

Proposed draft Syllabus for B.Sc. II Zoology

Submitted to

**Yashwantrao Chavan Institute of Science,
Satara
(Autonomous)**

Under

**Choice Based Credit System (CBCS)
(June 2019-2020)
B.Sc. Part II Zoology**

Semester III

Paper V: Animal Diversity II

Paper VI: Biochemistry

Semester IV

Paper VII: Reproductive Biology

Paper VIII: Applied Zoology

Yashwantrao Chavan Institute of Science, Satara

(Autonomous)

Syllabus for Bachelor of Science Part II

I) Title: Zoology

II) Year of Implementation: 2019-2020

III) Structure of Course:

1. Structure of Syllabus: B.Sc. – II Semester –III

Sr. No.	Course Title	Theory			Practical		
		Paper No.& Paper Code	No. of lectures Per week	Credits	Course Title	No. of lectures per week	Credits
1	Zoology	Paper-I: BZT301	3	2	Practical Paper – I : BZP303	8	4
		Paper-II: BZT302	3	2			

B.Sc. – II

Semester –VI

Sr. No.	Course Title	Theory			Practical		
		Paper No.& Paper Code	No. of lectures Per week	Credits	Course Title	No. of lectures Per week	Credits
1	Zoology	Paper-III: BZT401	3	2	Practical Paper – II: BZP403	8	4
		Paper-IV: BZT402	3	2			

Note: B: B. Sc. T=Theory and P= Practical

Evaluation Structure: B. Sc. II Sem-III & IV (Zoology)

Semester	Paper No. & Code	ESE	Internal Exam		Paper No. & Code	Practical		Submission		Total
			ISE I	ISE II		Exam	Journal	Seminar	Day to Day Performance	
III	Paper I :BZT301	30	5	5	Pr. Paper I: BZP 303(A)	25	5	5	5	150
	Paper II :BZT302	30	5	5	Pr. Paper I: BZP 303(B)	25	5			
	Total	60	10	10	Total	50	10	5	5	
IV	Paper III BZT 401	30	5	5	Pr. Paper II: BZP 403(A)	25	5	5	5	150
	Paper IV :BZT 402	30	5	5	Pr. Paper II: BZP 403(B)	25	5			
	Total	60	10	10	Total	50	10	5	5	
Total of Sem. III & IV		120	20	20	Total	100	20	10	10	300

IIIrd Semester – Number of papers 2

B.Sc. II Zoology

Second Year – Number of papers II

Paper V:

Animal Diversity II

Paper VI:

Biochemistry

IVth Semester – Number of papers 2

B.Sc. II Zoology

Second Year – Number of papers II

Paper VII:

Reproductive Biology

Paper VIII:

Applied Zoology

B. Sc. Part II Semester- III

B.Sc. II ZOOLOGY
PAPER V
BZT-301 (ANIMAL DIVERSITY-II)
Theory: 36 hrs. (45 lectures of 48 minutes)

Marks-50 (Credits: 02)

Unit 1:

Learning Objectives

1. To acquire knowledge of biology in diversity of organism.
2. To acquire the fundamental concepts of animal diversity.
3. Students will be able to communicate scientific information
4. Students should able to explain characteristics and classification of Protochordates, Agnatha, Pisces and Amphibia.

Protochordates:

(5)

General features and Retrogressive metamorphosis in Ascidian tadpole (Eg. Herdmania)

Agnatha:

(5)

General features of Agnatha and classification of cyclostomes.

Pisces:

(6)

General features and Classification up to order: Swim bladder, Breeding and parental care in fishes

Amphibia:

(7)

General features and Classification up to order: Neoteny and Parental care in Amphibia (Order: Anura, Apoda, Urodela) Ichthyophis

Learning Outcomes

1. Students should learn about classification and general characters of Protochordates, Agnatha, Pisces and Amphibia.
 2. Should will able to explain retrogressive metamorphosis.
 3. Student will able to explain breeding and parental care in fishes and amphibia.
-

Unit II

Learning Objectives

1. To acquire knowledge of biology in diversity of organism.
 2. Students will be able to explain and apply the fundamental concepts of animal diversity.
 3. Students will be able to communicate scientific information
 4. Students should able to explain characteristics and classification of Reptiles, Aves and Mammals.
-

Reptiles:

(7)

General features and Classification up to order:Venomous and non-venomous snakes, Bitingmechanism in snakes. First Aid Treatment, Sources of treatment (Govt. hospitals)

Information of Haffkin institute.

Aves:

(7)

General features and Classification up to order: Brain of fowl, Aerial Adaptations in birds (Morphological, Anatomical and Physiological).

Mammals:

(8)

General features and Classification up to order:Study of Adaptive radiations in mammals, (Duck Billed Platypus, Kangaroo, Bottle nose Dolphin, Blue Whale, Scaly ant eater, Spiny ant eater)

Learning Outcomes:

4. Students should learn about classification and general characters of Reptiles, Aves and Mammals.
 5. Should will learn difference between venomous and non-venomous snake.
 6. Student should learn to apply treatment for snake bite.
 7. Students should learn to classify animal's upto orders.
-

References:

1. Chordate Zoology-Jhordan & Verma – (Unit 1)
2. Chordates- V.S.Verma- S.Chand Publication- (Unit 1)
3. Vertebrate Zoology- P.S.Dhami- S.Chand Publication (Unit 1 & 2)
4. Modern textbook of Zoology- Vertebrates 2nd edition- R.L.Kotpal –Rastogi

Publication (Unit-2)

- 5. Zoology of chordates- Nigam- (Unit 1)**
- 6. Fundamental of Zoology-Verma and Dudhane (Unit 2)**
- 7. Practical Zoology –Vertebrates-R.L.Kotpal (Unit 1,2)**
- 8. Mannual of Practical Zoology –Chordates-P.S.Verma (Unit 1)**
- 9. Textbook of Zoology- S.S.Lal (Unit 1,2)**
- 10. Vertebrate Zoology –R.L.Kotpal (Unit 1,2)**

B. Sc. Part II Semester- III

ZOOLOGY

Paper-VI

BZT-302 (BIOCHEMISTRY)

Theory: 36 hrs. (45 lectures of 48 minutes)

Marks-50 (Credits: 02)

Unit 1:

Learning Objectives

1. Students will be able to acquire the specialized knowledge relevant to biochemistry.
 2. Students will be able to demonstrate and understanding the biochemical principles.
-

Water: Molecular structure of water, Properties of water and Significance of water **(5)**

Learning outcome

1. Students should understand properties and significance of water.
-

Unit II

Learning Objectives

1. Students will be able to understand basic laboratory technique in both chemistry and biology
 2. Students will be able to apply the scientific method to the experiments.
-

Nucleic acids:

1. **DNA and RNA.** Types ,Structure and functions **(5)**
 2. **Carbohydrate Metabolism:** Classification, Glycolysis, Krebs Cycle, **(10)**
Pentose Phosphate Pathway, Gluconeogenesis, Biological Significance.
Metabolic disorders of Carbohaydrate metabolism (Diabetes mellitus)
-

Learning outcomes

1. Students will able to know about types, structure and functions of nucleic acids.
2. Students should able to understand carbohydrate metabolism and its disorders.

Unit 3

Learning objectives

1. Students will be able to acquire the specialized knowledge relevant to biochemistry.
 2. Students will be able to demonstrate and understanding the biochemical principles.
 3. Students will be able to understand basic laboratory technique in both chemistry and biology
 4. Students will be able to apply the scientific method to the experiments.
-

Lipid Metabolism: (8)

Classification and β oxidation of palmitic acid, Biological Significance.

Lipid profile disorder (Obesity)

Protein metabolism: (8)

Classification, Transamination, Deamination and Urea Cycle, Biological Significance. Disorders of Protein Metabolism(Common any two)

Enzymes: (9)

Introduction (Classification and structure), Mechanism of enzyme action, Biological Significance, serum glutamic-oxaloacetic transaminase(SGOT), serum glutamate pyruvate transaminase (SGPT) tests.

Learning Outcomes

1. Student should learn interaction and interdependence of biochemical process.
 2. Student should know about synthesis of proteins, lipids and role in metabolic pathway.
 3. Students should understand types of enzymes and their mechanism.
-

References:

1. **Biotechnology and biochemistry- U.Sattyanarayana (Unit 3&4)**
2. **Elements of Biochemistry- H.S.Shrivastava- (Unit 1)**
3. **Animal Physiology and Biochemistry- Agarwal (Unit 2& 3)**
4. **Textbook of Biochemistry-Arumugam (Unit 2,3)**
5. **Cell biology,Genetics,Molecular biology and Evolution-P.S.Verma (Unit 1,2,3)**
6. **Textbook of Biochemistry-Dubey (Unit 2,3)**
7. **Molecular biology of Gene-Lewin (Unit 2,3)**
8. **Biochemistry by Lehninger(Unit 1,2,3)**
9. **Elements of Biochemistry- Kohnstoff(1,2,3)**
10. **Concept of Biochemistry –Martin (Unit 1,2,3)**
11. **Medical Chemistry –Sood and Sood(Unit 2,3)**
12. **Biochemistry and Molecular biology –Wilson and Walker (Unit 1,2,3)**
13. **Tools and Techniques of Biochemistry –Twyman (Unit 2,3)**

B. Sc. Part II
ZOOLOGY PRACTICAL-I
BZP-303

Marks-50 (Credits: 02)

PRACTICAL-I (Based on Animal diversity-II and Biochemistry of Semester-III).

Learning Objectives

1. To develop scientific attitude which is the major objective, this makes the students open minded, critical observations, curiosity, thinking etc.
 2. Abilities to apply scientific methods, collection of scientific data, problem solving, organize science exhibitions, clubs etc.
 3. Appreciation of the subject, contribution of the scientists, scientific methods, scientific programmes etc.
 4. Applications of the knowledge
-

Group A

Animal diversity-II:

1. Study of the following specimens with reference to morphological peculiarities and classification upto orders: Herdmania, Branchiostoma, Petromyzon, Sphyrna, Pristis, Torpedo,

2. Study of the following specimens with reference to morphological peculiarities and classification upto orders Labeo, Exocoetus, Anguilla, Ichthyophis, Ureotyphlus,

3. Study of the following specimens with reference to morphological peculiarities and classification upto orders Salamandra, Bufo, Hyla,

4. Study of the following specimens with reference to morphological peculiarities and classification upto orders *Chelone*, *Hemidactylus*, *Chamaeleon*, *Draco*, *Crocodylus*, *Gavialis*.

5. Characters identifying venomous and non-venomous snakes: Russell's viper, Saw scaled viper, Common krait, Indian Cobra, Sea snake, Rat snake and Checkered keel back, Sand bow.

6. Study of common birds from any six different orders.

7. Study of the following specimens with reference to morphological peculiarities and classification up to orders: *Sorex*, *Pipistrellus pipistrellus*, *Funambulus* and *Nycticebus bengalensis*.

An “**animal album**” containing photographs, cut outs, with appropriate write up about the above mentioned taxa. Different taxa/ topics may be given to students

For this purpose.

8. Dissection of brain of fowl.
 9. Temporary preparation of Hyoid apparatus, Sclerotic plate, Pecten of fowl.
 10. Temporary preparation of Cycloid, Ctenoid and Placoid scales in fishes.
 11. Desert adaptations in reptiles: Phrynosoma, Chameleon, Crocodile, Wall lizard
 12. Review article/work experience /project/visit
-

Learning outcomes

1. Students will be able to identify organisms up to order.
 2. Students develop the skill of dissection of brain of fowl.
 3. Students will be able to identify Characters of venomous and non-venomous snakes.
 4. Students understand Ethological peculiarities in desert animals.
-

Group B

Biochemistry

Learning objectives

1. To understand the fundamental chemical principles that govern complex biological systems.
 2. To study the qualitative and quantitative estimation of glucose proteins, carbohydrates, creatinine and cholesterol.
 3. To study DNA isolation in plants.
-
1. Qualitative tests of carbohydrates and lipid from given solutions (Glucose, Fructose, Sucrose, Lactose and Lipid).
 2. Estimation of total protein in given solutions by Lowry's method/ Quantitative estimation of amino acids by using Ninhydrin reaction.
 3. Study of activity of salivary amylase under optimum conditions.
 4. DNA isolation from plant/animal.
 5. Abnormal constituents of Urine and pathological significance.
 6. Estimation of Blood glucose
 7. Estimation of Blood Creatinine
 8. Estimation of blood Cholesterol
 9. Estimation of Blood Urea

Learning outcomes

1. Students will use current biochemical and molecular techniques to carry out experiments.
 2. Students will be able to understand fundamental properties of elements, their role in formation of biomolecules and in chemical reactions within living organisms.
-

Reference Books for Paper V and VI

- 1 **Biochemistry. VI Edition. W.H Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006).**
2. **Textbook of Medical Physiology, XII Edition, Guyton, A.C. and Hall, J.E. (2011).**
- 3 **Evolution. IV Edition.-B.K. and Hallgrímsson, B. (2008)**
4. **Harper's Illustrated Biochemistry. XXVIII Edition. Lange Medical Books/McGraw-Hill.**
Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2009).
5. **Principles of Biochemistry Nelson, D. L., Cox, M. M. and Lehninger, A.L. (2009)**
6. **Vertebrate life, 8th Edition Pough H. (2008)., 7.Young, J. Z. (2004).. III Edition. Oxford**

B. Sc. Part II Semester- IV

ZOOLOGY

Paper-VII

BZT 401 (REPRODUCTIVE BIOLOGY)

Theory: 36 hrs. (45 lectures of 48 minutes)

Marks-50 (Credits: 02)

Learning Objectives

-
1. To understand the scientific principles of reproduction.
 2. To understand human female reproductive anatomy.
 3. To understand role of and female reproductive hormones.
 4. To understand disorders of pregnancy.
-

Unit 1:

Pituitary Gland: Hormones related to reproductive physiology (3)

Functional anatomy of female reproduction: (14)

Ovary: folliculogenesis, ovulation, corpus luteum formation and regression; and
Reproductive cycles in human and their regulation, changes in the female tract; Ovum transport in the fallopian tubes; Sperm transport in the female tract, fertilization; Hormonal control of implantation; Hormonal regulation of gestation, Pregnancy diagnosis, Mechanism of parturition and its hormonal regulation; Lactation and its regulation.

Major disorders of pregnancy: Erythroblastosis foetalis

Miscarriage, Pre-eclampsia and Foetal growth restriction

Learning outcomes

1. Students will be able to understand the role of pituitary hormones.
2. Students will be able to know the functional anatomy of female reproduction.
3. Students will get knowledge about major disorders of pregnancy
4. -----

Unit 2:

Functional anatomy of male reproduction: (14)

Learning objectives

1. To understand the scientific principles of reproduction.
2. To understand human male reproductive anatomy.

3. To understand role of and male reproductive hormones.
 4. To understand the abnormalities of male reproduction.
1. Testis: Cellular functions, germ cell; Spermatogenesis; hormonal regulation; Epididymal function and sperm maturation; Accessory glands functions; Sperm transportation in male tract.
 2. Abnormality, Prostatic hypertrophy, Causes and Types of Infertility
-

Learning outcomes

1. Students will understand male reproductive hormones and its functional anatomy
 2. Students will understand the abnormalities of male reproduction.
-

Unit 3

Reproductive Health:

Learning objectives

1. To understand the scientific principles of reproduction.
 2. To understand the infertility causes and its management
 3. To study assisted reproductive technology
-

(14)

- 1. Infertility in male and female:** Causes, diagnosis and management
- 2. Assisted Reproductive Technology:** Sex selection, Sperm bank and laws, frozen embryos, invitro fertilization, Tubal Embryo Transfer (TET), Frozen Embryo Transfer (FET), Intra

Uterine Insemination (IUI), Zygote Intra Fallopian Transfer (ZIFT), Gamete Intra Fallopian Transfer (GIFT), Intra Cytoplasmic Sperm Injection, (ICSI), Modern contraceptive technologies.

Menstrual problems, Ectopic pregnancy, Endometriosis, Ovarian Tumors, Ovarian cysts, Ovarian torsion, Polycystic ovary.

Learning Outcomes:

1. Students will come to know about role of hormones in male and female reproductive system.
2. Students will understand causes, diagnosis and management of infertility in male and female.
3. Students will understand assisted reproductive technology.
4. Students will be aware about the reproductive health.

References:

1. **Human Physiology-Guyton (Unit 1,2,3)**
2. **The Physiology of Reproduction-Knobil, *et al.* (2014). (4th eds). (Unit 3,4)**
3. **The Physiology-A.K.Berry (2,3)**
4. **Human Physiology –Genarld Karp (Unit 1,2,3)**
5. **Animal Physiology –Mohan Arora (Unit 1,2)**
6. **Human Physiology –P.S.Verma (Unit 1,2,3)**
7. **Gynecology-Shaw (Unit 1,2,3)**
8. **Human Obs.Gynac.-Datta (Unit 1,2,3)**
9. **Human Anatomy-P.S.Verma (Unit 1,2)**
10. **Medical Gyanacology –Devid and Mathew(Unit 1,2,3)**

B. Sc. Part II Semester- IV
ZOOLOGY
Paper-VIII
BZT- 402(APPLIED ZOOLOGY)
Theory: 36 hrs. (45 lectures of 48 minutes)
Marks-50 (Credits: 02)

Learning Objectives

1. To know the host parasitic relationship.
 2. To know the interspecific and intraspecific relationship in organisms.
-

Unit 1:

Introduction to Host-parasite Relationship: (8)

Host, Definitive host, Intermediate host, Parasitism, Symbiosis, Commensalism, Reservoir, Zoonosis (Common Infectious Diseases)

Learning outcomes

1. Students will be able to understand the relationship between host and parasite
 2. Students will understand the common infectious diseases.
-

Unit 2:

Learning objectives

1. To study epidemiology of various diseases
 2. To study transmission and control of bacterial and viral diseases.
-

Epidemiology of Diseases: (8)

Transmission, Prevention and control of diseases: Tuberculosis, Herpes
Rickettsiae and Spirochaetes: Brief account of *Rickettsia prowazekii* and *Treponema pallidum*.

Learning outcomes

1. Students will be able to understand transmission, prevention and control of various

bacterial and viral diseases.

Unit 3:

Insects of Economic Importance

Learning objectives

1. To study the biology, damage caused by various crop pests
 2. To study the prevention and control of crop pests
-

(8)

Biology, Control and damage caused by *Helicoverpa armigera*, *Pyrrilla perpusilla* and *Papilio demoleus*, *Callosobruchus chinensis*, *Sitophilus oryzae*, *Tribolium castaneum*

Learning outcomes

1. Students will be able to understand the biology, damage and control of crop pests.
 2. Students will know about the prevention and control measures about damage caused by crop pests.
-

Unit 4:

Learning objectives

1. To study principles of poultry farming its management and poultry diseases.
 2. To study management of dairy farming.
 3. To study economic importance of lac insect.
-

Poultry Farming: Indigenous and Exotic breeds (10)

Principles of poultry breeding, Management of breeding stock and broilers, Processing and Preservation of eggs. Atomization of Poultry

Poultry Diseases: Coccidiosis, avian Flu, Fowl pox, Botulism, Fowl cholera

Dairy Farming:(9)

Management of model dairy farming

Common livestock diseases

Nutritive value of Milk products

Lac culture: Life cycle of Lac insect and Economic importance of Lac (2)

Learning Outcomes:

1. Student will understand technique of poultry farming.
 2. Students will know about the management of model dairy farming.
 3. Students will understand the life cycle and economic importance of lac insect.
 4. Students will be able to start their own business.
-

References:

1. **Applied Zoology- Dairy Farming –Dr.N.Arumugam- Saras Publication (Unit 4)**
2. **Textbook on applied entomology. K.P.Shrivastava (Unit 3)**
3. **Elements of Entomology- Rajendra Singh- (Unit 1,2,3)**
4. **Applied Zoology by R.L.Kotpal (Unit 1,2,3,4)**
5. **Economic Zoology by Manju Yadav (Unit 3,4)**
6. **Economic Zoology –Shailendra Singh (Unit 3,4)**
7. **Animal Husbandry by Ashok Kumar (Unit 1,2,3,4)**
8. **Applied Zoology by N. Arumugam (Unit 3,4)**

ZOOLOGY PRACTICAL-II BZP-403

Marks-50 (Credits: 02)

PRACTICAL-II (Based on Reproductive Biology and Applied Zoology of Semester-IV).

Learning Objectives

1. To develop skills in practical work, experiments and laboratory materials, instruments
 2. To develop interest in the subject and scientific hobbies.
 3. The students are expected to acquire the knowledge of animal science, natural phenomenon, manipulation of nature and environment by man.
 4. Understanding the scientific terms, concepts, facts, phenomenon and their interrelationships.
-

Group A

Reproductive Biology:

1. Study of animal house: Set up and maintenance of animal house, ,
 2. Study of animal house:Breeding techniques
 3. Study of animal house:care of normal and experimental animals.
 4. Study of stages of estrus cycle through permanent slides.
 5. Examination of histological sections from photomicrographs/ permanent slides of rat: Sections of testis, epididymis and accessory glands of male reproductive systems.
 6. Examination of histological sections from photomicrographs/ permanent slides of rat: Sections of ovary, fallopian tube, uterus (proliferative and secretory stages), cervix and vagina of female reproductive systems.
 7. Sperm count and sperm motility.
 8. Study of modern contraceptive devices (Photographs).
 9. Visit to gynecology section
 10. Awareness regarding population explosion
-

Learning outcomes

1. Students will able to understand set up, maintenance, breeding techniques of animal house.
 2. Students will understand the histology of male and female reproductive organs.
 3. Students will know about the experiments regarding sperm count and motility which is an integral part of infertility investigation in male.
-

Group B

Applied Zoology:

Learning objectives

1. To study life cycle and prevention of arthropod vectors
 2. To study damage caused by various stored grain pests
 3. To study biology and economic importance of crop pests.
 4. To study poultry, dairy farming and economic importance of lac.
-

4. Study of arthropod vectors associated with human diseases: *Pediculus*, *Culex*, *Anopheles*, *Aedes* and *Xenopsylla*.
 5. Study of insect damage to different plant parts/stored grains through damaged Products/photographs.
 6. Identifying feature and economic importance of *Helicoverpa (Heliothis) armigera*, *Papilio demoleus*, *Pyrilla perpusilla*,
 7. Identifying feature and economic importance of *Callosobruchus chinensis*, *Sitophilus oryzae* and *Tribolium castaneum*.
 8. Poultry: Egg and Meat Nutritive value
 9. Poultry diseases-
 10. Dairy: Nutritive value of Milk Products: Curd, Buttermilk, Ghee, Paneer, Cheese
 11. Life cycle of lac insect
 12. Economic importance of Lac
 13. Field trip to poultry farm or animal breeding center or any other suitable place related To Syllabus. Submission of field trip report (Printed/Hand writings).
-

Learning outcomes:-

1. Students will be able to acquire the knowledge of applied Zoology for the development own business (Income generation).
2. The students will be able to identify organisms in their own habitat with the help of study tour.
3. Students will able to calculate nutritive value of required daily food.
4. Students will know about the arthropod vectors which causes diseases in human.
5. Students will understand biology , damage and prevention methods of stored grain pests.
6. Students will understand identification, damage , prevention and economic importance of crop pests.

Reference Books for Paper VII and VIII

- 1. Medical Parasitology. II Ed Arora, D. R and Arora, B. (2001)..**
- 2. Agricultural Pests of India and South East Asia Atwal, A.S. (1986)**
- 3. Reproduction in Mammals. Austin, C.R. and Short, R.V. (1982).**
- 4. The Insects: Structure and Function. IV Edition- Chapman, R.F. (1998)., 5. Dennis, H. (2009). Agricultural Entomology. Timber Press (OR).**
- 6. Endocrinology. W.B. Saunders and Company- Degroot, L.J. and Jameson, J.L. (2010).**
- 7. Aquaculture and Fisheries Biotechnology Genetic Approaches Dunham R.A. (2004)..**
- 8. Reproduction in Farm Animals. Hafez, E. S. E. (1962).**
- 9. The Physiology of Reproduction Knobil, *et al.* (2014). (4th eds**
- 10. Preventive and Social Medicine. XVI Edition Park, K. (2007).**
- 11. Entomology and Pest Management. Pedigo L.P. (2002)**

