Ahmednagar Jilha Maratha Vidya Prasarak Samaj's

New Arts, Commerce and Science College, Ahmednagar (Autonomous)

(Affiliated to Savitribai Phule Pune University, Pune)

Choice Based Credit System (CBCS)

Bachelor of Science (B. Sc.)

Syllabus of

S. Y. B. Sc. Zoology

Implemented from

Academic Year 2022 - 23

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's

New Arts, Commerce and Science College, Ahmednagar (Autonomous)

Board of Studies in Zoology

Sr. No.	Name	Designation
1.	Hon. Prof. L.U. Kunjir	Chairman
2.	Hon. Prof. S. N. Pokale	Member
3.	Hon. Dr. A. D. Harkal	Member
4.	Hon. Prof. R. J. Chavan	Academic Council Nominee
5.	Hon. Prof. S. S. Nanware	Academic Council Nominee
6.	Hon. Dr. S. S. Teradalkar	Vice-Chancellor Nominee
7.	Hon. Prof. B. A. Pawar	Alumni
8.	Hon. Ms. Manjushree Tadvalkar	Industry Expert
9.	Hon. Shri. M. S. Kasture	Member (co-opt)
10.	Hon. Ms. S. P. Salve	Member (co-opt)
11.	Hon. Shri. G. G. Wakchoure	Member (co-opt)
12.	Hon. Ms. G. R. Devdhe	Member (co-opt)
13.	Hon. Ms. S. S. Mote	Member (co-opt)
14.	Hon. Ms. P. N. Dongare	Member (co-opt)
15.	Hon. Ms. S. J. Wagh	Member (co-opt)

Programme Structure and Course Titles

Sr. No.	Class	Semester	Course Code	Course Title	Credits
1.	F. Y. B.Sc.	I	BSC-ZO 101 T	Animal Systematics & Diversity- I	02
2.	F. Y. B.Sc.	I	BSC-ZO 102 T	Animal Ecology	02
3.	F. Y. B.Sc.	I	BSC-ZO 103 P	Zoology Practical Paper-I	1.5
4.	F. Y. B.Sc.	II	BSC-ZO 201 T	Animal Systematics & Diversity- II	02
5.	F. Y. B.Sc.	II	BSC-ZO 202 T	Cell Biology	02
6.	F. Y. B.Sc.	II	BSC-ZO 203 P	Zoology Practical Paper-II	1.5
7.	S. Y. B.Sc.	III	BSC-ZO 301 T	Animal Systematics & Diversity- III	02
8.	S. Y. B.Sc.	III	BSC-ZO 302 T	Genetics	02
9.	S. Y. B.Sc.	III	BSC-ZO 303 P	Zoology Practical Paper- III	02
10.	S. Y. B.Sc.	IV	BSC-ZO 401 T	Animal Systematics & Diversity- IV	02
11.	S. Y. B.Sc.	IV	BSC-ZO 402 T	Biological Techniques	02
12.	S. Y. B.Sc.	IV	BSC-ZO 403 P	Zoology Practical Paper- IV	02
13.	T. Y. B.Sc.	V	BSC-ZO 501 T	Animal Biology- I	02
14.	T. Y. B.Sc.	V	BSC-ZO 502 T	Mammalian Histology	02
15.	T. Y. B.Sc.	V	BSC-ZO 503 T	Applied Zoology- I	02
16.	T. Y. B.Sc.	V	BSC-ZO 504 T	Biochemistry	02
17.	T. Y. B.Sc.	V	BSC-ZO 505 T	Developmental Biology	02
18.	T. Y. B.Sc.	V	BSC-ZO 506 T	Parasitology	02
19.	T. Y. B.Sc.	V	BSC-ZO 507 P	Zoology Practical Paper- V	02
20.	T. Y. B.Sc.	V	BSC-ZO 508 P	Zoology Practical Paper- VI	02
21.	T. Y. B.Sc.	V	BSC-ZO 509 P	Zoology Practical Paper- VII	02
22.	T. Y. B.Sc.	V	BSC-ZO 510 T	Computer Applications in Biology	02
23.	T. Y. B.Sc.	V	BSC-ZO 511 P	Zoology Practical Paper- VIII	02

24.	T. Y. B.Sc.	VI	BSC-ZO 601 T	Animal Biology- II	02
24.	T. Y. B.Sc.	VI	BSC-ZO 602 T	Animal Physiology	02
25.	T. Y. B.Sc.	VI	BSC-ZO 603 T	Applied Zoology- II	02
26.	T. Y. B.Sc.	VI	BSC-ZO 604 T	Molecular Biology	02
27.	T. Y. B.Sc.	VI	BSC-ZO 605 T	Evolutionary Biology	02
28.	T. Y. B.Sc.	VI	BSC-ZO 606 T	Entomology	02
29.	T. Y. B.Sc.	VI	BSC-ZO 607 P	Zoology Practical Paper- IX	02
30.	T. Y. B.Sc.	VI	BSC-ZO 608 P	Zoology Practical Paper- X	02
31.	T. Y. B.Sc.	VI	BSC-ZO 609 P	Zoology Practical Paper- XI	02
32.	T. Y. B.Sc.	VI	BSC-ZO 610T	Recombinant DNA Technology	02
33.	T. Y. B.Sc.	VI	BSC-ZO611 Pr	Project	02
	Total	**06**	**33**		**67**

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's

New Arts, Commerce and Science College, Ahmednagar (Autonomous)

Syllabus of S.Y. B. Sc. Zoology (Semester-III)

under

Faculty of Science and Technology

Semester – III	**Paper – I**
Course Code: BSC-ZO 301 T	**Title of the Course: Animal Systematics and Diversity- III**
Credits: 02	**Total Lectures: 30 Hrs.**

Course Outcomes (COs)

After successful completion of this course students are able to ---

1. Understand classification and identification of lower chordates
2. Understand the morphological features of lower chordates
3. Understand the economic importance of lower chordates.

Detailed Syllabus

Unit	Name of Topic	Lectures Allotted
1.	**Phylum Hemichordata:** Characteristic features of Hemichordates External morphology of *Balanoglossus* Introduction to Classification of Phylum Hemichordata: Enteropneusta and Pterobranchia	**(02)**
2.	**Introduction to phylum Chordata:** Origin and Ancestry of Chordates. General features of Phylum Chordata Comparative features of Non-chordates and Chordates. Classification of Phylum Chordata upto Class level.	**(06)**
3.	**Group Protochordata** Introduction and characters of Group Protochrodata.	**(03)**

Classification of Group Protochordata: Subphylum Urochordata, Subphylum Cephalochordata.

External Morphology of *Herdmania*.

4. Introduction to Subphylum Vertebrata (01)

5. Division Agnatha: Jawless Fishes (04)

Introduction to division Agnatha.

Ancestry and affinities of Agnatha.

Living Jawless fishes: General Characters

External Morphology of (Example)

6. Introduction to Gnathostomata: Jawed Vertebrates (01)

7. Superclass: Pisces (06)

Introduction and Characters to Superclass Pisces.

Classification of Class Chondrichthyes, Class Osteichthyes.

External morphology of *Scoliodon*

Osmoregulation in fishes,

Migration in fishes, Economic Importance of Pisces

8. Class: Amphibia (07)

Introduction and general characters of class Amphibia.

External morphology and life cycle of frog

Classification of Class Amphibia: Anura, Gymnophiona and Caudata.

Parental care in Amphibia.

Neoteny and Paedogenesis in Amphibia

Suggested Reading:

1. **Modern Text-Book of Zoology, vertebrates.** By Kotpal, RL., Rastogi and Co.,
2. **Nigam H.C., Zoology of Chordates,** Vishal Publication, Jalandhar
3. **Jordan, E.L. and P.S.Verma Chordate Zoology,** S. Chand and Co., Ltd. Ram Nagar, New Delhi.
4. **Fundamentals of Zoology** Ghosh, Manna NCBA
5. **Biology of Vertebrate H.C**. Nigam Vishal Publishers
6. **Biology of Chordate** H.C. Nigam Vishal Publishers

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Syllabus of S.Y. B. Sc. Zoology (Semester-III)

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Semester – III	**Paper – II**
Course Code: BSC-ZO 302 T	**Title of the Course: Genetics**
Credits: 02	**Total Lectures: 30 Hrs.**

Course Outcomes (COs)

After successful completion of this course students are able to ---

1. Understand basic patterns of heredity and variation in living animals.
2. Understand the patterns of inheritance in population
3. Understand the human genetical perspectives
4. Understand the applications of genetics

Detailed Syllabus

Unit	Name of Topic	Lectures Allotted
1.	**Introduction to Genetics** Definition, Basic concepts in genetics, Recapitulation of Mendelian Genetics: monohybrid and dihybrid cross, law of dominance, Law of purity of gamete and law of independent assortment.	**(02)**
2.	**Gene Interactions** Allelic gene interaction: Incomplete dominance, codominance, Lethal genes (dominant and recessive) Non-allelic gene interactions: Complementary factors (9:7), Supplementary Factors (9: 3:4) Inhibitory factors (13:3) Duplicate dominant factors (15: 1). Multiple alleles, Concept of multiples alleles, ABO system, Concept of multiple genes (polygenic inheritance) with reference to skin	**(04)**

color in man

3. Chromosomes **(04)**

Introduction to morphology, composition and classification based on the centromeric position.

Types of chromosomes (autosomes, sex chromosome, polytene and lampbrush chromosomes)

4. Sex- determination: **(04)**

Chromosomal: XX-XY, ZZ-ZW, XX-XO methods, Haploid-Diploid Parthenogenesis, Gynandromorphy.

Environmental - Sex determination in *Bonellia.*

5. Population genetics: **(04)**

Gene pool, genotype and gene frequency,

Hardy-Weinberg's principle of population genetics,

Explanation of H-W equation and its applications.

6. Human genetics **(04)**

Preparation and analysis of human karyotype

Syndromes- autosomal- Down's (Mongolism), Patau's, Edward and Cri du chat

Sex chromosomal abnormalities in man: Klinefelter and Turner syndrome

7. Sex linked inheritance in human: **(04)**

Colorblindness, Haemophilia and hypertrichosis, Sex- influenced genes- Pattern baldness in human

8. Application of genetics **(04)**

Eugenics. Concept of cloning and transgenic animal

Gene Therapy

Suggested Readings:

1. **Concepts of Genetics: Klug W. S. and Cummings** M. R Prentice-Hall
2. **Genetics-a Conceptual Approach:** Pierce B. A. Freeman
3. **Genetics- Analysis of Genes and Genomes: Hartal D. L. and Jones E. W. Jones & Bartlett**
4. **An Introduction to Genetic Analysis:** Griffith A. F. et al Freeman
5. **Principles of Genetics:** Snustad D. P. and Simmons M. J. John Wiley & Sons.

6. **Genetics:** Strickberger M. W. Prentice-Hall

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Syllabus of S.Y.B.Sc. Zoology (Semester-III)

under

Faculty of Science and Technology

Semester – III	**Paper – III**
Course Code: BSC-ZO 303 P	**Title of the Course: Zoology Practical Paper- III**
Credits: 02	**Total Practical: 60 Hrs.**

Course Outcomes (COs)

After successful completion of this course students are able to ---

1. Understand classification and identification of museum specimens/ slides of lower chordates.
2. Understanding characteristics of lower chordates with the help of slides and culturing.
3. Solving problems related to patterns of inheritance

Detailed Syllabus: (Any 14)

Unit	Name of Topic	Lectures Allotted
1.	Museum study of Phylum Hemichordata: *Balanoglossus,* Group Protochordata: *Herdmania,* and division Agnatha: *Petromyzon.* (D)	**(01)**
2.	Museum study of Super class Pisces: *Labeo, Scoliodon, Hippocampus*. (D)	**(01)**
3.	Museum study of Class Amphibia: *Salamandra, Rana, Ichthyophis*. (D)	**(01)**
4.	Study of types of scales in fishes: Placoid scale, Cycloid scale, Ctenoid scale & Ganoid scale. (D)	**(01)**
5.	Study of types of tail in fishes: Homocercal, Heterocercal & Diphycercal. (D)	**(01)**

6.	Study of external characters & digestive system of locally available fish. (E)	**(01)**
7.	Study of brain of locally available fish (D)	**(01)**
8.	Temporary preparation of scales & its identification from locally available fish. – (E)	**(01)**
9.	Compulsory field visit to study pond ecosystem with reference to Pisces and amphibians, report writing and submission.	**(01)**
10.	Solving monohybrid crosses in genetics based on hypothetical problems	**01**
11.	Solving Dihybrid crosses in genetics based on hypothetical problems.	**01**
12.	Solving problems based on ABO blood groups in human based on hypothetical problems	**01**
13.	Identification of chromosome anomalies using Idiograms– Autosomal disorders (Down Syndrome / Edward's syndrome)	**01**
14.	Solving problems based on population genetics: 1. Allelic Frequency, Genotype Frequency using HW equation.	**02**
15.	Demonstration of preparation of polytene chromosome from salivary gland of Drosophila/ Chironomous larvae	**01**
16.	Identification of chromosome anomalies using Idiograms – X-linked disorders – (Klinefelter's syndrome / Turner's syndrome)	**01**

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Syllabus of S.Y. B. Sc. Zoology (Semester- IV)

under

Faculty of Science and Technology

Semester – IV	**Paper - I**
Course Code: BSC-ZO 401 T	**Title of the Course: Animal Systematics and Diversity- IV**
Credits: 02	**Total Lectures: 30 Hrs.**

Course Outcomes (COs)

After successful completion of this course students are able to ---

1. Understand classification and identification higher chordates.
2. Understand the morphological features of higher chordates.
3. Learn the economic importance higher chordates.

Detailed Syllabus

Unit	Name of Topic	Lectures Allotted
1.	**Class: Reptilia** Characteristic features of Reptiles. Classification of Reptiles. Characteristic features of Order Testudines, Order Sphenodonta, Order Squamata and Order Crocodilia with one example of each. External morphology of *Calotes* Adaptive radiation of reptiles, temporal vacuities in reptiles. Identification key of Venomous and Non-Venomous Snakes	**(08)**
2.	**Class: Aves** Characteristic features of Aves. Classification of Class Aves. Flight adaptations in Birds	**(08)**

External morphology of Pigeon

Migration in Birds

3. Class: Mammalia **(08)**

Salient features of Mammalia.

Classification of Mammalia

Adaptive radiation in Mammals

Dentition in Mammals

Economic Importance of Mammals

4. Study of Rat **(06)**

External morphology of Rat

Digestive System of Rat

Reproductive System (Male and Female)

Suggested Readings:

1. **Modern Text-Book of Zoology, vertebrates.** By Kotpal, RL., Rastogi and Co.,
2. **Nigam H.C., Zoology of Chordates,** Vishal Publication, Jalandhar
3. **Jordan, E.L. and P.S.Verma Chordate Zoology,** S. Chand and Co., Ltd. Ram Nagar, New Delhi.
4. **Fundamentals of Zoology** Ghosh, Manna NCBA
5. **Biology of Vertebrate H.C. Nigam** Vishal Publishers
6. **Biology of Chordate H.C. Nigam** Vishal Publishers

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Syllabus of S.Y. B. Sc. Zoology (Semester- IV)

under

Faculty of Science and Technology

Semester – IV	**Paper - II**
Course Code: BSC-ZO 402 T	**Title of the Course: Biological techniques**
Credits: 02	**Total Lectures: 30 Hrs.**

Course Outcomes (COs)

After successful completion of this course students are able to ---

1. Understand the basic apparatus in zoology laboratory.
2. Understand the basic principles of biological techniques.
3. Understand the applications of biological techniques.

Detailed Syllabus

Unit	Name of Topic	Lectures Allotted
1.	**Introduction to scientific apparatus**: Glass apparatus, miscellaneous apparatus, Apparatus for Heating, Types of Volume Measuring Devices, Burette, Pipette, and Volumetric Flask, Balances, Care, and maintenance of laboratory apparatus	**(02)**
2.	**Preparations of solutions**: Percent, Molar, Normal solution. PPM, PPB solutions, serial dilution.	**(03)**
3.	**Microscopy and micrometry** Introduction to Microscopy. Definitions-Resolving Power, Limit of Resolution and Magnification, Numerical Aperture. Basic principles of Light, Electron, and Fluorescence microscope, Basic Instrumentation of Compound and Electron Microscope (TEM and	**(06)**

SEM), Applications of microscopes: Light, Electron, and Fluorescence microscope

4. **Chromatography**: **(05)**

Principle and Applications of Paper Chromatography, Thin Layer Chromatography, and Column Chromatography (Size Exclusion and Affinity Chromatography).

5. **Electrophoresis**: **(04)**

Principle and applications of Gel electrophoresis (Agarose and PAGE Electrophoresis).

6. **Colorimetry and Spectrophotometry:** **(04)**

Principle, instrumentation and Applications colorimeter and Spectrophotometer.

7.. **Centrifugation:** **(03)**

Basic principle and applications of centrifuge. Type of ultracentrifuge.

8.. **Hematological techniques**: **(03)**

RBC counting, WBC counting, and Hb estimation.

Suggested Readings:

1. **Upadhyay & Nath Biophysical Chemistry** (Principles and Techniques) | - Himalaya Publishing House.
2. **D. Freifelder. Biophysical chemistry**. W.H. Freeman.
3. **Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology.**
4. **Ghatak K. L. Techniques and Methods in Biology:** Prentice Hall India Learning Private Limited.

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Syllabus of S. Y. B. Sc. Zoology (Semester-IV)

under

Faculty of Science and Technology

Semester – IV	**Paper – III**
Course Code: BSC-ZO 403 P	**Title of the Course: Zoology Practical Paper- IV**
Credits: 02	**Total Practical: 60 Hrs.**

Course Outcomes (COs)

After successful completion of this course students are able to ---

1. Understand classification and identification of museum specimens/ slides of higher invertebrates.
2. Understanding characteristics of higher invertebrates with the help of slides, models etc.
3. Understand the morphology and cell division.
4. Understand the techniques in cell biology.

Detailed Syllabus: (Any 14)

Unit	Name of Topic	Lectures Allotted
1.	Museum study of Class Reptilia: Venomous & Non – venomous snake – Two each. (D)	**(01)**
2.	Identification of Venomous & Non – venomous snakes with the help of pictorial taxonomic keys (D)	**(01)**
3.	Museum study of Class Aves: Crow, Kingfisher & Duck (D)	**(01)**
4.	Study of types of beaks & feet in birds – Any two each (D)	**(01)**
5.	Museum study of class Mammalia: Rat, Shrew & Bat. (D)	**(01)**
6.	Study of external characters & digestive system of Rat. (D)	**(01)**
7.	Study of Heart of Rat – (D)	**(01)**
8.	Study of reptilian/ avian diversity in and around the campus – (E)	
9.	Introduction and applications of glass apparatus in laboratory	**(01)**

10.	Demonstration DNA separation by gel Electrophoresis	**(01)**
11.	Preparation of standard graph for glucose and quantitative estimation using colorimeter	**(01)**
12.	Preparation of solution and its standardization by acid-base titration	**(01)**
13.	Instrumentation of Electrophoresis, Column Chromatography, Centrifuge,	**(02)**
14.	Separation of amino acids by paper chromatography/thin layer chromatography	**(01)**
15.	Determination of lambda max for glucose/ protein by colorimeter	**(01)**
16.	Estimation of Hemoglobin by haemoglobinometer	**(01)**
17.	WBC counting by hemocytometer method	**(01)**
18.	Principle and operation of Centrifuge	**(01)**