Ahmednagar Jilha Maratha Vidya Prasarak Samaj's

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

(Affiliated to Savitribai Phule Pune University, Pune)

National Education Policy (NEP)
Choice Based Credit System (CBCS)

Programme Skeleton and Syllabus of

B.Sc. Zoology (Major)

Implemented from

Academic Year 2023-24

Credit Distribution: B.Sc. Zoology (Major) including Minor and OE and other courses.

	Type of Courses	III Yr	IV Yrs (Honours)	IV Yrs Research
Major Zoology	Discipline-Specific Courses (DSC)	46	74	66
	Discipline Specific Elective (DSE)	08	16	16
	Skill Enhancement Courses (SEC)	06	06	06
	Vocational Skill Courses (VSC)	08	08	08
	On-Job Training (OJT)	04	08	04
	Field Project (FP)	04	04	04
	Community Engagement and Service (CEP)	02	02	02
	Research project	00	00	12
	Research Methodology	00	04	04
	Indian Knowledge System	02	02	02
	Total (I, II and III Year)	80	124	124
Minor	Minor	20	20	20
Other Courses	Open Elective (OE)/ Multidisciplinary Courses	12	12	12
	Co-Curricular Courses	08	08	08
	Ability Enhancement Courses	08	08	08
	Value Education Courses	04	04	04
	Total	132	176	176

B. Sc. Programme Framework: Credit Distribution

Year	Semester	Level	Major											Minor	OE	CC	AEC	VEC	Total
			DSC		DSE		SEC		VSC		FP/OJT /IN/CEP		IKS						
			T	P	T	P	T	P	T	P	T	P		T/P	-	-	-	-	-
I	II	4.5	4	2	-	-	-	2	-	-	-	-	2	03	3	2	2	2	22
I	II	4.5	6	-	-	-		2	-	2	-	-		03	3	2	2	2	22
Exit Option: Award of UG Certificate in Major with 44 credits and an additional 4 credit core NSQF course /Internship or Continue with Major and Minor																			
II	III	5.0	6	2	-	-		2	-	-	-	2		03	3	2	2	-	22
II	IV	5.0	6	2	-	-		-	-	2	-	2		03	3	2	2	-	22
Exit Option: Award of UG Diploma in Major with 88 credits and an additional 4 credit core NSQF course /Internship or Continue with major and minor																			
III	V	5.5	8	2	2	2	-	-	-	2		2		04	-	-	-	-	-	22
III	VI	5.5	6	2	2	2	-	-	-	2		4		04	-	-	-	-	-	22
Exit Option: Award of UG Degree in Major and Minor with 132 credits or continue with Major for a 4-year Degree																			
IV	VII	6.0	8	6	2	2	RM-4		-	-	-	-		-	-	-	-	-	-	-	22

IV	VIII	6.0	8	6	2	2	-	-	-	-	-	4		-	-	-	-	-	-	-	22
Four Year UG Degree(Honours) with Major and Minor with 176 credits																					
IV	VII	6.0	6	4	2	2	RM-4		-	-	-	4		-	-	-	-	-	-	-	22
IV	VIII	6.0	6	4	2	2	-	-	0	-	-	8		-	-	-	-	-	-	-	22
Four Year UG Degree (Honours with Research) with Major and Minor with 176 credits																					

B. Sc. Programme Framework: Course Distribution

Year	Semester	Level	Major											Minor		OE	CC	AEC	VEC	Total
			DSC		DSE		SEC		VSC		FP/OJT /IN/CEP		IKS							
I	-	-	T	P	T	P	T	P	T	P	T	P		T	P	-	-	-	-	-
I	I	4.5	**2**	**1**	-	-	-	1	-	-	-	-	1	1		1	1	1	1	10
I	II	4.5	**2**	-	-	-		1	-	**1**	-	-		1		1	1	1	1	09
Exit Option: Award of UG Certificate in Major with 44 credits and an additional 4 credit core NSQF course /Internship or Continue with major and minor																				
II	III	5.0	**2**	**1**	-	-		**1**	-	-	-	**1**		1		1	1	1	-	09
II	IV	5.0	**2**	**1**	-	-		-	-	**1**	-	**1**		1		1	1	1	-	09
Exit Option: Award of UG Diploma in Major with 88 credits and an \additional 4 credit core NSQF course /Internship or Continue with major and minor																				
III	V	5.5	**2**	**1**	**1**	**1**	-	-	-	**1**		**1**		1		-	-	-	-	08
III	VI	5.5	**2**	**1**	**1**	**1**	-	-	-	**1**		**1**		1		-	-	-	-	08
Exit Option: Award of UG Degree in Major and Minor with 132 credits or continue with Major for a 4-year Degree																				
IV	VII	6.0	**3**	**3**	**1**	**1**	**0**	**1**	-	-	-	-		-	-	-	-	-	-	09
IV	VIII	6.0	3	**3**	**1**	**1**	-	-	-	-	-	**1**		-	-	-	-	-	-	09
Four Year UG Degree(Honours) with Major and Minor with 176 credits																				
IV	VII	6.0	**2**	**2**	**1**	**1**	**0**	**1**	-	-	-	**1**		-	-	-	-	-	-	08
IV	VIII	6.0	**2**	**2**	**1**	**1**	-	-	-	-	-	**1**		-	-	-	-	-	-	07
Four Year UG Degree (Honours with Research) with Major and Minor with 176 credits																				

Programme Framework (Course Distribution): B.Sc. Zoology (Major)

Year	Semester	Level	Major											Total	
			DSC		DSE		SEC		VSC		FP/OJT /IN/CEP/PR		IKS		
			T	P	T	P	T	P	T	P	T	P	T	T	P/PR
I	I	4.5	2	1	-	-	-	1	-	-	-	-	01	03	02
I	II	4.5	2	-	-	-		1	-	1	-	-		02	02
II	III	5.0	2	1	-	-		1	-	-	-	1		02	03
II	IV	5.0	2	1	-	-		-	-	1	-	1		02	03
III	V	5.5	2	1	1	1	-	-	-	1		1		03	04
III	VI	5.5	2	1	1	1	-	-	-	1		1		03	04
B.Sc. Honours															
IV	VII	6.0	3	3	1	1	RM-1		-	-	-	-		05	04
IV	VIII	6.0	3	3	1	1	-	-	-	-	-	1		04	05
B.Sc. Honours with Research															
IV	VII	6.0	2	2	1	1	RM-1		-	-	-	1		04	04
IV	VIII	6.0	2	2	1	1	-	-	-	-	-	1		03	04

Programme Framework (Credit Distribution): B.Sc. Zoology (Major)

Year	Semester	Level	Major											Total
			DSC		DSE		SEC		VSC		FP/OJT /IN/CEP/RP		IKS	
			T	P	T	P	T	P	T	P	T	P	**T**	
I	I	4.5	4	2	-	-	-	2	-	-	-	-	02	10
I	II	4.5	6	-	-	-		2	-	2	-	-		10
II	III	5.0	6	2	-	-		2	-	-	-	2		12
II	IV	5.0	6	2	-	-		-	-	2	-	2		12
III	V	5.5	8	2	2	2	-	-	-	2		2		18
III	VI	5.5	6	2	2	2	-	-	-	2		4		18
IV	VII	6.0	8	6	2	2	RM-4		-	-	-	-		22
IV	VIII	6.0	8	6	2	2	-	-	-	-	-	4		22
IV	VII	6.0	6	4	2	2	RM-4	-	-	-	-	4		22
IV	VIII	6.0	6	4	2	2	-	-	-	-	-	8		22

Programme Framework (Courses and Credits): B.Sc. Zoology (Major)

Sr. No.	Year	Semester	Level	Course Type	Course Code	Title	Credits
1.	I	I	4.5	DSC-1	BS-ZO111T	Basic Zoology	02
2.	I	I	4.5	DSC-2	BS-ZO112T	Cell Biology	02
3.	I	I	4.5	DSC-3	BS-ZO113P	Zoology Practical Paper I	**02**
4.	I	I	4.5	SEC-1	BS-ZO114P	Laboratory Techniques-I	02
5.	I	I	4.5	IKS-1	BS-ZO115T	Animal Husbandary techniques in Ancient India	**02**
6.	I	II	4.5	DSC-4	BS-ZO121T	Mammalian Physiology	**03**
7.	I	II	4.5	DSC-5	BS-ZO122T	Genetics	**03**
8.	I	II	4.5	SEC-2	BS-ZO123P	Zoology Practical Paper - II	02
9.	I	II	4.5	VSC-1	BS-ZO124P	Laboratory Techniques- II	02
10.	II	III	5.0	DSC-6	BS-ZO231T	Animal Systematics and Diversity-I	03
11.	II	III	5.0	DSC-7	BS-ZO232T	Biological Techniques	03
12.	II	III	5.0	DSC-8	BS-ZO233P	Zoology Practical Paper – III	02
13.	II	III	5.0	SEC-3	BS-ZO234P	Zoology Practical Paper - IV	02
14.	II	III	5.0	FP-01	BS-ZO235P	Field Project	02
15.	II	IV	5.0	DSC-9	BS-ZO241T	Animal Systematics and Diversity-II	03
16.	II	IV	5.0	DSC-10	BS-ZO242T	Parasitology	03
17.	II	IV	5.0	DSC-11	BS-ZO243P	Zoology Practical Paper - V	02
18.	II	IV	5.0	VSC-2	BS-ZO244P	Zoology Practical Paper - VI	02
19.	II	IV	5.0	CEP-01	BS-ZO245P	Community Engagement Programme and Service	02
20.	III	V	5.5	DSC-12	BS-ZO351T	Animal Biology & Ecology	04
21.	III	V	5.5	DSC-13	BS-ZO352T	Biochemistry and Molecular Biology	04
22.	III	V	5.5	DSC-14	BS-ZO353P	Zoology Practical Paper - VII	02
23.	III	V	5.5	DSE-01	BS-ZO354T	Applied Zoology	02
24.	III	V	5.5	DSE-02	BS-ZO355P	Zoology Practical Paper – VIII	**02**
25.	III	V	5.5	VSC-3	BS-ZO356P	Zoology Practical Paper- IX	02
26.	III	V	5.5	FP-02	BS-ZO357P	Field Project	02
27.	III	VI	5.5	DSC-15	BS-ZO361T	Developmental Biology and Evolution	03
28.	III	VI	5.5	DSC-16	BS-ZO362T	Histology and Histochemistry	03
29.	III	VI	5.5	DSC-17	BS-ZO363P	Zoology Practical Paper- X	**02**
30.	III	VI	5.5	DSE-03	BS-ZO364T	Entomology	02
31.	III	VI	5.5	DSE-04	BS-ZO365P	Zoology Practical Paper- XI	02

32.	III	VI	5.5	VSC-4	BS-ZO366P	Zoology Practical Paper- XII	02
33.	III	VI	5.5	OJT-01	BS-ZO367P	On Job Training	04

B.Sc. Zoology (Major with Honours)

34.	IV	VII	6.0	DSC-18	BS-ZO471T	Comparative Animal Physiology	03
35.	IV	VII	6.0	DSC-19	BS-ZO472T	Cell and Molecular Biology	03
36.	IV	VII	6.0	DSC-20	BS-ZO473T	Economic Zoology	02
37.	IV	VII	6.0	DSC-21	BS-ZO474P	Zoology Practical Paper - XIII	02
38.	IV	VII	6.0	DSC-22	BS-ZO475P	Zoology Practical Paper - XIV	02
39.	IV	VII	6.0	DSC-23	BS-ZO476P	Zoology Practical Paper - XV	02
40.	IV	VII	6.0	DSE-05	BS-ZO477T	Biochemistry/Metabolic Pathways	02
41.	IV	VII	6.0	DSE-06	BS-ZO478P	Zoology Practical Paper - XVI	02
42.	IV	VII	6.0	RM-01	BS-ZO479T/P	Research Methodology	04
43.	IV	VIII	6.0	DSC-24	BS-ZO481T	Genetics and Biostatistics	03
44.	IV	VIII	6.0	DSC-25	BS-ZO482T	Endocrinology and Bioinformatics	03
45.	IV	VIII	6.0	DSC-26	BS-ZO483T	Developmental Biology	02
46.	IV	VIII	6.0	DSC-27	BS-ZO484P	Zoology Practical Paper - XVII	02
47.	IV	VIII	6.0	DSC-28	BS-ZO485P	Zoology Practical Paper - XVIII	02
48.	IV	VIII	6.0	DSC-29	BS-ZO486P	Zoology Practical Paper - XIX	02
49.	IV	VIII	6.0	DSE-07	BS-ZO487T	Ethology	02
50.	IV	VIII	6.0	DSE-08	BS-ZO488P	Zoology Practical Paper - XX	02
51.	IV	VIII	6.0	OJT-02	BS-ZO489P	On Job Training	04

B.Sc. Zoology (Major Honours with Research)

52.	IV	VII	6.0	DSC-20	BS-ZO471T	Comparative Animal Physiology	03
53.	IV	VII	6.0	DSC-21	BS-ZO472T	Cell and Molecular Biology	03
54.	IV	VII	6.0	DSC-22	BS-ZO473P	Zoology Practical Paper- XIII	02

55.	IV	VII	6.0	DSC-23	BS-ZO474P	Zoology Practical Paper-XIV	02
56.	IV	VII	6.0	DSE-05	BS-ZO475T	Biochemistry / Metabolic Pathways	02
57.	IV	VII	6.0	DSE-06	BS-ZO476P	Zoology Practical Paper- XV	02
58.	IV	VII	6.0	RM-01	BS-ZO477T	Research Methodology	04
59.	IV	VII	6.0	RP-01	BS-ZO478P	Research Project	04
60.	IV	VIII	6.0	DSC-20	BS-ZO481T	Genetics and Biostatistics	03
61.	IV	VIII	6.0	DSC-21	BS-ZO482T	Endocrinology and Bioinformatics	03
62.	IV	VIII	6.0	DSC-22	BS-ZO483P	Zoology Practical Paper- XVI	02
63.	IV	VIII	6.0	DSC-23	BS-ZO484P	Zoology Practical Paper- XVII	02
64.	IV	VIII	6.0	DSE-07	BS-ZO485T	Developmental Biology/ Ethology	02
65.	IV	VIII	6.0	DSE-08	BS-ZO486P	Zoology Practical Paper- XVIII	02
66.	IV	VIII	6.0	RP-02	BS-ZO487P	Research Project	08

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. Dr. S. N. Pokale	Chairman
2.	Hon. Dr. A. D. Harkal	Member
3.	Hon. Prof. R. J. Chavan	Academic Council Nominee
4.	Hon. Prof. S. S. Nanware	Academic Council Nominee
5.	Hon. Dr. S. S. Teradalkar	Vice-Chancellor Nominee
6.	Hon. Prof. B. A. Pawar	Alumni
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9.	Hon. Ms. S. P. Salve	Member (co-opt)
10.	Hon. Shri. G. G. Wakchoure	Member (co-opt)
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12.	Hon. Ms. S. S. Mote	Member (co-opt)
13.	Hon. Ms. P. N. Dongare	Member
14.	Hon. Ms. S. J. Wagh	Member

1. Prologue

Zoology is one of the major subjects of Basic Sciences and deals with all aspects of animal biology. It includes an interesting range of highly diverse topics. A zoology student needs to understand many areas of the subject to keep pace with advancements in Life Sciences. The Board of Studies has designed this under-graduate degree program in Zoology of New Arts, Commerce and Science College, Ahmednagar (Autonomous) with a substantial component of zoologists' needs as a skilled career zoologists need to pursue post-graduation and further academic studies. It follows the guidelines laid down by the University Grants Commission, New Delhi. This newly designed curriculum under National Education Policy 2020 is a perfect blend of the classical aspects in Zoology and the advanced and more specialized areas. This degree offers Discipline Specific Core Courses [DSC] in Basic Zoology, Animal Physiology, Cell Biology, Animal Systematics and Diversity, Parasitology and Genetics. In the third year, i.e., Semester V and Semester VI, Discipline-specific Courses [DSC], Discipline Specific Elective [DSE], Skill Enhancement Courses [SEC], Vocational Skill Courses [VSC], Indian Knowledge System [IKS] and Field Project [FP] have been offered. The DSC courses are Animal Biology and Ecology, Mammalian Histology, Applied Zoology, Biochemistry, Developmental Biology, Evolutionary Biology and Entomology. The SEC courses are Medical Laboratory Techniques. According to NEP 2020, IKS is the new introductory course. The IKS course is Animal Husbandary in Ancient India. In Semester II and III , the students also have a course dedicated to Field work and in VI semester the students are also offered for On Job Training programme.

The syllabus has been framed so that the student gains each year a broader perspective of the subject as he/ she progresses towards completion of the degree program. Field trips, educational visits and Project work have been included to experience the applications of the theory learned in the classroom. After completing the program, it is expected that students will understand and appreciate: animal diversity, few applications of Zoology, the Structure, functions and life processes at cellular, tissue, organ and system level, the significance of evolution, and basic concepts of human health. The students would also gain an insight into laboratory and fieldwork through the practical course, fieldwork and the project. Presenting this new syllabus to the teachers and students of B.Sc. Zoology I, we are delighted to state that efforts have been made to seek the inputs of all the stakeholders to make it more relevant. The new course will be effective from 2023-2024 and will follow the National Education Policy 2020 in a Semester mode. It has been primed keeping in view the distinctive

requirements of B.Sc. Zoology students. The contents have been drawn up to accommodate the widening prospects of the discipline of Life Sciences. They reflect the changing prerequisites of the students. The B. Sc. Zoology programme will offer 132 credits for 03 year degree programme and 176 credits for 04 years degree programme. This pattern has been specially aimed towards the overall development of the students. The calculation of credits and CGPA will be as per the guidelines of the Academic council. The B.Sc. Zoology program provides an appropriate blend of classical and applied aspects of the subject. This newly designed curriculum will allow students to acquire the skill in handling scientific instruments, planning and performing in the laboratory and exercising critical judgment, independent thinking and problem-solving skills.

2. Programme Outcomes (POs)

- **Disciplinary knowledge and skills**: Capable of demonstrating comprehensive knowledge and understanding of major concepts, theoretical principles and experimental findings in Zoology and its different subfields and other related fields of study, including broader interdisciplinary subfields.
- **Skilled communicator**: Ability to impart complex technical knowledge relating to Zoology clearly and concisely in writing and oral skills.
- **Critical thinker and problem solver**: Ability to have critical thinking and efficient problem-solving skills in the basic areas of Zoology
- **Sense of inquiry**: Capability for asking relevant/appropriate questions relating to issues and problems in the field of Zoology, and planning, executing and reporting the results of an experiment or investigation.
- **Team player/worker**: Capable of working effectively in a diverse classroom, laboratory, industry, and field-based situations.
- **Skilled project manager**: Capable of identifying/mobilizing appropriate resources required for a project and manage a project to completion while observing responsible and ethical scientific conduct; and safety and chemical hygiene regulations and practices.
- **Digitally literate**: Capable of using computers for Bioinformatics and computation and appropriate software for analysis of genomics and proteomics data, and employing modern bioinformatics search tools to locate, retrieve, and evaluate the location and biological annotation genes of different species.

- **Ethical awareness/reasoning**: Capable of conducting their work with honesty and precision, thus avoiding unethical behavior such as fabrication, falsification or misrepresentation of data or committing plagiarism, and appreciating environmental and sustainability issues.
- **Lifelong learners**: Capable of self-paced and self-directed learning aimed at personal development and improving knowledge/skill development and reskilling.

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's

New Arts, Commerce and Science College, Ahmednagar
(Autonomous)
Syllabus
B.Sc. Zoology (Major)

Title of the Course: Basic Zoology-I								
Year: I				**Semester: I**				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-1	BS-ZO111T	02	00	02	30	15	35	50

Learning Objectives:

1. To understand the basic concepts in zoology.
2. To understand the taxonomical terms and processes.
3. To understand the classification of living organisms with special emphasis on major animal phyla

Course Outcomes:

1. Understanding basics of origin of life and animal architecture.
2. Understanding the methods of classification of living organisms.
3. Understading the general charachteristics of major animal phyla.

Detailed Syllabus:

Unit	Name of Topic	Lectures Allotted
1.	Origin of life: Origin of life, Oparin and Haldane Theory, Urey and Millers Experiment, Origin of the Eukaryotic cell. Evolution of metazoa.	**(04)**
2.	Molecules of life: Carbohydrates, Lipids, Proteins, and Nucleic acids.	**(04)**
3.	Introduction to Animal Architecture: Symmetry, germ layers, coelom, levels of the organization, Protostomes and deuterostomes	**(03)**
4.	Introduction to Animal tissues, organs, and organ systems.	**(03)**
5.	Classification, Systematics, and Taxonomy; Taxonomic Hierarchy, Taxonomic types, Codes of Zoological Nomenclature; Principle of Priority; Synonymy and Homonymy; Concept of Species: Biological and Evolutionary. Introduction to Binomial Nomenclature. Concept of classification	**(04)**

–Two, Three Kingdoms, and Five Kingdom System of Classification.

6. Introduction to Kingdom Animalia: Nonchordates and chordates Invertebrates and Vertebrate, General Characteristics and Basic Body Plan of Nonchordates and Chordates. **(02)**
7. Introduction to Major Animal Phyla: Nonchordates and chordates (Porifera, Cnidaria, Platyhelminthes, Aschelminthes, Annelida, Arthropoda, Mollusca, Echinodermata,Protochordata, Chordata) **(10)**

Suggested Readings/Material:

1. **Powar C.B. Cell biology,** Himalaya Publication, Meerut.
2. **Dr. P.S.Verma and Dr. V. K. Agrawal, Cell Biology, Molecular Biology, Evolution and Ecology,** S. Chand Higher Academic, Publications.
3. **Karp, G. (2010) and Molecular Biology:** Concept and Experiments.VI Edition John Wiley and Sons. Inc.
4. **De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology**. VII Edition. Lippincott Williams and Wilkins, Philadelphia.
5. **Barnes, R.D. (1982). Invertebrate Zoology,** V Edition. Holt Saunders International Edition.
6. **Hadzi, J (1963): The Evolution of Metazoa,** Macmillan Newyork.
7. **Hyman. L. H (1955): The Invertebrates** Vol: I-X, Mcgraw Hill, Newyork.
8. **Modern Text-Book of Zoology, Invertebrates.** By Kotpal, RL., Rastogi and Co., Meerut.
9. **Nigam H.C., Zoology of Nonhordates,** Vishal Publication, Jalandhar-144008.
10. **Kotpal, RL. Rastogi Phylum Protozoa to Echinodermata (series),** Meerut
11. **Parker T.J and W.A Haswell (1972): A textbook of Zoology,** Vol –I (7th edition by Marshall and Williams) Mcmillan Press ltd.

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's

New Arts, Commerce and Science College, Ahmednagar
(Autonomous)
Syllabus
B.Sc. Zoology (Major)

Title of the Course: Cell Biology								
Year: I				**Semester: I**				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-2	BS-ZO112T	02	00	02	30	15	35	50

Learning Objectives:

1. To develop students' interest in cell biology
2. To provide basic knowledge of the general organization of a cell
3. To help students understand the structure and functions of various cell organelles
4. To provide basic knowledge of cell cycle
5. To provide basic knowledge regarding cell growth and death

Course Outcomes:

1. Understand the structure and types of cells.
2. Understand the structure and function of various cell organelles.
3. Understand the concepts of the cell division and cell death.
4. Understand the basic techniques in cell biology.

Detailed Syllabus:

Unit	Name of Topic	Lectures Allotted
1.	**Introduction to Cell Biology** Cell as a basic unit of life, Cell Theory, Structure and function of prokaryotic cell (*E. coli.*) Structure of eukaryotic cell (Plant Cell and Animal Cell).	**(03)**
2.	**Plasma Membrane** Introduction, Structure of plasma membrane: Fluid mosaic model, Transport across membranes: Active and Passive transport, Facilitated transport, exocytosis, endocytosis, phagocytosis – vesicles and their importance in transport, Other functions of Cell membrane- Protection, cell recognition, shape, storage, cell signaling (in brief), Cell Junctions: Tight junctions, gap junctions,	**(04)**

Desmosomes.

3. Endomembrane System **(05)**

Introduction, Structure, location and functions: Endoplasmic Reticulum, Golgi apparatus, Lysosomes and Ribosomes.

4. Mitochondria and Peroxisomes **(04)**

Introduction, ultrastructure and function of the mitochondria

Peroxisomes: Structure and function

5. Nucleus: Structure and function **(03)**

Introduction to Nucleus, Structure of Nucleus: Nuclear envelope, Nuclear pore complex, Nucleoplasm, Nucleolus, Functions of nucleus and nucleolus.

6. Introduction to Cytoskeleton: Microfilaments, Microtubules and Intermediate filaments. **(02)**

7. Cell Division **(04)**

Introduction, Cell cycle (G_O, G_1, S, G_2, M phases), Mitosis, Meiosis.

8. Cell Growth and Cell Death **(03)**

Cancer, Properties of cancer cell, Oncogenes and Tumor suppressor genes, Apoptosis and Necrosis.

9. Microscopy (in brief) **(02)**

Light Microscope

Phase-contrast microscope

Electron microscope

Suggested Readings:

12. **Powar C.B. Cell biology,** Himalaya Publication, Meerut.
13. **Dr. P.S.Verma and Dr. V. K. Agrawal, Cell Biology, Molecular Biology, Evolution and Ecology,** S. Chand Higher Academic, Publications.
14. **Karp, G. (2010) and Molecular Biology:** Concept and Experiments.VI Edition John Wiley and Sons. Inc.
15. **De Robertis, E.D.P. and De Robertis, E.M.F. (2006). Cell and Molecular Biology**. VII Edition. Lippincott Williams and Wilkins, Philadelphia.
16. **Copper , G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach,** V Edition. ASM Press and Sunderland, Washington, D.C.; Sinauer Associates, M.A.

17. **Becker , W.M. Kleinsmith, L.J. Hardin. J. and Bertoni, G.P. (2009). The World of the Cell.** VII Edition. Person Benjamin-Cummings Publishing, San Francisco.
18. **Bruce Albert, Bray Dennis, Levis Julian, Raff Martin, Roberts Keith and Watson James (2008). Molecular Biology of the Cell**, V Edition, Garland Publishing Inc., New York and London

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's

New Arts, Commerce and Science College, Ahmednagar
(Autonomous)
Syllabus
B.Sc. Zoology (Major)

Title of the Course: Zoology Practical Paper-I								
Year: I				**Semester: I**				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-3	BS-ZO113P	00	02	02	60	15	35	50

Learning Objectives:

1. To understand the taxonomical terms and processes.
2. To understand the classification of living organisms with special emphasis on major animal phyla.
3. To understand the basic techniques to study the cell.
4. To understand the various structural and functional aspects of cell.

Course Outcomes:

1. Understanding basics of origin of life and animal architecture.
2. Understanding the methods of classification of living organisms.
3. Understand the structure and types of cells.
4. Understand the structure and function of various cell organelles.

Detailed Syllabus:

Unit	Name of Practical	Practical Allotted
1.	Study of Microscope: Simple and Compound Microscope	**(01)**
2.	Study of permanent slides of animal tissues: Epithelial, Connective, Muscle, Nerve Tissues.	**(01)**
3.	Study of Bionomial Nomenclature with the help of any four examples.	
4.	Museum study of Porifera, Cnidaria, Platyhelminthes and Aschelminthes (any two type specimens of each Phylum).	**(01)**
5.	Museum study of Annelida, Arthropoda, Mollusca and Echinodermata (any two type specimens of each Phylum)	**(01)**
6.	Museum study of Pisces, Amphibia, Reptilia, Aves and Mammalia. (any two type specimens of each Classes)	**(01)**
7.	Qualitative analysis of Carbohydrate from animal tissue	**(01)**
8.	Qualitative analysis of Proteins from animal tissue	**(01)**
9.	Study of cell: Preparation of temporary mount of human buccal epithelial cells.	**(01)**

10.	Preparation of blood smears to observe the blood cells.	**(01)**
11.	Study of permanent slides of various stages of mitosis and meiosis.	**(01)**
12.	Temporary preparation of mitotic cells from onion root tips.	**(01)**
13.	Study of Cell organelles (any three) by using microphotographs.	**(01)**
14.	Study of types of cells. (permanent slide) any three.	**(01)**
15.	Visit to Zoological Museum/ National Park/ Wildlife Sanctuary/ Various Institutes	**(02)**

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New Arts, Commerce and Science College, Ahmednagar
(Autonomous)
Syllabus
B.Sc. Zoology (Major)

Title of the Course: Laboratory Techniques-I								
Year: I				**Semester: I**				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
SEC-1	BS-ZO114P	00	02	02	60	15	35	50

Learning Objectives:

1. To understand the basic techniques in biological science.
2. To understand the terminologies and formulae of chemical preparation.
3. To understand the various glasswares and devices in laboratory.

Course Outcomes:

1. Understanding the laboratory rules and regulations in wet lab.
2. Understanding the basic techniques and formulae of chemical preparation.
3. Understanding the fundamental processes of biological science.

Detailed Syllabus:

Unit	Name of Practical	Practical Allotted
1.	Study of laboratory safety practices and symbols	**(01)**
2.	Type, use, and maintenance of glassware in the laboratory.	**(01)**
3.	Measurements and measuring devices in the laboratory.	**(01)**
4.	Study of basic laboratory instruments	**(01)**
5.	Weighing Technique in the laboratory.	**(01)**
6.	Calibration of Volumetric Glassware.	**(01)**
7.	Sterilization Techniques in a Biology Laboratory.	**(01)**
8.	Preparation of %, Normal and Molar solutions.	**(01)**
9.	Preparation of normal saline, reagents and stains.	**(01)**
10.	Simple Acid-Base Titration	**(01)**
11.	Calibration of pH Meter and estimation of pH of a given sample	**(01)**
12.	Calculating Lambda max of a given molecule.	**(01)**
13.	Understanding the basic principle of the Colorimeter.	**(01)**
14.	Understanding the basic principle of Electrophoresis	**(01)**

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's

New Arts, Commerce and Science College, Ahmednagar

(Autonomous)

Syllabus

B.Sc. Zoology (Major)

Title of the Course:								
Year: I				**Semester: I**				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
IKS-1	BS-ZO115P	02	00	02	30	15	35	50

Note: Syllabus of IKS will be provided by the college.

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New Arts, Commerce and Science College, Ahmednagar
(Autonomous)
Syllabus
B.Sc. Zoology (Major)

Title of the Course: Mammalian Physiology								
Year: I				**Semester: II**				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-4	BS-ZO121T	03	00	03	45	30	70	100

Learning Objectives:

1. To understand the basic physiological processes of mammalian physiology.
2. To understand the structural and physiological aspects of mammalian physiology.
3. To inculcate the physiological aspect within the students.

Course Outcomes (COs)

1. Understand the physiological processes of animals (specific relation to mammals)
2. Understand the anatomical structures of physiological organs.
3. Learn the structure and role of various glands in physiology.

Detailed Syllabus:

	Name of Topic	Hours Allotted
1.	**Homeostasis: The central concept in physiology** An introduction to Animal Physiology The body fluids of animals Homeostasis Acclimation and Acclimatization	**(03)**
2.	**Nutrition and Digestion:** Anatomy of Mammalian Digestive System Physiology of Digestion. Vitamins - outline of fat soluble and water-soluble vitamins; Sources, deficiency and diseases.	**(05)**
3.	**Ventilation and Gas Exchange:** Anatomy of Respiratory System Lung ventilation. Structure and Function of Haemoglobin Transport of gases: O2 and CO2 transport.	**(05)**

4. Circulation: **(06)**

Blood: Definition and its constituents, functions of blood.
Heart: Structure of human heart, Pace maker, Cardiac Cycle.
Blood Vessels types: Arteries and Veins.
Portal System, ECG

5. Excretion: **(05)**

Structure of Mammalian Kidney, Structure and function of Nephron
Mechanism of urine formation.
Acid-Base Balance

6. Locomotion and Movement: **(05)**

Introduction to Human Skeleton,
Types of Muscles, Microscopic structure of skeletal muscles.
Sliding filament theory.

7. Reproduction: **(06)**

Sturcture of Male and Female Reproductive System (Rat)
Hormones of Testes and Ovaries.
Spermatogenesis and Oogenesis.

8. Endocrine System: **(04)**

Major Endocrine Glands their Hormones and Functions (Pituitary, Thyroid, Adrenal, Pancreas and Liver)

9. Nervous Control and Coordination **(06)**

Introduction to CNS, Structure of Nerve Cell, Types of Nerve Cell, Action Potential: Impulse generation and conduction, Resting Membrane Potential, Synapses: Types and transmission.

Suggested Readings/Material:

1. **Introduction to Animal Physiology**, Ian Kay, 2000, Bios Scientific Publishers Limited.
2. **Textbook of Medical Physiology**, Guyton A. C. & Hall J. E., 2006, 11th Edition, Hercourt Asia Pvt. Ltd. / W. B. Saunders Company
3. **Principles of Anatomy & Physiology, 2006**, 11th Edition, Tortora G. J. & Grabowski S., John Wiley & sons, Inc.
4. **Haematology:** De Gruchi.
5. **Human physiology,** Vol. I & II, 1980, 12th Edn. Dr. C. C. Chatterjee, Medical Applied Agency, Kolkata
6. **Text book of Animal Physiology**, 2008, 2nd Edn. Nagabhushanam, S. V. S. Rana, S. Kalavathy, Oxford University Press, India.
7. **Animal Physiology:** Adaptation and Environment, 1997, Schmidt-Nielsen, Knut, Cambridge University Press.
8. **General and Comparative Physiology**, 1983, 3rd Edn., Hoar W. S., Prentice Hall, UK.7.

9. **Medical Physiology**, 2006, Asis Das, Books and Allied Pvt. Ltd., Kolkata.
10. **Endocrinology,** 2005, Lohar P. S., M J P Publishers, Chennai.
11. **Vander, Sherman, Luciano's Human Physiology**: The Mechanisms of Body Function, 2003, 9 th Edn., Eric P. Widmaier, Hershel Raff, Kevin T. Strang, Mc Graw H.
12. **Tortora, G. J. and Derrickson, B. H. (2009) Principles of Anatomy and Physiology** (12th edition) John Wiley and Sons, Inc.

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's

New Arts, Commerce and Science College, Ahmednagar
(Autonomous)
Syllabus
B.Sc. Zoology (Major)

Title of the Course: Genetics								
Year: I				**Semester: II**				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
DSC-5	BS-ZO122T	03	00	03	45	30	70	100

Learning Objectives:

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

Course Outcomes:

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.	**(04)**
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	**(06)**

of multiple genes (polygenic inheritance) with reference to skin color in man

3. Chromosomes, Linkage and Recombination **(07)**

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

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

Linkage and recombination

4. Sex- determination: **(05)**

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

Environmental - Sex determination in *Bonellia*.

Dosage compensation

5. Population genetics: **(05)**

Gene pool, genotype and gene frequency,

Hardy-Weinberg's principle of population genetics,

Explanation of HW equation and its applications.

6. Human genetics and Chromosomal Disorders **(07)**

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 syndromes.

7. Sex linked inheritance in human and Mendelian Disorders **(06)**

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

Pedigree analysis with examples.

8. Applications of genetics **(05)**

Recombinant DNA Technology, Eugenics and Euthenics, Concept of cloning and transgenic animal, Gene Therapy.

Suggested Readings/Material:

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

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's

New Arts, Commerce and Science College, Ahmednagar
(Autonomous)
Syllabus
B.Sc. Zoology (Major)

Title of the Course: Zoology Practical Paper- II								
Year: I				**Semester: II**				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
SEC-2	BS-ZO123P	00	02	02	60	15	35	50

Learning Objectives:

1. To understand the basic physiological processes of mammalian physiology.
2. To understand the structural and physiological aspects of mammalian physiology.
3. To inculcate the physiological aspect within the students.
4. Understand basic patterns of heredity and variation in living animals.
5. Understand the patterns of inheritance in population

Course Outcomes:

1. To understand the basic physiological processes of mammalian physiology.
2. To understand the structural and physiological aspects of mammalian physiology.
3. Understand basic patterns of heredity and variation in living animals.
4. Understand the patterns of inheritance in population

Detailed Syllabus:

Unit	Name of Practical	Practical Allotted
1.	Haemoglobin estimation using Sahli's haemoglobinometer. (E)	**(01)**
2.	Preparation of haemin and haemochromogen crystals. (E)	**(01)**
3.	To estimate the blood glucose level from given sample. (E)	**(01)**
4.	Estimation of bleeding and clotting time. (E)	**(01)**
5.	Study of disorders caused by endocrine glands with the help of photographs. (D)	**(01)**
6.	Detection of blood groups in human being. (E)	**(01)**
7.	Qualitative detection of nitrogenous waste products (Ammonia, urea, uric acid) in given sample. (E)	**(01)**
8.	Demonstration of kymograph unit, Respirometer through available resources. (D)	**(01)**
9.	Measurement of lung capacity. (E)	**(01)**
10.	Solving monohybrid crosses in genetics based on hypothetical problems	**(01)**
11.	Solving Dihybrid crosses in genetics based on hypothetical	**(01)**

problems.

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.	**(01)**
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)**

Ahmednagar Jilha Maratha Vidya Prasarak Samaj's

New Arts, Commerce and Science College, Ahmednagar
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Syllabus
B.Sc. Zoology (Major)

Title of the Course: Laboratory Techniques- II								
Year: I				**Semester: II**				
Course Type	Course Code	Credit Distribution		Credits	Allotted Hours	Allotted Marks		
		Theory	Practical			CIE	ESE	Total
VSC-1	BS-ZO124P	00	02	02	60	15	35	50

Learning Objectives:

1. To understand the basic techniques in biological science.
2. To understand the terminologies and formulae of chemical preparation.
3. To understand the various glasswares and devices in laboratory.

Course Outcomes:

1. Understanding the laboratory rules and regulations in wet lab.
2. Understanding the basic techniques and formulae of chemical preparation.
3. Understanding the fundamental processes of biological science.

Detailed Syllabus:

Unit	Name of Practical	Practical Allotted
1.	Caliberation of Micrometer and Applications of Micrometry(D)	**(01)**
2.	Demonstration of spectrophotometer (D)	**(01)**
3.	Glassware and equipments for Haematology. (D)	**(01)**
4.	Techniques of Blood Collection(E)	**(01)**
5.	Plasma Separation (E)	**(02)**
6.	Serum separation (E)	**(01)**
7.	To perform Total leucocyte count by Haemocytometer (E)	**(01)**
8.	To perform Differential Leukocyte count (E)	**(01)**
9.	To perform Total RBC count (E)	**(01)**
10.	Stains used in Haematology (E)	**(01)**
11.	To measure blood pressure (E)	**(01)**
12.	Demonstration of ECG (D)	**(01)**
13.	Gram positive and Gram Negative Techniques (E)	**(01)**
14.	Paper chromatography(E)	**(01)**