



R.E. Society's

**R. P. GOGATE COLLEGE OF ARTS & SCIENCE AND
R.V. JOGALEKAR COLLEGE OF COMMERCE,
RATNAGIRI (AUTONOMOUS)**

NAAC accredited 'A' Grade (4th Cycle)

Ratnagiri-415 612 (Maharashtra-India)

Bachelor of Science (B. Sc.) Programme

Program: F.Y.B. Sc.

Course: ZOOLOGY

Syllabus for Semester I & II

Department of Zoology Under NEP 2020

Framed According to the National Education Policy (NEP 2020)

To be implemented from Academic Year: 2023-2024

PREAMBLE

In sharing this curriculum with the instructors and students of Semester I and Semester II (F.Y.B.Sc.) Zoology, I am delighted to announce that, for the very first time, we have made concerted efforts to gather feedback from all those involved in the learning process. This collaborative approach has allowed us to enhance its relevance and effectiveness.

Welcome to the beginning of your Bachelor of Science (B.Sc.) journey! We're excited to share how our education is changing for the better, following the National Education Policy (NEP) of 2020. This introduction will give you a clear idea of what's ahead in your first year.

The NEP 2020 has brought big changes to how we learn. It focuses on making you, the learner, the center of your education. It encourages you to be curious, creative, and a lifelong learner. Let's see how this new approach affects your first year in the B.Sc. program.

In your first year, we'll make sure you get a taste of different areas of science. Instead of studying each subject in isolation, we'll show you how they connect and overlap. This helps you see the bigger picture and understand how science works in the real world.

We believe in learning by doing. So, expect lots of hands-on experiments, fieldwork, and research projects. This way, you won't just memorize facts; you'll learn how to solve problems, which is super important in science.

We also want to make sure that everyone, no matter their background or abilities, feels welcome and supported. We understand that each student is unique, and our teaching methods will adapt to your needs. We're here to help you succeed.

To add more excitement, we offer a range of subjects and pathways for you to explore. You can choose what interests you most and even mix different subjects. This means you have more control over what you learn and can follow your passions.

In a nutshell, your first year in the B.Sc. program, following NEP 2020, is a journey of discovery and learning. We want you to be curious, embrace the diversity of ideas, and be ready for exciting opportunities ahead. Together, we'll explore the world of science and create a brighter future through knowledge, exploration, and innovation.

OBJECTIVES

- Introduce students to ecosystem concepts, biodiversity, wildlife conservation, and management using various teaching tools.
- Provide field experiences to deepen their understanding of ecological concepts.
- Equip students with knowledge in wildlife, opening up career opportunities in Wildlife Tourism.
- Enable students to identify socio-economic animals and understand their significance to humans.
- Foster an appreciation for the importance of biodiversity conservation and coexistence.
- Empower students to recognize potential risk factors affecting human health.
- Explain the role and impact of environmental conservation programs.
- Develop fundamental scientific skills, including observation, biological techniques, and experimental skills.

STRUCTURE OF THE COURSE:

SEMESTER – I

MAJOR COURSES

MAJOR COURSE CODE	COURSE TITLE	UNIT	TOPICS	CREDITS	NO. OF LECTURES
USZOO101	Wonders of Animal World, Biodiversity and its Conservation	1	Wonders of Animal World	2	30
		2	Biodiversity and its Conservation		
		3	Footsteps to follow		
USZOO102	Instrumentation and Animal Biotechnology	1	Laboratory safety, Units and Measurement	2	30
		2	Instrumentation		
		3	Animal Biotechnology		
USZOO1	Zoology Major Practical I	Practical based on USZOO101 and USZOO102		2	60

SEMESTER – II

MAJOR COURSES

MAJOR COURSE CODE	COURSE TITLE	UNIT	TOPICS	CREDITS	NO. OF LECTURES
USZOO201	Ecology and Ecosystem	1	Population ecology	2	30
		2	Ecology and Ecosystem		
		2	National parks and Sanctuaries of India		
USZOO202	Nutrition and Common Human Diseases	1	Nutrition	2	30
		2	Public Health and Hygiene		
		3	Common Human Diseases and Disorders		
USZOO2	Zoology Major Practical II	Practical based on USZOO201 and USZOO202		2	60

Syllabus for (F.Y. B. Sc.) Autonomous from the year 2023-24

Name of the Course	Wonders of Animal World, Biodiversity and its Conservation
Course Code (refer to student handbook)	USZO101
Class	F.Y.B.Sc.
Semester	01
No of Credits	02
Nature	Theory/ Practical/ Field visit
Type (applicable to NEP only)	Core Major
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	

Nomenclature: Wonders of Animal World, Biodiversity and its Conservation

Curriculum:

CO1- 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.

CO2- Learners would appreciate treasure of Biodiversity, its importance and hence would contribute their best for its conservation.

CO3-Minds of learners would be impulse to think differently and would be encouraged ipso facto to their original crude ideas from the field of biological sciences.

Unit	Title	Learning Points	No of Lectures
I	Wonders of Animal World	1.1 Echolocation in Bats and Cetaceans - 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 - Earthworm (Annelida) and Lizard (Reptile) 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) 1.10: Aves: Brood Parasitism (Cuckoo)	10
II	Biodiversity and its Conservation	2.1 Introduction to Biodiversity - Definition, Concepts, Scope and Significance 2.2: Levels of Biodiversity - Introduction to Genetic, Species and Ecosystem Biodiversity 2.3: Introduction of Biodiversity Hotspots- (Western Ghats and Indo- Burma Border) 2.4: Values of biodiversity - Direct and Indirect use value 2.5: Threats to Biodiversity - Habitat loss and Man-	10

		<p>Wildlife conflict</p> <p>2.6: Biodiversity conservation and management</p> <p>2.6.1: Conservation strategies: in situ, ex-situ, National parks, Sanctuaries and Biosphere reserves.</p> <p>2.6.2: 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)</p> <p>2.6.3: National Biodiversity Action Plan, 2002</p> <p>2.6.4: Introduction to Indian Wildlife (Protection) Act, 1972 and Convention for International Trade of endangered species</p>	
III	Footsteps to follow	<p>3.1: Dr. Hargobind Khorana (Genetic code)</p> <p>3.2: Dr. Varghese Kurien (Amul –White revolution)</p> <p>3.3: Dr. Salim Ali (Ornithologist)</p> <p>3.4: Anna Hazare (Water Conservation-Ralegan Siddhi)</p> <p>3.5: Baba Amte (Anandvan)</p> <p>3.6: Kiran Mazumdar Shaw (Biocon)</p> <p>3.7: Gadre Fisheries (Surimi)</p> <p>3.8 : Rajendra Singh</p>	10

PRACTICALS USZOOPI (Based on USZOO101)		1 Credit
1.	Mounting of foraminiferan shells from sand (any 3)	
2.	Study of types of Corals - Brain, Organ pipe, Stag Horn, Mushroom coral	
3.	Study of the following; a. Symbiosis (Termite and Trychonympha, hermit crab and sea anemone) b. Camouflage (leaf insect, chameleon) c. Cannibalistic mate-eating animals (Spider and Praying Mantis) d. Animal architects: Termites, Harvester ant and Baya weaver bird e. Study of bioluminescent organisms – Noctiluca, glow worm, fire fly, angler fish	
4.	Breeding and parental care in Amphibia- Rhacophorus, Midwife toad, Darwin's frog, Caecilian.	
5.	Mounting of scales of fish (placoid, cycloid and ctenoid)	
6.	Study of fossils.	
7.	a) Study of Adaptive radiation in Reptiles - Turtle, Tortoise, Phrynosoma, Draco) b) Identification and differentiation of venomous and non-venomous snakes (Scales, Fangs, Bite marks, etc.)	

8.	Study of Types of feathers (contour, filoplume, down), beaks (Nectar feeding , Insect catching, Fruit eating, Scavenging, Filter feeding), claws (perching, wading, swimming, hopping) in birds	
9.	The Culture of Paramecium.	
10.	a) Identification of birds - Coppersmith Barbet, Bulbul, Rose ringed Parakeet, Magpie Robin, two local birds. b) Field Report – To be done in a group of ten students (submission of written / typed report preferably along with photographs/ tables/ graphs. Other Suggested topics for field observation/survey: - Butterflies / Fishes / Migratory birds of local area. - Variations in Human like Attached vs. Free Earlobes, Blood Groups, Eye colour, etc. using statistical method.	

Note – 1. Practical sessions may be conducted using specimens authorized by wildlife and other regulating authorities. However, it is strongly recommended that teaching methods utilize photographs, audio-visual aids, simulations, models, etc., as recommended by the UGC and as envisaged in the regulations of the relevant monitoring bodies. No new specimens shall be procured for the purpose of conducting the practicals mentioned above.

2. There shall be at least one excursion/field trip.

REFERENCES AND ADDITIONAL READING

1. Vertebrate Zoology Volume I- Jordan and Verma, S. Chand and Co.
2. Invertebrate Zoology Volume II- Jordan and Verma, S. Chand and Co.
3. Invertebrate Zoology- T. C. Majumuria, S. Nagin and Co.
4. Chordate Zoology- P. S. Dhama and J. K. Dhama, R. Chand and Co.
5. Invertebrate Zoology- P. S. Dhama and J. K. Dhama, R. Chand and Co.
6. Introduction to Vertebrates- Moore Cambridge University- Low Priced Edition
7. Zoology- S. A. Miller and 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, Vol. II- T. Jeffery Parker and William. A. Haswell-Low Price Publications
16. Ecology and 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 and Deep Publications
19. Biodiversity- K.C. Agarwal- Agro Botanica Publications
20. Butterflies of India – Isaac Kehimkar- BNHS Publication0

Evaluation Pattern

A) Continuous Internal Evaluation: Maximum Marks:20

Method	Marks
(Class test, home assignment, seminar, viva voce, report submission, active class participation and attendance, etc.)	20

B) Semester End Examination: Maximum Marks: 30

Question No. and Sub questions (If any) (E.g. Q. 1 a) ...	Unit and sub-unit (with number and title)	Type of Question (Essay / short note / Objective / Diagram, etc.)	Marks
1.	Wonders of Animal World	Essay / short note (10 marks)	10
2.	Biodiversity and its Conservation	Essay / short note (10 marks)	10
3.	Footsteps to follow	Essay / short note (10 marks)	10

Practical Examination Pattern:

A) Continuous Internal Evaluation: Maximum Marks:20

Method	Marks
(viva voce, report submission, journal, active participation in lab work and attendance, etc.)	20

B) Semester End Examination: Maximum Marks: 30

Question No. and Sub questions (If any) (E.g. Q. 1 a) ...	Unit and sub-unit (with number and title)	Type of Question (Essay / short note / Objective / Diagram, etc.)	Marks
1.	-	Experiment 1	10
2.	-	Experiment 2	10
3.	-	Experiment 3	10

Syllabus for (F.Y. B. Sc.) Autonomous from the year 2023-24

Name of the Course	Instrumentation and Animal Biotechnology
Course Code (refer to student handbook)	USZOO102
Class	F.Y.B.Sc.
Semester	01
No of Credits	02
Nature	Theory/ Practical/ Field visit
Type (applicable to NEP only)	Core Major
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	

Nomenclature: Instrumentation and Animal Biotechnology

Curriculum:

CO1- Learners would work safely in the laboratory and avoid occurrence of accidents (mishaps) which will boost their scholastic performance and economy in use of materials/chemicals during practical sessions.

CO2- Learners would understand recent advances in the subject and their applications for the betterment of mankind; and that the young minds would be tuned to think out of the box.

CO-3 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.

Unit	Title	Learning Points	No of Lectures
I	Laboratory safety, Units and Measurement	1.1: Introduction to good laboratory practices 1.2: Use of safety symbols: meaning, types of hazards and precautions 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).	10
II	Instrumentation	Microscopy 2.1.1: Construction, principle and applications of Light microscopy, fluorescence microscopy, Electron microscopy and flow cytometry. 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, types of centrifuges, types of rotors, differential and density gradient centrifugation, Sonication and Freeze drying 2.5: Chromatography - Principle and applications (Paper, Adsorption, Column, Thin layer, Affinity, Gas chromatography and HPLC) 2.6: Electrophoresis - Principle and applications (AGE)	10

		and PAGE)	
III	Animal Biotechnology	<p>3.1 Biotechnology: Scope and achievements of Biotechnology (Fishery, Animal Husbandry, Medical, Industrial)</p> <p>3.2: Transgenesis: Retro viral method, nuclear transplantation method, DNA microinjection method and Embryonic stem cell method</p> <p>3.3: Cloning (Dolly)</p> <p>3.4: Ethical issues of transgenic and cloned animals</p> <p>3.5: Applications of Biotechnology:</p> <p>3.5.1: DNA fingerprinting: Technique in brief and its application in forensic science (Crime Investigation)</p> <p>3.5.2: Recombinant DNA in medicines (recombinant insulin)</p> <p>3.5.3: Gene therapy: Ex-vivo and In vivo, Severe Combined Immunodeficiency (SCID), Cystic Fibrosis</p> <p>3.5.4: Green genes: Green Fluorescent Protein (GFP) from Jelly fish- valuable as reporter genes used to detect food poisoning</p> <p>3.5.5 Genetically Modified organisms: Bt cotton, Land-mine detecting plants, Salmon fish, Human milk producing Cows, Featherless chickens</p>	10

PRACTICALS USZOO1(Based on USZOO102)		1 Credit
1.	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.	
2.	a) Study of parts of microscope and their functions. b) Technique of focusing a permanent slide under 10x and 45x (objectives).	
3.	a) Dilution of given sample and estimation of OD by using colorimeter. b) Calculation of concentration from the given OD using formula.	
4.	a) Separation of amino acids from the mixture by paper chromatography. b) Calculation of Rf value of separated pigments/amino acids from given chromatogram and their identification from standard chart.	
5.	Separation of pigments by adsorption chromatography using chalk.	
6.	Separation of lipids by TLC,	
7.	Separation of egg albumin by electrophoresis.	
8.	Identification of transgenic fish (Trout and Salmon) / cloned animals (Dolly sheep, cc cat and Snuppy dog) from photograph.	
9.	Extraction of fruit juice with pectinase from apple/guava/or any other suitable fruit	
10.	Application of DNA Fingerprinting in criminology (photograph of electrophoretic pattern to be given for interpretation by the students)	

Note – 1. Practical sessions may be conducted using specimens authorized by wildlife and other regulating authorities. However, it is strongly recommended that teaching methods utilize photographs, audio-visual aids, simulations, models, etc., as recommended by the UGC and as envisaged in the regulations of the relevant monitoring bodies. No new specimens shall be procured for the purpose of conducting the practicals mentioned above.

2. There shall be at least one excursion/field trip.

REFERENCES AND ADDITIONAL READINGS

1. Introduction to Practical Biochemistry – David T. Plummer (Tata McGraw Hill Publishing Co. Ltd.)
2. Introductory Practical Biochemistry – S.K. Sawhney and 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. Veera Kumari, (M.J.P. Publishers)
6. Principles and Techniques of Practical Biochemistry – Keith Wilson and John Walker, (Cambridge University Press)
7. Understanding biotechnology- Aluizio Borem, David Bove-Low price edition–Pearson Publication
8. A Textbook of Biotechnology – R. C. Dubey, S. Chand Publication.
9. A Manual of Medical Laboratory Technology -A. H. Patel, Navneet Prakashan Ltd.
10. Biological instruments and methodology – Dr. P. K. Bajpai, S. Chand company Ltd.
11. Calculations in Molecular biology and Biotechnology - Frank H. Stephenson, Academic Press.

Evaluation Pattern

C) Continuous Internal Evaluation: Maximum Marks:20

Method	Marks
(Class test, home assignment, seminar, viva voce, report submission, active class participation and attendance, etc.)	20

D) Semester End Examination: Maximum Marks: 30

Question No. and Sub questions (If any) (E.g. Q. 1 a) ...	Unit and sub-unit (with number and title)	Type of Question (Essay / short note / Objective / Diagram, etc.)	Marks
1.	Laboratory safety, Units and Measurement	Essay / short note (10 marks)	10
2.	Instrumentation	Essay / short note (10 marks)	10
3.	Animal Biotechnology	Essay / short note (10 marks)	10

Practical Examination Pattern:

C) Continuous Internal Evaluation: Maximum Marks:20

Method	Marks
(viva voce, report submission, journal, active participation in lab work and attendance, etc.)	20

D) Semester End Examination: Maximum Marks: 30

Question No. and Sub questions (If any) (E.g. Q. 1 a) ...	Unit and sub-unit (with number and title)	Type of Question (Essay / short note / Objective / Diagram, etc.)	Marks
1.	-	Experiment 1	10
2.	-	Experiment 2	10
3.	-	Experiment 3	10

Syllabus for (F.Y. B. Sc.) Autonomous from the year 2023-24

Name of the Course	Ecology and Ecosystem
Course Code (refer to student handbook)	USZOO201
Class	F.Y.B.Sc.
Semester	02
No of Credits	02
Nature	Theory/ Practical/ Field visit
Type (applicable to NEP only)	Core Major
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	

Nomenclature: Ecology and Ecosystem

Curriculum:

CO1- This unit would allow learners to study about nature of animal population, specific factors affecting its growth and its impact on the population of other life form.

CO2- 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.

CO3- Learners would be inspired to choose career options in the field of wild life conservation, research, photography and ecotourism.

Unit	Title	Learning Points	No of Lectures
I	Population ecology	1.1: Population dynamics 1.1.1: Population density 1.1.2: Natality 1.1.3: Mortality 1.1.4: Fecundity 1.1.5: Age structure 1.1.6: Sex ratio 1.1.7: Life tables 1.1.8: Survivorship curves 1.1.9: Population dispersal and distribution patterns 1.1.10 Niche concept 1.2: Population growth regulation 1.2.1: Intrinsic mechanism – Density dependent fluctuations and oscillations 1.2.2: Extrinsic mechanism- Density independent, environmental and climate factors, population interactions 1.3: Population growth pattern 1.3.1: Sigmoid 1.3.2: J Shaped 1.4: Human census (India) – Concept, mechanism and significance	10
II	Ecosystem	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,	10

		predation, antibiosis, parasitism)	
III	National parks and Sanctuaries of India	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	10

PRACTICALS USZOO2 (Based on USZOO201)		1 Credit
1.	Interpretation of the given graphs/ tables and comment on pattern of population nature: i. Survivorship curve ii. Life tables iii. Fecundity tables iv. Age structure v. Sex ratio	
2.	a) Calculation of Natality, Mortality, Population density from given data b) Estimation of population density by capture recapture method	
3.	Interpretation of Growth curves (Sigmoid and J shaped)	
4.	Estimation of hardness from given water sample (tap water v/s well water)	
5.	Estimation of Free carbon dioxide (Free CO ₂) from two different samples-aerated drinks(diluted) v/s tap water	
6.	Identification and interpretation of aquatic and terrestrial (Grassland) food chains and food webs	
7.	Construction of food chain/food web using given information/data.	
8.	a) Identification and interpretation of ecological pyramids of energy, biomass and number b) Construction of different types of pyramids from given data.	
9.	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)	

Note – 1. Practical sessions may be conducted using specimens authorized by wildlife and other regulating authorities. However, it is strongly recommended that teaching methods utilize

photographs, audio-visual aids, simulations, models, etc., as recommended by the UGC and as envisaged in the regulations of the relevant monitoring bodies. No new specimens shall be procured for the purpose of conducting the practicals mentioned above.

2. There shall be at least one excursion/field trip.

REFERENCES AND ADDITIONAL READING

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

Evaluation Pattern

E) Continuous Internal Evaluation: Maximum Marks:20

Method	Marks
(Class test, home assignment, seminar, viva voce, report submission, active class participation and attendance, etc.)	20

F) Semester End Examination: Maximum Marks: 30

Question No. and Sub questions (If any) (E.g. Q. 1 a) ...	Unit and sub-unit (with number and title)	Type of Question (Essay / short note / Objective / Diagram, etc.)	Marks
1.	Population ecology	Essay / short note (10 marks)	10
2.	Ecosystem	Essay / short note (10 marks)	10
3.	National Parks and Sanctuaries of India	Essay / short note (10 marks)	10

Practical Examination Pattern:**E) Continuous Internal Evaluation: Maximum Marks:20**

Method	Marks
(viva voce, report submission, journal, active participation in lab work and attendance, etc.)	20

F) Semester End Examination: Maximum Marks: 30

Question No. and Sub questions (If any) (E.g. Q. 1 a) ...	Unit and sub-unit (with number and title)	Type of Question (Essay / short note / Objective / Diagram, etc.)	Marks
1.	-	Experiment 1	10
2.	-	Experiment 2	10
3.	-	Experiment 3	10

Syllabus for (F.Y. B. Sc.) Autonomous from the year 2023-24

Name of the Course	Nutrition and Common Human diseases
Course Code (refer to student handbook)	USZOO202
Class	F.Y.B.Sc.
Semester	02
No of Credits	02
Nature	Theory/ Practical/ Field visit
Type (applicable to NEP only)	Core Major
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	

Nomenclature: Nutrition and Common Human diseases

Curriculum:

CO1- 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.

CO2-Promoting optimum conservation of water, 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.

CO3- 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.

Unit	Title	Learning Points	No of Lectures
I	Nutrition	1.1 Concept and definition of terms - Nutrition, Malnutrition and Health 1.2 Nutrients: Micronutrients and macronutrients 1.3: Importance of Dietary Fibres in food –Dietary fibre Classification, sources, composition, properties & nutritional significance 1.4: Minerals & Trace Elements, Bio-Chemical and Physiological Role, bio-availability & requirements, sources, deficiency & excess (Calcium, Sodium, Potassium Phosphorus, Iron, Fluoride, Zinc, Selenium, Iodine, Chromium) 1.5 Vitamins - Bio-Chemical and Physiological Role, bio-availability and requirements, sources, deficiency & excess. 1.6 Water - Functions, daily requirements, Water balance. 1.7: Concept of balanced diet, dietary recommendations to a normal adult, infant, pregnant woman and aged. 1.8: Malnutrition disorders – Anemia (B12 and Iron deficiency), Rickets, Beriberi, Marasmus, Goiter, Kwashiorkor (cause, symptoms, precaution and remedy). 1.9: Constipation, piles, starvation, acidity, flatulence, peptic ulcers (cause, symptoms, precaution and remedy). 1.10: Obesity (Definition and consequences). 1.11: BMI calculation and its significance.	10
II	Public Health and Hygiene	2.1: Health 2.1.1: Definition of Health, the need for health education and health goal.	10

		<p>2.1.2: Physical, psychological and Social health issues.</p> <p>2.1.3: WHO and its programmes - Polio, Small pox, Malaria and Leprosy (concept, brief accounts and outcome with respect to India).</p> <p>2.1.4: Ill effects of self-medication.</p> <p>2.2: Water and water supply</p> <p>2.2.1: Sources and properties of water.</p> <p>2.2.2: Purification of water, small scale, medium scale and large scale (rapid sand filters)</p> <p>2.2.3: Water footprint (concept, brief accounts and significance).</p> <p>2.3: Hygiene:</p> <p>2.3.1: Hygiene and health factors at home, personal hygiene, oral hygiene and sex hygiene.</p> <p>2.4: Radiation risk:</p> <p>2.4.1: Mobile Cell tower and electronic gadgets (data of recommended level, effects and precaution).</p> <p>2.5: Blood bank – Concept and significance</p>	
III	Common Human Diseases and Disorders	<p>3.0 Human diseases: Introduction and Types - Bacterial, Viral, Protozoan, Helminthic, infectious, non-infectious etc.</p> <p>3.1 Viral Diseases: Common Cold, Flu, Polio, Rabies</p> <p>3.2 Stress related disorders</p> <p>3.2.1: Hypertension, Diabetes type II, anxiety, insomnia, migraine, depression (cause, symptoms, precaution and remedy)</p> <p>3.3: Communicable and non-communicable diseases</p> <p>3.3.1: Tuberculosis, Typhoid, Pneumonia, Malaria and Dengue</p> <p>3.3.2 Swine flu (cause, symptoms, precaution and remedy).</p> <p>3.3.3: Hepatitis (A and B), AIDS, Gonorrhoea and Syphilis</p> <p>3.3.4: Diseases of respiratory system- Asthma, Bronchitis.</p> <p>3.3.5: Oral Cancer (Discuss cause/causative agents, symptoms, diagnostics, precaution /prevention and remedy)</p> <p>Allergies: hypersensitivity to foreign substances, e.g., pollen, dust, mites, etc.</p> <p>3.5 Drugs and Alcohol Abuse, causes and effects</p>	10

PRACTICALS USZOO2 (Based on USZOO202)		1 Credit
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/white bread. b) Moisture content from biscuits or other suitable food products.	
4.	Food adulteration Test: a) Milk adulterants (starch and glucose), methylene blue reduction Test (MBRT). b) Adulterants in Cheese, Butter, Jaggery, Ghee, Honey, Iodized Salt.	
5.	a) Estimation of protein content of two egg varieties. b) Study of efficacy of different antacids (any two antacids).	
6.	Study of Human Parasites Endoparasites - Protozoans (Entamoeba, Plasmodium), Helminthes (Ascaris, Wuchereria), Ectoparasites (Head louse, tick) and Exoparasites (Bed bug, Mosquito).	
7.	Screening of anaemic /non-anaemic persons using CuSO ₄ method.	
8.	First Aid – Demonstration Practical Training for teachers and students to be conducted by the experts from red cross, Civil defense, Civic authorities by individual institute or cluster colleges in rotation.	
9.	BMI analysis - Measurement of Height/ Weight and calculation of BMI using formula, preparation and submission of report. (10 students/ group-50 readings/group)	

Note – 1. Practical sessions may be conducted using specimens authorized by wildlife and other regulating authorities. However, it is strongly recommended that teaching methods utilize photographs, audio-visual aids, simulations, models, etc., as recommended by the UGC and as envisaged in the regulations of the relevant monitoring bodies. No new specimens shall be procured for the purpose of conducting the practicals mentioned above.

2. There shall be at least one excursion/field trip.

REFERENCES AND ADDITIONAL READING

1. Common Medical Symptoms edited - P. J. Mehta National Implicants 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. Essentials of Public Health and Sanitation- Part I and Part II. All India Institute of Local Self Government.
6. Textbook of Medical Parasitology- C. K. Jayaram Panikkar. Jaypee Brothers.
7. A Treatise on Hygiene and Public Health. -B. N. Ghosh. Calcutta Scientific Publishing Company.
8. Clinical Dietetics and Nutrition - F. P. Antia and Philip, Oxford University Press.
9. Nutrition: Principles and Application in Health Promotion - J. B. Lippincott Company. Philadelphia.
10. Are You Healing Yourself Mr. Executive - Dr. R. H. Dastur. IBH Publishing Company.
11. Food Nutrition and Health- Dr. Shashi Goyal, Pooja Gupta, S. Chand Publications.
12. Textbook of Human Nutrition - Mahtab Bamji, Prahlad Rao.

Evaluation Pattern

G) Continuous Internal Evaluation: Maximum Marks:20

Method	Marks
(Class test, home assignment, seminar, viva voce, report submission, active class participation and attendance, etc.)	20

H) Semester End Examination: Maximum Marks: 30

Question No. and Sub questions (If any) (E.g. Q. 1 a) ...	Unit and sub-unit (with number and title)	Type of Question (Essay / short note / Objective / Diagram, etc.)	Marks
1.	Nutrition	Essay / short note (10 marks)	10
2.	Public Health and Hygiene	Essay / short note (10 marks)	10
3.	Common Human Diseases and Disorders	Essay / short note (10 marks)	10

Practical Examination Pattern:

G) Continuous Internal Evaluation: Maximum Marks:20

Method	Marks
(viva voce, report submission, journal, active participation in lab work and attendance, etc.)	20

H) Semester End Examination: Maximum Marks: 30

Question No. and Sub questions (If any) (E.g. Q. 1 a) ...	Unit and sub-unit (with number and title)	Type of Question (Essay / short note / Objective / Diagram, etc.)	Marks
1.	-	Experiment 1	10
2.	-	Experiment 2	10
3.	-	Experiment 3	10

Date:

Place: Ratnagiri

Signature
Chairperson and HoD



R.E. Society's

**R. P. GOGATE COLLEGE OF ARTS & SCIENCE AND
R.V. JOGALEKAR COLLEGE OF COMMERCE,
RATNAGIRI (AUTONOMOUS)**

NAAC accredited 'A' Grade (4th Cycle)

Ratnagiri-415612 (Maharashtra-India)

**F. Y. B. Sc. SYLLABUS
FOR
VOCATIONAL SKILL COURSES (VSC) IN ZOOLOGY**

Laboratory Practices in Biological Sciences

Department of Zoology Under NEP 2020

Framed According to the National Education Policy (NEP 2020)

To be implemented from Academic Year: 2023-2024

PREAMBLE:

In alignment with the progressive vision outlined in the National Education Policy (NEP) of 2020, we are pleased to introduce a Vocational Skill Course in Laboratory Practices in Biological Sciences, incorporating Biostatistics, for the first-year Bachelor of Science (B.Sc.) students. This vocational course represents a vital step in realizing the transformative ideals of NEP 2020, which prioritize the development of practical skills, holistic education, and a dynamic, learner-centric approach.

The NEP 2020 envisions an educational landscape that not only imparts theoretical knowledge but also equips students with the practical skills necessary to excel in their chosen fields. This vocational skill course is designed to bridge the gap between academic learning and real-world application, aligning with NEP 2020's emphasis on experiential learning and skill development.

In launching this course, we place a strong emphasis on chemical preparation, recognizing its pivotal role in various scientific disciplines. Chemical preparation forms the backbone of experiments, analyses, and research in fields such as chemistry, biology, and environmental science. Through this course, students will gain practical knowledge and skills in chemical preparation, empowering them to conduct experiments, analyze substances, and contribute to scientific advancements. This emphasis on chemical preparation aligns with our commitment to providing a comprehensive and hands-on education that equips students with the tools they need to excel in their chosen fields.

The Vocational Skill Course in Laboratory Practices in Biological Sciences, with a focus on Biostatistics, under NEP 2020, is a testament to our commitment to providing students with a dynamic and relevant education. It empowers them with the practical skills and knowledge required for success in the ever-evolving field of biological sciences while aligning seamlessly with the visionary principles of NEP 2020. Through this course, we aim to cultivate a generation of biology professionals who are well-prepared, adaptable, and ready to contribute meaningfully to the world of science and research.

OBJECTIVES:

1. Provide hands-on experience in biological laboratory practices.
2. Develop skills in biostatistics for data analysis in biology.
3. Foster a holistic approach to learning, emphasizing practical skills.
4. Encourage active participation and experiential learning.
5. Prepare students for careers in research, industry, or healthcare by equipping them with practical skills.
6. Enhance understanding of biological concepts through real-world application.
7. Promote critical thinking and problem-solving in biological contexts.
8. Cultivate teamwork and collaboration through laboratory projects.
9. Align with the National Education Policy (NEP) 2020's vision for practical skill development and holistic education.

STRUCTURE OF THE COURSE:

SEMESTER I

ZOOLOGY-VOCATIONAL SKILL COURSE 1 (USZOVSC104)

VOCATIONAL SKILL COURSE CODE	COURSE TITLE	Unit	Title	CREDITS	NO. OF LECTURES
USZOVSC104	Laboratory Practices in Biological Sciences	Practical -I	Biological Material and Chemical Preparation, Dilutions, and Safety Handling.	1	30
		Practical -II	Exploring Various Analytical Methods.	1	30

Syllabus for (F.Y. B. Sc.) Autonomous from the year 2023-24

Name of the Course	Laboratory Practices in Biological Sciences
Course Code (refer to student handbook)	USZOVSC104
Class	F.Y.B.Sc.
Semester	01
No of Credits	02
Nature	Practical
Type (applicable to NEP only)	Vocational Skilled Course
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	

Nomenclature: Laboratory Practices in Biological Sciences

Course Outcomes:

CO1: Students will follow a protocol independently, including locating materials and equipment, practicing good lab procedures and accurately performing all experimental procedures.

CO2: To demonstrate proficiency in maintaining a safe workplace, including observation of lab safety procedures, use of personal protective equipment, identification hazards and proper disposal of commonly used chemicals and biohazardous materials.

CO3: To understand the underlying principles as well as practical guidelines of “how to do it” and “how to interpret it” statistical data particularly for bio system.

CO4: Students will be acquainted with the concept of biostatistics.

Curriculum:

	PRACTICAL - I (Biological Material and Chemical Preparation, Dilutions, and Safety Handling.)	1 Credits
1.	Interpretation of safety symbols (toxic, corrosive, explosive, flammable, skin irritant, oxidizing, compressed gases, aspiration hazards and Biohazardous infectious material)	
2.	Preparing a solution of known concentration from a known amount of solid material.	
3.	Preparing a solution of known concentration by dilution.	
4.	Preparing a solution of given molarity and volume.	
5.	Preparation of a solution of given normality.	
6.	Preparation of a solution of a given molality.	
7.	Preparation of a solution of given percentage.	
8.	Preparation of ppm and ppb solutions.	
9.	Preparing dilute solutions from concentrated ones.	
10.	a) Preparation of exact 1 N HCL b) Preparation of exact 1 N NaOH	

Evaluation Pattern

A) Continuous Internal Evaluation: Maximum Marks:20

Method	Marks
(viva voce, report submission, active participation in lab work and attendance, etc.)	20

B) Semester End Examination: Maximum Marks: 30

Question No. and Sub questions (If any) (E.g. Q. 1 a) ...	Unit and sub-unit (with number and title)	Type of Question (Essay / short note / Objective / Diagram, etc.)	Marks
1.	-	Experiment 1	10

2.	-	Experiment 2	10
3.	-	Experiment 3	10

PRACTICAL- II (Exploring Various Analytical Methods)			1 Credits
1.	Construction of a discrete frequency distribution.		
2.	Construction of a continuous grouped frequency distribution.		
3.	Construction of the bar diagram.		
4.	Construction of a histogram.		
5.	Construction of a pie diagram.		
6.	Construction of frequency polygon and frequency curve from the frequency table.		
7.	Calculation of the arithmetic mean, mode and median.		
8.	Calculation of median, quartiles, deciles and percentiles.		
9.	Calculation of range, quartile deviation, means deviation and standard deviation.		
10.	Calculation of coefficient of variation.		

Learning Resources recommended:

1. A Manual of Laboratory and Diagnostic Tests" by Frances Talaska Fischbach and Marshall Barnett Dunning III
2. Laboratory Techniques in Biochemistry and Molecular Biology" by Ralph Rapley
3. Laboratory Safety for Chemistry Students" by Robert H. Hill Jr. and David C. Finster
4. Biostatistics: A Foundation for Analysis in the Health Sciences" by Wayne W. Daniel and Chad L. Cross
5. Biostatistics: The Bare Essentials" by Geoffrey R. Norman and David L. Streiter
6. Principles of Biochemistry" by Albert L. Leininger, David L. Nelson, and Michael M. Cox.
7. Laboratory Techniques in Biochemistry and Molecular Biology" by M. S. Swaminathan and M. V. Krishnarao
8. "Biostatistics: Basic Concepts and Applications" by Madan M. Gupta
9. "Laboratory Techniques in Zoology" by J.P. Sharma
10. "Biostatistics: Principles and Practices" by M.N. Satyanarayana
11. "Experimental Techniques in Plant Disease Epidemiology" by S. Nagarajan and D. S. Rathore.
12. Biostatistics: A Foundation for Analysis in the Health Sciences" by B. K. Mahajan
13. "Biostatistics: Textbook and Practical Approach" by M. Swaminathan and S. Ravichandran
14. "Practical Manual of Experimental and Clinical Pharmacology" by S. R. Yadav and A. S. Yadav
15. "Biostatistics for Medical, Nursing and Pharmacy Students" by A. Subha Rani
16. "Laboratory Techniques in Botany" by H. S. Chauhan and G. M. M. Shah
17. "Research Methodology and Biostatistics" by Dr. R. R. Mehta

Evaluation Pattern

A) Continuous Internal Evaluation: Maximum Marks:20

Method	Marks
(viva voce, report submission, active participation in lab work and attendance, etc.)	20

B) Semester End Examination: Maximum Marks: 30

Question No. and Sub questions (If any) (E.g. Q. 1 a) ...	Unit and sub-unit (with number and title)	Type of Question (Essay / short note / Objective / Diagram, etc.)	Marks
1.	-	Experiment 1	10
2.	-	Experiment 2	10
3.	-	Experiment 3	10

Date:

Place: Ratnagiri



Signature
Chairperson and HoD



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**R. P. GOGATE COLLEGE OF ARTS & SCIENCE AND
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NAAC accredited 'A' Grade (4th Cycle)

Ratnagiri-415612 (Maharashtra-India)

**F. Y. B. Sc. SYLLABUS
FOR
Skill Enhancement Course (SEC) IN ZOOLOGY**

Aquarium Fish keeping

Department of Zoology Under NEP 2020

Framed According to the National Education Policy (NEP 2020)

To be implemented from Academic Year: 2023-2024

PREAMBLE:

Welcome to the exciting Skill Enhancement Course on Aquarium Fish Keeping, specially designed for First Year Bachelor of Science (B. Sc.) students under the National Education Policy 2020 (NEP 2020). This course introduces you to the captivating world of aquarium fish and provides hands-on experience in the care and management of aquatic life.

In alignment with the NEP 2020's emphasis on holistic education and skill development, this course aims to go beyond traditional classroom learning. It is designed to offer practical skills that can be applied both personally and professionally, fostering a deeper connection with the natural world and promoting sustainability.

Aquarium fish keeping is a rewarding hobby and a valuable skill, combining elements of biology, ecology, and responsible pet ownership. This course will not only teach you the art and science of creating and maintaining beautiful aquatic environments but will also instil a sense of responsibility and ethical consideration for the welfare of the fish and their habitats.

Throughout this course, you will learn about the principles of water quality, the various types of aquarium systems, the different species of fish suitable for captivity, and the art of creating aesthetically pleasing aquascapes. You will gain practical knowledge in setting up, maintaining, and troubleshooting aquariums, ensuring the health and well-being of your aquatic companions.

Beyond personal enrichment, this course equips you with valuable skills relevant to careers in the fields of aquaculture, aquatic ecology, and environmental conservation. The ability to understand and care for aquatic life is increasingly important in a world where preserving biodiversity and sustainable resource management are top priorities.

We encourage you to approach this skill enhancement course with enthusiasm and curiosity, as it not only enriches your academic experience but also enhances your practical abilities and fosters a deeper appreciation for aquatic ecosystems.

As you embark on this journey of Aquarium Fish Keeping, may you develop a lifelong passion for the underwater world, promoting responsible pet ownership and contributing to the broader goals of environmental conservation.

Best wishes for your Skill Enhancement Course on Aquarium Fish Keeping under NEP 2020.

OBJECTIVES:

- Introduce students to the fundamental principles of aquarium fish keeping.
- Provide hands-on experience in setting up and maintaining aquariums.
- Familiarize students with various species of aquarium fish suitable for captivity.
- Teach the importance of water quality and its impact on aquatic life.
- Develop practical skills in designing aesthetically pleasing aquascapes.
- Offer insights into potential career paths related to aquaculture, aquatic ecology, and conservation.
- Foster a deeper appreciation for aquatic ecosystems and biodiversity.
- Encourage responsible and sustainable practices in the management of aquatic environments.
- Align with the skill development goals of the National Education Policy 2020 (NEP 2020) to enhance students' practical abilities.

STRUCTURE OF THE COURSE:

SEMESTER II

ZOOLOGY- SKILL ENHANCEMENT COURSE 1 (USZOSEC204)

COURSE CODE	COURSE TITLE	Unit	Title	CREDITS	NO. OF LECTURES
USZOSEC204	Aquarium Fish keeping	1	Introduction to Aquarium fish keeping	1	15
		2	Fish Nutrition and aquarium maintenance		
		3	Fish Breeding		
			Practical based on three units	1	30

Syllabus for (F.Y. B. Sc.) Autonomous from the year 2023-24

Name of the Course	Aquarium Fish keeping
Course Code (refer to student handbook)	USZOSEC204
Class	F.Y.B.Sc.
Semester	01
No of Credits	02
Nature	Theory/ Practical/ Field visit
Type (applicable to NEP only)	Core Minor
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	

Nomenclature: Aquarium fish keeping

Curriculum:

CO1-Students will be able to understand the basic principles aquarium fish keeping

CO2- Students will set up and maintain a healthy aquarium ecosystem, including filtration, lighting and water quality control.

CO3- Identify common diseases in aquarium fish and implement preventive measures.

CO4- Apply appropriate treatment methods to address fish health issues.

CO5- Create a visually appealing aquarium with appropriate aqua scaping techniques.

Unit	Title	Learning Points	No of Lectures
I	Introduction to Aquarium fish keeping	1.1 Introduction to aquarium fish biology, Types of aquariums and setup requirements, Freshwater Vs. saltwater aquariums 1.2 Understanding the equipment needed for aquarium setup. 1.3 Selecting fish species, Identifying different fish species and their requirements 1.4 Choosing compatible fish species for a community aquarium 1.5 Understanding the role of filtration in maintaining water quality, Types of filtration systems and their pros and cons	5
II	Fish Nutrition and aquarium maintenance	2.1 Understanding the nutritional requirements of different fish species 2.2 Types of fish food and feeding techniques, preventing overfeeding and managing feeding schedules 2.3 Disease prevention and treatment, Common diseases in aquarium fish. Recognizing signs of illness and stress, Implementing quarantine procedures 2.4 Aquarium maintenance, Water changes and testing, cleaning techniques for aquarium glass, decorations and substrate 2.5 Maintenance of equipment (Filters, heaters, lights)	5
III	Fish Breeding	3.1 Fish Reproductive Biology- Understanding fish reproductive anatomy and physiology, Differentiating between male and female fish. 3.2 Selecting Breeding Candidates- Identifying healthy, sexually mature fish for breeding, Recognizing signs of readiness for breeding. 3.3 Breeding Setups- Setting up breeding tanks and	5

		<p>their specifications, Choice of breeding media (e.g., spawning mops, caves, or plants).</p> <p>3.4 Spawning Techniques- Introduction to different spawning methods, Inducing breeding through environmental cues.</p> <p>3.5 Egg Care and Hatching- Care and protection of fish eggs, Monitoring egg development and maintaining water quality, Feeding fry with appropriate food sources.</p>	
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Sr. No.	PRACTICAL	1 Credit
1.	Assess the compatibility of different fish varieties in a community tank.	
2.	Study the behaviour and preferences of different fish varieties.	
3.	Estimation of Nitrite and nitrate levels from water sample.	
4.	Investigate the impact of different water change frequencies on ammonia, nitrite, and nitrate levels.	
5.	Explore the correlation between nitrite and nitrate levels.	
6.	Determine the stability of pH levels in your aquarium.	
7.	Compare the effectiveness of natural materials (e.g., crushed coral) and chemical buffers in stabilizing pH.	
8.	Preparation of artificial fish feed (e.g., flakes, granules, pellets etc.)	
9.	Culture of live feed for fishes.	
10.	Investigate the impact of different feeding frequencies on fish health and water quality.	
11.	Observe the impact of overfeeding or other factors on ammonia levels.	
12.	Evaluate the effectiveness of your aquarium filter.	

REFERENCES AND ADDITIONAL READING

1. The Complete Idiot's Guide to Freshwater Aquariums" by Mike Wickham
2. The Simple Guide to Freshwater Aquariums" by David E. Boruchowitz
3. Fish Nutrition and Aquarium Maintenance:
4. Aquarium Care of Goldfish" by David E. Boruchowitz
5. Aquarium Plants: Their Identification, Cultivation, and Ecology" by Karel Rataj and Thomas J. Horeman
6. The 101 Best Tropical Fishes: How to Choose and Keep Hardy, Brilliant, Fascinating Species That Will Thrive in Your Home Aquarium" by Kathleen Wood
7. Breeding Aquarium Fishes: A Complete Introduction" by Herbert R. Axelrod and Warren E. Burgess,

Evaluation Pattern

C) Continuous Internal Evaluation: Maximum Marks:20

Method	Marks
(viva voce, report submission, active participation in lab work and attendance, etc.)	20

D) Semester End Examination: Maximum Marks: 30

Question No. and Sub questions (If any) (E.g. Q. 1 a) ...	Unit and sub-unit (with number and title)	Type of Question (Essay / short note / Objective / Diagram, etc.)	Marks
1.	-	Experiment 1	10
2.	-	Experiment 2	10
3.	-	Experiment 3	10

Date:

Place: Ratnagiri



**Signature
Chairperson and HoD**



R.E. Society's

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NAAC accredited 'A' Grade (4th Cycle)

Ratnagiri-415612 (Maharashtra-India)

**F. Y. B. Sc. SYLLABUS
FOR
OPEN ELECTIVES (OE) IN ZOOLOGY**

Health and Hygiene

Department of Zoology Under NEP 2020

Framed According to the National Education Policy (NEP 2020)

To be implemented from Academic Year: 2023-2024

PREAMBLE:

The National Education Policy 2020 represents a significant milestone as it marks the first education policy of the 21st century in our country. The primary goal is to transform pedagogy to render education more holistic, integrated, discovery-driven, learner-centric, flexible, and enjoyable. Simultaneously, it aims to make education more relevant and fulfilling for learners while equipping them for gainful and satisfying employment opportunities. Environmental education has gained increasing importance, prompting educational institutions to engage more actively in conservation initiatives.

One of the most significant aspects of this policy is its emphasis on subject flexibility, allowing learners to align their educational paths with their individual talents and interests. It advocates reducing the curriculum content to prioritize essential learning and encourage critical thinking, creativity, multidisciplinary, and the assimilation of new knowledge in rapidly evolving fields. The syllabus not only provides pedagogical guidance but also outlines clear objectives and desired outcomes for each topic, benefiting both teachers and students.

In keeping with the visionary principles outlined in the National Education Policy (NEP) of 2020, we are delighted to introduce an open elective focused on Health and Hygiene for first-year students pursuing a Bachelor of Science (B.Sc.). This open elective is thoughtfully designed to provide students with a dynamic and inclusive learning experience that aligns seamlessly with the transformative ethos of NEP 2020.

NEP 2020 is all about putting students at the center of their education. It means you get to choose what you're interested in and what matches your skills and future career goals. Our Health and Hygiene elective is a great example of this freedom and creativity. It's here to help you learn about health in a comprehensive way, and it will encourage you to think critically, explore science, and see how different subjects connect.

The success of this revamped syllabus hinges on the dedication and enthusiasm of educators, which has been consistently high throughout the process. To further support teachers, textbooks aligned with the new National Education Policy 2020 are being published for the first time. This course is designed to be dynamic and interactive, aiming to cultivate skilled professionals equipped with both knowledge and practical expertise.

OBJECTIVES:

1. Promote awareness of holistic health encompassing physical, mental, and social well-being.
2. Educate students about preventive health practices, including hygiene, nutrition, and lifestyle choices.
3. Develop critical thinking skills in evaluating health-related information and decision-making.
4. Encourage scientific inquiry and research within the context of health and hygiene.
5. Foster interdisciplinary connections by exploring the intersections of health with biology, psychology, sociology, and environmental science.
6. Emphasize the importance of community health and well-being, including public health initiatives and healthcare systems.
7. Provide a foundational understanding for students considering careers in healthcare, public health, nutrition, or related fields.

STRUCTURE OF THE COURSE:

SEMESTER I

OPEN ELECTIVE COURSES

OPEN ELECTIVE COURSE CODE	COURSE TITLE	UNIT	TOPICS	CREDITS	NO. OF LECTURES
USZOOOE104	Health and Hygiene - I	1	Introduction to personal health and Hygiene	2	30
		2	Nutrition and health		
		3	Mental Health and well-being		

SEMESTER II

OPEN ELECTIVE COURSES

OPEN ELECTIVE COURSE CODE	COURSE TITLE	UNIT	TOPICS	CREDITS	NO. OF LECTURES
USZOOOE204	Health and Hygiene - II	1	Reproductive Physiology	2	30
		2	Reproductive health and wellness		
		3	Reproductive hygiene		

Syllabus for (F.Y. B. Sc.) Autonomous from the year 2023-24

Name of the Course	Health and Hygiene - I
Course Code (refer to student handbook)	USZOOOE104
Class	F.Y.B.Sc.
Semester	01
No of Credits	02
Nature	Theory
Type (applicable to NEP only)	Open Elective
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	

Nomenclature: Health and Hygiene-I

Course Outcomes:

CO1: Students will acquire comprehensive understanding of the principles and practices related to personal health and hygiene

CO2: Students will learn practical strategies to promote healthy lifestyle and develop habits that contribute to over-all wellbeing.

CO3: Students will understand the fundamental principles of mental health and its critical role in overall well-being.

Curriculum:

Unit	Title	Learning Points	No of Lectures
I	Introduction to personal health and Hygiene	Introduction to health 1.1 Definition of health, Health Education the need for health education and health goal. 1.1.2 Physical, psychological and social health issues 1.1.3 Definition and importance of personal health and hygiene 1.1.4 Factors influencing personal health 1.1.5 Health promotion and disease prevention 1.2 Personal Hygiene practices 1.2.1 Hand hygiene and proper handwashing Techniques 1.2.2 Oral hygiene, brushing, flossing and Mouthwash 1.2.3 Body hygiene, bathing, skin and grooming	10
II	Nutrition and health	2.1 Nutrition and Healthy Eating Habits 2.1.1 Importance of nutrition for overall health and well-being 2.1.2 Macronutrients- Carbohydrates, proteins and fats: function, sources and recommended intake 2.1.3 Micronutrients – Vitamins and minerals: functions. Sources, and deficiency risks, role in supporting various physiological processes 2.1.4 Dietary guidelines: Recommended daily allowances (RDAs), Food pyramid/plate and balanced diet concept. 2.1.5 Caloric needs and expenditure, Basal metabolic rate (BMR) and factors affecting it 2.2 Special dietary needs 2.2.1 Nutrition during different life Stages (Pregnancy, infancy, aging) 2.2.2 Dietary considerations for athletes and physically active individuals 2.2.3. Health effects of poor nutrition	10

		2.2.4 Diet and disease prevention 2.2.5 Nutritional assessments	
III	Mental Health and well-being	2.1 Mental Health 2.1.1 Understanding mental health and its impact on overall well-being 2.1.2 Common mental health disorders (anxiety, depression, bipolar disorder) 2.1.3 Factors influencing mental health 2.1.4. Stress management techniques 2.1.5 Building resilience and positive coping Strategies 2.2 Sleep and Rest 2.2.1 Importance of sleep for health 2.2.2 Sleep hygiene practices 2.2.3 Strategies for improving sleep quality Benefits of physical activity 2.2.4 Digital devices and sleep: Impact of screen time on sleep quality, establishing technology free zones before sleep 2.2.5 Sleep and physical health: impact of sleep on immune function, metabolism and cardiovascular health	10

Learning resources recommended:

1. An Introduction to Community Health" by James F. McKenzie and Robert R. Pinger
2. Nutrition: Concepts and Controversies" by FrancesSizer and Ellie Whitney
3. Nutrition for Health, Fitness, and Sport" by Melvin H. Williams and Eric Rawson
4. Mental Health: A Person-Centred Approach" by Nicholas Procter and Helen P. Hamer
5. Introduction to Psychology" by James W. Kalat
6. Community and Public Health Nursing: Evidence for Practice" by Gail A. Harkness and Rosanna DeMarco
7. Health Promotion in Nursing Practice" by Nola J. Pender, Carolyn L. Murdaugh, and Mary Ann Parsons
8. Health and Wellness" by Gordon Edlin and Eric Galanty
9. The Human Body Book: An Illustrated Guide to its Structure, Function, and Disorders" by Richard Walker
10. Nutrition Science" by B. Srilakshmi
11. Public Health and Community Medicine" by K. Park
12. Mental Health: The Indian Perspective" by D. Nagaraja Rao
13. Health Education and Community Pharmacy" by Parveen Kumar
14. Nutrition and Dietetics" by Shubhangini A. Joshi
15. Hygiene and Sanitation" by R.K. Bansal
16. Mental Health Care in India: Current Issues and Emerging Perspectives" by S. K. Chaturvedi and Ajit Avasthi
- 17, Practical Community Medicine" by R. H. Sinha

Evaluation Pattern

A) Continuous Internal Evaluation: Maximum Marks:20

Method	Marks
(Class test, home assignment, seminar, viva voce, report submission, active class participation and attendance, etc.)	20

B) Semester End Examination: Maximum Marks: 30

Question No. and Sub questions (If any) (E.g. Q. 1 a) ...	Unit and sub-unit (with number and title)	Type of Question (Essay / short note / Objective / Diagram, etc.)	Marks
1.	Introduction to personal health and Hygiene	Essay / short note (10 marks)	10
2.	Nutrition and health	Essay / short note (10 marks)	10
3.	Mental Health and well-being	Essay / short note (10 marks)	10

Syllabus for (F.Y. B. Sc.) Autonomous from the year 2023-24

Name of the Course	Health and Hygiene - II
Course Code (refer to student handbook)	USZOOE204
Class	F.Y.B.Sc.
Semester	02
No of Credits	02
Nature	Theory
Type (applicable to NEP only)	Open Elective
Highlight revision specific to employability/ entrepreneurship/ skill development (if any) 100 words	

Nomenclature: Health and Hygiene-II

Course Outcomes:

CO1: Understand the anatomy and physiology of the reproductive system

CO2: Identify common sexually transmitted infections, their causes, symptoms and preventive measures

CO3: Understand the psychological and social aspects of reproductive health.

CO4: Knowledge of reproductive hygiene practices and their significance

Curriculum:

Unit	Title	Learning Points	No of Lectures
I	Reproductive Physiology	1.1 Introduction to reproductive health and hygiene 1.1.1 Definition and importance of reproductive health 1.1.2 Key concepts in reproductive hygiene 1.2 Reproductive Anatomy and Physiology 1.2.1 Male reproductive system, structure and Function 1.2.2 Regulation of male reproductive system 1.2.3 Female reproductive system, structure and Function 1.2.4 Menstrual cycle and hormonal regulation 1.2.5 Pregnancy and Hormonal changes 1.2.6 Menopause and aging 1.2.7 Assisted Reproductive technologies (ART)	10
II	Reproductive health and wellness	1.3 Contraception and family planning 1.3.1 Barrier methods (e.g. condoms diaphragms) 1.3.2 Hormonal methods (e.g. birth control pills, patches, injections) 1.3.3 Long-acting reversible contraceptives (e.g. intrauterine devices, implants) 1.3.4 Emergency contraception 1.4. Infertility and reproductive disorders: 1.4.1 causes of male and female infertility, 1.4.2 diagnosis, treatment options and emotional aspects 1.5 Sexually transmitted infections (STIs) 1.5.1 Common STIs, causes, symptoms and complications 1.5.2 Prevention, testing and treatment of STIs 1.5.3 Sexual health education and safe practices	10
III	Reproductive hygiene	2.1. Reproductive hygiene and self-care 2.1.1 Menstrual health management 2.1.2 Personal hygiene practices 2.1.3 Maintaining a healthy reproductive system	10

		2.1.4 Emotional wellbeing and self-care 2.2 Social and Psychological aspects of Reproductive Health 2.2.1 Gender roles and reproductive health 2.2.2 Relationships and communication 2.2.3 Sexual consents and rights 2.2.4 Reproductive health disparities	
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Learning resources recommended:

1. Guyton and Hall Textbook of Medical Physiology by John E. Hall
2. Reproductive Health and Wellness by K. D. Chavan
3. Reproductive Health: Global Issues, Challenges, and Strategies edited by Justin C. Konje and Omrana Pasha
4. Reproductive Hygiene by M. V. Thambi
5. Essentials of Reproductive Health by P. S. Bhatia and T. K. Dutta
6. Textbook of Reproductive Medicine edited by Sudha Salhan and Manju Puri
7. Women's Reproductive Health edited by P. Sinha and S. C. Shukla
8. Textbook of Human Reproductive Genetics by Aruna M. Raichur and Latha N. Shenoy
9. Textbook of Assisted Reproductive Techniques by Gita Khanna
10. Reproductive Endocrinology and Infertility: Integrating Modern Clinical and Laboratory Practice by Bharti Kalra and Shashank Joshi
11. Textbook of Gynaecology by Richa Saxena
12. Community Medicine: A Students Manual by Parikshit Sanyal
13. Women's Health and Reproductive Medicine edited by Duru Shah and Rishma Dhillon Pai.

Evaluation Pattern

A) Continuous Internal Evaluation: Maximum Marks:20

Method	Marks
(Class test, home assignment, seminar, viva voce, report submission, active class participation and attendance, etc.)	20

B) Semester End Examination: Maximum Marks: 30

Question No. and Sub questions (If any) (E.g. Q. 1 a) ...	Unit and sub-unit (with number and title)	Type of Question (Essay / short note / Objective / Diagram, etc.)	Marks
1.	Reproductive Physiology	Essay / short note (10 marks)	10
2.	Reproductive health and wellness	Essay / short note (10 marks)	10
3.	Reproductive hygiene	Essay / short note (10 marks)	10

Date:

Place: Ratnagiri



**Signature
Chairperson and HoD**