



**Janardan Bhagat Shikshan Prasarak Sanstha's
CHANGU KANA THAKUR
ARTS, COMMERCE & SCIENCE COLLEGE,
NEW PANVEL (AUTONOMOUS)**

**Re-accredited 'A+' Grade by NAAC
'College with Potential for Excellence' Status Awarded by UGC
'Best College Award' by University of Mumbai**

Program: B.Sc

**Revised Syllabus of F.Y.B.Sc. Zoology
Choice Based Credit & Grading System (75:25)
w.e.f. Academic Year 2019-20**

F.Y.B.Sc. Zoology Syllabus

Sr. No.	Heading	Particulars
1	Title of Course	Zoology
2	Eligibility for Admission	12 th Science of all recognised Board
3	Passing marks	40%
4	Ordinances/Regulations (if any)	
5	No. of Semesters	Two
6	Level	U.G.
7	Pattern	Semester (75:25)
8	Status	Revised
9	To be implemented from Academic year	2019-2020

PREAMBLE OF THE SYLLABUS:

The ongoing B.Sc. (H) Zoology course was introduced by the Faculty of Sciences from the academic year 2019-2020. The new course of F.Y.B.Sc. and T.Y.B.Sc. Zoology that will be effective from the academic year 2019- 2020, will follow the Semester mode. It has been prepared keeping in view the unique requirements of B.Sc. (H) Zoology students. The syllabus has been drawn up to introduction of the classical zoology with accommodation of widening horizons of the discipline of Biological Sciences.

The Board of Studies examined the existing syllabus and after analysing with respective subjects in term of content relevance, quality and pattern of teaching along with examination in present scenario.

With the holistic approach the syllabus including basic as well as advanced concepts in Zoology from first year and third year shall inspire the students for pursuing higher studies in Zoology and for becoming an entrepreneur and also enable students to get employed in the Biological research Institutes, Industries, Educational Institutes and in the various concerning departments of State and Central Government based on subject Zoology.

OBJECTIVES OF THE COURSE:

- To nurture interest in the students for the subject of Zoology
- To create awareness of the basic and modern concepts of Zoology
- To orient students about the importance of abiotic and biotic factors of environment and their conservation.
- To provide an insight to the basic nutritional and health aspects of human life.
- To inculcate good laboratory practices in students and to train them about scientific handling of important instruments.

COURSE OUTCOME:

The present course of B.Sc. Zoology introduced by the Board of studies and Faculty of Sciences from the academic year 2019-2020 has some expected outcomes of entire syllabi as follows:

1. The present syllabus of Zoology which deals with animals and animal life, including the study of the structure, physiology, development, and classification of animals will make the students interest ignited keeping in mind to sustain the beauty of Animal World.
2. This syllabus include the classification of animals, invertebrates, including sponges, flatworms, molluscs, insects, arthropods, and echinoderms, and vertebrates, including fishes, amphibians, reptiles, birds, and mammals which will expect from the students to do daily assignments, various projects, quizzes based on animal life along with laboratory write-ups which will help the students to inculcate Academic Writing in Science Research.
3. Holistic approach of the Zoology syllabus will lead the students to have and find the employment in the sector of Biological research Institutes, Industries, Educational Institutes and in the various concerning departments of State and Central Government based on subject Zoology
4. Holistic approach of the Zoology syllabus will lead the students to pursue higher studies in Zoology and become an entrepreneur.

F. Y. B. Sc. Zoology

For the subject of Zoology there shall be two papers for 45 lectures each comprising of three units of 15 L each.

Semester-I

1. Paper-I -Unit-I will be for Kingdom Animalia I
2. Paper-I- Unit-II will be for Wonders of animal world
3. Paper-I- Unit-III will be for Biodiversity and its conservation.
4. Paper-II-Unit-I will be for Laboratory safety and Units of Measurement
5. Paper-II-Unit-II will be for Instrumentation
6. Paper-II- Unit-III will be for Animal Biotechnology

Semester-II

1. Paper-I- Unit-I will be for Kingdom Animalia II
2. Paper-I- Unit-II will be for Ecosystem
3. Paper-I -Unit-III will be for National park and Sanctuaries.
4. Paper-II-Unit-I will be for Nutrition and Health
5. Paper-II-Unit-II will be for Common Human Parasites
6. Paper-II- Unit-III will be for Common human Diseases and Disorders

SCHEME OF EXAMINATION FOR EACH SEMESTER:

Internal Evaluation: 25 (20 marks internal test and 05 marks for attendance)

Semester End Examination: 75 Marks will be as follows -:

I	Theory:	
	Each theory paper shall be of two and half hour duration.	
	All questions are compulsory and will have internal options.	
	Q-1	From Unit – I (having internal options.) 20 M
	Q-2	From Unit – II (having internal options.) 20M
	Q-3	From Unit – III (having internal options.) 20M
	Q-4	Questions from all the THREE Units with equal weightage of marks Allotted to each Unit. 15 M
II	Practical	The External examination per practical course will be conducted as per the Following scheme.
Sr. No.	Particulars of External Practical Examination	Marks
1.	Laboratory Work	35+35 = 70
2.	Field visit and report	05+05= 10
3.	Journal	05+05 = 10
4.	Viva	05+05 = 10
	TOTAL	100

Choice Based Credit Grading and Semester System (CBCGS)

F.Y.B. Sc. Course – ZOOLOGY

To be implemented from the Academic year 2019-2020

SEMESTER I

COURSE CODE	UNIT	TOPICS	CREDITS	LECTURES/WEEK
USC1Z01	I	Kingdom Animalia I	2	1
	II	Wonders of animal world		1
	III	Biodiversity and its conservation		1
USC1Z02	I	Laboratory safety and Units of Measurement	2	1
	II	Instrumentation		1
	III	Animal Biotechnology		1
USC1Z0P	Practical based on both courses		2	6

SEMESTER II

COURSE	UNIT	TOPICS	CREDITS	LECTURES/WEEK
USZ0201	I	Kingdom Animalia II	2	1
	II	Ecosystem		1
	III	National park and Sanctuaries		1
USZ0202	I	Nutrition and Health	2	1
	II	Common human Parasites		1
	III	Common Human Diseases		1
USZ0P2	Practical based on both courses		2	6

**SYLLABUS F.Y.B.Sc. ZOOLOGY
UNIT WISE DISTRIBUTION**

Semester I		Semester II	
Course 1	Course 2	Course 3	Course 4
Unit 1 Wonders of animal world	Unit 1 Laboratory Safety and Units of Measurement	Unit 1 Kingdom Animalia II	Unit 1 Nutrition and Health
Unit 2 Kingdom Animalia I	Unit 2 Instrumentation	Unit 2 Ecosystem	Unit 2 Common Human parasites
Unit 3 Biodiversity and its Conservation	Unit 3 Animal Biotechnology	Unit 3- National Parks and Sanctuaries	Unit 3- Common Human Diseases and Disorders
Practical (USC1ZOP)	Practical (USC1ZOP)	Practical (USC2ZOP)	Practical (USC2ZOP)

Syllabus for F.Y.B.Sc.
Program B.Sc.

Course: ZOOLOGY

**Semester I
Paper I and Practical I**

PEDAGOGY

Semester- I Course- I

Today's youth is self-confident, motivated as well as creative to sustain himself / herself in this competitive era of technology, this innovative approach leads to nation building.

Keeping in mind sustainability of "Zoology" as a subject, must therefore be facilitated to study, to understand, to gain knowledge as to relate with day to day life's awareness, usefulness economic importance to enhance livelihood. Use of animals for their sustainability likewise their uses with the help of technology to attain good human health and social well-being.

The author recommends classical zoology would become good, sound and knowledgeable experience to the students. Student would get stimulated environs to study microscopic as well as macroscopic life.

Students would be encouraged by studying classical Zoology to reconnect with the beautiful Animal World!!!

F.Y.B.Sc. ZOOLOGY

(THEORY)

SEMESTER I

USC1ZO1 (Course 1)

**Kingdom Animalia, Wonders of Animal World, Biodiversity and its
Conservation**

Unit 1: Wonders of Animal World (15 L)

Objective: To take learners through a captivating journey of hoarded wealth of marvelous animal world.

Desired Outcome: Curiosity will be ignited in the mind of learners, to know more about the fascinating world of animals which would enhance their interest and love for the subject of Zoology.

- 1.1. Echolocation in Bats and Cetaceans E.g. Dolphins and Whales
- 1.2. Mechanism of Pearl formation in Mollusca
- 1.3. Bioluminescence in Animals: Noctiluca, Glow worm, Firefly, Angler Fish (Mechanism and use for the animal)
- 1.4. Regeneration in Animals E.g. Earthworm and Lizard
- 1.5. Mimicry in Butterflies and its significance: Great Egg fly and Common Crow, Common Palm fly and Plain Tiger
- 1.6. Mechanism of Coral formation and types of Coral reefs
- 1.7. Bird migration: Definition, types and factors inducing bird migration
- 1.8. Adaptive features of desert animals: Reptiles (*Phrynosoma*) and Mammals (Camel)
- 1.9. Breeding and Parental care in:
 - 1.9.1. Pisces - Ovo-viviparous (Black Molly/Guppy), Mouth brooders (Tilapia), Brood pouches (Sea horse)
 - 1.9.2. Amphibia - Mouth brooders (Darwin's Frog), Egg carriers (Midwife Toad)

1.9.3. Mammals- Egg-laying (Duck-billed Platypus), Marsupials
(Kangaroo)

1.9.4. Aves: Brood Parasitism (Cuckoo)

Unit 2: Kingdom Animalia I

(15 L)

Objective: To acquaint the learner about basic of systematic and understand the hierarchy of hierarchy of different invertebrates also to know the characters of different phyla along with brief study of examples. To aware the learner about economically important invertebrate fauna.

Desired Outcome: Learner would come to know about basic of systematic and the hierarchy. Learner would have knowledge about different phyla with their respective examples and its economic importance.

2.1: Phylum Protozoa

General Characters, Classification representative examples (Amoeba, Paramecium, Euglena, Plasmodium)

2.2: Phylum Porifera

Characters, Classification and Representative examples
(Leucosolenia, Euplactella, Hyalonema, , Euspongia)

2.3: Phylum Coelenterata (Cnidaria)

Characters, Classification and Representative examples (Physalia, Obelia, Aurelia, sea Anemone)

2.4: Phylum Platyhelminthes

Characters, Classification and Representative examples (Fasciola, Planaria, Liverfluke, Tapeworm)

2.5: Phylum Aschelminthes

Characters, Classification and Representative examples (Ascaris (round worm), Ancylostoma (hook worm), Enterobius (pinworm))

2.6: Phylum Annelida

Characters, Classification and Representative examples (Nereis, Earthworm, Leech)

2.7: Phylum Arthropoda

Characters, Classification and Representative examples (Crab, Lobster, Beetle, Dragonfly, Butterfly, Moth, Spider, Centipede, Millipede)

2.8: Phylum Mollusca

Characters, Classification and Representative example (Chiton, Dentalium, Pila, Unio, Sepia and Nautilus)

2.9: Phylum Echinodermata

Characters, Classification and Representative examples (Starfish, Brittle star, Sea urchin, Sea cucumber, Feather star)

Unit 3: Biodiversity and its Conservation

(15 L)

Objective: To orient learners about rich heritage of Biodiversity of India and make them understand significance of its conservation.

Desired Outcome: Learners would appreciate treasure of Biodiversity, its importance and hence would contribute their best for its conservation.

3.1: Introduction to Biodiversity- Definition, Concepts, 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), International Union for Conservation of Nature and Natural Resources (IUCN), United Nations Environment Program - World Conservation Monitoring Centre (UNEP-WCMC)

3.6.3: National Biodiversity Action Plan, 2002

3.6.4: Introduction to Indian Wildlife (Protection) Act, 1972 and Convention for International Trade of endangered species

**SEMESTER I
Practical USC1ZOP
(Course I)**

1. Level of organization in Animal Kingdom

- a) Symmetry: Asymmetric organization: Amoeba, Radial Symmetry: Sea Anemone, Aurelia, Bilateral Symmetry: Planaria, Liver fluke
- b) Acoelomate. Pseudocoelomate and Coelomate animal
Acoelomate: Planaria, Pseudocoelomate: Acsaris and Coelomate: Earthworm
- c) Segmentation: Psudosegmentation (Pseudometamerism): Tapeworm, Metamerism (Metameric segmentation): Earthworm
- d) Specialization of body parts for division of labour
Cephalization: Cockroach, Cephalothorax: Prawns

2. Study of classification and morphological characteristics of invertebrates

- a) Phylum Protozoa
 - i. Class: Sarcodina e.g. amoeba
 - ii. Class: Ciliophora eg. Paramecium
 - iii. Class: Mastigophora e.g Euglena
- b) Phylum Porifera
 - i. Class Calcaria e.g. Leucosolenia
 - ii. Class :Desmospongia e.g. Euspongia
- c) Phylum Coelenterata
 - i. Class Hydrozoa e.g.Obelia
 - ii. Class: Scyphozoa e.g. Aurelia
 - iii. Class: Anthrozoa e. g. Sea anemone
- d) Phylum Platyhelminthes
 - i. Class turbelaria e.g. Palnaria
 - ii. Class: Termatoda e.g. Liver fluke
 - iii. Class: Cystoda e.g. tapeworm (*Taenea solium*)
- e) Phylum Neamtohelminthes e.g. Ascaris
- f) Phylum Annelida Class Polychaeta e.g. neries
 - i. Class ologochaeta e.g. Earthworm

- ii. Class Hirudinea e.g. Leech
- g) Phylum Arthropoda Class Crustacea e.g. Crab
 - i. Class insect e.g. beetle, Butterfly, moth
 - ii. Class Arachnida e.g. spider
 - iii. Class Merapoda centipede. Millipede
- h) Phylum Mollusca
 - i. Class Amphinura e.g. Chiton
 - ii. Class Scyphopoda e.g. Dentanium
 - iii. Class Gastropoda e.g. pila
 - iv. Class Pelecypoda Bivalvia
 - v. Class Cephalopoda Sepia
- i) Phylum Echinodermata Class Asteroidea Starfish
 - i. Class Ophiuroidea e.g. brittle star
 - ii. Class Echinoidea Sea urchin
 - iii. Class Holothuroidea Sea cucumber
 - iv. Class Crinoidea Feather Star

3. Study of the following;

- i. Symbiosis (Termite and Trychonympha, hermit crab and sea anemone)
- ii. Camouflage (leaf insect, chameleon)
- iii. Cannibalistic mate-eating animals (Spider and Praying Mantis)
- iv. Animal architects: Termites, Harvester ant and Baya weaver bird
- v. Study of bioluminescent organisms – Noctiluca, glow worm, fire fly, angler fish.
- vi. Breeding and parental care in Amphibia- Rhacophorus, Midwife toad, Darwin's frog, Caecilian.

4. Mounting of foraminiferan shells from sand

5. Preparation and observation of paramecium culture

6. Study of types of Corals - Brain, Organ pipe, Stag Horn, Mushroom coral

7. Field Report – To be done in a group of ten students (submission of written / typed report preferably along with photographs/ tables/ graphs.

8. Observations of fauna in the field (with reference to theory syllabus).

Course I (USC1Z01)

REFERENCES AND ADDITIONAL READING

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. Majupuria , S. Nagin and Co.
5. Chordate Zoology- P. S. Dhama and J. K. Dhama , R. Chand and Co.
6. Invertebrate Zoology- P. S. Dhama and J. K. Dhama , 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
22. Manuals of Laboratory Specimens Invertebrates Gurudarshan Singh

Syllabus for F.Y.B.Sc.
Program B.Sc.

Course: ZOOLOGY

Semester I
Paper II and Practical II

PEDAGOGY

Semester- I Course- II

In the era of modern and fast developing world all of us face challenge to maintain pace between Classical Sciences & Applied Sciences.

To overcome this dilemma of challenges the new syllabus of F.Y.B.Sc. Zoology Course – II has incorporated topics like Animal Biotechnology and Instrumentation.

It's imperative to make the students aware about risk involved while using various chemicals, handling various instruments in the laboratory. Students would get help to integrate the knowledge based theory and practical concepts.

Students would get knowledge to recognize the various Hazards symbols, Safety symbols used in laboratory as a Good Laboratory Practices. Student would get to know how to deal, care and ethics regarding animal's life.

Having knowledge of Good Laboratory Practices, various Symbols, and Hazardous chemicals would help students to explore to enhance the related career options and also entrepreneurship possibilities keeping, caring, loving nature towards animal in their future life.

USC1Z02 (Course 2)

**Laboratory safety units and measurement, Instrumentation and
Animal biotechnology**

Unit 1: Laboratory safety, Units and Measurement (15 L)

Objective: *To make learners aware of the risks involved in handling of different hazardous chemicals, sensitive (electrical/electronic) instruments and infectious biological specimens especially during practical sessions in the laboratory and to train them to avoid mishap.*

Desired Outcome: *Learners would work safely in the laboratory and avoid occurrence of accidents (mishaps) which will boost their scholastic performance and understanding of economy in use of materials/chemicals during practical sessions.*

1.1: Introduction to laboratory safety practices

1.2: Safety Measures to be taken in a Zoology Laboratory

1.3: Units of measurement:

1.3.1: Calculations and related conversions of each: Metric system-length (meter to micrometer); weight (gram to microgram), 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: Introduction and scope, Sampling and its types, Central Tendencies (mean, median, mode) Tabulation, Graphical representations (Histograms, bar diagrams, pie diagrams).

Unit 2: Instrumentation

(15 L)

Objective: To provide learner a complete insight about the structure and train the learner with operational skills of different instruments required in Zoology.

Desired Outcome: Learner would be able to select and operate suitable instruments for the studies of different components of Zoology. Further learner would be skilled in the area of research.

2.1: Microscopy

2.1.1: Construction, principle and applications of dissecting and compound microscope.

2.2: Colorimetry and Spectroscopy - Principle and applications.

2.3: pH - Sorenson's pH scale, pH meter - principle and applications.

2.4: Centrifuge - Principle and applications (clinical and ultra-centrifuges).

2.5: Chromatography- Principle and applications (Partition and Adsorption)

2.6: Electrophoresis - Principle and applications (AGE and PAGE)

Unit 3: Animal Biotechnology

(15 L)

Objective: To acquaint learner to the modern developments and concepts of Zoology. Highlighting the applications of knowledge, aiming for the benefits of human being.

Desired Outcome: Learner would understand the recent advances in the subject, its applications for the betterment of mankind; and that the young minds would be tuned to think out of the box.

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

3.2: Transgenesis: Retroviral method, Nuclear transplantation method, DNA microinjection method and Embryonic stem cell method

3.3: Cloning (Dolly)

3.4: Ethical issues of transgenic and cloned animals

3.5: Applications of Biotechnology:

3.5.1: DNA fingerprinting: Technique in brief and its application in forensic science (Crime Investigation)

3.5.2: Recombinant DNA in medicines (recombinant insulin)

3.5.3: Genetherapy: Ex-vivo and In vivo, Severe Combined Immunodeficiency (SCID), Cystic Fibrosis

3.5.4: Green genes: Green Fluorescent Protein (GFP) from Jelly fish-valuable as reporter genes used to detect food poisoning.

SEMESTER I
Practical USC1ZOP
(Course II)

1. a) Interpretation of safety symbols (toxic, corrosive, explosive, flammable, skin irritant, oxidizing, compressed gases, aspiration hazards and Biohazardous infectious material.)
b) Study of central tendencies and plotting of Bar diagram, histogram and pie diagram.
2. Identification of transgenic fish (Trout and Salmon) / cloned animals (Dolly sheep, cc cat and Snuppy dog) from photograph.
3. Calculation of pH of three different samples (one each acidic, alkaline and neutral) using pH paper/Universal Indicator and confirming the result with pH meter.
4. Application of DNA Fingerprinting in criminology (photograph of electrophoretic pattern to be given for interpretation by the students)
5. a) Study of parts of microscope and their functions.
b) Technique of focussing a permanent slide under 10x and 45x (objectives).
6. a) Dilution of given sample and estimation of OD by using colorimeter.
b) Calculation of concentration from the given OD using formula.
7. Calculation of pH of three different samples (one each acidic, alkaline and neutral) using pH paper/universal indicator/pH indicator from red cabbage and confirming the result with pH meter.
8. a) Separation of amino acids from the mixture by paper chromatography.
b) Calculation of R_f value of separated pigments/amino acids from given chromatogram and their identification from standard chart.
c) Separation of pigments by adsorption chromatography using chalk.
d) Separation of lipids by TLC

Course II (USC1Z01)

REFERENCES AND ADDITIONAL READINGS

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.

Syllabus for F.Y.B.Sc.
Program B.Sc.

Course: ZOOLOGY

Semester II
Paper I and Practical I

PEDAGOGY

Semester - II Course- III

We the author recommended in the previous Semester-I Course- I about classical zoology where student would have knowledge about Invertebrates / Non-chordates and now in this semester they would have knowledge and exploring various Vertebrates /Chordates.

It would help the students to understand the significance of protection, economic importance in livelihood about various species they study during the entire course.

Author has thrown light on the areas like ecosystem and its essentials. Author tried to cater the knowledge regarding National Parks, Sanctuaries with respect to nation-India.

The most interesting, innovating, fascinating topic i.e. ecotourism is incorporated in the present course.

SEMESTER-II

USC2ZO1 (Course: 3)

**Kingdom Animalia, Ecology and Wildlife
Management**

Unit 1: Kingdom Animalia II (15 L)

Objective: To introduce learners to describe the 7 phyla of animals with the key changes that taken place from simple to complex organism.

Desired Outcome: This lesson explores the classification system used to identify animals. This unit is specifically designed to move quickly beyond the knowledge level to high-level thinking.

1.1: Phylum Chordata Group Protochordata Subphylum Hemichordata and Urochordata

1.2: General characters of Class Pisces, Amphibia, Reptiles, Aves, Mammals with examples

Unit 2: Ecosystem: (15 L)

Objective: To impart knowledge of different components of ecosystem and educate about essentials of coexistence of human beings with all other living organisms.

Desired Outcome: Learners will grasp the concept of interdependence and interaction of physical, chemical and biological factors in the environment and will lead to better understanding about implications of loss of fauna specifically on human being, erupting spur of desire for conservation of all flora and fauna.

2.1: Concept of Ecosystems

2.1.1: Ecosystem - Definition and components

2.1.2: Impact of temperature on biota

2.1.3: Biogeochemical cycles (Water, Oxygen, Nitrogen, Sulphur)

2.1.4: Fresh water ecosystem – Lentic and Lotic

2.1.5: Food chain and food web in ecosystem (Fresh water and Grass land).

2.1.6: Ecological pyramids - energy, biomass and number.

2.1.7: Animal interactions (commensalism, mutualism, predation,

antibiosis, parasitism)

Unit 3: National parks and Sanctuaries of India (15 L)

Objective: *To enlighten learners about the current status of wild life conservation in India in the light of guidelines from different relevant governing agencies vis-à-vis with adversity of poaching and biopiracy.*

Desired Outcome: *Learners would be inspired to choose career options in the field of wild life conservation, research, photography and ecotourism.*

- 3.1:** Concept of Endangered and Critically Endangered species using examples of Indian Wildlife with respect to National Parks and Wildlife Sanctuaries of India (Sanjay Gandhi National Park, Tadoba Tiger Reserve, Corbett National Park, Kaziranga National Park, Gir National Park, Silent Valley, Pirotan Island Marine Park, Keoladeo Ghana National Park, Bandipur Sanctuary)
- 3.2:** Management strategies with special reference to Tiger and Rhinoceros in India
- 3.3:** Ecotourism
- 3.4:** Biopiracy

SEMESTER II

Practical USC2ZOP (Course III)

1. Study of classification and morphological characteristics of vertebrates
 - a) Phylum Chordata
 - i. Subphylum Eurochordata e.g. Herdmania
 - ii. Subphylum Cephalochordata e.g. Amphioxus
 - iii. Subphylum Vertebrata e.g. Petromyzon (Sea lamprey), Myxine (Hagfish)
 - iv. Class Pisces Shark (Scoliodon) , Skate (Rhinobatys), Sting ray (Dasiatias), Electric ray , Sciena, Flying fish, Tilapia
 - v. Class Amphibia Frog, toad
 - vi. Class Reptilia Chameleon, Calotes, Turtle, Cobra
 - vii. Class Aves duck, kingfisher, Parakeet
 - viii. Class Mammalia Bat, Shrew
2. Mounting of scales of fish (Placoid, Cycloid, Ctenoid)
3. Identification and interpretation of aquatic and terrestrial (Grassland) food chains and food webs
4. Construction of food chain/food web using given information/data.
5. a) Identification and interpretation of ecological pyramids of energy, biomass and number
b) Construction of different types of pyramid from given data.
6. Study of the following:
 - a) Endangered (Great Indian Bustard, Asiatic lion, Blackbuck, Olive Ridley sea turtle) and critically endangered species (Slender-billed vulture, Gharial, Malabar civet) of Indian wildlife and state reasons for their decline.
 - b) Study Biodiversity hotspots using world map (Western Ghats and Indo-Burma) Study of sanctuaries, national parks, biosphere reserves in India with respect to its brand fauna as listed in theory)
7. Study of Adaptive radiation in Reptiles - Turtle, Tortoise, Phrynosoma, Draco
8. Identification of venomous and Non venomous snakes

USC2ZO1 (Course III)

REFERENCES AND ADDITIONAL READING

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.

Syllabus for F.Y.B.Sc.
Program B.Sc.

Course: ZOOLOGY

Semester II
Paper II and Practical II

PEDAGOGY

Semester- II Course- IV

In today's competitive era our life faces many challenges along with issues like Stress, Strain, Pain, Violence, Impatience, Threats due to emerging technology. Not only this, our exposure make us to have infectious diseases, chronic diseases.

We as a person show concern regarding public health, mental health degradation of environment along with longevity.

The present course, would give opportunity to the students to become conscious, efficient and knowledgeable agents in the arena of Personal Health and Public Health in total.

SEMESTER-II

Course: 4 [USC2Z02]

NUTRITION, PUBLIC HEALTH AND HYGIENE

Unit 1: Nutrition and Health (15 L)

Objective: To make learners understand the importance of balanced diet and essential nutrients of food at different stages of life.

Desired Outcome: Healthy dietary habits would be inculcated in the life style of learners in order to prevent risk of developing health hazards in younger generation due to faulty eating habits.

1.1: Concept of balanced diet, dietary recommendations to a normal adult, infant, pregnant woman and aged.

1.2: Malnutrition disorders – Anemia (B12 and Iron deficiency), Rickets, Marasmus, Goiter, Kwashiorkar (cause, symptoms, precaution and remedy).

1.3: Constipation, piles, starvation, acidity, flatulence, peptic ulcers (cause, symptoms, precaution and remedy).

1.4: Obesity (Definition and consequences).

1.5: Importance of fibres in food.

1.6: Significance of breast feeding.

1.7: Swine flu and Dengue (cause, symptoms, precaution and remedy). **1.8:** BMI calculation and its significance.

Unit 2: Common Human parasites (15 L)

2.1: General parasitology: Classification, Host parasite relationship

2.2: Ectoparasites: Head louse, Mosquito, Bedbug, Tick (Habitat, Morphology, Life cycle, Mode of Infection, Treatment)

2.3: Endoparasite: Entamoeba histolytica, Plasmodium vivax, Ascaris lumbricoides, Wuchereria bancrofti (Habitat, Morphology, Life cycle, Mode of Infection, Treatment)

UNIT 3: Common Human Diseases and Disorders (15 L)

Objective: To educate learners about causes, symptoms and impact of stress related disorders and infectious diseases.

F.Y.B.Sc. Zoology Syllabus

Desired Outcome: Learners will be able to promptly recognize stress related problems at initial stages and would be able to adopt relevant solutions which would lead to psychologically strong mind set promoting positive attitude important for academics and would be able to acquire knowledge of cause, symptoms and precautions of infectious diseases.

3.1: Stress related disorders

3.1.1: Hypertension, Diabetes type II, anxiety, insomnia, migraine, depression (cause, symptoms, precaution and remedy)

3.2: Communicable and non-communicable diseases

3.2.1: Tuberculosis and Typhoid

3.2.2: Hepatitis (A and B), AIDS, Gonorrhoea and Syphilis

3.2.3: Diseases of respiratory system- Asthma, Bronchitis.

3.2.4: Oral Cancer

(Discuss cause/causative agents, symptoms, diagnostics, precaution /prevention and remedy)

SEMESTER II

Practical USC2ZOP (Course IV)

1. Qualitative estimation of Vitamin C by Iodometric method.
2. Determination of blood pressure by sphygmomanometer.
3. Food adulteration Test:
 - a) Milk adulterants (starch and glucose), methylene blue reduction Test (MBRT).
 - b) Adulterants in Cheese, Butter, Jaggery, Ghee, Honey, Iodised Salt.
4.
 - a) Estimation of protein content of two egg varieties.
 - b) Study of efficacy of different antacids (any two antacids).
5. Study of Human Parasites
 - a) Endoparasites - Protozoans (Entamoeba, Plasmodium), Helminths (Ascaris, Wuchereria)
 - b) Ectoparasites (Head louse, tick) and Exoparasites (Bed bug, Mosquito).
6. Screening of anaemic/non-anaemic persons using CuSO₄ method
7. BMI analysis - Measurement of Height/ Weight and calculation of BMI using formula, preparation and submission of report. (10 students/ group-50 readings/group)
8. Disorders caused due to deficiency of nutrients
Kwashiokor, Marasmus, Goiter, Rickets

USC2Z02 (Course IV)

REFERENCES AND ADDITIONAL READING

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. Epidemiology and Management for Health Care for all. P.V. Sathe, A. P. Sathe, Popular Prakashan, Mumbai.
8. Textbook of Medical Parasitology- C. K. JayaramPaniker. Jaypee Brothers.
9. Prevention of Food Adulteration, Act 1954. Asian Law House.
10. Clinical Dietetics and Nutrition - F. P. Antia and Philip, Oxford University Press.
11. A Complete Handbook of Nature Cure - Dr. H. K. Bakru, Jaico Publishing House.
12. Dietetics - B. Srilakshmi, New Age International (P) Ltd. Publishers.
13. Nutrition: Principles and Application in Health Promotion - J. B. Lippincott Company. Philadelphia.
14. Are You Healing Yourself Mr. Executive - Dr. R. H. Dastur. IBH Publishing Company.
15. Food Nutrition and Health- Dr. Shashi Goyal, Pooja Gupta, S. Chand Publications.
16. Public Health Nutrition. Edited - Michael J. Gidney, Barrie M. Margetts, John M. Kearney and Lenore Arab. Willey Blackwell Publication.
17. Food and Nutrition – Vol. I and II - Dr. Swaminathan , Bappco Publication.
18. Textbook of Human Nutrition - Mahtab Bamji, Prahlad Rao.
19. Total Health by Paramjit Rana.
20. Medical Parasitology. R. L. Ichhpujani and Rajesj Bhatia 3rd Edition. Jaypee BrothersPublication.

