Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara, (An Autonomous)

Syllabus under Autonomy

B.Sc. I Zoology

Syllabus to be implemented from 2022

NEP 2020

Syllabus for B.Sc. I (Zoology)

Preamble:

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 & livestock.
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 day.
8) To make the pupils fit for the society.
9) In Autonomous the addition of more syllabus will be very helpful to students which will improve their knowledge in depth.
10) To inculcate in the student's highest values of life, understand the human niche in nature and apply the knowledge of life sciences for betterment of society.
11) To inspire students to reach frontiers of life sciences through commitment, hard work, study and research.

General Objectives of the Program:

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, phenomena & 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.

Program Outcomes:

1. The student will graduate with proficiency in the subject of his choice.
2. The student will be eligible to continue higher studies in his subject.
3. The student will be eligible to pursue higher studies abroad.
4. The student will be eligible to appear for the examinations for jobs in government organizations.
5. The student will be eligible to appear for jobs with minimum requirement of B. Sc. Program.

Program Specific Objectives:

1. The students are expected to understand the fundamentals, principles, concepts and recent developments in the Zoology.
2. The practical course is framed in relevance with the theory courses to improve the understanding of the various concepts in Zoology.
3. It is expected to inspire and boost interest of the students in Zoology.
4. To develop the power of appreciations, the achievements in science and role in nature and society.
5. To enhance student sense of enthusiasm for science and to involve them in an intellectually stimulating experience of Course in a supportive environment.

Program Specific Outcomes:

1. Understand the basics of Zoology.

2. Learn, design and perform experiments in the labs to demonstrate the concepts, principles and theories learned in the classrooms.

3. Develop the ability to apply the knowledge acquired in the classroom and laboratories to specific problems in theoretical and experimental Zoology.

4. Identify their area of interest in academic, research and development.

5. Perform job in various fields' like science, environment, education, banking, business and public service, etc. or be an entrepreneur with precision, analytical mind, innovative thinking, clarity of thought , expression, and systematic approach.

1. **Title:** Zoology

2. **Year of Implementation:** The syllabus will be implemented from June, 2022 onwards.

3. Duration: The course shall be a full time.

4. Pattern: Semester examination.

5. Medium of Instruction: English.

6. Structure of Course:

B.Sc. I, Semester I

Level	Semester	Course	Course Title	Course Category	No. of Lectures Per Week	Credits
5	I	C1	DSC-1	Theory Paper -I	05	04
			DSC-2	Theory Paper -II		
			Practical-1	Practical Paper -I	04	02
		C2	DSC-1	Theory Paper -I	05	04
			DSC-2	Theory Paper -II		
			Practical-1	Practical Paper -I	04	02
		C3	DSC-1	Theory Paper -I	05	04
			DSC-2	Theory Paper -II		
			Practical-1	Practical Paper -I	04	02
		C4	DSC-1	Theory Paper -I	05	04
			DSC-2	Theory Paper -II		
			Practical-1	Practical Paper -I	04	02
		AECC- I	English	Theory Paper -I	05	04
		SEC- I	Skill Courses	TH + Practical	02	01
		VBC	Value Based Course	TH	02	01
					Total Credits of Semester – I	30

B.Sc. I, Semester II

Level	Semester	Course	Course Title	Course Category	No. of Lectures Per Week	Credits
5	II	C5	DSC-3	Theory Paper -III	05	04
			DSC-4	Theory Paper -IV		
			Practical-2	Practical Paper -II	04	02
		C6	DSC-3	Theory Paper -III	05	04
			DSC-4	Theory Paper -IV		
			Practical-2	Practical Paper -II	04	02
		C7	DSC-3	Theory Paper -III	05	04
			DSC-4	Theory Paper -IV		
			Practical-2	Practical Paper -II	04	02
		C8	DSC-3	Theory Paper -III	05	04

			DSC-4	Theory Paper -IV		
			Practical-2	Practical Paper -II	04	02
		AECC- II	English	Theory Paper -II	05	04
		SEC- II	Skill Course	Theory + Practical	03	02
Total Credits of Semester -II						30
Total Credits of Level 5						60
Exit option 1 : Exit with Certificate Course in Science with completion of 60 Credits						

B.Sc. – I, Semester –I

Level	**Semester**	**Course Code**	**Course Title**	**Course Category**	**No. of Lectures Per Week**	**Credits**
5	I	Course-I: BZT101	Animal Diversity I	Theory Course -I	05	04
		Course-II: BZT102	Physiology	Theory Course -II		
		BZP 103	Practical Course I	Practical Course -I	04	02
					Total Credits	06
	II	Course-III: BZT201	Cell Biology and Evolutionary Biology	Theory Course -III	05	04
		Course-IV: BZT202	Genetics	Theory Course -IV		
		BZP203	Practical-1	Practical Course -II	04	02
					Total Credits	06

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

B. Sc. Part-I Semester-I

BZT101: Course I - ANIMAL DIVERSITY – I (Credits: 02)

Course Objectives: Student will be able to…..

1. know classification and locomotory organs in protozoa.
2. explain the importance of corals and parasitic adaptation.
3. Know about mode of transmission of diseases by vectors.
4. Know about the scope and species in pearl culture.

Total Credits = 2

UNIT No.	Semester – I BZT101: Course I - ANIMAL DIVERSITY – I	No. of hours per unit
UNIT I	**Kingdom – Protista**	5
	❖ General characters and classification up to classes ❖ Locomotory Organelles and locomotion in Protozoa	
	Phylum – Porifera	4
	❖ General characters and classification up to classes ❖ Canal system in *Sycon*	
UNIT II	**Phylum – Cnidaria**	3
	❖ General characters and classification up to classes ❖ Importance and types of corals.	
	Phylum – Platyhelminthes	6
	❖ General characters and classification up to classes ❖ Life history of *Taenia solium* and its parasitic Adaptations.	
UNIT III	❖ **Phylum – Nemathelminths**	4
	❖ General characters and classification up to classes ❖ Life history of *Ascaris lumbricoides* and its parasitic adaptations.	
	❖ **Phylum – Arthropoda**	5
	❖ General characters and classification up to classes ❖ Arthropod as a vector: Mosquito, House fly, Bed bug (w.r.t. Morphology, classification, Mode of Transmission of Disease) ❖ Metamorphosis in insects.	

UNIT IV	**Phylum – Annelida**	**2**
	❖ General characters and classification up to classes ❖ Species of Earthworm used for Vermicomposting ❖ Preparation of vermicompost bed.	
	Phylum– Mollusca	2
	❖ General characters and classification up to classes ❖ Scope in Pearl culture ❖ Species in pearl culture	
	Phylum– Echinodermata	2
	❖ General characters and classification up to classes ❖ Water vascular system in Asteroidea	
	Aquatic biology	3
	❖ Fresh water and marine water habitat of fishes.	

Course Outcomes: Student should be able to

1. know about unicellular animal their locomotion.
2. explain the importance of corals and parasitic adaptation.
3. gain the knowledge in mode of transmission of diseases by vectors.
4. gain the knowledge in the scope and species in pearl culture.

Reference Books:

1. Edward Ruppert and Robert Barnes, *Invertebrate Zoology*, VIII Edition. (Thomson Press: India, 2006).
2. Robert Barnes, Peter Calow, Olive, P.J.W. , Golding ,D. W. and Spicer , J.I. *The Invertebrates*: A New Synthesis, III Edition, (Oxfard, Wiley Blackwell Science, 2002).
3. Brian Hall and Bendedikt Hallgrimsson (2008). Strickberger's Evolution. IV Edition, (Jones and Barlett publishers Inc., 2008).
4. R.L. Kotpal. Modern Text Book of Zoology: Invertebrate 10thEdition. (Rastogi Publications, New Delhi, 2003).
5. Dhami. Invertebrate Zoology 10thEdition.(New Delhi, R. Chand & Company, 2003)
6. E.L. Jordan. Invertebrate Zoology 12thEdition. (S Chand & Co Ltd, India, 2013).

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BZT102: Course II - PHYSIOLOGY

Course Objectives: Students will be able to…

1. learn physiology of digestion.
2. know various terms of physiology
3. explain cardiovascular system.
4. summarize what he learns.

Total Credits: 02

Unit No.	BZT102: Course II - PHYSIOLOGY	No. of hours per unit
UNIT I	**Digestion**	09
	❖ Physiology of digestion in the alimentary canal. ❖ Absorption of carbohydrates, proteins, lipids.	
UNIT II	**Respiration**	04
	❖ Pulmonary ventilation ❖ Transport of oxygen and carbon dioxide in blood	
	Excretion	05
	❖ Structure of nephron ❖ Mechanism of urine formation, Counter – current Mechanism	
UNIT III	**Cardiovascular system**	06
	❖ Composition of blood ❖ Structure of heart ❖ Origin and conduction of the cardiac impulse ❖ Cardiac cycle	
	❖ **Blood Pressure**	02
	❖ Measurement of systolic & diastolic pressure ❖ cardiac output	
	❖ **ECG measurement**	01
	❖ Physiological measurement & significance	

UNIT NO.	BZT102: Course II - PHYSIOLOGY	No. of hours per unit
UNIT IV	**Reproductive Physiology** ❖ Reproduction and Endocrine glands: Physiology of Male reproduction: Hormonal control of spermatogenesis. ❖ Physiology of female reproduction: Hormonal control of menstrual cycle.	09
	Total Contact Hours	36

Course Outcomes: Students should be able to…

1. Student will gain knowledge about animal physiology.
2. The students will able to understand process of digestion, respiration and excretion.
3. Students able to understand special assessment techniques which may be used in the physical examination of the cardiovascular system, including blood pressure and electrocardiogram (ECG).
4. Students will able to understand cardiac disorders, abnormality in blood pressure and ECG.

Reference Books:

1. John Young, *The Life of Vertebrates*, III Edition. (Oxford university press, 2004)
2. Harvey Pough, *Vertebrate life* , VIII Edition, (Pearson International,2012).
3. Brian Hall and Bendedikt Hallgrimsson. *Strickberger's Evolution*, IV Edition, (Jones and Barlett publishers Inc., 2008).
4. Gerard Tortora, and Bryan Derrickson, *Principles of Anatomy and Physiology*, XI Edition , (John Wiley & Sons , Inc., 2009).
5. Eric Widmaier, Hershel Raff and Kevin Strang, *Vander's Human Physiology*, XI Edition, (Boston: McGraw Hill Higher Education, 2008).
6. Arthur Guyton, and John Hall, *Textbook of Medical Physiology*, XII Edition, (Harcourt Asia Pvt .Ltd /W.B. Saunders Company, 2011).

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Practical: BZP103 **Practical I**

Course Objectives: Students will be able to

1. know scientific terms, concepts, facts, phenomena & their interrelationships.
2. define, explain scientific methods, collection of scientific data.
3. know physiological measurement related to body.
4. summarize what he learns.

Total Credits = 2 PRACTICAL No.	**Practical:** BZP103 **Practical I**
I	Study of the following specimens: ❖ Study of *Amoeba, Euglena, Plasmodium, Paramoecium,* w.r.t. classification and locomotion. Study of Sycon, *Hyalonema*and *Euplectella*, Obelia, *,Physalia ,Aurelia ,Tubipora, Metridium , Taenia solium* , Male and female *Ascaris lumbricoides, Aphrodite ,Nereis , Pheretima ,Hirudinaria , Palaemon ,Cancer , Limulus ,Palamnaeus, Scolopendra , Julus ,Periplaneta ,Apis,Chiton, Dentalium, Pila ,Unio , Loligo , Sepia , Octopus ,Pentaceros ,Ophiura, Echinus, Cucumaria and Antedon*, w.r.t. classification and morphological peculiarities.
II	**1. Study of the following:** i. T.S. and L.S. of Sycon, ii. Life history *Taenia* and *Ascaris* and their parasitic adaptations.
III	**Demonstration/ Preparations of hemin and hemochromogen crystals.**
IV	**Measurement of Blood Pressure by Sphygmomanometer.**
VI	**Recording of ECG.**
VII	**Study Tour: Visit to Natural History Museum and submission of report.**

Course Outcomes: Students should be able to…

1. describe unique character of each phylum.
2. known animals with different phyla, their distribution and their relationship with the environment.
3. develop practical skill in various hematological practical.
4. understand importance of health and hygiene.

5. known difference of bloods of difference species depending upon the shape of the crystal.

BZT201: Course III - CELL BIOLOGY, EVOLUTIONARY BIOLOGY (Credits: 02)

Course Objectives: Student will be able to

1. learn about cells and cell organelles.
2. define structure of organelles and chromosomal abnormality.
3. know about evolution theories
4. explain theories of evolution and extinction.

Credits: 02	**BZT201: COURSE III - CELL BIOLOGY, EVOLUTIONARY BIOLOGY**	**No. of hours per unit**
UNIT I	**Cell Structure**	04
	❖ Cell theory and diversity in cell size and shape	
	Structure of Nucleus	02
	❖ Nucleus with reference to Nuclear Membrane, Nucleoplasma, Chromatin and nucleolus.	
	❖ **Structure of Chromosome**	03
	❖ With reference to morphology and organization (Nulceosome), Polytene Chromosome	
UNIT II	**Ultra Structure and Functions of the following**	06
	❖ Plasma Membrane (Fluid Mosaic Model)	
	❖ Mitochondria	
	❖ Endoplasmic reticulum	
	❖ Golgi Complex	
	❖ Lysosome	
	❖ **Diseases related chromosomes abnormality**	03
	❖ **Sex linked**-Klinefelter's, and Turner's Syndrome	
	❖ **Autosomal Diseases** – Down's, Edward's and Patau's Syndrome.	
UNIT III	❖ **History of Life**	03
	❖ Major Events in History of Life	
	❖ **Introduction to Evolutionary Theories**	06
	Lamarckism, Darwinism, Neo- Darwinism	
UNIT IV	❖ **Direct Evidences of Evolution**	04
	Types of fossils, Incompleteness of fossil record, dating of fossils	

Credits: 02	BZT201: COURSE III - CELL BIOLOGY, EVOLUTIONARY BIOLOGY	No. of hours per unit
	Extinction	05
	Mass extinction (Causes, Names of five major extinctions, K-T extinction in detail), Role of Extinction in evolution.	

Course Outcomes: Students should be able to

1. gain knowledge about cell and cell organelle.
2. understand structure of nucleus and chromosome.
3. know about the ultra structure of cell organelle and their functions.
4. understand diseases related to chromosomes and their abnormality.
5. understand evolution theories and role of extinction in evolution.

Reference Books:

1. Eduardo De Robertis and De Robertis EME – *Cell and Molecular Biology*, 8th Edition. (Lea and Febiger, U.S., 2006).
2. C.B. Powar – *Cell biology*, (Himalaya Pub.House, 2010).
3. N. Arumugam, Cell biology, (Saras Publication, 2012).
4. P. S. Verma & V. K. Agarwal, *Cell biology , genetics , molecular biology, Evolution and Ecology*, (S. Chand and Company Ltd., 2005).
5. R.P. Meyyan , N , Arumugam – *Genetics & Evolution* (Saras Publication, 2015).
6. Pawan Gupta – *Cell and Molecular Biology* (Rastogi Publication, Delhi)
7. Mark Ridley, *Evolution*, III Edition , (Blackwell Publishing, 2004).
8. Nicholas Barton, Derek Briggs, Jonathan Eisen, David Goldstein, and Nipam Patel. *Evolution*. (Cold spring, Harbour Laboratory Press., 2007).
9. Brian Hall and Bendedikt Hallgrimsson. *Strickberger's Evolution*, IV Edition, (Jones and Barlett publishers Inc., 2008).
10. Neil Campbell and Jane Reece (2011), *Biology*, IX Edition, (Benjamin, Cummings, 2011).

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BZT202: Course IV – GENETICS (Credits: 02)

Course Objectives: Students will be able to….

1. gain a basic understanding on human genetics and hereditary.
2. define various terms of Genetics.
3. apply to real life situations and one's life the principles of human heredity.
4. learn about chromosomal aberrations and its consequences.

Unit No.	BZT202: COURSE IV – GENETICS	No. of hours per unit
UNIT I	**Introduction to Genetics**	01
	❖ Mendel's work on transmission of traits, Molecular basis of Genetic information. Mendelian and post Mendelian Genetics	08
	Principles of Inheritance, Incomplete dominance and co-dominance, gene interaction, Multiple alleles w.r.t. ABO, Rh blood groups and coat colour in rabbit.	
UNIT II	**Linkage, Crossing over**	09
	Linkage and process of crossing over, Coupling and repulsion theory, Cytological evidences of crossing over.	
UNIT III	❖ **Mutations**	06
	❖ Chromosomal mutations: Deletion, Duplication, Inversion, Translocation, Aneuploidy and polyploidy, induced gene mutation. Genetic Counseling, Importance, Diagnosis of genetic / inherited diseases.	
UNIT IV	❖ **Sex Determination**	09
	Chromosomal theory of sex determination e.g. Insects, Sex linked inheritance- Colorblindness and Haemophilia.	

Course Outcomes: Students should be able to…

1. understand Mendelian genetics, their principles and gene interaction.
2. Apply the principles of Rh blood groups.
3. Describe Genetic linkage.
4. Understanding the stochastic nature of crossing over
5. identify and describes various chromosomal mutations.
6. Interpret the clinical implications of genetic disorders.

Reference Books:

1. Verma P.S.and Agarwal V .K. – Genetics , S. Chand and company
2. Strick berger – Genetics . C Millian publications
3. Winchester –Genetics Oxford publication
4. Pritam Verma & Vishnu Agarwal, Cell biology, Genetics , molecular biology, Evolution and Ecology, (S. Chand Publisher, 2004).
5. R.P. Meyyan , N , Arumugam – Genetics & Evolution
6. Eldon Gardner, Michael Simmons, Peter Snustad, (2008), *Principles of Genetics*, VIII Edition, (Wiley, 2008).
7. Peter Snustad and Michael Simmons, *'Principles of Genetics'*, V Edition , (John Wiley and Sons Inc., 2009).
8. William Klug, Michael Cummings and Charlotte Spencer, *Concepts of Genetics*. X Edition, (Benjamin Cummings, 2012).
9. Peter Russell, *Genetics A Molecular Approach* III Edition. (Benjamin cummings, 2009).
10. Anthony Griffiths, Susan Wessler, Richard Lewontin, and Sean Carroll. *Introduction to Genetic Analysis*. IX Edition , (W.H. Freeman and Company, 2007).

Practical II: BZP203 **(credits: 02)**

Course Objectives: Students will be able to…

1. gain a basic knowledge of Blood groupings and applications.
2. learn Mendelian Inheritance and post mendelian modifications.
3. co-relate human genetics with real life situations.
4. learn about fossil evidences.

Practical No.	**Practical II:** BZP203
1	**Demonstration/Identification of ABO and Rh blood groups**
2	**Demonstration/ Cytological Preparations**
	Mitochondria –Stained preparation of mitochondria from onion peeling / Hydrilla leaf /Oral mucosa by using Janus Green B . Polytene Chromosome – Stained preparation of Polytene chromosome larva / Drosophila larva.
3	**Study of fossil evidences from plaster cast models and pictures.**
4	**Darwin's Finches with diagrams / cut outs of beaks of different species**
5	**Study of Mendelian Inheritance and gene interactions (Non Mendelian Inheritance) using suitable examples.**
	Verify the results using Chi – square test , Study of Linkage , recombination, gene mapping using the data (minimum 10 Examples on Mono , Dihybrid ratio , Incomplete dominance, Co- dominance , Multiple alleles , Sex linked inheritance , Linkage and crossing over and Gene interaction).
6	**Study of Human Karyotypes**
7	**Diagnosis Test of inherited diseases**
8	**Study of Human Genetic traits (any five)**

Course Outcomes: Students should be able to…

1. develop practical skill.
2. solve various genetic examples.
3. understand Human Genetic traits.
4. understand importance of blood group.
5. known process of evolution.
6. form various plaster cast model and known their importance in fossil evidences.

Reference Books:

1. Edward Ruppert and Robert Barnes, *Invertebrate Zoology*, VIII Edition. (Holt Saunders International Edition, 2006).
2. Robert Barnes, Peter Calow, Olive, P.J.W. , Golding ,D. W. and Spicer , J.I. *The Invertebrates*: A New Synthesis, III Edition, (Oxfard, Wiley Blackwell Science, 2002).
3. John Young. *The Life of Vertebrates* , III Edition. (Oxford university press, 2004).
4. Harvey Pough, *Vertebrate life*, VIII Edition , (Pearson International, 2009).
5. Brian Hall and Bendedikt Hallgrimsson. *Strickberger's Evolution*, IV Edition, (Jones and Barlett publishers Inc., 2008).
6. Practical Zoology by Kotpal (2008).
7. Practical Zoology by Verma & Agarwal (2012).