Rayat Shikshan Sanstha's

YASHAVANTRAO CHAVAN INSTITUTE OF SCIENCE, SATARA

(AN AUTONOMOUS COLLEGE)

Reaccredited by NAAC with 'A+' Grade

Bachelor of Science Part - II

Zoology

Syllabus to be implemented w .e. f. June, 2022

Structure of the course: Semester III

Sr. No.	Subject title	Theory					Practical	
		Course No. and Course code	Title of Course	No. of lectures per week	Credits		No. of lectures per week	Credits
1.	Zoology	Course V BZT 301	Animal Diversity II	6	4	Zoology practical III BZP 303	8	4
		Course VI BZT 302	Biochemistry	6	4			

Structure of the course: Semester IV

Sr. No	Subject title	Theory					Practical	
		Course No.andCourse Code	Title of Course	No. of lectures per week	Credits		No. of lectures per week	Credits
1.	Zoology	Course VII BZT 401	Reproductive biology	6	4	Practical IV BZP 403	8	4
		Course VIII BZT 402	Applied Zoology	6	4			

Evaluation structure –

Semester III -

	ESE	Internal Exam		Practical			Submission	Total
		ISE-I	ISE-II		Exam	Journal	Home assignment + Student Performance	
Course V	30	5	5	Practical-III(A)	25	5	5	150
Course VI	30	5	5	Practical IV(A)	25	5	5	

Semester IV -

	ESE	Internal Exam		Practical			Submission	Total
		ISE-I	**ISE-II**		**Exam**	**Journal**	**Industrial visit/Educational Tour + Student Performance**	
Course V	30	5	5	Practical-III(A)	25	5	5	150
Course VI	30	5	5	Practical IV(A)	25	5	5	

Structure and titles of the course for Semester III

Code	Name of Course	Units
BZT 301	**Animal Diversity-II** (Credits:02; Total Hours : 45)	**Unit I:** Protochordates and Agnatha **Unit II:** Pisces, Amphibia **Unit III :** Reptiles, Aves **Unit IV :** Mammals
BZT 302	**Biochemistry** (Credits:02; Total Hours : 45)	**Unit I:** Concept of biomolecules and its metabolic pathways **Unit II**: Nucleic acids **Unit III :** Lipid and Protein Metabolism **Unit IV :** Enzymes

Semester III

Course no. – **BZT** 301 , Course Title - **ANIMAL DIVERSITY-II**

Course Objectives: Student will able to

1. To extend knowledge of animals belonging to class Protochordates, jawless animals of class agnatha and amphibia.
2. To make them understand how to classify the fishes (Pisces) depending on their anatomical features.
3. To recognize distinguishing characters of reptiles that will help to different them to differentiate between poisonous and non-poisonous snakes.
4. To make them recognize different characters of class mammals belonging to various habitats.

Credits (Total Credits 2)	SEMESTER-III BZT 301 ANIMAL DIVERSITY-II	No. of hours per unit/credits
UNIT - I	**General features of Protochordates and Agnatha**	10
	Protochordates : General features & Classification with examples (Hemichordata Balanoglossus, Urochordata- Ascidian tadpole, Cephalochordata – Amphioxus. **Agnatha :** General features of Agnatha and classification of cyclostomes upto orders	
UNIT - II	**Pisces and Amphibia**	13
	Pisces: General features and Classification up to order: Swim bladder, Breeding and parental care in fishes **Amphibia:** General features and Classification up to order: Neoteny and Parental care in Amphibia (Order:Anura, Apoda, Urodela) Icthyophis	
UNIT - III	**Reptiles and Aves**	14
	Reptiles: General features and Classification up to order: Venomous and non-venomous snakes, Identification characters of Venomous and non-venomous snakes, Poison Apparatus ,Biting mechanism in snakes, Effect of venom, First Aid Treatment , venom and antivenom production. **Aves:** General features and Classification up to order: Brain of fowl, Aerial Adaptations in birds (Morphological, Anatomical and Physiological).	
UNIT - IV	**Mammals**	**08**
	General features and Classification up to order: Study of Adaptive radiations in mammals, Egg Laying mammals, Aquatic mammals.	

Course outcomes : Upon successful completion of the course, students will be able to :

CO1: Describe the properties of biomolecules and their metabolic pathways

CO2: Sketch the structure of DNA and RNA with necessary significance.

CO3: Understand the concepts of Beta oxidation pathway and transamination and deamination process.

CO4: Analyse the enzymatic actions occurring in our body using SGOT, SGPT tests.

References-

1. Jordan& Verma ,Chordate Zoology-– (Unit1)
2. V.S. Verma- Chordates S.Chand Publication- (Unit1)
3. P.S.Dhami ,Vertebrate Zoology- S.Chand Publication (Unit 1 &2)
4. R.L.Kotpal ,Modern textbook of Zoology- Vertebrates 2nd edition–Rastogi Publication (Unit-2)
5. Nigam ,Zoology of chordates (Unit 1)
6. Fundamental of Zoology-Verma and Dudhane (Unit2)
7. Practical Zoology –Vertebrates-R.L.Kotpal (Unit1,2)
8. Mannual of Practical Zoology –Chordates-P.S.Verma (Unit1)
9. Textbook of Zoology- S.S.Lal (Unit1,2)
10. Vertebrate Zoology –R.L.Kotpal (Unit1,2)

Semester III

Course no.- BZT 302 , Course title - Biochemistry

Course Objectives:

1. To demonstrate various biomolecules and its related metabolic pathways
2. To illustrate the structures and functions of nucleic acids.
3. To classify the lipids and understand the breakdown process in body.
4. To categorize various enzymes and determine its mechanism of action in our body

Credits (Total Credits 2)	SEMESTER-III BZT 302 Applied Microbiology	No. of hours per unit/credits
UNIT - I	**Introduction to Biomolecules**	**(08)**
	Concept of biomolecules and its metabolic pathways (Carbohydrates, lipids, Protiens, Water)	
UNIT - II	**Nucleic acids:**	**(13)**
	1.DNA and RNA. Types , Structure and functions **2.Carbohydrate Metabolism:** Classification, Glycolysis, Krebs Cycle, Pentose Phosphate Pathway, Gluconeogenesis, Biological Significance. Metabolic disorders of Carbohydrate metabolism (*Diabetes mellitus*)	
UNIT - III	**Lipid and protein metabolism**	**(14)**
	Lipid metabolism: Classification of lipids and β oxidation of palmitic acid, **Biological Significance. Lipid profile disorder (Obesity)** **Protein metabolism:** Classification of proteins, Transamination, Deamination and Urea Cycle, Biological Significance. Disorders of Protein Metabolism (Common any two)	
UNIT - IV	**Introduction to Enzymes**	**(10)**
	Enzymes: Introduction (Classification and structure), Characteristics of enzymes, Mechanism of enzyme action, Biological Significance, serum glutamic-oxaloacetic transaminase(SGOT), serum glutamate pyruvate transaminase (SGPT) tests.	

Course outcomes : Upon successful completion of the course, students will be able to :

CO1: Describe the properties of biomolecules and their metabolic pathways

CO2: Sketch the structure of DNA and RNA with necessary significance.

CO3: Understand the concepts of Beta oxidation pathway and transamination and deamination process.

CO4: Analyze the enzymatic actions occurring in our body using SGOT, SGPT tests.

References

1. Biotechnology and biochemistry- U.Sattyanarayana (Unit3&4)
2. Elements of Biochemistry- H.S.Shrivastava- (Unit1)
3. Animal Physiology and Biochemistry- Agarwal (Unit 2&3)
4. Textbook of Biochemistry-Arumugam (Unit2,3)
5. Cell biology, Genetics, Molecular biology and Evolution-P.S.Verma (Unit1,2,3)
6. Textbook of Biochemistry-Dubey (Unit2,3)
7. Molecular biology of Gene-Lewin (Unit2,3)
8. Bichemistry by Lehninger(Unit1,2,3)
9. Elements of Biochemistry-Kohnstuff(1,2,3)
10. Concept of Biochemistry –Martin (Unit1,2,3)
11. Medical Chemistry –Sood and Sood(Unit2,3)
12. Biochemistry and Molecular biology –Wilson and Walker (Unit1,2,3)
13. Tools and Techniques of Biochemistry –Twyman (Unit 2,3)

BZP 303 Zoology Practical III

Course Objectives: Student will able -

1. To develop scientific attitude which is the major objective, this makes the students open minded, critical observations, curiosity, thinking etc.
2. To apply scientific methods, collection of scientific data, problem solving, organize science exhibitions, clubs etc.
3. To appreciate the subject, contribution of the scientists, scientific methods, scientific programmes etc.
4. To apply of the obtained knowledge in the identification of animals and classify them .

Credits (Total Credit 04)	**SEMESTER-III BZP 303 Practical III**	**No. of hours per unit/credits**
	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 up to orders Salamandra, Bufo, Hyla, 4.Study of the following specimens with reference to morphological peculiarities and classification up to 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 theabove mentioned taxa. Different taxa/ topics may be given to students for this purpose. 8.Dissection(demonstration) 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: Phyrenosoma, Chameleon, Crocodile, Wall lizard 12.Review article/work experience/project/visit	
	Group B	
	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. Study of Urease activity	

Course outcomes- Upon completion of the practical's Student will be able to -

1. Demonstrate the peculiarites of specimens based on their morphological characters.
2. Describe various adaptations in animals based on their habitat .
3. Apply current biochemical and molecular techniques to carry out experiments.
4. Illustrate fundamental properties of elements, their role in formation of biomolecules and in chemical reactions within living organisms.

Practical references-

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).B.K. and Hallgrimsson, B. Evolution. IV Edition. (2008)

3. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. Harper's Illustrated Biochemistry.XXVIII Edition.Lange Medical Books/Mc Graw3Hill. (2009).

4.Principles of Biochemistry Nelson, D. L., Cox, M. M. and Lehninger, A.L.(2009)

5.Vertebrate life, 8th Edition Pough H. (2008)., 7.Young, J. Z. III Edition. Oxford(2004)..

SEMESTER- IV

Course no. - BZT 401 Course title: **REPRODUCTIVE BIOLOGY**

Course Objectives:

1. To inculcate knowledge of reproductive system in female and detail process of pregnancy up till parturition.
2. To explain about different organs of male reproductive system and their functions.
3. To provide information about regulation of hormones in male and females.
4. To infer the details of technologies used to assist the reproductive health.

BZT 401	**REPRODUCTIVE BIOLOGY** (CREDITS:02; TOTAL HOURS : 45)	**Unit I:** Functional anatomy of female reproduction: **Unit II**: Functional anatomy of male reproduction **Unit III :** Gonadal hormones in male & females and their regulation **Unit IV :** Reproductive Health
BZT 402	**Applied Zoology** (CREDITS:02; TOTAL HOURS : 45)	**Unit I:** Introduction to Host-parasite Relationship **Unit II: Epidemiology of Diseases** **Unit III** : Insects of Economic Importance **Unit IV : Poultry and dairy farming practices**

Credits (Total Credits 2)	SEMESTER-IV BZT401	No. of hours per unit/credits
UNIT - I	**Functional anatomy of female reproduction:**	**(13)**
	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, Pregnancy diagnosis, Mechanism of parturition. Major disorders of pregnancy: *Erythroblastosis foetalis*, Miscarriage, Pre-eclampsia and Foetal growth restriction.	
UNIT - II	**Functional anatomy of male reproduction:**	**(10)**
	1. Testis: Cellularfunctions, germ cell; Spermatogenesis; Epididymal function and sperm maturation; Accessory glands functions; Sperm transportation in male tract. 2. Abnormality, Prostatic hypertrophy, Causes and Types of Infertility	
UNIT - III	**Gonadal hormones in male & females and their regulation-**	**(8)**
	Introduction to gonads, its functions, Male gonad hormone- Testosterone, Inhibin, Androsterone, Female gonad hormone – Oestrogen, Progesterone, Hormonal control of implantation ,partutrition ,Lactation	
UNIT - IV	**Reproductive Health**	**(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),IntraUterine 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.	

Course outcomes: Upon completion of this course Student will be able to

CO1.Enlist names of different organs present in male and female reproductive system and their functions

CO2. Justify the reasons for infertility in male & Female

CO3. Describe various gonadal hormones and their regulatory mechanism .

C04. Analyse various assisted reproductive technologies according to diagnosis

References

1. **Human Physiology-Guyton (Unit 1,2,3)**
2. **The Physiology of Reproduction-Knobil*, et al*. (2014). (4th eds). (Unit3,4)**
3. **The Physiology-A.K.Berry(2,3)**
4. **Human Physiology –Genarld Karp (Unit1,2,3)**
5. **Animal Physiology –Mohan Arora (Unit1,2)**
6. **Human Physiology –P.S.Verma (Unit 1,2,3)**
7. **Gynacology-Shaw (Unit1,2,3)**
8. **Human Obs.Gynac.-Datta (Unit1,2,3)**
9. **Human Anatomy-P.S.Verma (Unit 1,2)**
10. **Medical Gyanacology –Devid and Mathew(Unit1,2,3)**

Semester IV

Course – **BZT 402** Course Title : **Applied Zoology**

Course Objectives:

1. To provide knowledge regarding host-parasite relationship
2. To create awareness about the transmission and prevention of diseases
3. To make them understand economic importance of various insects causing damage to crops
4. To provide knowledge about the management of poultry and dairy farming

Credits (Total Credits 2)	**SEMESTER-IV** **BZT402** Appiled Zoology	**No. of hours per unit/credits**
UNIT - I	**Introduction to Host-parasite Relationship**	08
	Host, Definitive host, Intermediate host, Parasitism, Symbiosis, Commensalism, Reservoir, Biological Importance of Parasites, Introduction to Zoonosis Diseases	
UNIT - II	**Epidemiology of Diseases:**	10
	Transmission, Prevention and control of diseases: Tuberculosis, Herpes, Rickettsiae and Spirochaetes: Brief account of *Rickettsia prowazekii* and *Treponema pallidum.*	
UNIT - III	**Insects of Economic Importance**	14
	Biology, Control and damage caused by *Helicoverpa armigera, Pyrilla perpusilla* and *Papilio demoleus, Callosobruchus chinensis, Sitophilus oryzae, Tribolium castaneum*	
UNIT - IV	**Poultry and Dairy farming practices**	**13**
	Poultry Farming: Indigenous and Exotic breeds , 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 chlorella **Dairy Farming**: Management of model dairy farming, Common livestock diseases Nutritive value of Milk products.	

Course outcomes: Upon successful completion of this units, student will be able to

CO1. Define the terms like host, parasite and Zoonotic diseases etc.

CO2. Identify routes of transmission, preventive and control measures of various diseases.

CO3.Analyse the causes of damage to the crops caused by insects.

CO4. Design the models for managing poultry and dairy farms and determine the nutritive value of milk products .

References

1. **Ashok Kumar ,Animal Husbundry (Unit 1,2,3,4)**
2. **Dr.N.Arumugam , Applied Zoology- Dairy Farming - Saras Publication (Unit4)**
3. **K.P.Shrivastava ,Textbook on applied entomology. (Unit3)**
4. **Manju Yadav, Economic Zoology by (Unit 3,4)**
5. **N. Arumugam Applied Zoology by (Unit3,4)**
6. **R.L.Kotpal , Applied Zoology (Uint1,2,3,4)**
7. **Rajendra Singh , Elements of Entomology (Unit1,2,3)**
8. **Shailendra Singh , Economic Zoology (Unit 3,4**

ZOOLOGY PRACTICAL-II

BZP-403

Marks-50 (Credits: 02)

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

Course 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. To Understand the scientific terms, concepts, facts, phenomenon and their interrelationships.

Credits (Total Credit 04)	SEMESTER-IV BZP 403 Practical III	No. of hours per unit/credits
	Group A Reproductive Biology:	
	1. Study of animal house: Set up and maintenance of animal house.	
	1. Study of animal house: Breeding techniques	
	2. Study of animal house: care of normal and experimental animals.	
	3. Study of stages of estrus cycle through permanent slides	
	4. Examination of histological sections from photomicrographs/ permanent slides ofrat: Sections of testis, epididymis and accessory glands of male reproductive systems.	
	2. 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.	
	3. Sperm count and sperm motility.	
	4. Study of modern contraceptive devices (Photographs).	
	5. Awareness regarding population explosion	
	6. Visit to gynecology section	

	Group B : Applied Zoology	
	1.Study of arthropod vectors associated with human diseases: *Pediculus, Culex, Anopheles, Aedes* and *Xenopsylla.*	
	2.Study of insect damage to different plant parts/stored grains through damaged Products/photographs.	
	3. Identifying feature and economic importance of *Helicoverpa* (*Heliothis armigera*, *Papilio demoleus*, *Pyrilla perpusilla,*	
	4.Identifying feature and economic importance of *Callosobruchus chinensis, Sitophilus oryzae* and *Tribolium castaneum*	
	5. Poultry: Egg and Meat Nutritive value	
	6. Poultry diseases	
	7. Dairy: Nutritive value of Milk Products: Curd, Buttermilk, Ghee, Paneer,Cheese	
	8. 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).	

Course outcomes:-Upon Successful completion of practicals ,students will be able to –

1. Understand the set up , maitainenance,breeding techniques of animal house.
2. Identify organisms in their own habitat with the help of study tour.
3. Compare the differences in histologigal slides of male and female reproductive organs
4. Students will interpret the biology, damage and prevention methods of stored grain and crop pests.
5. Formulate the knowledge of applied Zoology for the development own business (Income generation).

Reference Books for Paper BZT 401 and 402

1. Arora, D. R and Arora, B , Medical Parasitology. II Ed.(2001)..

2. Atwal, A.S , Agricultural Pests of India and South East Asia.(1986)

3. Chapman, R.F. The Insects: Structure and Function. IV Edition- (1998).

4. Dennis, H. Agricultural Entomology. Timber Press(2009).

6. Degroot, L.J. and Jameson, J.L , Endocrinology. W.B. Saunders and Company-.(2010).

7. Dunham R.A , Aquaculture and Fisheries Biotechnology Genetic Approaches.(2004)..

8. Knobil, *et al*. ,The Physiology of Reproduction (2014). 4theds

9. Park, K Preventive and Social Medicine. XVI Edition. (2007).

10. Pedigo L.P , Entomology and Pest Management.(2002)