

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II



Hindi Vidya Prachar Samiti's

Ramniranjan Jhunjhunwala College

of Arts, Science & Commerce

(Empowered Autonomous College)

Affiliated to

UNIVERSITY OF MUMBAI

Syllabus for the F.Y.B.Sc. MAJOR (under NEP)

SEMESTER : I & II

PROGRAM : B.Sc. ZOOLOGY

PROGRAM CODE : RJSUZOO

Course Code : RJMAJZOO111 & RJMAJZOO112

(REVISED in 2023-2024 in alignment with the NEP 2020 facilitating the inter and multidisciplinary learning and multiple entry and exit of the students.)

(CBCS 2023-2024)

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

PREAMBLE

The National Education Policy 2020 is the first education policy of the 21st century that aims to address the many growing developmental imperatives of our country. This Policy proposes the revision and revamping of all aspects of the education structure, including its regulation and governance, to create a new system that is aligned with the aspirational goals of 21st century education, including SDG4, while building upon India's traditions and value systems. National Education Policy is based on the principle that education must develop not only cognitive capacities - both the 'foundational capacities' of literacy and numeracy and 'higher-order' cognitive capacities, such as critical thinking and problem solving – but also social, ethical, and emotional capacities and dispositions.

In the three-year UG program, the student has two exit options. Students also have the option for choosing the Honors program of four years study in a given discipline and later converting it to five-year integrated PG degree program. As undergraduate student, he/she learns the core subject (Major), subject complementing the core subject (Minor), a course from other discipline (OEC or GEC) Vocational and Skill Enhancement course from the Major (VSEC). The remaining verticals under NEP 2020 are IKS (Indian Knowledge System), AEC (Ability Enhancement Course), VEC (Value Enhancement Course) and with progressive three years of UG, student also completes at different levels OJT (On Job Training), FP (Field Projects), CEP (Community Engagement Program), RP (Research Project) which helps him/her in understanding their roots, application of the knowledge for the benefit of self and the society. Vertical CC (Co-curricular activities and activities related to yoga and human well-being) helps in preparing youth with good character and inter personal relationships.

The Department of Zoology at Ramniranjan Jhunjhunwala College was established in 1963. Currently it offers undergraduate, postgraduate and Ph.D courses in the subject of Zoology. The department provides facilities such as a well-equipped lab. with LCD projectors, fish Museum and museum for specimen, departmental library, computer facility, research facilities to students. The subject of Zoology offers the basic understanding about the vast diversity of the animal kingdom across the globe. It enables the students to strengthen their knowledge in Animal Sciences and also in the other allied branches of Zoology. Keeping the interest of learner in mind, the syllabus has been carefully designed. It has a balance of the classical aspects of Zoology which includes topics like taxonomy, ecology and advanced aspects which include topics on introductory biochemistry and biotechnology.

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

The undergraduate curriculum has been meticulously designed by considering the need for the subject development, industry requirement, research outlook, competitive exams and entrepreneurship skills. Each unit included in the syllabus has clearly defined objectives. It focuses on outcome-based learning. It aims at inculcating the critical thinking, enhancing the analytical ability, developing writing skills of the students. The syllabus includes field trips to ecological habitats, national parks, sanctuaries, natural history museum, reputed research institutes and industries to widen the student's horizon. The students are encouraged to participate in various project-based activities.

Topics like animal diversity and ecology have been included to recognise the vital role animals play in ecosystem and also to develop empathy towards the animals. This will motivate students towards careers in wildlife right from the early graduation phase. To hone the analytical skills, topics such as animal biotechnology, bioinformatics, genetic engineering has been rightly placed in the syllabus. Wide range of topics such as life processes, biochemistry, molecular biology, genetics, toxicology, haematology, immunology, applied immunology, endocrinology, histology, animal tissue culture, Zoo pharmacognosy have been included. The course content includes applied biology-fishery, entomology, wildlife with a view of developing entrepreneurship skills in the learner.

Owing to the current needs of the industry and other sectors, the syllabi is designed in a manner that the learner will be able to apply the knowledge and skills acquired in varied fields. The course encourages a sense of responsibility and empathy towards all living beings, promoting sustainable practices in the learner.

PROGRAM OUTCOMES FOR UNDERGRADUATE DEGREE PROGRAM IN ZOOLOGY

Program outcome refers to the overall characteristic an individual is supposed to acquire on completion of the three-year degree program in Bachelor of Science. The attributes based on acquisition, accumulation, and processing of knowledge of the subject are transferable beyond the discipline and useful in different domains of life.

Critical Thinking: Concepts, methodology and ability to formulate questions stimulate the inquisitiveness and critical thinking amongst the students.

Scientific Temperament: The nurturing of the young minds to observe and analyse the experiments in the laboratory or a phenomenon occurring around them to obtain a logical scientific explanation for it.

Analytical Thinking: The ability to think analytically can be developed by training and practice. The syllabus offers the student to understand the concept and design projects or experiments based on them.

Domain knowledge: The domain knowledge is the key to the understanding of advances and complex subject matter.

Social Ethics: The students are exposed to different problems caused due to human activity. They learn to conduct themselves without creating a damage to fellow beings.

Animal Ethics: The sensitization towards ethical issues associated with use of animals in the laboratory is highlighted and the solutions to overcome it are introduced.

Problem Solving: The ability to handle a situation is enhanced in the students by problem solving assignments, case studies, projects to make them competent, conscious and creative individual.

Environmental Sustainability: Environment related issues are addressed through workshops, Guest lectures and field studies.

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

DEPARTMENT OF ZOOLOGY

PROGRAMME : B.SC ZOOLOGY

PROGRAMME SPECIFIC OUTCOMES (PSOS) FOR B.SC ZOOLOGY

Sr. .No.	A student completing BSc.Zoology will be able to:
PSO1	Understands the nature and basic concepts of systematic classification, ecology, biomolecules, animal biotechnology, cell biology and genetics.
PSO2	Analyse and comprehend the concepts of Enzymology, developmental biology, histology and molecular biology. Acquaint with the skills in fishery biology, medical diagnostics and environment management to boost entrepreneurship skills.
PSO3	Acquire skills and necessary training for techniques in haematology, immunology, physiology, endocrinology, molecular biology, toxicology and field biology. Enhance knowledge on biostatistics, bioinformatics, Wild-life tourism and epidemiology to provide wider job prospects in the realm of Zoology.
PSO4	Perform laboratory procedures as per standard protocols in the areas of animal diversity, genetics, biochemistry, molecular biology, physiology, immunology, developmental biology, environmental biology and ethology.
PSO5	Apply ethical principles and knowledge in understanding of Zoology to one's own life and work. Applications of biological sciences in different areas that contributes towards Nation building.

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

Credit Structure for B.Sc Semester I as per NEP 2020 Implemented
from the academic year 2023-2024
Course Code: RJMAJZOO111

Semester I
Level 4.5 Major Zoology

Courses	Credits	Total Credits	Course Titles
Major Theory I	2	6	Systematics and Diversity of Life and Fundamentals of Ecology RJMAJZOO111
Major Theory II	2		Biomolecules and Basics in animal Biotechnology. RJMAJZOO112
Major Practical	2		Practicals related to Theory I & II RJMAJZOOP111
Minor Theory I Chemistry/Botany	2	6	As offered by the Dept of Chemistry/Botany (student has made a choice while taking admission)
Minor Theory II Chemistry/Botany	2		
Minor Practical	2		
Open Elective Course (OEC)/ Generic Elective Course (GEC)	2	2	Zoology students will choose OEC/GEC from the basket of courses offered by Commerce and Arts. Department of Zoology offers students OEC: RJOECZOO111- Biodiversity and Conservation
Vocational & Skill Enhancement Course (VSEC)	2 (Practical based)	2	Basic Laboratory Techniques. RJVSCZOO111
*Value Enhancement Course (VEC)	2	2	Environmental Science RJVECZOO111
Ability Enhancement Course (AEC)	2	-	-
Indian Knowledge System (IKS)	2	2	Bharatavarsha and Pranishastra RJIKSZOO111
Co-curricular Course (CC)	2	2	Co-curricular/ Extension activities/Community service (30 hour) RJCCZOO111
Total Credits	22	22	

*As per University Grid

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

**Credit Structure for B Sc Semester II as per NEP 2020 Implemented
from the academic year 2023-2024
Course Code: RJMAJZOO112**

**Semester II
Level 4.5 Major Zoology**

Courses	Credits	Total Credits	Course Titles
Major Theory I	2	6	Systematics and Diversity of Life and Cell biology RJMAJZOO121
Major Theory II	2		Biomolecules and Genetics RJMAJZOO122
Major Practical	2		Practicals related to Theory I & II RJMAJZOO121
Minor Theory I Chemistry/Botany	2	6	As offered by the Dept of Chemistry/Botany (student has made a choice while taking admission)
Minor Theory II Chemistry/Botany	2		
Minor Practical	2		
Open Elective Course (OEC)/ Generic Elective Course (GEC)	2	2	Students shall choose from the basket of Electives offered by the departments of Arts and Commerce Department of Zoology offers OEC RJOECZOO121 - 'Management Of Lifestyle Diseases' to students of Arts and Commerce faculties.
Vocational & Skill Enhancement Course (SEC)	2 (Practical based)	2	Fundamentals of techniques in Biotechnology RJSECZOO121
*Value Enhancement Course (VEC)	2	2	Environmental Science RJVECZOO121
*Ability Enhancement Course (AEC)	2	2	Communication Skills in English RJAECZOO121
IKS	--	-	-
CC	2	2	Co-curricular/ Community service 30 hour RJCCZOO121
Total Credits	22	22	

***As per University Grid**

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

**DISTRIBUTION OF TOPICS AND CREDITS AS PER NEP 2020 IMPLEMENTED FROM
ACADEMIC YEAR 2023-2024**

F.Y.B.Sc. ZOOLOGY SEMESTER I

Course code	Unit	Topic headings	Credits	Duration
RJMAJZOO111	Paper Title: Systematics and Diversity of Life and Fundamentals of Ecology.		02	30 Hours
	I	Systematics and Diversity of Life- I		
	II	Fundamentals of Ecology		

Course code	Unit	Topic headings	Credits	Duration
RJMAJZOO112	Paper Title: Biomolecules and Basics in animal Biotechnology.		02	30 Hours
	I	Biomolecules-I		
	II	Basics in Animal Biotechnology		

Course code	Topic headings		Credits	Duration
RJMAJZOO111	Practical based on Paper I and II		02	60 Hours

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

SEMESTER	:	I
TITLE OF THE SUBJECT/COURSE	:	SYSTEMATICS AND DIVERSITY OF LIFE AND FUNDAMENTALS OF ECOLOGY
COURSE CODE	:	RJMAJZOO111
CREDITS	:	02
DURATION	:	30 HRS

LEARNING OBJECTIVES	
1	To introduce classification of living organisms.
2	To emphasize on levels of structural organization in animals.
3	To understand the concepts of ecology and ecosystem.

COURSE OUTCOMES	AFTER COMPLETING THE COURSE, THE LEARNER WILL BE ABLE TO;	PSO ADDRESSED	BLOOM'S TAXONOMY LEVEL
CO1	identify and associate the phylum with specific structural organization.	1, 4	BT Level I, II identify, classify and describe
CO2	understand the interaction and effects of various biotic and abiotic factors	1, 3, 4	BT level I Understand

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

F.Y.B.Sc ZOOLOGY SEMESTER-I (THEORY)	L Hrs	Cr
PAPER I-Title: Systematics and Diversity of Life and Fundamentals of Ecology Course Code: RJMAJZOO111	30	02
UNIT I	15	
Systematics and Diversity of Life -I		
1.1 Introduction to systematics and systems of classification with emphasis on Kingdom Animalia 1.2 Levels of Organization: Organisation of germ layers, Coelom development and its type, Types of symmetry, Segmentation and Cephalisation. 1.3 Salient features of phyla (non-Chordate) and their classes I: Porifera, Coelenterata Platyhelminthes, Nematelminthes. 1.4 Salient features of phyla (non-Chordate) and their classes II : Annelida, Arthropoda, Mollusca, Echinodermata.		
UNIT II	15	
Fundamentals of Ecology		
2.1 Introduction to Ecology: Scope of Ecology, Law of limiting factor, Concept of habitat and niche. 2.2 Ecosystem: Components of ecosystem, food chain & food web, energy pyramids, energy flow in ecosystem, Primary and secondary productivity. 2.3 Study of Physical Factors: Light, Temperature and Soil. 2.4 Animal Interaction: Commensalism, Amensalism, Mutualism, Parasitism, Predation and Competition. 2.5 Population Ecology: Concept, Factors influencing population dynamics, growth curves and survivorship curves, population dispersal.		

Suggested References:

1. Invertebrate Zoology Volume II- Jordan and Verma.
2. A Text book of Invertebrate Zoology - S. N. Prasad.
3. Invertebrate Zoology, Barnes, R.D.
4. Invertebrate zoology, Dhami, P.S and Dhami, J. K.
5. Modern Textbook of Zoology, Invertebrates, R. L. Kotpal
6. Modern Biology- V. B. Rastogi
7. Fundamentals of Ecology-E.P Odum
8. Ecology and Environment-P.D.Sharma, R.K Rastogi

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

SEMESTER	:	I
TITLE OF THE SUBJECT/COURSE	:	BIOMOLECULES AND BASICS IN ANIMAL BIOTECHNOLOGY
COURSE CODE	:	RJMAJZOO112
CREDITS	:	02
DURATION	:	30 HRS

LEARNING OBJECTIVES	
1	To appreciate the structure and functions of biomolecules.
2	To introduce the concepts and principles of biotechnology.
3	To develop the skills and techniques required in the field of biotechnology.

COURSE OUTCOMES	AFTER COMPLETING THE COURSE THE LEARNER WILL BE ABLE TO:	PSO ADDRESSED	BLOOM'S TAXONOMY LEVEL
CO1	understand the structure- function relationship of biomolecules.	1,4	BT Level I, II, remember, understand
CO2	comprehend the methods of transgenesis and various ethical issues associated with it.	2,3	BT level I, II and III Gain knowledge, relate, articulate
CO3	familiarize with the applications of biotechnology.	4,5	BT level III, Apply

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

F.Y.B.Sc ZOOLOGY SEMESTER-I (THEORY)	L Hrs	Cr
PAPER II - Biomolecules and Basics in Animal biotechnology Course Code: RJMAJZOO112	30	02
UNIT I		
BIOMOLECULES-I	15	
1.1 Basic biochemistry: Concept of monomers & polymers, Role and significance of carbon, types of chemical bonds. 1.2 Water: Structure and properties (physical and chemical). 1.3 pH and buffer: Definition of pH, pH scale, Concept of buffer. 1.4 Carbohydrates: Classification, Isomerisation and biological role. 1.5 Nucleic Acids: Structure of nucleotides, DNA and its types (A, B & Z), RNA and its types. Biological role of nucleic acids.		
UNIT II		
BASICS IN ANIMAL BIOTECHNOLOGY	15	
2.1 Introduction :Concept of Biotechnology, An overview of achievements in the field of fishery, animal husbandry, medicine and industry. 2.2 Transgenesis : Definition, Methods of transgenesis- Retroviral method, nuclear transplantation method, DNA micro injection method and embryonic stem cell method. 2.3 Cloning: Animal Cloning (Dolly experiment), Ethical issues of transgenic and cloned animals. 2.4 Applications of Biotechnology: Forensic biotechnology, Enzyme Technology and medical biotechnology.		

Suggested References:

1. Biochemistry –U. Satyanarayana
2. Biochemistry-Conn & Stump
3. Introductory Practical Biochemistry – S.K. Sawhney and Randhir Singh.
4. Biotechnology -John Smith
5. Basic biotechnology- Colin and Bjorn
6. Animal biotechnology-R. Sasidhara

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

SEMESTER	:	I
TITLE OF THE SUBJECT/COURSE	:	PRACTICALS BASED ON 1.SYSTEMATICS AND DIVERSITY OF LIFE & FUNDAMENTALS OF ECOLOGY. 2.BIOMOLECULES-I AND BASICS IN ANIMAL BIOTECHNOLOGY
COURSE CODE	:	RJMAJZOO111
CREDITS	:	02
DURATION	:	60 HRS

LEARNING OBJECTIVES	
1	To study the animal classification.
2	To perform soil analysis for selected parameters.
3	To introduce concepts of population ecology.
4	To understand the significance of qualitative estimations of biomolecules.

COURSE OUTCOMES	AFTER COMPLETING THE COURSE, THE LEARNER WILL BE ABLE TO;	PSO ADDRESSED	BLOOM'S TAXONOMY LEVEL
CO1	identify and classify the animals based on their external features into phylum and class.	1, 4	BT Level I, II identify, classify and describe
CO2	develop the analytical thinking and application skills.	1, 3, 4	BT level I,IV Understand, analyze

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

F.Y.B.Sc ZOOLOGY SEMESTER-I (PRACTICALS)
Paper Code: RJMAJZOOPI11
Practical based on PAPER I: 1. Observation of permanent slides and specimen A. Levels of organization in Animal kingdom i. Symmetry: Amoeba, Aurelia, Planaria ii. Coelom: T.S. of Planaria, T.S. of Ascaris, T.S. of Earthworm iii. Segmentation : Tapeworm, Earthworm iv. Cephalization : Cockroach, Crab. B. Animal Diversity -I i. Porifera: Leucosolenia, Euplectella, Bath sponge ii. Coelenterate: Hydra, Aurelia, Sea anemone, Tubipora iii. Platyhelminthes: Planaria, Liver fluke and Tapeworm iv. Nematelminthes: Ascaris v. Annelida: Nereis, Earthworm, Leech vi. Arthropoda: Lobster, Beetle, Spider, Centipede vii. Mollusca: Chiton, Dentalium, Pila, Unio, Sepia viii. Echinodermata: Starfish, Brittle star, Sea urchin, Sea cucumber, Feather star. 2. Determination of soil pH: by pH metre, universal indicator, pH paper. 3. Estimation of salinity by refractometer. 4. Determination of population density: Subsampling method using Daphnia. 5. Study of population size by mark, release, recapture method Practical based on PAPER II: 6. Qualitative tests for carbohydrates. 7. Extraction and qualitative detection of DNA. 8. Extraction and qualitative detection of RNA.

References:

1. Invertebrate Zoology- E.L.Jordan
2. Introductory Practical Biochemistry – S.K. Sawhney and Randhir Singh
3. Introduction to Practical Biochemistry – David T. Plummer.

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

QUESTION PAPER FOR PRACTICAL EXAMINATION -SEMESTER I

PRACTICAL PAPER CODE: RJMAJZOOP111

Total marks: 50

Q.1 Major experiment **11M**

A) DNA **OR** B) RNA **OR** C) Soil pH **OR** D) Test for Carbohydrates

Q.2.Minor experiment **08 M**

A. Salinity of water by refractometer. **OR**

B. Estimation of population density of *Daphnia*

OR

C. Study of population size by mark, release, recapture method

Q3 Identification **21 M**

a. Symmetry/Coelom

b. Segmentation/Cephalization

c. Identify& classify: Porifera/ Coelenterata

d. Identify& classify:Platyhelminthes/Nemathelminthes

e. Identify& classify: Annelida/Arthropoda

f. Identify& classify: Mollusca

g. Identify& classify:Echinodermata

Q.4 Viva **05M**

Q.5 Journal and attendance **05M**

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

SKELETON PAPER FOR THEORY -SEMESTER I

Total marks: 30

Q1. Attempt any three from the following (BASED ON UNIT I).

15M

- 1.
- 2
- 3
- 4
- 5
- 6

Q2. Attempt any three from the following (BASED ON UNIT 2).

15M

- 1.
- 2
- 3
- 4
- 5
- 6

SEMESTER-II

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

F.Y.B.Sc. ZOOLOGY SEMESTER II (Major)

**DISTRIBUTION OF TOPICS AND CREDITS AS PER NEP 2020 IMPLEMENTED FROM
ACADEMIC YEAR 2023-2024**

Course code	Unit	Topic headings	Credits	Duration
RJMAJZOO121	Paper Title: Systematics and Diversity of Life and Cell biology.		02	30 Hours
	I	Systematics and Diversity of Life- II		
	II	Cell Biology		

Course code	Unit	Topic headings	Credits	Duration
RJMAJZOO122	Paper Title: Biomolecules and Genetics		02	30 Hours
	I	Biomolecules-II		
	II	Genetics		

Course code	Topic headings		Credits	Duration
RJMAJZOO121	Practical based on Paper I and II		02	60 Hours

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

SEMESTER	:	II
TITLE OF THE SUBJECT/COURSE	:	SYSTEMATICS AND DIVERSITY OF LIFE AND CELL BIOLOGY .
COURSE CODE	:	RJMAJZOO121
CREDITS	:	02
DURATION	:	30 HRS

LEARNING OBJECTIVES	
1	To acquire knowledge about the diversity of chordates.
2	To identify, classify chordates and vertebrates on the basis of their salient features.
3	To understand the structural and functional organisation of cells.
4	To analyse the complexities of the nucleus and organelles of the cell.

COURSE OUTCOMES	AFTER COMPLETING THE COURSE, THE LEARNER WILL BE ABLE TO;	PSO ADDRESSED	BLOOM'S TAXONOMY LEVEL
CO1	understand the taxonomy with respect to chordate and vertebrate characteristic features.	1, 4	BT Level I, II identify, classify and describe
CO2	acquire insights into the structural and functional aspects of a cell and its organelles .	1, 2, 4	BT level I, III Understand, Analyse

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

F.Y.B.Sc ZOOLOGY SEMESTER-II (THEORY)	L Hrs	Cr
PAPER I-Title: Systematics and Diversity of Life and Cell Biology Course Code: RJMAJZOO121	30	2
UNIT I		
SYSTEMATICS AND DIVERSITY OF LIFE- II	15	
1.1 Salient features of Hemichordata and their classes 1.2 Salient features of Chordata 1.3 Salient features of Protochordata and their classes 1.4 Salient features of Subphylum Vertebrata up to their classes.		
UNIT II		
CELL BIOLOGY	15	
2.1 Cellular Organization: Difference between Prokaryotes and Eukaryotes. 2.2 Structure and function of Plasma membrane, Importance of membrane fluidity and asymmetry . 2.3 Cytoplasmic Membrane System: Structure and function of Endoplasmic Reticulum(SER, RER), Golgi Complex, Lysosomes: Primary and Secondary Lysosomes 2.4 Structure and Function: Mitochondria, Nucleus		

Suggested References:

1. Chordate Zoology- Jordan E. L. and P. S. Verma.
2. Chordate Zoology- Dhami P. S. and Dhami J. K..
3. Vertebrate Zoology Volume I- Jordan and Verma.
4. Cell Biology- Singh and Tomar.
5. Cell and Molecular Biology E.D.P De Robertis and E.M.R Robertis
6. Cell Biology- Pawar.

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

SEMESTER	:	II
TITLE OF THE SUBJECT/COURSE	:	BIOMOLECULES AND GENETICS
COURSE CODE	:	RJMAJZOO122
CREDITS	:	02
DURATION	:	30 HRS

LEARNING OBJECTIVES	
1	To understand the structure and biological significance of proteins, lipids and Vitamins.
2	To introduce concepts of inheritance with special emphasis on Mendelian genetics, multiple alleles, linkage and crossing over.

COURSE OUTCOMES	AFTER COMPLETING THE COURSE THE LEARNER WILL BE ABLE TO:	PSO ADDRESSED	BLOOM'S TAXONOMY LEVEL
CO1	understand the structure and function of lipids and proteins and vitamins.	1,4	BT Level I, II, remember, understand
CO2	apply the principles of Mendelian inheritance.	2	BT level I, II and III Gain knowledge, understand, relate
CO3	comprehend the concept of crossing over and linkage.	1,4	BT level III, Apply

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

F.Y.B.Sc ZOOLOGY SEMESTER-II (THEORY)		L Hrs	Cr.
PAPER II - Biomolecules-II and Genetics		30	2
Course Code: RJMAJZOO122			
UNIT I			
BIOMOLECULES-II		15	
1.1 Lipids: Introduction, classification of Lipids, simple, compound & derived lipids, Saturated & Unsaturated Fatty Acids, Glycerides (mono, di & tri), Biological roles of lipids.			
1.2: Proteins: Structure & Classification of Amino acids, amino acid pool, Peptide bond, Structure of protein- primary, secondary, tertiary and quaternary. Biological role of proteins			
1.3: Vitamins: Introduction and classification. Biological role of vitamins.			
UNIT II			
GENETICS		15	
2.1 Introduction to genetics : Definition and scope of genetics. Brief explanation of the following terms: Gene ,Allele, wild type and mutant alleles, locus, dominant and recessive traits, homozygous and heterozygous, genotype and phenotype.			
2.2 Mendelian Genetics : Mendel's laws of Inheritance, Monohybrid cross, Dihybrid cross, Exceptions to Mendelian Inheritance : Incomplete dominance, Co-dominance.			
2.3 Multiple Alleles : Concept of multiple alleles, Coat colour in rabbit, ABO and Rh blood group systems in man.			
2.4 Linkage and Crossing Over : Concept of Linkage and crossing over and its mechanism			

Suggested References:

1. Biochemistry- Harper.
2. Outline of Biochemistry- E.E. Conn and P.K. Stumpf
3. Principles of Biochemistry- Lehninger A.L. Nelson D.L. and Cox M.M ,
4. Principles of Genetics. Gardner, E.J., Simmons, M.J and Snustad, D.P. John Wileyand Sons.
5. Concepts of Genetics. Klug, W.S., Cummings M.R., Spencer, C.A. Benjamin Cummings.
6. Principles of Genetics -Eldon John Gardner, Michael J. Simmons, D. Peter Snustad
7. Genetics-W. Strickberger

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

SEMESTER	:	II
TITLE OF THE SUBJECT/COURSE	:	PRACTICALS BASED ON 1.SYSTEMATICS AND DIVERSITY OF LIFE AND CELL BIOLOGY . 2. BIOMOLECULES AND GENETICS.
COURSE CODE	:	RJMAJZOO121
CREDITS	:	02
DURATION	:	60 HRS

LEARNING OBJECTIVES	
1	Enable learners to identify and associate the phylum with specific structural organisation.
2	To make the learner observe different cell organelles using permanent slide or microphotograph.
3	To introduce mathematical approaches and probability to solve problems based on genetics.

COURSE OUTCOMES	AFTER COMPLETING THE COURSE, THE LEARNER WILL BE ABLE TO;	PSO ADDRESSED	BLOOM'S TAXONOMY LEVEL
CO1	identify and associate the phylum with specific structural organisation.	1, 4	BT Level I, II identify, classify and describe
CO2	comprehend microphotographs and permanent slides to study different cell organelles.	1, 3, 4	BT level I Understand
CO3	understand mathematical approaches and probability to solve problems based on genetics.	1,5	BT level I,II Understand, Apply

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

F.Y.B.Sc ZOOLOGY SEMESTER-II (PRACTICALS)		
PRACTICAL PAPER CODE: RJMAJZOOP121		
Practicals based on PAPER I:		
1.Observation of slides and specimens.		
● Hemichordata: Balanoglossus ● Urochordata: Herdmania ● Cephalochordata: Amphioxus ● Cyclostomata: Petromyzon ● Pisces: Chondrichthyes: Stingray ● Osteichthyes: Rohu ● Amphibia: Caecilian, Salamander, Frog ● Reptilia: Turtle, Chameleon, Cobra, Crocodile. ● Aves: Ostrich, Kingfisher, Duck ● Mammalia: Platypus, Kangaroo, Shrew, Dolphin, Bat.		
2. Ultrastructure of cell organelles – (Electron micrographs)		
a. Nucleus	b. Endoplasmic reticulum (smooth and rough)	c. Mitochondria
d. Golgi apparatus	e. Lysosomes	
Practicals based on PAPER II:		
3..Qualitative tests for proteins.		
4. Qualitative tests for lipids.		
5. Qualitative estimation of Vitamin C by Iodometric method.		
6. Problems based on genetics.		
7. Field visit and report submission		

References:

1. Biochemistry –U. Satyanarayana
2. Introduction to Practical Biochemistry – David T. Plummer
3. Introductory Practical Biochemistry – S.K. Sawhney and Randhir Singh.
4. Problems on genetics molecular genetics and evolutionary genetics- Pranab kumar Banerjee.

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

QUESTION PAPER FOR PRACTICAL EXAMINATION -SEMESTER II

PRACTICAL PAPER CODE: RJMAJZOOP121

Total marks: 50

Q.1 Major experiment **10M**

Qualitative tests for;

A. Proteins **OR** B. Lipids **OR** C. Vitamin C

Q.2.Minor experiment (Problem based on genetics) **07M**

Monohybrid, Dihybrid **OR** Multiple allelism

Q3. Identification **18M**

a. Identify and classify Hemichordata /Urochordata/ Cephalochordata/ Cyclostomata

b. Identify and classify Chondrichthyes/Osteichthyes

c. Identify and classify Amphibia

d. Identify and classify Reptilia

e. Identify and classify Aves/ Mammalia

f. Identify and Comment on ultrastructure of cell organelle - **Nucleus/Mitochondria/Golgi**

Apparatus/Lysosomes/Endoplasmic Reticulum

Q4. Excursion Report **05M**

Q5. Viva **05M**

Q6. Journal and attendance **05M**

SKELETON PAPER FOR THEORY -SEMESTER II

Total marks: 30

Q1. Attempt any three from the following (BASED ON UNIT I).

15M

- 1.
- 2
- 3
- 4
- 5
- 6

Q2. Attempt any three from the following (BASED ON UNIT 2).

15M

- 1.
- 2
- 3
- 4
- 5
- 6

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

Scheme of Examinations

1. Internal examination 20 marks by MCQ/Assignment/Project/Survey/Presentation/Seminar.
2. One External (Semester End Examination) of 30 marks. Duration 1 hour.
3. One combined Practical Examination at the end of Semester consisting of 50 marks with minimum 20 marks for passing.
4. Minimum marks for passing Semester End Theory and Practical Exam are 40 %.
5. Students must appear for Internals to be eligible for the Semester End Examination.
6. Students must appear Semester End Examination to be able to complete total credits for a given Semester.
7. Field excursion is compulsory.
8. A candidate will be allowed to appear for the practical examinations if he/she submits a certified Journal of F.Y.B.Sc. Zoology.
9. HOD's decision, in consultation with the Principal, shall remain final and abiding to all.

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

Mapping of the course to Local/ Regional/National/International relevance

Class	Course Name	Course Code	Local relevance	Regional relevance	National relevance	International relevance
F Y B Sc Zoology	Systematics and Diversity of Life and Fundamentals of Ecology. Biomolecules and Basics in animal Biotechnology .	RJMAJZOO111 RJMAJZOO121	Relevance of Population Dynamics Locally	Relevant to the types of Regional Ecosystems	It will help to identify and classify invertebrate and understanding their ecology. Relevant to Biotechnology industries in India.	Application of Biotechnology on global scenario.
F Y B Sc Zoology	Systematics and diversity of Life and Cell biology Biomolecules and Genetics	RJMAJZOO121 RJMAJZOO122	Relevance of Population Dynamics Locally. Relevance of locally available food in nutrition.	Relevant to the types of Regional Ecosystems	It will help to identify and classify vertebrate and understanding their ecology. Application of Genetics in prevalence of certain genetic diseases.	The role of Biomolecules in the designing of nutrition with respect to Environmental requirements.
F Y B Sc Zoology	Practicals	RJMAJZOOP 101 RJMAJZOOP 121	Soil pH, salinity of local areas and understand their local relevance.	Study of diversity of animals relating it with their regional distribution.	The techniques learnt can be used to study distribution of animals in India	The techniques learnt w.r.t can be used in sampling of soil and water across the globe.

F.Y.B. Sc NEP Zoology Major Syllabus Semester- I & II

Mapping of the course to Employability/ Entrepreneurship/Skill development

The purpose of education is to craft a career that gives job satisfaction and stability. The designing of any course work should therefore be able to cater to this aspiration of the students. There are always some students who have entrepreneurial skills and are looking to learn something that fulfills their desire to be an entrepreneur. Knowledge gets an edge when it imparts skills that can then be used to refine the same knowledge and make it applicable. This skill-based learning sets a foundation for a bright and better future.

Class	Course Name	Course Code	Topic focussing on Employability/ Entrepreneurship/skill development	Employability/Entrepreneurship/Skill development	Specific activity
F Y B Sc Zoology	Systemics and Diversity of Life-I Fundamentals of Ecology Biomolecules-I Basics in Animal Biotechnology	RJMAJZOO111 RJMAJZOO112	Systemics and Diversity focusses on identification and classification of invertebrates. Fundamentals of ecology Biomolecules-I Animal Biotechnology	The topics focus on identifying invertebrates. These are used as biosensors of pollution, model organisms in research laboratory, food for aquaculture. The knowledge of habitat of animals can be applied in designing of zoo, employability in Zoo, survey of population, field based census. The skill for employability as lab technician. In the field of research.	Taxonomic classification of invertebrates. Habitat, ecosystem and their characteristics, adaptations of animals, population ecology. Knowledge of biomolecules and their diagnostic applications.
F Y B Sc Zoology	Systemics and Diversity of Life-I and Cell Biology Biomolecules II and Genetics	RJMAJZOO121 RJMAJZOO122	Systemics and Diversity of Life-I Biomolecules-II	The topics focus on identifying vertebrates. Skills for survey-based research, ecological studies. The skill for employability as lab technician. In the field of diagnostics	Taxonomic classification of vertebrates. Classification and biochemical properties.
F Y B Sc Zoology	Practical's	RJMAJZOOP 111, RJMAJZOOP 121,		Basic laboratory Skills Analytical skills Interpretation skills Writing skills	Soil analysis, salinity estimation, identification and classification of animals.