Rayat Shikshan Sanstha's

SADGURU GADAGE MAHARAJ COLLEGE, KARAD.

(An Autonomous)

Accredited By NAAC with 'A^{+} (3.63 CGPA)' Grade

ISO- 9001-2015 Certified

Affiliated to Shivaji University, Kolhapur

Bachelor of Science (B.Sc.)

DEPARTMENT OF ZOOLOGY (ENTIRE)

Under the Faculty of Science and Technology
Choice Based Credit System (CBCS)

Regulations in accordance with **National Education Policy-2020**
to be implemented from Academic Year 2024-25

Syllabus For

B.Sc. Part –I (ZOOLOGY-Entire)

SEMESTER I & II

(Syllabus to be implemented from June 2024)

Rayat Shikshan Sanstha's
SADGURU GADAGE MAHARAJ COLLEGE, KARAD.
(An Autonomous College)
Regulations and Guidelines as per NEP 2020

Choice Based Credit System (CBCS) Syllabus for Bachelor of Science Part- I (Zoology - Entire)

1. Title: B.Sc. I Zoology (Entire)

2. Year of Implementation: 2024-25

3. 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.

4. 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.

5. 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.

6. 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.

6. 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.

Structure of the Course: B.Sc. I (Entire Zoology)

Level	Year	Sem.	Course Type	Course Code	Course Title	Credits	No. of Lectures / Practicals
4.5	I	Sem. I	DSC-I	BZT24-101	Animal Diversity-I	2T	30
			DSC-II	BZT24-102	Cell Biology and Genetics	2T	30
			DSC-P-I	BZP24-103	Practical-I	2P	15
			OE-1	OEZOO24-101	Vermiculture	2T	30
			IKS-1	IKS-1		2T	30
		Sem-II	DSC-III	BZT24-201	Animal Diversity-II	2T	30
			DSC-IV	BZT24-202	Animal Physiology	2T	30
			DSC-P-II	BZP24-203	Practical-II	2P	15
			OE-2	OEZOO24-201	Diet and Nutrition	2T	30
			VEC-1	VEC-1	Democracy, Election and Constitution	2T	30

B.Sc. Zoology Semester I

Course Code and title: BZT24-101 ANIMAL DIVERSITY – I

Credits: 02 **Total Lectures: 30**

COURSE OBJECTIVES

1. To learn the animal classification.
2. To understand the canal system in Sycon.
3. To acquire the knowledge about types of corals and parasitic adaptations of Tapeworm and Ascaris.
4. To identify the species of earthworm used for vermicomposting and vermiwash.
5. To acquire the knowledge about Phylum- Arthropoda, Mollusca, Echinodermata.

Topic No.		Lectures
	Credit – I	
1.	**Kingdom –Protista:** General characters and classification up to classes; Locomotory Organelles and locomotion in Protozoa. **Phylum-Porifera:** General characters and classification up to classes; Canal system in *Sycon*	7
2.	**Phylum –Cnidaria:** General characters and classification up to classes; Polymorphism in Hydrozoa. **Phylum-Platyhelminthes:** General characters and classification up to classes; Life history of *Taenia solium* and its parasitic adaptations.	8
	Credit –II	
3.	**Phylum-Nemathelminthes:** General characters and classification upto classes; Life history of *Ascaris lumbricoides* and its parasitic adaptations. **Phylum –Annelida:** General characters and classification up to classes; Species of earthworm used for Vermicomposting, Preparation of vermicompost bed and vermiwash.	7
4.	**Phylum –Arthropoda:** General characters and classification up to classes; Vision in Arthropoda, Metamorphosis in Insects **Phylum–Mollusca :** General characters and classification up to classes; Torsion in Gastropods **Phylum–Echinodermata :** General characters and classification up to classes; Water vascular system of Asteroidea	8

Course Outcomes: Student should be able to….

1. The animal classification.
2. Explain the canal system in Sycon.
3. Apply the knowledge about types of corals and parasitic adaptations of Tapeworm and Ascaris.
4. Classify the species of earthworm used for vermicomposting and vermiwash.

Reference Books:

1. Edward Ruppert and Robert Barnes, *Invertebrate Zoology*,VIII Edition. (Thomson Press: India, 2006) Pages 998.
2. RobertBarnes, 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) Pages:512.
3. Brian Hall and Bendedikt Hallgrimsson (2008). Strickberger's Evolution.IV Edition, (Jones and Barlett publishers Inc., 2008) Pages 760.
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) Pages 848.

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B.Sc. Zoology Semester I

Course Code and title: BZT24-102 Cell Biology and Genetics

Credits: 02 **Total Lectures: 30**

Course Objectives:

1. To learn the cells and cell organelles.
2. To explain various cell organelles.
3. To sketch and label figures of cell organelles.
4. To learn about Genetics.
5. To explain various terms of Genetics.
6. To sketch and label various figures related to Genetics.

Topic No.		Lectures
	Credit – I	
1.	**Structure and Function of Cell -**Cell theory and diversity in cell size and shape **Structure and Function of Nucleus-** Nuclear membrane, Chromatin and Nucleolus. **Structure of and Function Chromosome-**Nucleosome concept and Polytene Chromosome.	10
2.	**Ultra Structure and Functions of** Plasma membrane (Fluid Mosaic Model), Mitochondria, Endoplasmic Reticulum, Golgi complex and Lysosomes**.**	5
	Credit –II	
3.	**Introduction to Genetics -** Mendel's work on transmission of traits, Genetic variation and Molecularbasis of Genetic variation.**Mendelian and Neo Mendelian Genetics** - Principles of Inheritance, Incomplete dominance and Co-dominance,Gene Interaction, Multiple Alleles (ABO blood groups, Rh factors andCoat colour in Rabbit) and Sex linked inheritance.	10
4.	**Mutations-** Chromosomal Mutations: Structural and Numerical changes, Euploidy and Aneuploidy, Induced Gene Mutation. **Genetic Counseling**	5

Course Outcomes: Student should be able to……

1. Define cells and cell organelles.
2. Explain various cell organelles.
3. Sketch and label figures of cell organelles.
4. Learn about Genetics.
5. Explain various terms of Genetics.
6. Sketch and label various figures related to Genetics

Reference Books:

1. De Robertis EDP and De Robertis EME – Cell and MolecularBiology
2. C.B. Powar – Cell biology , Himalaya Pub.House
3. Cell biology –Dr. N .Arumugam
4. Genetics by P.P.Meyyam
5. P.S.Verma&V.K.Agarwal-Cell biology , genetics , molecular biology, Evolution and Ecology
6. P.K. Gupta – Cell and Molecular Biology
7. VermaP.S.andAgarwal V .K. – Genetics , S. Chand andcompany
8. Strickberger – Genetics. C Millian publications
9. Winchester –Genetics Oxfordpublication
10. R.P. Meyyan , N , Arumugam – Genetics &Evolution
11. Gardner , E.J., Simmons , M.J., Snustad , D.P.(2008), Principles of Genetics ,VIII Edition ,WileyIndia.
12. Snustad , D.P. Simmons, M.J. (2009), 'Principles of Genetics', V Edition , JohnWiley and SonsInc.
13. Klug , W .S ., Cummings , M.R. Spencer ,C.A.(2012),Concepts of Genetics. X Edition, Benjamin Cummings.
14. Russell , P.J.(2009), Genetics A Molecular Approach III Edition.Benjamincummings.
15. Griffiths , A.J.F. , Wessler , S.R. Lewontin , R.C. and Carroll , S.B. introductionto Genetic Analysis. IX Edition , W.H. Freeman and Co

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B.Sc. Zoology Semester I

Course Code and title: BZP24-103 (Practical-I) Practicals Based on

Animal Diversity-I and Cell Biology and Genetics

Credits: 02 **Total Practicals: 15**

Sr. No.	Name of the Experiment	Number of practical
1.	**Study of the following Phyla with respect to classification and morphological peculiarities.-i.Protista:** *Amoeba, Euglena, Plasmodium, Paramoecium***ii.Porifera:** Sycon, *Hyalonema*and *Euplectella*, Bath sponge **iii. Coelenterata:** Obelia, *Physalia, Aurelia, Tubipora*and *Metridium***iv.Platyhelminthes:***Taeniasolium*.**.** **v. Nemathelminths:** *Ascarislumbricoides,* **vi.Annelida:** *Aphrodite, Nereis, Pheretima, Hirudinaria***vii.Arthropoda:** *Palaemon, Cancer, Limulus, Palamnaeus, Scolopendra, Julus, Periplaneta, Apis***viii.Mollusca:** *Chiton, Dentalium ,Pila ,Unio, Loligo, Sepia,, Octopus* **ix.Echinodermata:** *Pentaceros ,Ophiura, Echinus, Cucumaria and Antedon,*	01
2.	**Study of the following:**i.T.S. and L.S. of Sycon.ii. Life cycle and parasitic adaptations of *Taenia* and *Ascaris*.	01
3.	Culture of Protozoa (Paramoecium culture)	01
4.	Preparation of portable vermicompost unit and economic importance of vermicompost.	01
5.	Preparations of Haemin and Hemochromogen crystals.	01
6.	Cytological Preparations of Mitochondria –Stained preparation of mitochondria from Oral mucosa by using Janus Green B.	01
7.	Cytological Preparations of Polytene Chromosome – Stained preparation of polytene chromosome of Chironomus larva / Drosophila larva.	01
8.	Separation of nucleus from sheep liver by differential centrifugation method.	01
9.	Study of life cycle of Drosophila.	01
10.	Study of phenotypic variation in Drosophila (Wing and eye mutant)	01
11.	Human Genetics – Widows peak, Tongue roller, Ear lobes and Hypertrichosis.	01

12.	Study of Mendelian Inheritance: Monohybrid ratio, Dihybrid ratio, Incomplete dominance, Codominance and Multiple alleles.	01
13.	Study of Human Karyotypes.	01
14.	Study of Human Genetic traits.	01
15.	Study of Human Genetic traits.	01

B.Sc. Zoology Semester I

Course Code and title: OEZOO24 -101 VERMICULTURE

Credits: 02 **Total Lectures: 30**

Course Objectives:

1. The course, Vermiculture is aimed at acquiring knowledge about vermiculture, and its importance.
2. It is aimed at understanding the biology of earthwork and earthworm culture.
3. It is aimed to enable the students to become familiar with the procedure of setting up a vermicomposting bed.
4. It is aimed so that the students can use the vermicompost and vermiwash in their fields.

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Topic No.		Lectures
1.	1.Introduction to vermiculture: definition, meaning, history 2.Different useful species of earthworms, local and exotic species of earthworms 3.Role of earthworms in soil ecosystem 4.Basic characteristics of earthworms suitable for vermicomposting.	10
2.	1. Biology of earthworm: Habit habitat, Systematic position, Morphology, General body plan. 2. Reproduction and Life cycle of an earthworm 3.Methods of vermicomposting: (a) Low-cost floor beds, (b) Tank system 4.Material required for vermicomposting 5. Ideal conditions required for vermiculture: Temperature, pH, Moisture.	10
3.	1.Procedure for vermicomposting 2.Harvesting the products of vermiculture: Earthworms, Vermicompost, Vermiwash 3.Vermicompost: Properties, Uses, role in the growth of plants Vermiwash: Utility in agriculture 4.Enemies and diseases of earthworms and their management 5.Economic importance of vermiculture and potential of entrepreneurship	10

Course Outcomes: Students should be able to…

1. Learn the Vermiculture is aimed at acquiring knowledge about vermiculture, and itsimportance.
2. Learn the understanding the biology of earthwork and earthworm culture.
3. Understand the procedure of setting up a vermicomposting bed.
5. Learn to use the vermicompost and vermiwash in theirfields.

References

Dr. Keshav Singh (2022). Textbook of Vermicompost: Vermiwash and Biopesticides. Biotech Books. New Delhi.

2. EIRI Board of Consultants & Engineers (2009). Handbook Of Biofertilizers andVermiculture (Pb). Engineers India Research.

3. Sathe T. V. (2022). Vermiculture and Organic Farming. Daya Publishing House.

B.Sc. Zoology Semester II

Course Code and title: BZT24-201 Animal Diversity-II

Credits: 02 **Total Lectures: 30**

Course Objectives:

1. To acquire knowledge of biology in diversity of organism.
2. To able to explain and apply the fundamental concepts of animal diversity.
3. To make communicate scientific in formation
4. To able to explain characteristics and classification

Topic No.		Lectures
	Credit – I	
1.	**Protochordates:** General features and Retrogressive metamorphosis in Ascidian tadpole (Eg.Herdmania) **Agnatha:** General features of Agnatha and classification of cyclostomes up to classes.	7
2.	**Pisces:** General features and Classification up to order: Swim bladder, parental care in fishes. **Amphibia:** General features and Classification up to order: Neoteny and Parental care in Amphibia (Order:Anura, Apoda, Urodela) Icthyophis	8
	Credit –II	
3.	**Reptiles:**General features and Classification up to order: Venomous and non-venomousSnakes, Biting mechanism in snakes. First Aid Treatment, Sources of treatment, (Govt. hospitals) Information of Haffkin institute.	7
4.	**Aves:** General features and Classification up to order: Brain of fowl, Aerial Adaptations in birds (Morphological, Anatomical and Physiological). **Mammals:** 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).	8

Course Outcomes: Student should be able to……..

1. Learn about classification and general characters of animals.
2. Learn difference between venomous and non-venomous snake.
3. Learn to apply treatment for snakebite.
4. Learn to classify animals up to orders.

References:

1. Chordate Zoology-Jhordan&Verma – (Unit1)

2. Chordates- V.S.Verma- S.Chand Publication- (Unit1)

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 (Unit2)

7. Practical Zoology –Vertebrates-R.L.Kotpal (Unit1,2)

8. Manual 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)

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B.Sc. Zoology Semester II

Course Code and title: BZT24-202 Animal Physiology

Credits: 02 **Total Lectures: 30**

Course Objectives:

1. Learn animals with different phyla, their distribution and their relationship with the environment.
2. Develop practical skill in various hematological practical.
3. Explain importance of health and hygiene.
4. Differentiate of bloods of difference species depending upon the shape of the crystal.

Topic No.		Lectures
	Credit – I	
1.	**Nerve and muscle :** Structure of a Neuron, Resting membrane potential, Origin of Action Potential and its propagation in Non-myelinated nerve fibers, Ultra-structure of skeletal muscle, Molecular and Chemical basis of muscle contraction	9
2.	**Digestion:** Physiology of digestion; Absorption of Carbohydrates and Lipids	6
	Credit –II	
3.	**Respiration:** Pulmonary ventilation, Transport of Oxygen and Ca in blood.**Excretion:** Structure of Nephron, Mechanism of urine fo Counter – Current Mechanism.	6
4.	**Cardiovascular system**: Composition of blood, Structure of heart, Origin and conduction of the Cardiac impulse and Cardiac cycle.**Blood Pressure:** Measurement of Systolic and Diastolic pressure, Cardiac output. **ECG measurement:** Physiologicalmeasurement and significance	9

Course Outcomes: Student should be able to ……

1. Define the digestion and absorption in alimentary canal in human.
2. Describe the mechanism of pulmonary ventilation and urine formation.
3. Apply special assessment techniques which may be used in the physical examination of the cardiovascular system, including blood pressure and electrocardiogram (ECG).
4. Interpret the reproductive physiology of male and female

References:-

1. Hall B.K. and Hallgrimsson B. (2008). Strickberger's Evolution .IV Edition, Jones and Barlett publishers Inc.Tortora ,G.J. and Derrickson , B.H.(2009). Principles of Anatomy and Physiology,XI Edition ,John Wiley & Sons , Inc.
2. Widmaier, E.P.,Raff , H. and Strang , K.T.(2008) Vander's Human Physiology , XI Edition, McGrawHill
3. Guyton, A.C. and Hall, J.E.(2011). Textbook of Medical Physiology, XII Edition ,Harcourt Asia Pvt .Ltd /W.B. Saunders Company.

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B.Sc. Zoology Semester II

Course Code and title- BZP24-203 Practicals Based on Animal Diversity-II and Animal Physiology

Credits: 02 **Total Lectures: 30**

Sr. No.	Name of the Experiment	Number of practical
1.	**Study of the following specimens with reference to morphological peculiarities and classification-i. Protochordates:** Herdmania, Branchiostoma, **ii.Agnatha:**Petromyzon**iii.Pieses :**Hammer headed shark**,** Saw fish, Electric ray,Labeo, Exocoetus, Anguilla **iv. Amphibia :**Ichthyophis**,** Salamandra, Bufo, Hyla. **v. Reptiles :***Chelone, Hemidactylus, Chamaeleon, Draco, Crocodylus* **vi. Aves:** Parrot, Woodpeaker, Horned, owl, Vulture, Sparrow, Pigeon, **vii.Mammals:***Sorex, Pipistrelluspipistrellus, Funambulus andNycticebusbengalensis.*	01
2.	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 boa.	01
3.	Dissection of brain of fowl.	01
4.	Temporary preparation of Hyoid apparatus, Sclerotic plate, Pectenoffowl.	01
5.	Temporary preparation of Cycloid, Ctenoid and Placoid scales infishes.	01
6.	Adaptations in reptiles: Phyrenosoma, Chameleon, Crocodile, Walllizard	01
7.	Bleeding and clotting time	01
8.	Determination of Grip strength	
9.	Measurement of Blood Pressure by Sphygmomanometer.	01
10.	Recording of ECG.	01
11.	Measurement of lung capacity by using peak flow meter.	01
12.	Analysis of ABO blood groups and Rh factor.	01
13.	Study of osmotic phenomenon or permeability in red blood cells.	01

14.	Determination of hemoglobin (Hb) by using Sahli's Haemoglobinometer.	01
15.	Review article/work experience/project/visit	01

B.Sc. Zoology Semester II

Course Code and title: GEZOO24 -201 Diets and Nutrition

Credits: 02 **Total Lectures: 30**

Course Objectives:

1. To understand the components of the diet
2. To know the importance of a balanced diet and apply the knowledge to day-to-day life.
3. Enable students to calculate the BMI and caloric needs of a person.
4. To develop the skill of designing the diet for different physiological and pathological conditions.

Topic No.		Lectures
1.	1.Nutrients: Definition, Sources and their importance a. Carbohydrates b. Proteins c. Lipids d. Vitamins e. Minerals: f. Water	10
2.	1. Balanced Diet: Definition, Composition, importance 2. BMI: Definition, Calculation, Values 3. Caloric needs: Definition, Caloric need calculation based on age, and occupation	10
3.	Designing diet for a. Weight loss b. Weight gain c. Bodybuilding d. Diabetic patients e. A patient with Cardiovascular disorder f. A sports person	10

Course Outcomes: Student should be able to ……

1. Able to understand the components of the diet
2. Understand importance of a balanced diet and apply the knowledge to day-to-day life.
3. Students are able to calculate the BMI and caloric needs of a person.

References:

1. John E. Hall and Michael Hall (1984). Guyton and Hall textbook of medical physiology. Pp. 1091.
2. Sumati R. Mudambi and M. V. Rajagopal (2007). Fundamentals of Food, Nutrition and Diet Therapy. New Age International Publishers. New Delhi. Pp. 425.
3. Shubhangini A. Joshi (2015). Nutrition and dietetics. McGraw Hill Education Private Ltd. pp. 645.
4. Nutrition Sciences by B. Srilakshmi (2006). New Age International (P) Ltd. Publishers. Pp. 406