

Gentlemen and Mesdames,

The syllabus committee for FYBSc Zoology comprising of the teachers, students and alumni has completed the first draft. The syllabus is framed after incorporating suggestions from every stake holder. In fact a meeting was also held in the Indian Merchants' Chamber for the purpose thus attempting to bridge the gap between the industry and the academia.

The efforts have fetched good dividends in the form of an innovative product indeed. Being the first draft errors are expected which could be rectified when pointed, leading to perfection.

A pre-amendment meeting is called on 14th Nov 2014, at Government of Maharashtra I. Y. College, Jogeshwari (East) for all the Zoology teachers.

I take this opportunity to appeal to the public at large to forward critical suggestions on the attached syllabus, on email ID harmonium.mnk@gmail.com on 10th November 2014 enabling us to improve upon.

All are also invited for the workshop on 14th for healthy discussion, by blocking the seat through email (harmonium.mnk@gmail.com) to Dr Manisha Kulkarni HOD Zoology, IY College on 10th November, 2014. The registration Fees are Rs ,200/- to cover hospitality and other expenses.

Looking forward to valuable suggestions and your kind support for this first attempt of total transparency solely with the view to give the best to the next generation.

Viayak Dalvie,

Chairman, BOS IN ZOOLOGY.

I endorse the introduction of this transparent methodology and appeal to all the stakeholders to contribute their valuable views for enriching the syllabus.

Dr.Rajpal Hande

Director

BCUD ,UOM

UNIVERSITY OF MUMBAI



Syllabus for First Year Program of Science Faculty Course: ZOOLOGY

w.e.f. 2015-16

Semester I and II

**(As per Choice Based Credit and Grading System with facility
for Credit transfer)**

Syllabus Committee Members

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**Syllabus for
First Year Program of
Science Faculty
Course – ZOOLOGY**

To be implemented from Academic year 2015-16

SEMESTER - I

COURSE CODE	UNIT	TOPICS	CREDITS	LECTURES/WEEK
USZO101	I	Wonders of animal world	2	1
	II	Biodiversity and its conservation		1
	III	Case Studies		1
USZO102	I	Laboratory safety and Units of measurement	2	1
	II	Animal Biotechnology		1
	III	Instrumentation		1
USZOP1	Practical based on both courses		2	6

SEMESTER - II

COURSE CODE	UNIT	TOPICS	CREDITS	LECTURES/WEEK
USZO201	I	Population Ecology	2	1
	II	Ecosystem		1
	III	National park and Sanctuaries		1
USZO202	I	Nutrition and Health	2	1
	II	Public health and hygiene		1
	III	Common human diseases		1

USZOP2	Practical based on both courses	2	6
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**Syllabus for
First Year Program of
Science Faculty
Course – ZOOLOGY**

- 1. Preamble**
- 2. Pedagogy**
- 3. Syllabus Semester I & II**
- 4. References and Additional Reading**
- 5. Scheme of Examination and Paper Pattern**
- 6. Distribution of periods**
- 7. Model Question bank**

Aims

- **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.**

PEDAGOGY

SYLLABUS F.Y.B.ScZOOLOGY

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 & Units of Measurement	Unit 1 Population Ecology	Unit 1 Nutrition & Health
Unit 2 Biodiversity & its Conservation	Unit 2 Animal Biotechnology	Unit 2 Ecosystem	Unit 2 Public Health & Hygiene
Unit 3 Case Studies	Unit 3 Instrumentation	Unit 3 National Parks & Sanctuaries	Unit 3 Common Human Diseases
Practical I	Practical II	Practical I	Practical II

PROPOSED F.Y.B.Sc. ZOOLOGY SYLLABUS (THEORY)

SEMESTER I

COURSE-1 Wonders of Animal World, Biodiversity and its Conservation [USZO 101]

Unit: 1 Wonders of Animal World : (15 L)

Objective : To take students through a captivating journey of hoarded wealth of marvellous animal world.

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

- Echolocation in Bats and Cetaceans- Dolphins and Whales
- Microscopic structure of Molluscan shell (Gastropod), Mechanism of Shell and Pearl formation in Mollusca
- Bioluminescence in Animals- Noctiluca, Glow worm, Firefly, Angler Fish (Mechanism and use for the animal)
- Regeneration in Animals - Earthworm (Annelida) and Lizard (Reptile)
- Mimicry and its significance in butterflies – Great Eggfly & Common Crow, Common Palmfly & Plain tiger, Kallima Butterfly.
- Mechanism of Coral formation and types of Coral reefs
- Bird migration-Definition, types and factors inducing bird migration
- Adaptive features of desert animals –Reptiles (Phrynosoma) and Mammals (Camel)
- Breeding and parental care in
 - Pisces- Oviparous, Viviparous, Ovo-viviparous, mouth brooders, Brood pouches (Tilapia, Shark, Hippocampus)
 - Amphibia- Mouth brooders, Egg carriers (Midwife Toad, Darwin's Frog)
 - Reptiles-Effect of temperature in sex determination
 - Aves- Brood Parasitism (cuckoo)
 - Mammals-Marsupials (Kangaroo)
- Identification of Venomous and non-Venomous Snakes
- Venom apparatus in snake
- Haemotoxic and neurotoxic venom, anti-venin, poly venin (preparation and uses)

Unit: 2 Biodiversity and its Conservation: (15 L)

Objective : To orient students about rich heritage of Biodiversity of India and make them understand significance of its conservation with more emphasis to Western Ghats.

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

- Introduction to Biodiversity- Definition, Concepts, Scope and Significance
- Levels of biodiversity- Introduction to Genetic, Specific, Ecosystem, Biodiversity
- Biodiversity hotspots- Western Ghats and Marine Nature Park- Pirotan island
- Values of biodiversity- Direct use value, Indirect use value
- Threats to biodiversity- Habitat loss and Man- Wildlife conflict
- Biodiversity conservation and management

Conservation strategies - *In situ*, *ex situ*, National parks, Sanctuaries and Biosphere reserves

International efforts Convention on Biological Diversity (CBD), International Union for Conservation of Nature (IUCN), United Nations Environment Program-World Conservation Monitoring Centre (UNEP-WCMC)

National biodiversity action plan, 2002

Unit: 3 Case Studies :(15 L)

Objective : To teach learners about innovative and novel work of scientists/philosophers in the field of biological sciences related to ecological balance, Wildlife conservation and human welfare.

Desired Outcome :Minds of students would be impulsed to think differently and would be encouraged to ipso facto their original crude ideas from the field of biological sciences.

- Dr. HarGobind Khorana (Genetic code)
- Kailash Shankhala (The Tiger Man of India)
- Romulus Earl Whitaker (Herpetologist)
- Dr. Varghese kurian (Amul –White revolution)
- Dr. Salim Ali (Ornithologist)
- Rajendra Singh (Water Conservation-Tarun Bharat Sangh)
- Ananda Mohan Chakrabarty (Super bug *Pseudomonas*)

- Baba Amte (Anandvaan)
- Dr. Lalji Singh (DNA fingerprinting)
- Kiran Mazumdar Shaw (Biocon)
- Anna Hazare (Ralegan Siddhi)
- Gadre Fisheries (Surimi from trash fishes)
- Minamata Bay – (Biomagnification)
- Amrita Devi Bishnoi – (1st Forest Protection Movement, 1731)
- Ahmed Khan Bangalore (Polyblend – Reducing Plastic Pollution)

Total **12 case studies** need to be taught from this unit. Ten can be from the syllabus and two cases to be added of importance to the area/region of the specific college.

REFERENCES

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

MODEL QUESTION BANK

UNIT I- (05 Marks)

1. Write a note on echolocation in Dolphins/ Whales
2. Describe shell formation in Mollusca

3. Write a short note on : Pearl formation in Mollusca
4. Describe : Mechanism of bioluminescence
5. Enumerate the uses of bioluminescence
6. Describe the uses of bioluminescence for..... (Noctiluca, Glow worm, Firefly, Angler fish etc.)
7. Write a short note on : Luciferin – Luciferase interaction
8. Describe the process of regeneration in Earthworm
9. What is regeneration? Explain the term with an example
10. What is mimicry? Explain with an example.
11. Describe: mimicry in butterfly
12. Describe briefly the formation of Corals
13. What are Corals? State its types.
14. Write a short note on: Types of Coral reefs.
15. Describe needs of migration in birds.
16. Explain: Types of migration in Birds.
17. Describe briefly, the factors inducing migration in birds.
18. How does Camel adapt itself to the desert environment?
19. Describe parental care and breeding in (Examples of Pisces, Amphibia)
20. Describe briefly. The effect of temperature in sex determination.
21. Describe briefly: Brood parasite
22. Write a short note on: Haemotoxic Venom / Neurotoxic Venom/ Preparation of Poly Venin
23. Describe Venom apparatus in Snakes.
24. Explain Anti Venom giving its uses.
25. Write the characteristic features of Venomous snakes/ Non Venomous Snakes.

UNIT II- (05 Marks/10 Marks)

Questions that could be asked for 10 marks:

1. Explain biodiversity and its importance. What is a biodiversity hotspot? Explain Western Ghats as biodiversity hotspot in India.
2. Explain: Direct use value / Indirect use value
3. Explain biodiversity and its types.
4. Enumerate and explain threats to biodiversity.
5. State the factors which amount to habitat loss.
6. Explain the concept of Man- Wildlife conflict with an example.
7. Give a detailed account on in- situ hybridization/ ex - situ hybridization
8. Describe National Park and state its importance in conservation
9. Describe Sanctuary and state its importance in conservation
10. What is a National Park? Describe(Any 1 National Park)
11. Give a brief account on biosphere reserve.

12. Give a detailed account on: CBD (Convention on Biological Diversity)/ National Biodiversity Action Plan 2002

Questions that could be asked for 05 marks:

1. Explain biodiversity and mention its types.
2. Explain biodiversity and give two importance
3. Describe National Park/ Sanctuary/Biosphere reserve
4. Explain biodiversity hotspot
5. Write names of important fauna of national park/ sanctuary

UNIT III - (10 Marks)

1. Give a detailed account on:(Name of the eminent personality)
For E.g.:Lalji Singh, Dr.Rajendra Singh, KiranMazumdar Shaw, Amrita Devi Bishnoi, Anna Hazare, Baba Amte etc.
2. Describe in detail-(Name of the case study)
For E.g.: Minamata bay incidence, Amul white revolution, 1st forest protection movement. 1931, Super bug- Pseudomonas etc.
3. Give a detailed account on the contribution made by Dr.Salim Ali in the field of Ornithology.
Similarly, Dr.NeelamKhaire/ Romulus Earl Whitaker – Herpetology etc.

Course 2: INSTRUMENTATION & ANIMAL BIOTECHNOLOGY [USZO 102]

Unit : 1 Laboratory safety, units and measurement: (15 L)

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

Desired Outcome: Students will be skilled to select and operate suitable instruments for the studies of different components of Zoology of this course and also of higher classes including research.

- Good laboratory practices (minimum 12 important points)
- Use of safety symbols- meaning, types of hazards, precautions and first aid

Units of measurement

- Calculations and related conversions of each: Metric system- length (meter to micrometer); weight (gram to microgram) Surface (Square measures), Volumetric (Cubic measures)
- Magnification calculations from electron micrograph
- Temperature- Celsius, Fahrenheit, Kelvin
- Concentrations- Percent solutions, ppt, ppm, dilutions
- Molarity, Normality

- Biostatistics- Sampling and its types, Central Tendencies (mean, median, mode) Tabulation, Graphical representations (Histograms, bar diagrams, pie diagrams).

Unit: 2 Animal Biotechnology: (15 L)

Objective: To acquaint students to the modern developments and concepts of Zoology highlighting their applications aiming for the benefit of human being.

Desired Outcome: (a) Students will be able to understand recent advancements of the subject and their applications for the betterment of mankind.

(b) Young minds would be tuned to think out of box provoking ideas for genuine research in the subject.

- Animal Biotechnology : Scope and achievements of Biotechnology (minimum 5 important achievements)
- Transgenesis - nuclear transplantation method, DNA microinjection method and Embryonic stem cells method.
- Production of transgenic animals (Rainbow trout, Salmon).
- Ethical issues of Human cloning & transgenic animals

Applications of Biotechnology

- DNA fingerprinting– Technique in brief and its application in forensic science - one example (Paternity dispute)
- Therapeutic applications – Retroviral method – ADA therapy
- Recombinant DNA in medicines (recombinant insulin)
- Gene therapy- Types, vectors in gene therapy, SCID
- Bioremediation- types- *Ex vivo* & *In vivo*, application in environmental biotechnology- soil bioremediation – *Ex situ* (composting - vermicomposting, Green genes- Green Fluorescent Protein (GFP) from Jelly fish-valuable as reporter genes used to detect food poisoning.

Unit : 3 Instrumentation: (15 L)

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

(b) To teach students about different conversions of units and measurements.

Desired Outcome: (a) Students will be able to work safely in the laboratory and avoid occurrence of accidents (mishaps) which will boost their scholastic performance.

(b) Economy in use of materials/chemicals during practical sessions and accurate representations of findings and results with correct units and measurements during examination.

- Microscopes-
Structure, principle and applications of compound & dissecting microscope.
Principle and applications of transmission and scanning electron microscopes, phase contrast & fluorescence microscopes (Structure is not expected)
- Colorimetry - principle & applications
- pH- Sorenson's pH scale, pH meter-principle and applications.
- Centrifuge – principle, types (clinical, ultra centrifuges)
- Chromatography – principle, types (Paper, Thin layer, Column) and applications
- Electrophoresis (AGE & PAGE) - principle and applications

REFERENCE BOOKS AND ADDITIONAL READINGS:

1. Introduction to Practical Biochemistry – David T. Plummer (Tata McGraw Hill Publishing Co. Ltd.)
2. Introductory Practical Biochemistry – S.K. Sawhney & Randhir Singh (Narosa Publishing House)
3. Methods in Biostatistics – B. K. Mahajan (Jaypee Publications)
4. Microscopy and Cell Biology - V.K. Sharma (Tata McGraw Hill Publishing Co. Ltd.)
5. Bioinstrumentation – L. Veerakumari (M.J.P. Publishers)
6. Principles and Techniques of Practical Biochemistry – Keith Wilson & John Walker (Cambridge University Press)
7. Biotechnology- Thieman and Pallidino - Pearson edu.
8. Biotechnology –Glick
9. Biochemistry –Satyanarayana
10. Understanding biotechnology- Aluizio Borem ,David Bowe-Low price edition –Pearson Publication
11. Vermicology - Ismail Sultan
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.

MODEL QUESTION BANK

UNIT 1: (5 marks)

1. Describe in brief (Minimum five points)
 - a. Good laboratory practices

- b. Chemical hazards in a laboratory
 - c. Physical hazards in a laboratory
 - d. Biological hazards in a laboratory
 - e. Personal hygiene in laboratory
 - f. Waste disposal and first aid
2. Define and give conversions of the three scales of measuring temperature.
 3. Define molarity. How would you prepare
 - a. 1 litre of 0.1 M NaOH solution? (mol.wt.of NaOH=40)
 - b. 100 ml of 1M NaOH
 - c. 500 ml of 0.2 M NaOH
 4. Define normality. How would you prepare 1 litre of 2 N NaOH solution?
 5. Explain briefly the measures of central tendencies?
 6. Define mean, median and mode and explain each with an example.
 7. The observations of length (in cm) of 10 fishes are 22, 24, 34, 26, 28, 31, 20, 25, 36, 32. Calculate the arithmetic mean of fish length (in cm).
 8. Calculate the arithmetic mean for the following data on fish length by Direct method.

Class interval (length in cm)	5-15	15-25	25-35	35-45	45-55
Frequency (no. of fish)	9	21	40	22	8

9. Calculate the arithmetic mean for the above data on fish length by shortcut method.
10. How do you find the median of the data and state the significance of median.
11. What is mode? How do you calculate mode for ungrouped and grouped data?
12. What is random sampling? State the significance.
13. Explain simple, subdivided and multiple bar diagrams.
14. What is a pie diagram? Write the formula for calculating the angles of degrees for different components.
15. The following data shows the areas in million square miles of the oceans of the world. Construct a pie diagram for the data.

Ocean	Pacific	Atlantic	Indian	Antarctic	Arctic	Total
Area (million sq. miles)	70.8	41.2	28.5	7.6	4.8	152.9

16. What is a histogram/Bar diagram? Explain how it is constructed.

UNIT 2: (5 marks)

1. Give applications of Biotechnology in the field of Medicine.
2. Give the Scope of Biotechnology in different areas as a diagrammatic sketch
3. What is SCID? Name the scientist who discovered the gene therapy for it.
4. In SCID which enzyme does not work properly?
5. Which cells are used for SCID gene therapy?
6. Which gene is defective in SCID?
7. Define transgenesis and mention any two transgenic animals.
8. Ethical issues of transgenesis.
9. Ethical issues of Human cloning.
10. Enlist five applications of DNA finger printing.

(10 marks)

11. Describe SCID and its treatment with suitable diagram.
12. Explain Transgenesis using Embryonic stem cells
13. Explain Bioremediation of soil using Vermicomposting.
14. What is Cystic fibrosis? Explain its diagnostic biotechnological method.
15. Describe use of composting method for soil bioremediation.
16. Explain retrovirus method of treating ADA.

UNIT 3: (10 marks)

1. Describe the components of a compound microscope with a neat labeled diagram.
2. Explain the principle and the applications of compound microscope.
3. Discuss in detail the principle, construction and applications of dissecting microscope.
4. Write the principle and applications of (10 marks each)
 - a. TEM (Transmission electron microscope)
 - b. SEM (Scanning electron microscope)

- c. Phase contrast microscope
 - d. Fluorescence microscope
5. Compare and contrast compound and electron microscope.
 6. Explain the principle of centrifugation and add a note on its application.
 7. Describe types of centrifuges.
 8. Explain the construction of centrifuge, its operation & precautions.
 9. What is pH? Give the principle and applications of pH meter.
 10. Describe paper chromatography as a separation technique.
 11. Explain the principle and applications of TLC.
 12. Discuss the principle of column chromatography and explain the technique.
 13. Describe Agarose gel electrophoresis. Add a note on its applications.
 14. Explain the principle, technique and applications of Polyacrylamide gel electrophoresis.
 15. With the help of a diagram, explain the parts of a colorimeter. Discuss the principle & uses.

SEMESTER-II

Course: 3 Ecology and Wildlife Management [USZO 201]

- **Unit 1: Population ecology: (15 L)**

Objective: To teach population as a unit of ecology, its dynamics and regulatory factors important for its sustenance.

Desired Outcome: This unit will allow students to learn about nature of human population, specific factors affecting its growth and its impact on the population of other life form.

Brief account of:

- Population density
- Natality
- Mortality
- Fecundity
- Age structure
- Sex ratio
- Life tables

Survivorship curves
Population dispersal and distribution patterns
Niche concept

- **Population growth**

Sigmoid growth pattern
J Shaped growth pattern

- **Population Growth regulation**

Intrinsic mechanism- Density dependent fluctuations and oscillations
Extrinsic mechanism- Density independent, environmental and climatic factors, population interactions- types in a tabular form with examples.

Unit: 2 Ecosystem: (15 L)

Objective : To gain knowledge of different components of eco system and educate about essentials of coexistence of human being with all other living organisms.

Desired Outcome :(a) Students will grasp the concept of interdependence and interaction of physical, chemical and biological factors in the environment.

(b) It will lead to better understanding about implications of loss of fauna on human being, erupting spur of desire for conservation of all fauna and flora.

- **Concept of Ecosystem**

Major concept of ecosystem-Definition, components, basic properties and principles
Concept of limiting factor – Impact of temperature on biota
Biogeochemical cycles (H₂O, Carbon, Phosphorous, Nitrogen , O₂)
Energy flow in ecosystem.
Fresh water ecosystem:– Lentic e.g. Pond and Lotic e.g. River
Food chain in ecosystem and food web (Fresh water and Grass land).
Ecological pyramids- energy, biomass and number.
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 bio piracy.

Desired Outcome : Students would be motivated to choose their career in the field of wild life conservation, research, photography and ecotourism.

- Concept of Endangered and Critically Endangered species of Indian Wildlife (minimum 2 examples each)
- Wildlife Protection Act, 1972 with respect to National parks and sanctuaries
- Prevention of Cruelty to Animals Act, 1960 and Animal Ethics
- Management strategies with special reference to Tiger and Rhinoceros in India;
- National parks and Sanctuaries of India (Sanjay Gandhi National Park, Tadoba Tiger Reserve, Corbett National Park, Ranthambhore National Park, Gir National Park, Keoladeo Ghana National Park, Silent Valley, Dachigam Sanctuary, Bandipur Sanctuary, Sunderban National Park)
- Ecotourism
- Biopiracy

SEMESTER II

MODEL QUESTION BANK

UNIT 1(10 marks)

Describe with suitable Example

1. J-Shaped and Sigmoid Growth pattern
2. Population dispersal and distribution pattern
3. Natality and Mortality
4. Natality and Fecundity
5. Fecundity and Mortality
6. Density dependant fluctuation and oscillations
7. Population interactions
8. Age structure and population density
9. Concept of Niche and its significance in population Ecology.

5 marks question (For Q. No. 4 sub question 'b')

Write Notes on / Give a brief account of

1. Population density
2. Natality
3. Mortality
4. Fecundity
5. Age structure
6. Sex ratio
7. Survivorship curve
8. Sigmoid growth pattern
9. J-shaped growth curve
10. Intrinsic mechanism
11. Extrinsic mechanism
12. Niche
13. Population dispersal and distribution pattern

UNIT 2(5 marks)

1. Effect of temperature on metabolism
2. Impact of temperature on reproduction
3. Effect of temperature on animal behaviour
4. Define ecosystem and describe any 2 abiotic factors
5. Define ecosystem and describe any 2 biotic factors
6. Explain producers / autotrophs
7. Give a brief account of various levels of consumers in an ecosystem
8. Explain / Describe in short the inter-relationship between biotic and abiotic factors
9. Describe the following (any one of the cycles can be asked) Water cycle, Carbon cycle, Phosphorous cycle, Nitrogen cycle and Oxygen cycle
10. Explain any one of the following (any one of the natural ecosystems can be asked) pond or river
11. Explain food chain from terrestrial or aquatic ecosystem
12. What is food web and explain the same with a suitable example
13. Give a brief account of :
Energy pyramid, Pyramid of biomass, Pyramid of numbers.

Unit: 3 (10 marks question)

1. State the differences between National park and Sanctuary?
2. Write an account of critically endangered species of Indian wildlife with at least two examples.
3. Explain briefly management strategy of any one tiger project in India.
4. Briefly explain management strategy of Rhinoceros project in India.
5. Write in detail about Wild life Protection Act 1972.
6. What is biopiracy? Explain with suitable examples.
7. Write a note on flora and fauna of Sanjay Gandhi national park.
8. Write an account of Tadoba tiger reserve project.
9. Give an account of biodiversity of Jim Corbett national park.
10. Write a note on Ranthambore Tiger reserve.
11. Write in details about Gir Lion project.
12. Write a note on Keoladeo Ghana National park.
13. Write an account of biodiversity of Silent valley.
14. Write a note on Dachigam national park.
15. Describe in detail about Bandipur tiger reserve.
16. Write in details of Sunderban wildlife sanctuary.
17. Write a note on Ecotourism in India with few examples.

REFERENCES

1. Fundamentals of Ecology by Eugene P. Odum and Grey W. Barrett, Brook Cole/ Cengage learning
2. Fundamentals of Ecology by M.C.Dash – Tata McGraw hill company Ltd, New Delhi
3. Ecology by Mohan P. Arora – Himalaya Publishing House
4. Field Biology and Ecology By Alen H. Benton and William E. Werner – Tata McGraw Hill ltd, New Delhi
5. Ecology and Environment by Sharma P.D. ,Rastogi Publication, Mumbai
6. Ecology : Principles & Applications by Chapman J.L. , Cambridge University trust
7. Ecology by Subramaniam and others , Narosa Publishing House
8. Wildlife laws and its impact on tribes by Mona Purohit, Deep and deep Publication
9. Biology by Eldra Solomon, Linda R. Berg and Diana W. Martin, Thomson/ Brooks/ Cole

COURSE 4: - NUTRITION, PUBLIC HEALTH AND HYGIENE [USZO 202]

Unit: 1 Nutrition and Health: (15 L)

Objective : To make students substantiate importance of balanced diet and essential nutrients of food at different stages of life with respect to modern life style.

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

- Concept of balanced diet, dietary recommendations to a normal adult, infant, pregnant woman and aged.
- Malnutrition disorders - Anemia-B12, Vit. D, Marasmus, Scurvy, Goiter, Night blindness, Kwashiorkar (cause – symptoms – precaution and remedy).
- Constipation, piles, anorexia, starvation, acidity, flatulence, peptic ulcers (cause – symptoms – precaution and remedy).Obesity (Definition and minimum 5 points of significance).
- Importance of fibers in food (minimum 5 points).
- Significance of breast feeding (minimum 5 points).
- Food toxins and food adulteration.
- BMI calculation and its significance.

Unit 2 – Public Health and Hygiene (15 L)

Objective: (a) To impart knowledge about source, quantum and need for conservation of fast depleting water resource.

(b) To teach essentials of maintaining proper sanitation and hygiene and optimizing use of electronic gadgets.

Desired Outcome: Promoting optimum conservation of water, encouragement for maintaining adequate personal hygiene, optimum use of electronic gadgets, avoiding addiction, thus facilitating to achieve the goal of healthy young India in true sense.

- **Health:**

Definition of Health, the need for health education & health-goal.

Physical, psychological & Social health issues.

W.H.O. and its programmes - polio, small pox, malaria, leprosy, tuberculosis (concept, brief accounts and outcome with respect to India).

Ill effects of self-medication.

- **Water and water supply :**

Sources and properties of water.

Purification of water, small scale, medium scale and large scale (rapid sand filters)

Water footprint (concept, brief accounts and significance).

- Sanitation:

The disposal of human and animal waste, refuse, sewage treatment plant and effluent treatment plant (mechanism and significance).

- Hygiene

Hygiene and health factors at home, personal hygiene oral hygiene and sex hygiene.

- Radiation risk: Mobile Cell tower & electronic gadgets (data of recommended level, effects and precaution).
- First aid for dog bite and treatment.
- Different symbols of first aid with meaning and significance.

UNIT 3- Common Human Diseases and disorders (15 L)

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

Desired Outcome: (a) Students 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 mindset promoting positive attitude important for academics.

(b) Acquiring knowledge about cause, symptoms and precautions about infectious diseases would help students prevent frequent sickness not only for them but also of their family members.

- **STRESS RELATED DISORDERS**

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

- **COMMUNICABLE AND NON-COMMUNICABLE DISEASES**

Tuberculosis, common flu, dengue, malaria

- Hepatitis (A and B), AIDS, Gonorrhoea & Syphilis
- Diseases of respiratory system- asthma, bronchitis.

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

REFERENCES AND ADDITIONAL READING

1. Common Medical Symptoms edited by P.J. Mehta National **Inblisents** and Distributions
2. Parks Textbook of Preventive and Social Medicine k. Park M/S Banarasidas Bhanot Jabalpar.
3. Human Physiology – Volume I – II C.C. Chatterjee. Medical Allied agency, Kolkatta.
4. Parasitology (Protozoology and Helminthology) K.D. Chatterjee - Chatterjee Medial Publishers.
5. Nand’s handbook of Forensic Medicine and Toxicology Apurba Nandy. NCBA publication.
6. Essentials of Public Health and Sanitation- Part I and Part II. All India Institute of Local Self Government.
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. A Treatise on Hygiene and Public Health. B.N. Ghosh. Calcutta Scientific Publishing Company.
10. Prevention of Food Adulteration, Act 1954. Asian Law House.
11. Clinical Dietetics and Nutrition. F.P. Antia and Philip Oxford University Press.
12. A Complete Handbook of Nature Cure. Dr. H.K. Bakru. Jaico Publishing House.
13. Dietetics by B. Srilakshmi. New Age International (P) Ltd. Publishers.
14. Nutrition: Principles and Application in Health Promotion. J.B. Lippincott Company. Philadelphia.

15. Are You Healing Yourself Mr. Executive. Dr. R.H. Dastur. IBH Publishing Company.
16. Food Nutrition and Health. Dr. Shashi Goyal, Pooja Gupta. S. Chand Publications.
17. Public Health Nutrition. Edited by Michael J. Gidney, Barrie M. Margetts, John M. Kearney and Lenore Arab. Willey Blackwell Publication.

MODEL QUESTION BANK

Unit I (5 marks)

- 1) Concept of balanced diet and dietary recommendations of any 1 of the following:-
a) Normal adult b) Infant c) Pregnant woman d) Aged
- 2) Cause and symptoms of the following:- a) Anemia b) B12 deficiency c) Vitamin D deficiency d) Marasmus e) Kwashiorkor f) Scurvy g) Goiter h) Night blindness
- 3) Precautions and remedy for all above mentioned health conditions.
- 4) Significance of breast feeding.
- 5) Importance of fibres in food.
- 6) Names of food adulterant and toxins with 2 side effects of each.
- 7) Causes, symptoms, precautions and treatment of a) Constipation, b) Piles, c) Anorexia, d) Starvation, e) Flatulence, f) Peptic Ulcer, g) Obesity, h) Insomnia
- 8) Definition of BMI, its method of calculation and significance.

Unit II (5/10 marks)

Question of 5 marks:-

- Q.1) Concept, brief account and outcome of WHO Programs:-
- a) Polio
 - b) Smallpox
 - c) Malaria
 - d) Leprosy

e) Tuberculosis

Q.2) a) Explain the concept of health goal and health knowledge.

b) Enlist different needs of health education.

c) State five points of social health issues.

Question of 10 marks:-

Q.1) Describe sources and properties of water in relation to human consumption.

Q.2) Describe methods of purification of water – small scale, medium scale and large scale.

Q.3) Explain the concept of water footprint and give its significance.

Q.4) Describe disposal of human and animal waste – STP and ETP its functioning and significance.

Q.5) Give a brief of risk of radiation from mobile cell towers and electronic gadgets.

Q.6) Explain the concepts of physical health, psychological health and myth related to it.

Q.7) Describe the term hygiene and explain in brief health factors related to it at home.

Q.8) Explain personal hygiene, oral hygiene and sex hygiene with 2 significance of each.

Q.9) Describe ill effects of self medication with respect of antibiotics and steroids.

Unit III (10 marks)

Q.1) Causes, Symptoms, Precautions & Remedy

a) Hypertension

b) Diabetes Type II

c) Anxiety and Insomnia

d) Migraine and depression

Q.2) Causes, Symptoms, Precautions & Remedy

a) Tuberculosis

b) Common flu

c) Dengue

d) Malaria

- e) Typhoid
- f) Hepatitis A
- g) Hepatitis B
- h) AIDS

Semester-II		
Course-I (Practical) USZO P2		
1.	a) Study of Marine (Atlantic) and terrestrial (Grassland) food chains and food webs	
	b) Construction of food chain/food web using given information	
2.	a) Study of ecological pyramids of energy, biomass and number	

	b) Construction of different types of pyramid from given data.	
3.	Estimation of Hardness from given water sample(Tapwater& well water)	
4.	Estimation of Free carbon dioxide (Free CO ₂) from two different samples- aerated drinks(diluted) V/s Tap water	
5.	Calculation of Nataliy, Mortality, Population density from given data	
6.	a) Interpretation of Growth curves (Sigmoid and J shaped)	
	b) Interpretation of the given graphs/ table and comment on pattern of population nature/ dispersal :	
	i. Survivorship curve	
	ii. Life tables	
	iii. Fecundity tables	
	iv. Age structure	
	v. Sex ratio	
7.	Calculations of Central tendencies(Mean, Mode, Median) from the given data.	
8.	Construction/Interpretation of given Bar Diagram/ Pie chart.	
9.	BMI analysis- Measurement of Height/ Weight and calculation of BMI using formula, preparation and submission of report. (10 students/ group-50 readings/group)	
Semester-I		
Course-II (Practical) USZO P1		
1.	(a) Calibration and selection of glassware/instrument for accurate measurement (b) Interpretation of safety symbols (Not more than 16)	
2.	<u>Microscopy:</u>	
	a) Parts and its significance of Compound microscope	
	b) Focusing a permanent slide under 10 X and 45 X	
	c) Magnification (Calculate magnification from given data/electrograph/ micrograph)	
3.	<u>Colorimetry</u>	
	a) Dilution of coloured solution (Minimum three concentrations of given sample) and estimation of OD by using colorimeter.	
	b) Determination of OD of the coloured solution and calculating its concentration by using formula.	
4.	<u>pH metry</u>	
	a) pH of various samples (one each acidic, alkaline and neutral) using pH paper/Universal Indicator	
	b) Preparation of pH indicator using red cabbage extract: An alternative to Universal indicator	
5.	<u>Chromatography:</u>	
	a) Adsorption chromatography using chalk	
	b) Paper chromatography using crab shell/ molluscan shells	
	c) Interpretation of given chromatogram- (i) Comment on chemical/ physical nature of separated pigment and affinity with solvent system. (ii) Find out R _f value of separated pigments and identify from standard	

	chart.	
	d) Thin Layer Chromatography (TLC) for lipids/oils (essential oil capsule)	
6.	a) Fermentation of fruit juice	
	b) Extraction of fruit juice with pectinase/ apple/ guava, or any other suitable fruit	
7.	Preparation of Biodetergents using raw organic domestic waste.(Demonstration)	
8.	Identification of transgenic/genetically modified animals from photograph. (Liger, Green Fluorescence Protein, SCID Mice)	
9.	Application of DNA Fingerprinting in Paternity dispute (electrophoretic pictures to be used for interpretation by the students)	

SCHEME OF EXAMINATION

- (a) Internal assessment of twenty five (25) marks per course per semester should be conducted as class test according to the guidelines given by University of Mumbai vide circular number UG/04 of 2014 Dated 5th June 2014 to be implemented from academic year 2014-15.
- (b) External assessment of seventy five (75) marks per course per semester should be conducted as per the following skeleton paper pattern.
- (c) One practical examination of fifty (50) marks per course each should be conducted at the end of every semester.

PROPOSED PAPER PATTERN FOR THE ABOVE SYLLABUS

All Questions are compulsory

Figures to the right indicate full marks

Time: 2.5 hours

Total marks: 75

Q.1.	UNIT 1 Answer any four out of eight (5 marks each)	20 marks
Q.2.	UNIT 2 a. Answer any one of the two (10 marks) b. Answer any two out of the four (5 marks each)	20 marks
Q.3.	UNIT 3 Answer any two out of four (10 marks each)	20 marks
Q.4.	a. Unit 1 - (5 marks) b. Unit 2 - (5 marks) c. Unit 3- (5 marks)	15 marks

* For Question 4 it is recommended to have objective questions such as –

- (a) Match the column
- (b) MCQ
- (c) Give one word for
- (d) True and False
- (e) Define the term
- (f) Answer in one sentence etc.

Semester-II		
Course-II (Practical) USZO P2		
1.	Qualitative estimation of Vitamin C by Iodometric method.	
2.	Microscopic structure of starch granules of different cereals.	3 minimum
3.	Screening of anaemic/non-anaemic persons using CuSO ₄ method.	
4.	a) Estimation of maltose from brown/white bread.	
	b) Moisture content from biscuits or other suitable food products.	
5.	Food adulteration:	
	a) Milk adulterants (Starch, Urea and Glucose), Methylene Blue Reduction Test (MBRT).	
	b) Adulterants in Cheese, Butter, Jaggery, Ghee, Honey, Iodised Salt.	
6.	Study of effect of pH and temperature on amylase activity.	
7.	a) Estimation of protein content of 2 egg varieties.	
	b) Study of efficacy of different antacids.	
8.	a) Human Protozoans (Entamoeba, Leishmania, Plasmodium, Trypanosoma) Helminths(Tapeworm, Ascaris, Wuchereria) Parasites.	
	b) Endoparasites (Enterobius, Dracanculus) and Ectoparasites (Bed bug, Mosquito).	
9.	Identification and interpretation of given symbols/techniques with reference to First Aid and Personal Hygiene based on specific situation-condition (with the help of photograph).	

SEMESTER – I (Course-I) USZO P1
Proposed Skeleton Paper Pattern (Practical)

Time: 3 hrs

Marks: 50

Q.1. (15 Marks)

From the given sample mount foraminiferan shells

OR

Mount scales (Placoid and either cycloid or ctenoid) and melanophores from fishes

OR

Demonstrate cyclosis in Paramecium and irritability

Q.2. Mark/Identify the marked spot on the map and write its significance. (10 Marks)

Biodiversity Hotspots on the world map giving their importance (Min. 2)

OR

National parks and Sanctuaries on the India map and write their significance. (Min. 2)

OR

Endangered organism of Indian wildlife (Min. 2) and place it in the correct National park/ Sanctuary on the given map giving reason of their decline.

Q.3. Identify and giving reasons (Venomous/Non-venomous snake) (5 Marks)

Q.4. Identification (one specimen each) (10 Marks)

- a. Adaptive radiation
- b. Types of corals/ Breeding amphibians
- c. Types of feathers, beaks, legs
- d. Bioluminescent animals
- e. Mimicry

Q.5. Field study report (Biodiversity). (10 Marks)

SEMESTER – I (Course-II) USZO P1
Proposed Question Paper Pattern (Practical)

Time: 3 hrs

Marks: 50
(8 Marks)

Q. 1. (A) Dilution of sample and estimation of OD using colorimeter.
(at least three dilutions)

OR

Calculation of concentration from given OD (by formula as well as standard graph) both the result should be compared.

OR

Find out pH of water samples (3) and comment on its chemical nature.

OR

Prepare pH indicator from red cabbage and identify given samples. (3)

(B). Fermentation of fruit juice. **(7 Marks)**

OR

Extraction of fruit juice with pectinase.

Q. 2. Adsorption chromatography using chalk **(10Marks)**

OR

Paper chromatography of food colours

OR

Calculate R_f and identify the pigment.

OR

Thin Layer Chromatography (TLC) for separation of lipids

Q. 3. Identify parts and write its function. **(5 Marks)**

OR

Focusing a slide under 10 X and 45 X using permanent slide

OR

Calculation of magnification of an Electron micrograph using formula.

Q. 4. Identification **(10Marks)**

[Safety Symbols (two), glasswares, parts of microscope, DNA fingerprinting]

**SEMESTER – II (Course-I) USZO P2
Proposed Question Paper Pattern (Practical)**

Time: 3 hrs

Marks: 50

Q.1.

(15 Marks)

Estimate Hardness from given water sample and comment on its significance.

OR

Estimate Free CO₂ from given water sample and comment on its significance.

Q.2.

(10Marks)

Solve the given problems (using statistical approach wherever possible) based on (Any two)

Natality

Mortality

Population density

Population ecology

Q.3. Identify and interpret the given graph/ growth curve and comment on the pattern of population dispersal.

(5 Marks)

Q.4. Study the given information and give answer on the basis of food chain/ food web, Ecological pyramids and give its significance. (any 1)

(10 Marks)

OR

Prepare food chain/food web or ecological pyramid from the given data.

Q.5. Submission of report of Body Mass Index (at least of 3 persons per students)

(10Marks)

SEMESTER – II (Course-II) USZO P2
Proposed Question Paper Pattern (Practical)

Time: 3 hrs

Marks: 50

Q.1. (15 Marks)

Qualitative estimation of Vitamin C from given sample.

OR

Determination of effect of pH on amylase activity.

OR

Determination of effect of Temperature on amylase activity

Estimation of Maltose content from bread.

Q.2. (10 Marks)

Study of food adulterants (any 2 samples).

OR

Evaluation of milk quality by Methylene Blue Reduction Test (MBRT).

OR

Effect of antacids on acidic solution.

OR

Estimation of albumin content from different types of eggs.

Q.3. (5 Marks)

Determination of moisture content from biscuits.

OR

Study of microscopic structure of starch granules from various cereals.

OR

Detection of milk adulterants (any one).

Q.4. Identification (10 Marks)

a) One specimen each from Protozoan, Helminths Parasites.

b) One specimen either from Ecto/ Endoparasite.

c) Photograph of first aid symbol.

d) Photograph of Personal hygiene.

Q.5. Journal and Viva voce (10 Marks)

Note : Syllabus committee recommends at least one excursion/field trip per year of not more than three days compulsory for students to attend. If long excursion is not possible at least one excursion of one day each should be organised and made compulsory for students to attend per semester.