

SHIVAJI UNIVERSITY, KOLHAPUR.



Accredited By NAAC with 'A' Grade

Revised Syllabus For

B.Sc Part- III

Zoology

Syllabus to be implemented from

June, 2020 onwards.

SHIVAJI UNIVERSITY, KOLHAPUR

Revised Syllabus for Bachelor of Science

B. Sc. III – Zoology –To be implemented from June 2020

GENERAL OBJECTIVES OF THE COURSE

1) Aims:

1. To impart the knowledge of animal science to the pupils.
2. To make the pupils to use the knowledge in their daily life.
3. To make the pupils aware of natural resources and environment.
4. Application of knowledge in Zoology for nutrition, agriculture & live stock.
5. To provide practical experiences which form a part of their learning processes.
6. To develop aptitude for scientific work & ability to pursue studies far beyond graduation.
7. To encourage the pupils to take life science as a carrier which is the need now a days.
8. To make the pupils fit for the society.

2) Objectives –

1. To impart knowledge is the basic aim of education. The students are expected to acquire the knowledge of animal science, natural phenomenon, manipulation of nature & environment by man.
2. Understanding the scientific terms, concepts, facts, phenomenon & their interrelationships.
3. Applications of the knowledge.
4. To develop skills in practical work, experiments & laboratory materials, instruments.
5. To develop interests in the subject & scientific hobbies.
6. To develop scientific attitude which is the major objective? This makes the students open minded, critical observations, curiosity, thinking etc.
7. Abilities to apply scientific methods, collection of scientific data, problem solving, organize science exhibitions, clubs etc.
8. Appreciation of the subject, contributions of scientists, scientific methods, scientific programs etc.

3) DURATION

- The course shall be full time course.
- The duration of course shall be three years.

4) **PATTERN:** Pattern of Examination will be semester for theory and annual for practical with INTERNAL ASSESSMENT (Project/Seminar/Field work for theory) Scheme

5) **MEDIUM OF INSTRUCTION:** The medium of instruction shall be in English.

6) **STRUCTURE OF COURSE:** B.Sc. III – Zoology THEORY – No. of papers: Eight, No of practicals: Four SEMESTER V-Paper IX to XII & SEMESTER VI- Paper XIII to XVI

SEMESTER-V Theory

Sr. No.	Subject	Marks	University	Internal
1	Zoology Paper- IX	50	40	10
2	Zoology Paper- X	50	40	10
3	Zoology Paper- XI	50	40	10
4	Zoology Paper- XII	50	40	10

Total=200

SEMESTER-VI Theory

Sr. No.	Subject	Marks	University	Internal
1	Zoology Paper- XIII	50	40	10
2	Zoology Paper- XIV	50	40	10
3	Zoology Paper- XV	50	40	10
4	Zoology Paper- XVI	50	40	10

Total = 200

PRACTICALS- Annual

09	Practical—V	50
10	Practical – VI	50
11	Practical – VII	50
12	Practical – VIII	50

Total 200

Total = 600

7. SCHEME OF TEACHING AND EXAMINATION (Teaching scheme - Hrs/Week)

No	Sem. - V	Sem. - VI	L	P	Total
1	Paper No IX Paper No. XIII	Paper No IX Paper No. XIII	3		
2	Paper No IX Paper No. XIII	Paper No IX Paper No. XIII	3		
3	Paper No IX Paper No. XIII	Paper No IX Paper No. XIII	3		
4	Paper No IX Paper No. XIII	Paper No IX Paper No. XIII	3		
			12		12
1	Practical V			5	
2	Practical VI			5	
3	Practical VII			5	
4	Practical VIII			5	
				20	20
	Total				32

8) SCHEME OF EXAMINATION

Question paper will be set in the view of the / in accordance with the entire syllabus and preferably covering each unit of syllabi.

9) EQUIVALENCE IN ACCORDANCE WITH TITLES AND CONTENTS OF PAPERS (FOR REVISED SYLLABUS)

Refer copy of revised syllabus

10) OTHER FEATURES

1. Required Books, Journals stated in each syllabus of Part I, Part II and Part III Zoology and Fisheries.

A) LIBRARY : Reference and Text Books, Journals, and Periodicals, Reference Books for Advanced Studies.

B) SPECIFIC EQUIPMENTS: Necessary to run the Course (T.V., L.C.D., and Overhead Projector), (Computer and necessary software's, operating systems etc.)

C) LABORATORY SAFETY EQUIPMENTS

- Fire Extinguishers at least two sets in each laboratory. (Lab. area 600 sq.ft.)

- Leakage of gases be avoided.
- Primary medical aid box (First Aid Kit)
- Sugar / Glucose – 500 gm pack: Pinch of sugar and a cup of drinking water in hypoglycemic condition. OR In extreme weakness of student or person concerned.
- Rules of animal ethics should be strictly followed.

D) LABORATORY INSTRUCTIONS

- 1) Always wear an apron inside the laboratory. Do not wear it outside.
- 2) Do not drink or eat inside the laboratory.
- 3) Do not place pencil, fingers or any material in the mouth. Moisten labels with water.
- 4) Use microscopes and other instruments carefully.
- 5) Discard all used glassware such as test tube, pipettes, petry-plates, glass slides in receptacle meant for it. a
- 6) Put cotton plugs, papers, matches, waste dissection material etc. in a waste-paper basket. Do not throw them in sink not leave them on desk or floor.
- 7) Regard all cultures as pathogenic. Take every precaution against infection.
- 8) Report all accidents to the instructor immediately.
- 9) Wash hands thoroughly with soap and water before and after dissection and experiment.
- 10) Always turn off water, gas and electricity before leaving the laboratory.
- 11) When students enter in laboratory they should have – A Laboratory Journal, pencil and eraser, foot rule, dissection box with dissecting instruments, a small napkin.
- 12) All drawings must be made with drawing pencil only.
- 13) As the journal is to represent student's bonafide work during the whole year, student should keep it as clean as possible and DO NOT LOOSE IT
- 14) Students should not forget that unless their journals are certified, they are not allowed to appear for the university examination

11) COMMON NATURE OF QUESTION FOR THEORY

PAPER: SEMISTER – V Zoology Paper (IX, X, XI, XII)

SEMISTER – VI Zoology Paper (XIII, XIV, XV, XVI)

Q. 1	Multiple Choice Questions (Eight questions)	08
Q. 2	Long answer questions (Attempt any two out of three)	16
	A.	
	B.	
	C.	
Q. 3	Shorn Notes (Attempt any four out of Six)	16
	a.	
	b.	
	c.	
	d.	
	e.	
	f.	

SHIVAJI UNIVERSITY, KOLHAPUR

Syllabus of B.Sc. Part III Zoology

Zoology Paper- IX

DSE-E29 (COMPARATIVE ANATOMY OF VERTEBRATES)

Theory: 30 hrs. (37.5 lectures of 48 minutes) (Credits 2)

Unit 1: Integumentary System	4
1. Generalized structure of integument	
2. Functions of Integument	
3. Soft and Hard epidermal derivatives	
4. Hard epidermal derivatives	
Unit 2: Skeletal System	4
1. Vertebral column	
2. Appendicular skeleton	
Unit 3: Digestive System	4
Brief account of alimentary canal and digestive glands	
Unit 4: Respiratory System	4
Brief account of Gills, lungs, air sacs	
Unit 5: Circulatory System	4
Evolution of heart and aortic arches	
Unit 6: Evolution of Kidney	3
Succession of kidney	
Unit 7: Nervous System	3
Comparative account of brain	
Unit 8: Sense Organs	4
Comparative account of ear and eye of vertebrates	

SUGGESTED READINGS:

1. Kardong, K.V. (2005) Vertebrates' Comparative Anatomy, Function and Evolution. IV Edition. McGraw-Hill Higher Education. Kent, G.C. and Carr R.K. (2000). Comparative Anatomy of the Vertebrates. IX Edition
2. The McGraw-Hill Companies. Hilderbrand, M and Gaslow G.E. Analysis of Vertebrate Structure, John Wiley and Sons Walter, H.E. and Sayles, L.P; Biology of Vertebrates, Khosla Publishing House.

3. Outlines of comparative anatomy, Romer & Parsons, Central Book Depot, The Vertebrate Body (Saunders).
4. Biology of Vertebrates Walter & Sayles; (McMillan).

5. Chordate Zoology, P.S. Dhami & J. K. Dhami - R. Chand & Co., New Delhi.
6. Modern Textbook of Zoology, R. L. Kotpal, Rastogi Publications, Meerut.
7. The Life of Vertebrates, 3rd Edition, 1993, J. Z. Young E. L. B.S. Oxford.
8. Chordate Zoology - E.L. Jordan, S. Chand & Co., New Delhi.
9. The Phylum Chordata - 1987, H.H. Newman, Distributor Satish Book Enterprise, Agra. 8. Comparative Anatomy of the Vertebrates G. C. Kent.

SHIVAJI UNIVERSITY, KOLHAPUR

Syllabus of B.Sc. Part III Zoology

Zoology Paper- X

DSE-F29 (Molecular Cell Biology and Animal Biotechnology)

Theory: 30 hrs. (37.5 lectures of 48 minutes) (Credits 2)

Unit 1: Molecular Biology –	7
1) DNA Replication (Semiconservative mode)	
2) DNA Damage and Repair mechanism	
3) Regulation of gene expression- Operon concept	
4) Genetic Code:	
i) Properties of Genetic code	
ii) Codon assignment	
iii) Wobble hypothesis	
Unit 2: Protein synthesis	8
A) Transcription	
i) Process in prokaryotes and eukaryotes	
ii) RNA polymerase	
iii) Post transcriptional modification in RNA	
B) Translation in prokaryotes and eukaryotes	
i) Initiation	
ii) Elongation	
iii) Termination	
Unit 3 : Molecular Techniques in Gene manipulation	15
1. Restriction enzymes: Nomenclature, detailed study of Type II.	
2. Characteristics of Cloning vectors: Plasmids, Cosmids, Phagemids, Lambda Bacteriophages	
3. Gene cloning: Transformation techniques by Calcium chloride method and electroporation	
4. Construction of genomic and cDNA libraries	
5. Southern, Northern and Western blotting	
6. DNA sequencing: Sanger method	
7. Polymerase Chain Reaction,	
8. DNA Finger Printing	
9. DNA micro array	

SUGGESTED READINGS:

1. Brown, T.A. (1998). Molecular Biology Labfax II: Gene Cloning and DNA Analysis. II Edition, Academic Press, California, USA. Glick, B.R. and Pasternak, J.J. (2009).
2. Molecular Biotechnology - Principles and Applications of Recombinant DNA. IV Edition, ASM press, Washington, USA. Griffiths, A.J.F., J.H. Miller, Suzuki, D.T., Lewontin, R.C. and Gelbart, W.M. (2009).
3. An Introduction to Genetic Analysis. IX Edition. Freeman and Co., N.Y., USA. Snustad, D.P. and Simmons, M.J. (2009).
4. Principles of Genetics. V Edition, John Wiley and Sons Inc. Watson, J.D., Myers, R.M., Caudy, A. and Witkowski, J.K. (2007).
5. Recombinant DNAGenes and Genomes- A Short Course. III Edition, Freeman and Co., N.Y., USA. Beauchamp, T.I. and Childress, J.F. (2008).
6. Principles of Biomedical Ethics. VI Edition, Oxford University Press.
7. Cell and Molecular Biology, 8th Edition, De. Robertis EDP and De Robertis Jr. EMF, Lippincott Williams and Wilkins, Philadelphia.
8. Cell Biology, C.B. Powar, Himalaya Publication House.
9. Cell and Molecular Biology, E.J. Dupraw, Academic Press, New York.
10. Cell Structure and Function - A. G. Loewy, P. Siekevitz, J. R. Meninger & J. A. N. Gallant, Saunder College, Philadelphia.
11. Molecular Biology of the Cell - 3rd Edition, Bruce Alberts, Dennis Bray, Julian Lewis, Martin Raff, K. Roberts & James D. Watson, Garian Publishing, New York.

SHIVAJI UNIVERSITY, KOLHAPUR

Syllabus of B.Sc. Part III Zoology

Zoology Paper- XI

DSE-F30 (Biotechniques and Biostatistics)

Theory: 30 hrs. (37.5 lectures of 48 minutes) (Credits 2)

Unit I: Genetically Modified Organisms

9

1. Production of cloned and transgenic animals:
 - a. Nuclear Transplantation
 - b. Retroviral Method
 - c. DNA microinjection
2. Applications of transgenic animals:
 - a. Productions of pharmaceuticals
 - b. Production of donor organs
3. Knockout mice.

Unit II: Culture Techniques and Applications

6

- a. Animal cell culture: Introduction, principle and applications
- b. Stem Cells: Introduction to stem cells
 - i) Potency of stem cells: Totipotency, Pluripotency, Multipotency, Unipotency
 - ii) Sources of stem cells-Embryo, Fetal, Adult, Bone marrow

Unit III: Biostatistics

15

- a. Classification of Biological data
- b. Frequency distribution
- c. Tabulation
- d. Graphical representation of data
- e. Measures of central tendency (Mean, Median, Mode)
- f. Dispersion – Mean, deviation & standard deviation
- g. Correlation – Scattered diagram, Karl Pearson's correlation coefficient and Spearman's rank correlation coefficient.

SUGGESTED READINGS:

1. Brown, T.A. (1998). Molecular Biology Labfax II: Gene Cloning and DNA Analysis. I Edition, Academic Press, California, USA. Glick, B.R. and Pasternak, J.J. (2009). Molecular Biotechnology - Principles and

2. Applications of Recombinant DNA. IV Edition, ASM press, Washington, USA. Griffiths, A.J.F., J.H. Miller, Suzuki, D.T., Lewontin, R.C. and Gelbart, W.M. (2009)
3. An Introduction to Genetic Analysis. IX Edition. Freeman and Co., N.Y., USA. Snustad, D.P. and Simmons, M.J. (2009).
4. Principles of Genetics. V Edition, John Wiley and Sons Inc. Watson, J.D., Myers, R.M., Caudy, A. and Witkowski, J.K. (2007).
5. Recombinant DNA Genes and Genomes- A Short Course. III Edition, Freeman and Co., N.Y., USA. Beauchamp, T.I. and Childress, J.F. (2008).
6. Principles of Biomedical Ethics. VI Edition Oxford University Press.
7. Elements of Biotechnology - P. K. Gupta, Rastogi Publications.
8. Gene V & VI, 1994, Lewin B., Oxford University Press, Oxford.
9. Concept of Genes-Pearson Edition 9. Cell and Molecular Biology

SHIVAJI UNIVERSITY, KOLHAPUR

Syllabus of B.Sc. Part III Zoology

Zoology Paper- XII

DSE-F31 (AQUATIC BIOLOGY)

Theory: 30 hrs. (37.5 lectures of 48 minutes) (Credits 2)

Unit 1: Aquatic Biomes **10**

- a. Freshwater ecosystem (lakes, wetlands, streams and rivers),
- b. Estuaries
- c. Intertidal zones
- d. Oceanic pelagic zone
- e. Marine benthic zone
- f. Coral reefs

Unit 2: Freshwater Biology **10**

1. Lakes
 - a. Lake as an Ecosystem
 - b. Lake Morphometry
 - c. Physico-chemical characteristics
 - i. Light
 - ii. Temperature
 - iii. Thermal Stratification
 - iv. Dissolved solids
 - v. Carbonates
 - vi. Bicarbonates
 - vii. Phosphates and Nitrates
 - viii. Turbidity
 - ix. Dissolved gases (Oxygen Carbon dioxide)
 - x. Nutrient Cycle – (Nitrogen, Sulphur and Phosphorus)
2. Streams
 - a. Different stages of stream development
 - b. Physico-chemical Environment
 - c. Adaptation of hill stream fishes

Unit 3: Endocrinology **10**

- a. Study of endocrine glands – Anatomy and histology
- b. Hormones- Nature, role, regulation and disorders with reference to the following
thyroid gland, parathyroid gland, adrenal gland and islets of Langerhans

SUGGESTED READINGS:

1. Anathakrishnan : Bioresources Ecology 3rd Edition
2. Goldman : Limnology, 2nd Edition
3. dum and Barrett : Fundamentals of Ecology, 5th Edition
4. Pawlowski : Physicochemical Methods for Water and Wastewater Treatment, 1st
5. Edition Wetzel : Limnology, 3rd edition
6. Trivedi and Goyal : Chemical and biological methods for water pollution studies
7. Welch : Limnology Vols. I-II
8. Animal Physiology – Nelson (Cambridge)
9. Endocrinology – Hadely
10. General Endocrinology – Bangara and Turner (W.B. Saunders)
11. Reproductive Physiology – Nalbandov A. V.

SHIVAJI UNIVERSITY, KOLHAPUR

Syllabus of B.Sc. Part III Zoology

Zoology Paper- XIII

DSE-E30 (DEVELOPMENTAL BIOLOGY OF VERTEBRATES)

Theory: 30 hrs. (37.5 lectures of 48 minutes) (Credits 2)

Unit 1 : Gametogenesis	6
1. Types of Eggs	
2. Fertilization – Types and Process of Fertilization	
3. Types of Cleavages	
Unit 2: Early Development of Frog	6
1. Structure of mature egg and its membranes	
2. Cleavage	
3. Blastula and its fate map	
4. Process of gastrulation	
5. Types of Morphogenic Movements	
6. Fate of three germinal layers	
7. Neurulation	
8. Metamorphosis in frog and its hormonal regulation	
Unit 3: Chick Embryology	15
1. Structure of sperm	
2. Structure of egg and vitellogenesis	
3. Fertilization and cleavage	
4. Blastula and its fate map	
5. Process of gastrulation	
6. Organogenesis	
a. Development of neural tube and brain up to 72 hours of incubation	
b. Development of gut up to 72 hours of incubation	
c. Development of blood and heart up to 72 hours of incubation	
d. Foetal membranes and significance	
Unit 4: Late Embryonic Development	3
1. Implantation of embryo in human being	
2. Placenta – Formation, types and significance	

SUGGESTED READINGS:

1. An Introduction to Embryology 1981, Balinsky B.L., Saunders College, Philadelphia.
2. Developmental Biology; Patterns/Principles/Problems, 1982, Saunders J. W. Collier MacMillan, Publishers, London.
3. Developmental Biology, 1997, 3rd Edition, Gilbert S.F. Saunder Associates Inc. U.S.A.
4. Developmental Biology, 1992 3rd edition, Browder L.W. Erickson C.A. & Williams, R J. Saunders College, Publications, London.
5. A Text Book of Embryology, Dr. Puranik P. G., S. Chand & Co. 6. Developmental Biology, 1984, Browder L.W. , Saunders College Publicaions, U.S.A.
6. Development of Chick embryo, 1972, Lillie. 8. Developmental Biology, 1991, 3rd Edition, Sinaur Associates, Inc. U.S.A. Gilbert, S. F. (2006).
7. Developmental Biology, VIII Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA. Balinsky, B.I. (2008).
8. An introduction to Embryology, International Thomson ComputerPress. Carlson, Bruce M (1996). Patten's Foundations of Embryology, McGraw Hill, Inc.

SHIVAJI UNIVERSITY, KOLHAPUR

Syllabus of B.Sc. Part III Zoology

Zoology Paper- XIV

DSE-E32 (IMMUNOLOGY)

Theory: 30 hrs. (37.5 lectures of 48 minutes) (Credits 2)

Unit 1: Overview of the Immune System	7
1. Introduction to basic concept in immunology	
2. Principles of innate and adaptive immune system	
Unit 2: Cells and Organs of the immune system	8
1. Haematopoeisis	
2. Cells of immune system	
3. Organs (Primary and Secondary lymphoid organs) of the immune system	
4. Immune responses- Humoral and cell mediated	
Unit 3 : Antigens	7
1. Basic properties of antigens	
2. B and T cell epitopes	
Unit 5: Immunoglobulin / Antibodies	8
1. Structure, Classes and Functions of Antibodies	
2. Antigen – Antibody interactions	
3. Hybridoma Technology: Monoclonal Antibodies in diagnosis and therapeutics	

SUGGESTED READINGS:

1. Kindt, T. J., Goldsby, R.A., Osborne, B. A. and Kuby, J (2006). Immunology, VI Edition. W.H. Freeman and Company. David, M., Jonathan, B., David, R. B. and Ivan R. (2006).
2. Immunology, VII Edition, Mosby, Elsevier Publication. Abbas, K. Abul and Lechtman H. Andrew (2003.) Cellular and Molecular
3. Immunology. V Edition. Saunders Publication.

SHIVAJI UNIVERSITY, KOLHAPUR

Syllabus of B.Sc. Part III Zoology

Zoology Paper- XV

DSE-E31 (Applied Zoology - II)

Theory: 30 hrs. (37.5 lectures of 48 minutes) (Credits 2)

Unit 1: Apiculture	8
1. Types and casts of honey bee	
2. Honey Comb	
3. Bee Keeping	
a. Artificial models of bee hive – Newton and Langstroth models	
b. Bee keeping Equipments	
c. Extraction of Honey	
4. Medicinal Value of Honey	
Unit 2 : Animal Husbandary	5
1. Indigenous and exotic breeds of cattle	
2. Preservation and artificial insemination in cattle	
3. Induction of early puberty	
4. Synchronization of estrus in cattle	
5. Commercial importance of dairy farming	
Unit 3: Pearl culture	4
1. Species of oyster	
2. Process of Pearl formation: natural and artificial	
3. Maintenance of oysters	
4. Harvesting	
5. Importance of Pearl	
Unit 4: Freshwater prawn culture	3
1. Species of Prawn	
2. Site selection	
3. Farm Construction	
4. Production system: fertilization, Larval Development, Food and feeding	
5. Harvesting	
Unit 5: Fish Technology	5
Genetic improvements in aquaculture industry:	
1. Induced breeding	
2. Transportation of fish seed	
3. Feeding and development	
4. Harvesting and Marketing	

Unit 4 : Goat Farming-

5

1. Breeds
2. Feeding
3. Housing
4. Economic Importance

SUGGESTED READINGS:

1. Mollusca - Hyman.
2. Prawn and Prawn Fishery of India - Kurian.
3. Fish Culture - K. H. Alikuhni.
4. Fish Culture - Lagter.
5. Fishes of India. - Khanna.
6. Hand Book of Animal Husbandary and Dairy - Mudlyer.
7. Bee keeping in India - Sardar Sing.
8. Bee Keeping in India- M. G. Smith.
9. Poultry keeping in India - Naidu P.N.M.
10. Poultry Husbandary - M. A. Jule. 18. Poultry Husbandary - Moorthy.
11. Outlines of Dairy Technology - Sukumar De.
12. Milk and milk products - Clarence Henry Eckles, Willes Barnes Combs, Harold Macy

SHIVAJI UNIVERSITY, KOLHAPUR

Syllabus of B.Sc. Part III Zoology

Zoology Paper- XVI

DSE-F32 (Insect Vectors and Histology)

Theory: 30 hrs. (37.5 lectures of 48 minutes) (Credits 2)

Unit I: Dipteran as Disease Vectors

18

1. Dipteran as important insect vectors
 - a. Mosquitoes
 - b. Sand fly
 - c. Houseflies
2. Study of mosquito born diseases –
 - a. Malaria
 - b. Dengue
 - c. Chikungunya
 - d. Viral encephalitis
 - e. Filariasis
3. Control measures of Mosquitoes
4. Study of house fly as important mechanical vector
 - a. Myiasis, Control of house fly

Unit II: Siphonoptera as Disease Vectors

6

1. Fleas a important insect vectors
2. Host-specificity
3. Study of Flea-borne diseases
 - a. Plague
 - b. Typhus fever
4. Control of fleas

Unit III: Histology of mammalian organs

6

Tooth, tongue, Salivary glands, Stomach, Duodenum, Ileum, Liver, Pancreas, Kidney

SUGGESTED READINGS:

1. Imms, A.D. (1977). A General Text Book of Entomology. Chapman & Hall, UK
Chapman, R.F. (1998).
2. The Insects: Structure and Function. IV Edition, Cambridge University Press, UK
Pedigo L.P. (2002).
3. Entomology and Pest Management. Prentice Hall Publication Mathews, G. (2011).
4. Integrated Vector Management: Controlling Vectors of Malaria
5. Insect Vector Borne Diseases. Wiley-Blackwell
6. Textbook of Histology: Bloom W and Fawcett D.W.
7. Histology: Lippincott. Ham, A.W.
8. Histology: Greep, R.O and well, L.
9. An Atlas of Histology. Heinemann Educational Book Ltd. London and ELBS: Freeman.
W.H. and Bracegirdle, B.
10. Microscopic Anatomy of vertebrates, Lea and Febigen. Philadelphia: Kendall, J.I.
11. Histology of Mammals: Athavale, M.V and Latey, A. N.

SHIVAJI UNIVERSITY, KOLHAPUR
Syllabus of B.Sc. Part III Zoology
Zoology Practical – I (Credits-02)

Comparative anatomy and developmental biology of vertebrates

I. Comparative Study of following

1. V.S. of skin of vertebrates
2. Digestive system of vertebrates
3. Respiratory system of vertebrates
4. Heart of vertebrates
5. Brain of vertebrates
6. Osteology
 - a) The skeleton of fowl (Disarticulated)
 - b) The skeleton of rabbit (Disarticulated)
 - c) Mammalian skull's – (any one herbivorous and one carnivorous animal)

II. Study of developmental stages of frog.

1. Cleavage
2. Blastulation
3. Gastrulation
4. Neurulation
5. Stages of metamorphosis in frog
 - a. External gill stage
 - b. Internal gill stage
 - c. Forelimb stage
 - d. Hind limb stage
 - e. Tail bud stage
 - f. Juvenile stage

III. Study of Chick Embryo

12. Whole mount of chick embryo – 18, 24, 33, 48 and 72 hours.
13. T.S. of chick embryo – 18, 24, 33, 48 and 72 hours.

VI. Preparation of whole mount chick embryo.

IV. Study of Histological structures of placenta (permanent slide or microphotographs)

- 1) Epitheliochorial
- 2) Endotheliochorial
- 3) Hemochorial
- 4) Syndesmochorial
- 5) Hemoendothelial

V. Examination of Gametes – Frog or Rat sperm & ovum through slides or microphotographs.

SHIVAJI UNIVERSITY, KOLHAPUR

Syllabus of B.Sc. Part III Zoology

Zoology Practical – II (Credits-02)

Applied Zoology – II and Immunology

Unit 1: Applied Zoology

1. Apiculture

- a. Casts of Honey Bees
- b. Bee Hive(Photographs or models)
- c. Pollen Basket
- d. Sting Apparatus
- e. Honey
- f. Newton's model of Bee Hive (Photographs or models)
- g. Bee keeping Equipments (Photographs or models)

2. Preservation & Artificial insemination in cattles

8. Pearl culture

- a. Species of oyster
- b. Process of Pearl formation: natural and artificial
- c. Importance of Pearl

9. Freshwater prawn culture

- a. Species of Prawn
- b. Site selection
- c. Farm Construction
- d. Production system
- e. Harvesting

10. Goat farming

- a. Breeds (any four = 2 Indigenous and 2 Exotic)
- b. Housing
- c. Feeding

6. Visit to goat farm or animal breeding centre – submission of visit report

B] Immunology

1. Study of lymphoid organ's (Photograph, Models, Videos)
2. Histological study of (slides or photographs)
 - a. Spleen
 - b. Thymus
 - c. Lymph nodes
3. Preparation of stained blood smears to study various types of blood cells
4. Determination of ABO blood groups
5. Demonstration of
 - a. ELISA
 - b. Immuno-electrophoresis

C] Cell counting and viability test from splenocytes of farm breed animals / cell lines

SHIVAJI UNIVERSITY, KOLHAPUR

Syllabus of B.Sc. Part III Zoology

Zoology Practical – III (Credits-02)

Molecular biology, Animal biotechnology, Biostatistics & Biotechniques

I] Microtechnique

1. Preparation of permanent histological slides by HE technique
2. Histochemical technique
 - a. AB PH 1 technique
 - b. AB PH 2.5 technique
 - c. PAS technique

II] Biotechniques

1. Chromatography – Separation of amino acid by paper chromatography
2. DNA isolation
3. Demonstration of DNA by feulgan technique
4. To study the following technique (photographs)
 - a) Southern blotting
 - b) Northern blotting
 - c) Western blotting
 - d) DNA sequencing (Sangers method)
 - e) PCR
 - f) DNA fingerprinting

III) Biostatistics

Any 10 example based on theory

- IV] Project (any suitable work possible in local area or from the syllabus) Report of the same to be submitted at the time of practical examination**

SHIVAJI UNIVERSITY, KOLHAPUR

Syllabus of B.Sc. Part III Zoology

Zoology Practical – IV (Credits-02)

Aquatic biology, insect vector & diseases

A] Aquatic biology

1. Determination of area of a lake using graphimetric & gravimetric method
2. Identify the zooplanktons present in lake ecosystem
3. Determination of turbidity or transparency from nearby lake or water body
4. Determination of dissolved oxygen
5. Determination of free CO₂
6. Determination of alkalinity (Carbonates & bicarbonates) from water collected from nearby lake or water body
7. Estimation of total hardness of water
8. Instruments used in limnology & their significance
 - a) Secchi disc
 - b) Van Dorn bottle
 - c) Conductivity meter
 - d) Turbidity meter
 - e) PONAR grab sampler
9. Visit to seashore/water reservoir/animal sanctuary to study animal diversity. Report of tour should be submitted at the time of practical examination
10. Endocrine glands (Anatomy and Histology) – Thyroid, Parathyroid, Adrenal and Pancreas.

B] Insect Vectors & diseases

10. Study of different kinds of mouthparts of insects
 - a) Chewing & biting
 - b) Chewing & lapping
 - c) Piercing & sucking
 - d) Sponging
 - e) Siphoning
11. Study of following insect vectors through permanent slides or photograph
 - a) Insect vector – Mosquito, sandfly & housefly
 - b) Study of mosquito born diseases – Malaria, dengue, chikungunya, encephalitis, filariasis
 - c) Study of sandfly born diseases – Visceral leishmanians, Cutaneous leishmanians, Phlebotomus fever
 - d) Study of housefly born diseases – Myiasis
 - e) Study of flea born diseases – Plague, typhus
12. Histology of Following mammalian organs-
 - a) Tooth (V.S.)
 - b) Tongue
 - c) Salivary gland
 - d) Stomach
 - e) Duodenum
 - f) Ileum
 - g) Liver
 - h) Pancreas
 - i) Kidneys