

Resolution No.:AC/I(19-20).2.RUS12

**S.P. Mandali's
RAMNARAIN RUIA AUTONOMOUS COLLEGE**



Syllabus for: F.Y.B.Sc.

Program: B.Sc.

Course Code: ZOOLOGY (**RUSZOO**)

(Choice Based Credit System (CBCS) with effect from academic year 2019-20)

PREFACE

Science plays a key role in overall advancement and progress of the society. All UG and PG students should be accordingly equipped with well designed and structured knowledge, current evolvments and skills to contribute in all fields of science and technology. This approach has compelled us to include necessary modifications to syllabi of University of Mumbai. The subject board meeting was conducted to receive and include all the necessary suggestions for the benefaction and betterment of students. Here we present revised F.Y.B.Sc. syllabus for Semester I and Semester II which emphasizes on development of students from scientific point of view. It is hoped that this curriculum document prepared would provide the expected level of competency.

Syllabus for F.Y.B.Sc. Course – ZOOLOGY SEMESTER – I
Credit Based and Grading System

SEMESTER - I

Paper code	Unit	Topics	Credits	Lectures/week
Paper I RUSZOO101	I	Levels of organization: Non-chordates	2	3
	II	Wonders of animal world		
	III	Biodiversity and its conservation		
Paper II RUSZOO102	I	Laboratory safety and units of measurements	2	3
	II	Animal biotechnology		
	III	Instrumentation		
Practical RUSZOO101	Practical based on both Papers (RUSZOO101 and RUSZOO102)		2	6

SEMESTER - II

Syllabus for F.Y.B.Sc. Course – ZOOLOGY

Paper code	Unit	Topics	Credits	Lectures/week
Paper I RUSZOO201	I	Levels of organization: Chordates	2	3
	II	Population Ecology and Ecosystem		
	III	National parks and Sanctuaries		
Paper II RUSZOO202	I	Nutrition and health	2	3
	II	Public health and hygiene		
	III	Common human Diseases.		
Practical RUSZOO201	Practical based on both Papers (RUSZOO201 and RUSZOO202)		2	6

UNIT WISE DISTRIBUTION

SEMESTER –I		SEMESTER-II	
Paper I	Paper II	Paper I	Paper II
Levels of organization: Non-chordates	Laboratory safety and units of measurements	Levels of organization: Chordates	Nutrition and health
Wonders of animal world	Animal biotechnology	Population Ecology and Ecosystem	Public health and hygiene
Biodiversity and its conservation	Instrumentation	National parks and Sanctuaries	Common human Diseases
Practical Based on Paper I	Practical Based on Paper II	Practical Based on Paper I	Practical Based on Paper II

**F.Y.B.Sc. ZOOLOGY
(THEORY)
SEMESTER I**

**Paper I
Paper Code RUSZOO101**

**LEVELS OF ORGANIZATION: NON-CHORDATES, WONDERS OF ANIMAL
WORLD AND BIODIVERSITY AND ITS CONSERVATION**

Objective:

- To make learners acquainted with basics of animal classification through levels of organization in Invertebrates including the introduction to wealth of marvelous animal world and rich heritage of Biodiversity of India

Desired Outcome:

- Curiosity will be ignited in the mind of learners, to know more about the classification of invertebrates, fascinating world of animal and treasure of Biodiversity, which will make them, understand significance of its conservation and hence would contribute their best for it.

Unit I: Levels of Organization: Non-chordates (15 Lectures)

1.1: Levels of organization in animal kingdom:

1.1.1: Uni-cellularity versus multi-cellularity, colonization and organization of germ layers (Diploblastic and triploblastic condition) - Division of labour and organization of tissues (brief fate of ectoderm, mesoderm and endoderm)

1.1.2: Coelom - Types

- a) Acoelomate - e.g. Platyhelminthes - *Planaria*
- b) Pseudocoelomate - e.g. Nematoda - *Ascaris* (Round worm)
- c) Coelomate - e.g. Annelida - *Pheretima* (Earthworm)

1.1.3: Symmetry - Types

- a) Asymmetry - e.g. *Amoeba*
- b) Radial - e.g. Bi-radial - *Aurelia* (Jelly -fish); Penta-radial- *Asterais* (Starfish)
- c) Bi-lateral- e.g. Simple- *Planaria*; Complex - *Mus* (Rat)

1.1.4: Segmentation and metamerism - Types

- a) Homonymous - e.g. Annelida- *Pheretima* (Earthworm)
- b) Heteronomous - e.g. Crustacean- *Panulirus* (Lobster)
- c) Cephalization -e.g. Insecta- *Periplanata* (cockroach)
- d) Tagmatization -e.g. *Panulirus* (Lobster)
- e) Cephalothorax - e.g- *Penaeus* (Prawn)

1.2: Unicellular and multicellular organization:

(Salient features with examples for phyla, sub-phyla and classes mentioned below)

1.2.1: Unicellular organization: phylum Protozoa

1.2.2: Multicellular organization: Colonization level -Phylum Porifera

1.2.3: Multicellular organization: Division of labour (cell -differentiation) Phylum Coelenterate

1.3: Triploblastic Acoelomate and Pseudocoelomate organization:

1.3.1: Acoelomate organization –Phylum Platyhelminthes

1.3.2: Pseudocoelomate Organization: Phylum Nematelminthes

1.4: Triploblastic coelomate organization:

1.4.1: Animals with metameric segmentation: Phylum Annelida

1.4.2: Animals with jointed appendages: Arthropoda including metamorphosis

1.4.3: Animals with Mantle: Phylum Mollusca

1.4.4: Animals with enterocoel: Phylum Echinodermata

Unit 2: Wonders of Animal World

(15 Lectures)

2.1: Echolocation in Bats and Cetaceans: Dolphins and Whales

2.2: Mechanism of Pearl formation in Mollusca

2.3: Bioluminescence in Animals:

2.3.1: Noctiluca

2.3.2: Glow worm

2.3.3: Firefly

2.3.4: Angler Fish (Mechanism and use for the animal)

2.4: Regeneration in Animals:

2.4.1: Earthworm (Annelida)

2.4.2: Lizard (Reptile)

2.5: Mimicry in Butterflies and its significance:

2.5.1: Great Eggfly and common Crow

2.5.2: Common Palmfly and Plain Tiger

2.6: Mechanism of Coral formation and types of Coral reefs

2.7: Bird migration: Definition, Types and Factors inducing bird migration

2.8: Adaptive features of desert animals:

2.8.1: Reptiles (*Phrynosoma*)

2.8.2: Mammals (Camel)

2.9: Breeding and Parental care in:

2.9.1: Pisces –

a) Ovo-viviparous (Black Molly/Guppy)

- b) Mouth brooders (*Tilapia*),
 - c) Brood pouches (Sea horse)
- 2.9.2: Amphibia –
 - a) Mouth brooders (Darwin's Frog)
 - b) Egg carriers (Midwife Toad)
- 2.9.3: Mammals –
 - a) Egg-laying (Duck-billed Platypus)
 - b) Marsupials (Kangaroo)
- 2.9.4: Aves: Brood Parasitism (Cuckoo)

Unit 3: Biodiversity and its Conservation

(15 Lectures)

- 3.1: Introduction to Biodiversity:** Definition, Concepts and Scope and Significance
- 3.2: Levels of Biodiversity:** Introduction to Genetic, Species and Ecosystem Biodiversity
- 3.3: Introduction of Biodiversity Hotspots:** Western Ghats and Indo- Burma Border
- 3.4: Values of biodiversity:** Direct and Indirect use value
- 3.5: Threats to Biodiversity:** Habitat loss and Man-Wildlife conflict
- 3.6: Biodiversity conservation and management:**
 - 3.6.1: Conservation strategies: in situ, ex-situ, National parks, Sanctuaries and Biosphere reserves.
 - 3.6.2: Introduction to International efforts: Convention on Biological Diversity (CBD)
 - 3.6.3: International Union for Conservation of Nature and Natural Resources (IUCN), United Nations Environment Program - World Conservation Monitoring Centre (UNEP-WCMC)
 - 3.6.4: National Biodiversity Action Plan, 2002
 - 3.6.5: Introduction to Indian Wildlife (Protection) Act, 1972 and Convention for International Trade of endangered species

Project: Submission of written or typed report along with photographs, graphs and tables on biodiversity (Insects/Fishes/Birds) covering different areas.

**F.Y.B.Sc. ZOOLOGY
(THEORY)**

SEMESTER I

**Paper II
Paper Code: RUSZOO102**

ANIMAL BIOTECHNOLOGY and INSTRUMENTATION

Objective:

- To acquaint learners to the modern developments and concepts of Zoology highlighting their applications aiming for the benefit of human being and making them aware of risks involved in handling of different hazardous chemicals, instruments and infectious biological specimens especially during practical sessions in the laboratory and to train them to avoid mishap.

Desired Outcome:

- Learners will be skilled to select and operate suitable instruments for the studies of different components of Zoology and work safely in the laboratory and avoid occurrence of accidents (mishaps). Besides learners would understand recent advances in the subject and their applications for the betterment of mankind.

Unit 1: Laboratory safety, Units and Measurement

(15 Lectures)

1.1: Introduction to good laboratory practices

1.2: Use of safety symbols:

1.2.1: Concept

1.2.2: Types of hazards

1.2.3: Precautions

1.3: Units of measurement:

1.3.1: Calculations and related conversions of each:

a) Metric system- length (meter to micrometer)

b) Weight (gram to microgram)

c) Volumetric (Cubic measures)

1.3.2: Temperature: Celsius, Fahrenheit, Kelvin

1.3.3: Concentrations: Percent solutions, ppt, ppm, ppb dilutions, Normality, Molarity and Molality

1.3.4: Biostatistics:

a) Introduction and scope

b) Sampling and its types

c) Central Tendencies (mean, median, mode)

d) Tabulation and Graphical representations (Histograms, bar diagrams, pie diagrams)

Unit 2: Animal Biotechnology

(15 Lectures)

1.1: Biotechnology: Scope and achievements of Biotechnology (Fishery, Animal Husbandry, Medical, Industrial)

1.2: Transgenesis:

- 1.2.1: Retro viral method
- 1.2.2: Nuclear transplantation method
- 1.2.3: DNA microinjection method
- 1.2.4: Embryonic stem cell method

1.3: Cloning (Natural and Artificial)

- 1.3.1: Natural cloning - *Planaria*, Identical twins (monozygotic) and Non-identical twins (dizygotic)
- 1.3.2: Artificial cloning -Dolly and Macaque monkey

1.4: Ethical issues of transgenic and cloned animals

1.5: Applications of Biotechnology:

- 1.5.1: Blotting techniques- Southern, Northern and Eastern
- 1.5.2: DNA fingerprinting - Technique in brief and its application in forensic science (Crime Investigation)
- 1.5.3: Recombinant DNA in medicines (recombinant insulin)
- 1.5.4: Gene therapy: Ex-vivo and *In vivo*, Severe Combined Immunodeficiency (SCID), and Cystic Fibrosis
- 1.5.5: Green genes: Green Fluorescent Protein (GFP) from Jelly fish-valuable as reporter genes used to detect food poisoning

Unit 3: Instrumentation

(15 Lectures)

3.1: Microscopy: Construction, Principle and applications of dissecting and compound microscope

3.2: Colorimetry and Spectroscopy: Principle and applications

3.3: pH:

- 3.3.1: Sorenson's pH scale
- 3.3.2: pH meter - Principle and applications

3.4: Centrifuge: Principle and applications (clinical and ultra centrifuges)

3.5: Chromatography: Principle and applications (Partition and Adsorption)

3.6: Electrophoresis: Principle and applications (AGE and PAGE)

Assignment: Genetically modified Organisms (GMOs): Production and applications (Submission of typed or written report)

**F.Y.B.Sc. ZOOLOGY
(PRACTICAL)**

SEMESTER I

Practical based on Paper I (RUSZOO101)

1. Levels of organization:

- a) Symmetry - *Ameoba*, Sea anemone, Liverfluke, *Planaria*
- b) Coelom – *Planaria*, *Ascaris*, Earthworm
- c) Segmentation – Tapeworm and Earthworm
- d) Cephalization - Cockroach

2. Classification:

- a) Protozoa - *Ameoba*, *Paramoecium*, *Euglena*, *Plasmodium*
- b) Porifera - *Leucosolenia*, *Euspongia*
- c) Coelenterata – *Hydra*, *Obelia* colony, *Aurelia*, Sea anemone, *Fungia*
- d) Platyhelminthes - *Planaria*, *Fasciola hepatica*, *Taenia solium*
- e) Nematelminthes - *Ascaris*
- f) Annelida - *Nereis*, Earthworm, Leech
- g) Arthropoda - Crab, Lobster, *Lepisma*, Beetle, Dragonfly, Butterfly, Moth, Spider, Millipede and Centipede
- h) Mollusca – *Chiton*, *Dentalium*, *Pila*, Bivalves, *Sepia*, *Nautilus*
- i) Echinodermata – Starfish, Brittle star, Sea urchin, Sea cucumber and Feather star

3. Mounting of Foraminiferan shells

4. Study of types of corals: Brain Coral, Organ pipe Coral, Staghorn Coral, Mushroom Coral

5. Study of: Symbiosis, Camouflage, Cannibalistic mate-eating animals, Animal architects (Termite, Harvester ant, Baya weaver bird) Bioluminescent organisms (Noctiluca, Firefly, Glow worm, Angler Fish)

6. Breeding and parental care in Amphibians (Rhacophorus, Midwife toad Darwin's frog, Caecilian)

7. Mounting of scales of Fish

8. Identification of common urban birds with respect to: a) feathers b) beaks and c) claws (Preferably slide show)

9. Field visit to Snake park: To study venomous and non-venomous snakes and adaptive radiation in other reptiles. (Submission of written or typed report).

**F.Y.B.Sc. ZOOLOGY
(PRACTICAL)**

SEMESTER I

Practical based on Paper II (RUSZOO102)

1. a) Interpretation of safety symbols (toxic, corrosive, explosive, flammable, skin irritant, oxidizing, compressed gases, aspiration hazards and Biohazardous infectious material, Radioactivity, Environmental toxicity)
b) Study of Central tendencies and plotting of Bar diagram, histogram and pie diagram
2. To demonstrate immobilization of Enzyme and its activity.
3. Calculation of pH of three different samples (one each acidic, alkaline and neutral) using Red Cabbage Indicator and confirming the result with pH meter
4. a) Study of parts of microscope and their functions.
b) Technique of focusing a permanent slide under 10X and 45X.
5. a) Dilution of given sample and estimation of OD using colorimeter
b) Calculation of concentration from the given OD using formula.
6. a) Separation of amino acids from the mixture by paper chromatography.
b) Calculation of R_f value of a separated pigments/amino acids from the given chromatogram and their identification from standard chart.
7. a) Separation of pigments by adsorption chromatography using chalk
b) Separation of Lipids by TLC.
8. Visit to Forensic laboratory / Biotechnology Laboratory and submission of report.

SEMESTER I

Paper I (RUSZOO101)

REFERENCES

1. Wonders of the Animal World - University Text Book of Zoology, F.Y.B.Sc. Semester I Course 1. V.V. Dalvie, G.B. Raje, P. Sardesai, N.S. Prabhu, University Press.
2. Vertebrate Zoology Volume I- Jordan and Verma , S. Chand and Co.
3. Invertebrate Zoology Volume II- Jordan and Verma , S. Chand and Co.
4. Invertebrate Zoology- T. C. Majumuria , S. Nagin and Co.
5. Chordate Zoology- P. S. Dhami and J. K. Dhami , R. Chand and Co.
6. Invertebrate Zoology- P. S. Dhami and J. K. Dhami , R. Chand and Co.
7. Introduction to Vertebrates- Moore Cambridge University- Low Priced Edition
8. Zoology- S. A. Miller and J. B. Harley, Tata McGraw Hill
9. Modern Textbook of Zoology, Invertebrates, R. L. Kotpal
10. Fundamentals of Ecology- E. P. Odum , Sunders Publication
11. Fundamentals of Ecology- M.C.Dash-2nd edition, Tata McGraw Hill
12. Essentials of Ecology and Environmental Science - S.V.S Rana
13. Biodiversity- S.V.S Rana- Prentice Hall Publications
14. Modern Biology- V. B. Rastogi
15. Biology of Mollusca- D. R. Khanna
16. A Textbook of Zoology, Vol. II- T. Jeffery Parker and William. A. Haswell-Low Price Publications
17. Ecology and Environment- P. D. Sharma, R. K. Rastogi Publications
18. Introduction to Ecology- R. Dajoz
19. Wildlife Laws and its Impact on Tribes- Mona Purohit , Deep and Deep Publications
20. Biodiversity- K.C.Agarwal- Agro Botanica Publications
21. Butterflies of India – Isaac Kehimkar- BNHS Publication

SEMESTER I

Paper II (RUSZOO102)

REFERENCES

1. Basic Laboratory Techniques, Instrumentation and Biotechnology- University Text Book of Zoology, F.Y.B.Sc. Semester I Course 2. V.V. Dalvie, R. G. Deshmukh, R. D'souza and H.U. Shingadia University Press.
2. Introduction to Practical Biochemistry – David T. Plummer (Tata McGraw Hill Publishing Co. Ltd.)
3. Introductory Practical Biochemistry – S.K. Sawhney and Randhir Singh (Narosa Publishing House)
4. Methods in Biostatistics – B. K. Mahajan, (Jaypee Publications)
5. Microscopy and Cell Biology - V. K. Sharma, (Tata McGraw Hill Publishing Co. Ltd.)
6. Bioinstrumentation – L. Veerakumari, (M.J.P. Publishers)
7. Principles and Techniques of Practical Biochemistry – Keith Wilson and John Walker, (Cambridge University Press)
8. Biotechnology- Thieman and Pallidino, Pearson edu.
9. Biotechnology –Glick and Pasternak
10. Biochemistry –Satyanarayana
11. Understanding biotechnology- Aluizio Borem ,David Bowe-Low price edition – Pearson Publication
12. A Textbook of Biotechnology – R. C. Dubey, S. Chand Publication.
13. A Manual of Medical Laboratory Technology -A. H. Patel, Navneet Prakashan Ltd.
14. Biological instruments and methodology – Dr. P. K. Bajpai, S. Chand company Ltd.
15. Calculations in Molecular biology and Biotechnology - Frank H. Stephenson, Academic Press.

MODALITY OF ASSESSMENT

A] Internal assessment - 40%

Sr. no.	Evaluation type	Marks
1.	One class test (Objective and Descriptive)	20
2.	Two Assignments/ Case study/ Research project/ Group Discussion/ Presentation/ Viva	15
3.	Active participation in routine class and Overall conduct as a responsible student (Theory and Practical)	05

- **Internal Assessment Paper = 20 Marks** (Duration – **30 min** for each paper.)

Class Test Paper pattern -

Q1.A) Fill in the blanks **05M**

Q1.B) Match the Columns **05M**

Q.2. Write short notes on (Any two) **10M**

- a)
- b)
- c)

B] External examination - 60%

- **Semester End Theory Assessment = 60 Marks** (Duration – **two hours** for each paper.)

Theory Question Paper Pattern –

- There shall be three questions each of 20 marks.
- On each unit there will be one question.
- All questions shall be compulsory with internal choice within the questions.
- Question may be subdivided into sub-questions a, b, c... and the allocation of marks depend on the weightage of the topic

F.Y.B.Sc. Skeleton Question Paper Pattern

Three Units- Each Unit 20 Marks [Total marks = 60]

Q.1. A) Answer any two of the following: (10M)

- 1)
- 2)
- 3)

Q.1. B) Write short note on: (Any two): (10M)

- 1)
- 2)
- 3)

Q.2. A) Answer any two of the following: (10M)

- 1)
- 2)
- 3)

Q.2. B) Write short note on: (Any two) (10M)

- 1)
- 2)
- 3)

Q.3. A) Answer any two of the following: (10M)

- 1)
- 2)
- 3)

Q.3. B) Write short note on: (Any two) (10M)

- 1)
- 2)
- 3)

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F.Y.B.Sc. PRACTICALS
Semester I
Practical based on Paper I (RUSZOO101)

Semester I
Skeleton Practical Examination Question Paper Pattern
Internal Practical
Practical I based on Paper I RUSZOO101

Duration: 1 hours

Total Marks: 20

Q.1. Identify and classify giving reasons. (Spots A to E). (10)

Q.2. Identification. (Spots A to E) (10)

- a. Types of corals
- b. Amphibians-breeding and parental care
- c. Adaptive radiation in reptiles
- d. Types of feathers/ claws in birds
- e. Types of beaks in birds

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Semester I

Skeleton Practical Examination Question Paper Pattern
Semester End
Practical I based on Paper I RUSZOO101

Duration: 1.30 hours

Total Marks: 30

Q.1. From the given sample mount the Foraminiferan shells. (10)

OR

Mount the scales from fishes. (placoid and cycloid/ctenoid) (10)

Q.2. Identify and describe. (Spot a, b, c and d) (12)

Type of interaction/speciality. (symbiosis, camouflage, cannibalistic mate eating animals and animal architects, bioluminescence)

Q.3. Report submission of field visit to snake park and viva based on it (05)

Q.4. Journal (03)

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F.Y.B.Sc. PRACTICALS
Semester I
Practical based on Paper II (RUSZOO102)

Semester I
Skeleton Practical Examination Question Paper Pattern
Internal Practical
Practical II based on Paper II RUSZOO102

Duration: 1 hour

Total Marks: 20

- Q. 1** Dilute the given sample and estimate the OD using colorimeter (3 dilutions) and Calculate concentration from given OD by formula (15)
OR
Using red cabbage pH indicator, determine pH of the given samples and comment on their chemical nature (15)
OR
Demonstrate the immobilization of enzyme and its activity (15)
- Q. 2.** Focus the given slide under 10 X and 45 X and show it to examiner (05)
OR
Prepare a frequency distribution table / Plot histogram / Pie diagram / Bar diagram from the given data (05)

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Semester I
Skeleton Practical Examination Question Paper Pattern
Semester End
Practical I based on Paper I RUSZOO101

Duration: 1.30 hours

Total Marks: 30

- Q. 1.** Perform experiment for separation of pigments by adsorption chromatography (10)
OR
Perform experiment for separation of mixture of amino acids by paper Chromatography. (10)
OR
Perform Thin Layer Chromatography (TLC) for separation of lipids (10)
- Q.2.** Identification :
(Safety Symbols (two), parts of compound microscope, transgenic animals, DNA Finger-printing) (10)
- Q. 3.** Report submission of Visit to Forensic/Biotechnology lab and Viva based on it (07)
- Q.4.** Journal (03)

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F.Y.B.Sc. THEORY
SEMESTER II
Paper I
Paper Code RUSZOO201

**LEVELS OF ORGANIZATION: CHORDATES, ECOLOGY AND
NATIONAL PARKS AND SANCTUARIES OF INDIA**

Objective:

- To enhance learner's knowledge of classification of vertebrates, ecology, ecosystems and various interactions within them and the current status of wild life conservation in India in the light of guidelines from different relevant governing agencies.

Desired Outcome:

- Learners would be enhanced with the knowledge of classification, ecology and ecosystems which will equip them for field experience and will inspire them to explore different components of Ecological interactions including research and choose career options in the field of wild life conservation, research, photography and ecotourism.

Unit 1: Levels of Organization: Chordates

(15 Lectures)

1.1: Phylum: Hemichordata

1.2: Phylum: Chordata

1.2.1: Subphylum: Urochordata

1.2.2: Subphylum: Cephalochordata

1.3: Subphylum Vertebrata

1.3.1: Super-class: Agnatha – Class Cyclostomata

1.3.2: Super-class: Gnathostomata

1.3.3: Class: Pices (Cartilagenous and bony fish)

1.3.4: Class: Amphibia

1.3.5: Class: Reptilia

1.3.6: Class: Aves

1.3.7: Class: Mammalia

Unit 2: Population Ecology and Ecosystem

(15 Lectures)

2.1: Concept of ecosystem

2.2: Concept of energy flow: Food chain and food web

2.3: Concept of biogeochemical cycles with respect to current ecological issues:

- 2.3.1: Carbon cycle
- 2.3.2: Oxygen cycle
- 2.3.3: Nitrogen cycle
- 2.3.4: Phosphorous cycle
- 2.3.5: Sulfur cycle
- 2.3.6: Water cycle

2.4: Concept of population and community:

- 2.4.1: Population - Natality, mortality, population growth, survivorship curve, density age and sex composition
- 2.4.2: Community - Ecological niche, ecological succession, ecological climax

2.5: Concept of animal interaction: Symbiosis, Mutualism, Commensalisms, Parasitism and predation, Antibiosis

Unit 3: National parks and Sanctuaries of India

(15 Lectures)

3.1: Concept of Endangered and Critically Endangered species:

- Using examples of Indian Wildlife with respect to National Parks and Wildlife Sanctuaries of India –
 - a) Sanjay Gandhi National Park
 - b) Tadoba Tiger Reserve
 - c) Corbett National Park
 - d) Kaziranga National Park
 - e) Gir National Park
 - f) Silent Valley
 - g) Pirotan Island Marine Park
 - h) Keoladeo Ghana National Park
 - i) Bandipur Sanctuary
 - j) Namdapha National Park
 - k) Hemis National Park
 - l) Keibul Lamjao National Park

3.2: Management strategies with special reference to Tiger and Rhinoceros in India

3.3: Ecotourism

3.4: Bio-piracy

Project: Construct food chain and food web and interpret its energy flow observed in your surrounding area. (Model/ Chart preparation)

**F.Y.B.Sc. ZOOLOGY
(THEORY)**

SEMESTER II

**Paper II (RUSZOO202)
NUTRITION, PUBLIC HEALTH AND HYGIENE**

Objective:

- To impart knowledge about source, quantum and need for conservation of fast depleting water resource and essentials of maintaining proper sanitation, hygiene and optimizing use of electronic gadgets along with causes, symptoms and impact of stress related disorders and infectious diseases emphasizing on knowledge of balanced diet and essential nutrients of food at different stages of life.

Desired Outcome:

- Promoting optimum conservation of water and encouragement for maintaining adequate personal hygiene, optimum use of electronic gadgets, avoiding addiction, thus facilitating achievement of the goal of healthy young India in true sense and promptly recognizing stress related problems at initial stages and would help learners to adopt relevant solutions to have psychologically strong mind set along with healthy dietary habits

Unit 1: Nutrition and Health

(15 Lectures)

1.1: Concept of balanced diet: Food Pyramid, Dietary recommendations to a normal adult, Infant, Pregnant woman and Aged person

1.2: Malnutrition disorders:

1.2.1: Anemia (Iron deficiency and Vitamin B12) - (cause, symptoms, diagnosis, treatment and prevention)

1.2.2: Marasmus (cause, symptoms, diagnosis, treatment and prevention)

1.2.3: Kwashiorkor (cause, symptoms, diagnosis, treatment and prevention)

1.2.4: Goiter (cause, symptoms, diagnosis, treatment and prevention)

1.3: Vitamins – cause, symptoms, diagnosis, treatment and prevention (Scurvy, Rickets, Beriberi, Pellagra and Night blindness) and poisoning

1.4: Starvation, acidity and peptic ulcers: cause, symptoms, diagnosis, treatment and prevention

1.5: Obesity: Definition, consequences and treatment

1.6: Importance of fibers in food

1.7: Diabetes type I and II

1.8: Anthropometry – Definition, Measurements and applications

Unit 2: Public Health and Hygiene

(15 Lectures)

2.1: Health:

- 2.1.1: Definition of Health, the need for health education and health goal
- 2.1.2: Physical, psychological and Social health issues
- 2.1.3: WHO and its programs - Polio, Small pox, Malaria and Leprosy (concept, brief accounts and outcome with respect to India)
- 2.1.4: Ill effects of self-medication

2.2: Water and water supply

- 2.2.1: Sources and properties of water
- 2.2.2: Purification of water, small scale, medium scale and large scale (rapid sand filters)
- 2.2.3: Water footprint (concept, brief accounts and significance)

2.3: Hygiene

- 2.3.1: Hygiene and health factors at home, personal hygiene, oral hygiene and sex hygiene
- 2.3.2: Radiation risk - Mobile Cell tower and electronic gadgets (data of recommended level, effects and precaution)

2.4: First Aid : Dog bite and its treatment

2.5: Blood bank – Concept and significance

UNIT 3: Common Human Diseases and Disorders

(15 Lectures)

3.1: Stress related disorders: (Causes, symptoms, precaution and remedy)

- 3.1.1: Hypertension
- 3.1.2: Swine flu and Dengue
- 3.1.3: Anxiety
- 3.1.4: Insomnia
- 3.1.5: Migraine
- 3.1.6: Depression

3.2: Communicable and non-communicable diseases: (Cause/causative agents, symptoms and diagnosis, precaution, prevention and remedy Management/treatment)

- 3.2.1: Tuberculosis only pulmonary in theory others extra pulmonary in practical
- 3.2.2: Typhoid
- 3.2.3: Hepatitis (A and B) C, D and E
- 3.2.4: AIDS
- 3.2.5: Gonorrhea
- 3.2.6: Syphilis
- 3.2.7: Diseases of respiratory system- Asthma and Bronchitis
- 3.2.8: Cholera

Project: Community service/ Awareness in Health and hygiene supported with submission of documentary evidences

Ramnarin Ruia Autonomous College

**F.Y.B.Sc. ZOOLOGY
(PRACTICAL)**

**SEMESTER II
Practical based on Paper I (RUSZOO201)**

1. Classification:

- a) Hemichordata - *Balanoglossus*
 - b) Urochordata - *Herdmania*
 - c) Cephalochordata - *Amphioxus*
 - d) Cyclostomato – *Petromyzon*, *Myxine*
 - e) Pisces – Shark, Skates, Sting ray/Electric ray, Flying fish
 - f) Amphibia – Frog, Toad, Caecilian, Salamander
 - g) Reptilia – Chameleon, *Calotes*, Turtle, Tortoise, Snake, Crocodile
 - h) Aves – Kite, Kingfisher, Duck
 - i) Mammalia – Shrew, Hedgehog, Guinea pig, Bat
- 2.** Interpretation of the given graphs or tables and comment on pattern of population nature: Survivorship curve, Life tables, Fecundity tables, Age structure and sex ratio
- 3.** a) Calculation of Natality, Mortality, Population density from given data
- b) Estimation of population density by capture-recapture method
- 4.** Interpretation of Growth curves (Sigmoid and J shaped)
- 5.** Estimation of hardness from given water sample (Tap water versus Well water)
- 6.** Estimation of free carbon dioxide (free CO₂) from two different samples (Aerated drinks (diluted) versus Tap water)
- 7.** Estimation of dissolved oxygen (O₂) from two different samples (Tap water and Bottled Mineral water)
- 8.** Estimation of sulfur from given soil sample.
- 9.** Construction of food chain and food web using given information/data:
- a) Identification and interpretation of ecological pyramids of energy, biomass and number
 - b) Construction of different types of pyramids from given data
- 10. Field visit:** Guided nature tour to any National Park and submission of report

**F.Y.B.Sc. ZOOLOGY
(PRACTICAL)
SEMESTER II**

Practical based on Paper II (RUSZOO202)

1. Qualitative estimation of Vitamin C by Iodometric method
2. Study of microscopic structure of starch granules of different cereals (wheat, maize and jowar)
3. a) Estimation of maltose from brown and white bread
b) Moisture content from biscuits or other suitable food products
4. Food adulteration test –Milk adulterants (starch and glucose), Methylene blue reduction test (MBRT)
5. a) Estimation of protein content of two egg varieties
b) Study of efficacy of different antacids (any two)
6. **Study of Human Parasites –**
 - a) Endoparasites – Protozoans (*Entamoeba*, *Plasmodium*), Helminthes (*Ascaris*, *Wuchereria*)
 - b) Ectoparasites – Head louse and Tick
 - c) Exoparasites – Bed bug and Mosquitoes
7. Screening of anemic/non-anemic persons using CuSO₄ method
8. BMI analysis – using formula.
9. Diseases - Oral cancer, TB, bronchitis (causes, symptoms and management)
10. Preparation and submission of BMI report.
11. **First Aid** – Practical training for students to be conducted by the experts and respective authorities.

SEMESTER II
Paper I RUSZOO201

REFERENCES

1. Introduction to Ecology and Wildlife - University Text Book of Zoology, F.Y.B.Sc. Semester II Course 3. University Press.
2. Fundamentals of Ecology - Eugene P. Odum and Grey W. Barrett, Brook Cole/ Cengage learning
3. Fundamentals of Ecology - M. C. Dash , Tata McGraw Hill company Ltd, New Delhi
4. Ecology - Mohan P. Arora , Himalaya Publishing House
5. Field Biology and Ecology -- Alen H. Benton and William E. Werner ,Tata McGraw Hill ltd, New Delhi
6. Ecology and Environment - Sharma P. D , Rastogi Publication, Mumbai
7. Ecology : Principles and Applications - Chapman J.L , Cambridge University trust
8. Ecology - Subramaniam and Others, Narosa Publishing House
9. Wildlife laws and its impact on tribes - Mona Purohit, Deep and deep Publication
10. Biology - Eldra Solomon, Linda R. Berg and Diana W. Martin, Thomson/ Brooks/ Cole
11. Economic Zoology, Biostats and Animal Behaviour - Shukla, Mathur, Upadhyay, Prasad. Rastogi Publications.

SEMESTER II
Paper II (RUSZOO202)
REFERENCES

1. Common Diseases, Health and Hygiene - University Text Book of Zoology, F.Y.B.Sc. Semester II Course 4. University Press.
2. Common Medical Symptoms edited - P. J. Mehta National Inblisents and Distributions
3. Parks Textbook of Preventive and Social Medicine K. Park M/S Banarasidas Bhanot Jabalpar.
4. Human Physiology – Volume I – II C. C. Chatterjee, Medical Allied agency, Kolkatta.
5. Parasitology (Protozoology and Helminthology) - K. D. Chatterjee, Chatterjee Medial Publishers.
6. Nand's handbook of Forensic Medicine and Toxicology - Apurba Nandy, NCBA publication.
7. Essentials of Public Health and Sanitation- Part I and Part II. All India Institute of Local Self Government.
8. Epidemiology and Management for Health Care for all. P.V. Sathe, A. P. Sathe, Popular Prakashan, Mumbai.
9. Textbook of Medical Parasitology- C. K. JayaramPaniker. Jaypee Brothers.
10. A Treatise on Hygiene and Public Health. -B. N. Ghosh. Calcutta Scientific Publishing Company.
11. Prevention of Food Adulteration, Act 1954. Asian Law House.
12. Clinical Dietetics and Nutrition - F. P. Antia and Philip, Oxford University Press.
13. A Complete Handbook of Nature Cure - Dr. H. K. Bakru, Jaico Publishing House.
14. Dietetics - B. Srilakshmi, New Age International (P) Ltd. Publishers.
15. Nutrition: Principles and Application in Health Promotion - J. B. Lippincott Company. Philadelphia.
16. Are You Healing Yourself Mr. Executive - Dr. R. H. Dastur. IBH Publishing Company.
17. Food Nutrition and Health- Dr. Shashi Goyal, Pooja Gupta, S. Chand Publications.
18. Public Health Nutrition. Edited - Michael J. Gidney, Barrie M. Margetts, John M. Kearney and Lenore Arab. Willey Blackwell Publication.
19. Food and Nutrition – Vol. I and II - Dr. Swaminathan , Bappco Publication.
20. Textbook of Human Nutrition - Mahtab Bamji, Prahlad Rao.
21. Total Health by Paramjit Rana.

MODALITY OF ASSESSMENT

A] Internal assessment - 40%

Sr. no.	Evaluation type	Marks
1.	One class test (Objective and Descriptive)	20
2.	Two Assignments/ Case study/ Research project/ Group Discussion/ Presentation/ Viva	15
3.	Active participation in routine class and Overall conduct as a responsible student (Theory and Practical)	05

- **Internal Assessment Paper = 20 Marks** (Duration – **30 min** for each paper.)

Class Test Paper pattern -

Q1.A) Fill in the blanks **05M**

Q1.B) Match the Columns **05M**

Q.2. Write short notes on (Any two) **10M**

- a)
- b)
- c)

B] External examination - 60%

- **Semester End Theory Assessment = 60 Marks** (Duration – **two hours** for each paper.)

Theory Question Paper Pattern –

- There shall be three questions each of 20 marks.
- On each unit there will be one question.
- All questions shall be compulsory with internal choice within the questions.
- Question may be subdivided into sub-questions a, b, c... and the allocation of marks depend on the weightage of the topic

F.Y.B.Sc. Skeleton Question Paper Pattern

Three Units- Each Unit 20 Marks [Total marks = 60]

Q.1. A) Answer any two of the following: (10M)

- 1)
- 2)
- 3)

Q.1. B) Write short note on: (Any two): (10M)

- 1)
- 2)
- 3)

Q.2. A) Answer any two of the following: (10M)

- 1)
- 2)
- 3)

Q.2. B) Write short note on: (Any two) (10M)

- 1)
- 2)
- 3)

Q.3. A) Answer any two of the following: (10M)

- 1)
- 2)
- 3)

Q.3. B) Write short note on: (Any two) (10M)

- 1)
- 2)
- 3)

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F.Y.B.Sc. PRACTICAL
Semester II
Practical based on Paper I (RUSZOO201)

Skeleton Practical Examination Question Paper Pattern
Internal Practical

Duration: 1 hour

Total Marks: 20

- Q1.** Solve the given problems (using statistical approach wherever possible)
(Any two) Natality / Mortality / Sex ratio / Fecundity / Population density. (10)
- Q2.** Identify brand animals (04) and place them in their respective
National Parks/Sanctuaries on given map quoting reason for decline. (10)
OR
- Q2.** Mark National parks and Sanctuaries (04) on the map of India and mention
the name of their brand animals stating reasons for their decline. (10)
OR
- Q2.** Identify endangered and critically endangered animals and state their reason
for the decline. (10)

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Semester II
Skeleton Practical Examination Question Paper Pattern
Semester End

Duration: 1.30 hours

Total Marks: 30

- Q1.** Estimate Hardness and CO₂ from the given water samples and compare the results. (15)
OR
- Q1.** Estimate Dissolved Oxygen from the given samples and compare the results. (15)
OR
- Q1.** Estimate sulfur content from given soil sample. (15)
- Q2.** Study the given information and give answers on the basis of food web/food chain
and ecological pyramids (05)
OR
- Q2.** Prepare a food web/food chain and ecological pyramids from the given data
and give its significance. (05)
OR
- Q2.** Identify and interpret the given graph/ growth curve/ age structure and
comment on the pattern of population dispersal. (05)
OR
- Q2.** Determine population density by capture and recapture method. (05)
- Q.3.** Field visit report submission (National Parks) and viva based on it (07)
- Q6.** Journal and Viva voce (03)

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F.Y.B.Sc. PRACTICAL
Semester II
Practical based on Paper II (RUSZOO202)

Skeleton Practical Examination Question Paper Pattern
Internal Practical

Duration: 1 hour

Total Marks: 20

Q.1. Determine moisture content from biscuits/any other suitable food product. (05)
OR

On the basis of microscopic structure of starch granules identify different cereals (any two). (05)

OR

Detect adulterants present in the given milk sample (any two). (05)

OR

Determine whether given blood sample is from anaemic/non-anaemic person using CuSO₄ Method and suggest the appropriate diet. (05)

Q.2. Identification (15)

- a) One specimen of Protozoan Parasites.
- b) One specimen of Helminth Parasites.
- c) One specimen from Ectoparasite / Exoparasite
- d) One specimen from Endoparasite
- e) Oral cancer/ TB/ bronchitis

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Semester II
Skeleton Practical Examination Question Paper Pattern
Semester End

Duration: 1.30 hours

Total Marks: 30

Q.1. Estimate Vitamin C from the given sample. (15)

OR

Estimate Maltose content from bread. (15)

OR

Estimate protein content from two different types of eggs. (15)

Q.2. Analyze the given food sample and identify food adulterants (any 2 samples). (05)

OR

Evaluate milk quality by Methylene Blue Reduction Test (MBRT). (05)

OR

Determine efficacy of different antacids (any two) on acidic solution. (05)

Q.3. Submission of report of Body Mass Index (viva based on it) (07)

Q.4. Journal (03)

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