10

III. Immunology

12. Demonstration of lymphoid organs
13. Histological study of spleen, thymus and lymph nodes through slides/photographs
14. Preparation of stained blood film to study various types of blood cells
15. ABO blood group determination
16. Any other practical depending on feasibility

10**SUGGESTED READINGS:**

1. Julio Celis Nigel Carter Kai Simons J. Small Tony Hunter David Shotton, Cell Biology (3rd edition). Academic Press
2. Verma P.S. (Author), Agarwal (2004): Cell Biology, Genetics, Molecular Biology, Evolution & Ecology. S Chand publisher
3. N Arumugam (2014): Cell Biology & Molecular Biology. Saras publications
4. Cells and Tissues: Introduction to Histology By N D Cells and Rogers. A W Academic Press
5. Basic medical Histology: Biology of cells, tissues and organs By Kessel Richard G Oxford University Press
6. Text Book of Histology By Bloom and Fawcett. Saunders Publishers Philadelphia
7. Bailey's Text Book of Histology By W M Copenhaver, R P Bunge and Mary B Bunge. Willims and Wilkins Company, Baltimore
8. Kindt, T. J., Goldsby, R.A., Osborne, B. A. and Kuby, J (2006). *Immunology*, VI Edition. W.H. Freeman and Company.
9. David, M., Jonathan, B., David, R. B. and Ivan R. (2006). *Immunology*, VII Edition, Mosby, Elsevier Publication.
10. Mosby, Elsevier Publication.
11. Abbas, K. Abul and Lechtman H. Andrew (2003.) *Cellular and Molecular Immunology*. V Edition. Saunders Publicati

Scheme of Semester End Practical Examination: 40 Marks

(Question Paper Pattern) I/II SEMESTER B.Sc. PRACTICAL EXAMINATION-2024-25
ZOOLOGY

Assessment Distribution of Marks (Perform all the experiments as per the instructions in each question)

- | | |
|--------------------------|----------|
| 1. Major Experiments | 12 Marks |
| 2. Minor Experiments | 08 Marks |
| 3. Identifications (A-D) | 12 Marks |
| 4. Viva | 04 Marks |
| 5. Journal | 04 Marks |

Total = 40 Marks

Note: Same Scheme may be used for IA (Formative Assessment) examination for 40 marks and converted to 10 IA marks