HSNC University, Mumbai

Ordinances and Regulations

With Respect to

Choice Based Credit System

(CBCS)

For the Programmes under

The Faculty of Science and Technology

In the subject of

Zoology

With effect from the Academic year 2020-2021

Section C

Zoology

Part 1- Preamble

Zoology as a subject offers the basic understanding about the animal kingdom and their functioning of various physiological, metabolic, biochemical aspects. This Course takes the students through the fascinating world of animals and their habitats, it explains economic and ecological importance of the animals and the Conservation Strategies. The course includes Classical Zoology, Biodiversity, Biotechnology, Instrumentation, Ecology and Population Studies which enables the students to strengthen their knowledge in Animal Sciences and helps to develop and understanding of scope of the subject as an employment opportunity.

This Course has Two Theory Papers and Two Practical Paper in each of the Semesters. With the introduction of Choice Based Grading System, there will be a continuous evaluation throughout the year in the form of Internal Assessment and Term End Assessment.

1 **Course Objectives:**

USFZO101:

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

USFZO102:

- 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.

- 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.

- 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.

USFZO201:

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

USFZO202:

- 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.

- 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.
- 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.

2. Process adopted for curriculum designing:

The department conducted multiple meetings with the academic, Industry partners and established alumni. After discussion with them at different stages of syllabus development, the changes in the syllabus were introduced.

3. Salient features, how it has been made more relevant:

After discussion and interaction with the industry and academic partners and understanding the requirement of the industries and other related fields certain changes in the syllabus are introduced. Certain portion of animal diversity were added to provide the physiological and other related study of various organisms in addition to their specialty in the animal world.

4. Learning Outcome

First year B.Sc. course is the entry point for the students to undergraduate classes which acts like a guiding force for them to make up their mind in selecting a subject they would wish to pursue their studies in future for carving their career in a particular field. This curriculum will enable the following:

- To nurture interest in the students for the subject of Zoology
- To take the learner through a captivating journey of understating the diversity of Animal Kingdom and hoarded wealth of marvelous animal world (Invertebrates).
- To orient learners about rich heritage of Biodiversity of India and make them understand significance of its conservation.
- To impart knowledge of different components of ecosystem and educate about essentials of coexistence of human beings with all other living organisms.
- 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.
- To facilitate the learning of population ecology, its dynamics and regulatory factors important for its sustenance
- To impart knowledge about source, quantum and need for conservation of fast depleting water resource and essentials of maintaining proper sanitation, hygiene and optimizing use of electronic gadgets.
- To educate learners about causes, symptoms and impact of stress related disorders and infectious diseases.
- To make learners understand the importance of balanced diet and essential nutrients of food at different stages of life.

5. Input from stakeholders:

- Inclusion of relevant topics has been done based on the inputs from the stakeholders of the Department including students and teachers.
- The study of Invertebrate and vertebrates will be taught in addition to the wonders of Animal kingdom.
- More hands-on and skill-based practical sessions have been added in the syllabus.
- In view of Economic Zoology as an important branch from carrier prospects, industrial visits are suggested.
- Study of Instrumentation and Applied Zoology has made the syllabus more suitable for absorption in Industries.
- Economic Zoology will motivate the students to become an entrepreneur,

Part 2- The Scheme of Teaching and Examination is as under:

Semester – I

Summary

Sr. No.	Choice Based Credit System			Subject Code	Remarks
1	Core Course (**Zoology**)			US-FZO-101 US-FZO-102 US-FZO-P1 US-FZO-P2	NIL
2	Elective Course	Discipline Specific Elective (DSE) Course		-	
		2.1	Interdisciplinary Specific Elective (IDSE) Course	-	
		2.2	Dissertation/Project	-	
		2.3	Generic Elective (GE) Course	-	
3	Ability Enhancement Courses (AEC)			US-FFC	
	Skill Enhancement Courses (SEC)			-	

First Year Semester I Internal And External Detail Scheme

Sr. No.	Subject Code	Subject Title	Periods Per Week						Seasonal Evaluation Scheme				Total Marks
			Units	S. L.	L	T	P	Credit	S. L. E	CT	TA	SEE	
1	USFZO101	Diversity and Wonders of Animal Kingdom	3	20% *	3	0	0	2	10	20	10	60	100
2	USFZO102	Laboratory Safety, Units of Measurement, Instrumentation and Animal Biotechnology	3	20% *	3	0	0	2	10	20	10	60	100
3	USFZOP1	Practicals Based on course 1 Practicals Based on course 2			0	0	6	2				100 (80+ 20)	100
	Total Hours / Credit							06	Total Marks				300

***One to two lectures to be taken for CONTINUOUS self -learning Evaluation.**

Ist Year Semester – I Units – Topics – Teaching Hours

S.N	Subject Code	Subject Unit Title		Hours/Lectures	Total No. of hours/lectures	Credit	Total Marks
1	USFZO101	I	Diversity and Wonders of Animal Kingdom-I	15	45 L	2	100 (60+40)
		II	Biodiversity and its Conservation	15			
		III	Ecosystem Ecology	15			
2	USFZO102	I	Laboratory Safety and units of Measurement	15	45L	2	100 (60+40)
		II	Animal Biotechnology	15			
		III	Instrumentation	15			
3	USFZOP1	I	Practicals based on course 1 of theory	3	45x2= 90L lectures per batch	2	100 (80+10+10)
		II	Practicals based on course 2 of theory	3			
			TOTAL			6	300

- **Lecture Duration – 45 Minutes = 0 .75 Hours. (45 Lectures equivalent to 33.75 hours)**
- **One Credit =16.87 hours equivalent to 17 Hours**

Part -3 Detail Scheme Theory

Curriculum Topics along with Self-Learning topics - to be covered, through self-learning mode along with the respective Unit. Evaluation of self-learning topics to be undertaken before the concluding lecture instructions of the respective UNIT

Course Code: I

Unit	Content	No. of Lectures
I	**Diversity and Wonders of Animal Kingdom I** 1.1. Unicellular and multicellular organization (Salient features with examples of phylum and classes mentioned below) 1.2.1 : Unicellular organization: Phylum Protozoa 1.2.2 : Multicellular organization: Colonization level- Phylum Porifera 1.2.3 : Multicellular organization: Division of labour (Cell differentiation)- Phylum Coelenterata;Formation of Corals 1.3 Triploblastic acoelomate and Pseudocoelomate organization 1.3.1 : Acoelomate organization - Phylum Platyhelminthes 1.3.2 :Pseudocoelomate organization – Phylum Nemathelminthes 1.4 : Triploblastic coelomate organization 1.4.1 : Animals with metameric segmentation- Phylum Annelida 1.4.2: Animals with jointed appendages- Phylum Arthropoda; Bioluminescence	15
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 2.6 – Biodiversity conservation and management 2.6.1 – Conservation strategies: in situ, ex-situ, National parks, Sanctuaries and Biosphere reserves. 2.6.2 – Introduction to International efforts : Convention on Biological Diversity (CBD), International Union for Conservation of Nature and Natural Resources (IUCN), United	15

	Nations Environment Program - World Conservation Monitoring Centre (UNEP- CMC) 2.6.3 –National Biodiversity Action Plan, 2002- 2003 2.6.4 – Introduction to Indian Wildlife (Protection) Act, 1972 and Convention for International Trade of endangered species	
III	**Ecosystem Ecology** 3.1 : Concept of Ecosystems 3.1.1: Ecosystem Definition and components 3.1.2 : Impact of temperature on biota 3.1.3: Biogeochemical cycles (Water, Oxygen, Nitrogen, Sulphur) 3.1.4 : Fresh water ecosystem – Lentic and Lotic 3.1.5: Food chain and food web in ecosystem (Fresh water and Grass land). 3.1.6: Ecological pyramids - energy, biomass and number. 3.1.7: Animal interactions (commensalism, mutualism, predation, antibiosis, parasitism) Two Case Studies can be mentioned.	15

Self-Learning topics (Unit wise)

Unit	Topics
I	The students will identify one model organism in their vicinity or during a visit and do the detailed investigation on the same with respect to their classification and body organization. Also the students can identify the animal for its economic or environmental importance.
II	The students can identify the "Threats to Biodiversity - Habitat loss and Man-Wildlife conflict" in their surrounding areas and list them. They can consider the examples of Sanjay Gandhi National Park and Arrey Colony etc.
III	The students have an opportunity to identify a Fresh water ecosystem in their area and comment on the ecological status with respect to the fauna and food chain and food web in it. Example as Ban-Ganga and Powai Lake.

Online Resources

Swayam portal :

Introduction of Biodiversity Hotspots- (Western Ghats and Indo- Burma Border)
Values of biodiversity - Direct and Indirect use value

Concept of Ecosystems: Ecosystem Definition and components

1. *epgp.inflibnet.ac.in, moocs online sourses Environmental Sciences, (530) Paper -03 Biodiversity and conservation, Module : 03, 04,05*
2. *epgp.inflibnet.ac.in, moocs online courses Environmental Sciences, (530) Paper -1 Ecosystem structure & amp. And functions, Module : 01,02,03 Ecosystem concept structure, structure and function*
3. epgp.inflibnet.ac.in Zoology (184)Paper 1: Principles of Ecology Module 8 a and b Life and fecundity table part 1 and 2
4. Moocs online Course (UG) Moocs online course UG: Diet Management in Health and disease

Course Code: II		
Unit	**Content**	**No. of Lectures**
I	**Laboratory safety and Units of 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).	15
II	**Animal Biotechnology** 2.1:Biotechnology: Scope and achievements of Biotechnology (Fishery, Animal Husbandry, Medical, Industrial) 2.2:Transgenesis: Retro viral method, Nuclear transplantation method, DNA microinjection method and Embryonic stem cell method 2.3:Cloning (Dolly) 2.4 :Ethical issues of transgenic and cloned animals 2.5 : Applications of Biotechnology: 2.5.1 : DNA fingerprinting: Technique in brief and its application in forensic science (Crime Investigation) 2.5.2 : Recombinant DNA in medicines (recombinant insulin) 2.5.3 : Gene therapy: Ex-vivo and In vivo, Severe Combined Immunodeficiency (SCID), Cystic Fibrosis 2.5.4: Green genes: Green Fluorescent Protein (GFP) from Jelly fish-valuable as reporter genes used to detect food poisoning. 2.6: Food biotechnology: Applications of biotechnology in making	15

	bread, beer, wine, yogurt and cheese	
III	**Instrumentation** 3.1: Microscopy 3.1.1: Construction, principle and applications of dissecting and compound microscope, Scanning Electron Microscropy, Transmission Electron Microscopy. 3.2 : Colorimetry and Spectroscopy - Principle and applications. 3.3 : pH - Sorenson's pH scale, pH meter - principle and applications. 3.3: Centrifuge - Principle and applications (clinical and ultra centrifuges). 3.4.:Chromatography- Principle and applications (Partition and Adsorption) 3.5:Electrophoresis - Principle and applications (AGE and PAGE) 3.6 Introduction to PCR	15

Self-Learning topics (Unit wise)

Unit	Topics
I	Students will list out the precautions while performing any practical in the laboratory. The students will prepare the MSDS for the chemicals used in experiment will the use of safety symbols.
II	The student will try to identify the ancient and traditional method of preparation of Bread/Wine/Beer/Vinegar and try to compare it with the modern techniques of Biotechnology.
III	The students will be working in the laboratory with various instruments throughout the academic year and will learn to use them efficiently by learning their SOPs.

Online Resources

Swayam portal

Transgenesis: Retro viral method, Nuclear transplantation method, DNA microinjection method and Embryonic stem cell method

Chromatography- Principle and applications (Partition and Adsorption)

1. *epgp.inflibnet.ac.in, moocs online courses Biotechnology (261) Paper -09 Animal Cell*
2. *epgp.inflibnet.ac.in, moocs online courses Analytical chemistry/ instrumentation (221) Paper -03 Chromatography Techniques, Module : 01 & 02*

Part -4

Paper-I-Practical Total Credit: 1

Title of Paper: Diversity and Wonders of Animal Kingdom

Course Code:			
Unit	**Content**	**No. of Lectures**	**Reference Books**
I,II and III	1. Mounting of foraminiferan shells from sand (any 3) Study of types of Corals - Brain, Organ pipe, Stag Horn, Mushroom coral 2. 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 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.) 7. Study of Types of feathers(contour, filoplume, down), beaks(Nectar feeding , Filter feeding), claws (perching, wading, swimming, hopping) in birds 8 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. 9. Observations of fauna in the field (with reference to theory syllabus).	03 lectures per practical per batch	Practical Reference 1,2,3

***Note –**

The practical may be conducted by using specimens authorized by the wild such other regulating authorities though it is strongly recommended that the same should be taught by using photographs/audio-visual aids/ simulations / models, etc. as recommended the UGC and as envisaged in the regulations of the relevant monitoring bodies. Specimen, however, shall be procured for the purpose of conducting practical here-in-above.

#There shall be at least one excursion/field trip

Paper-II-Practical **Total Credit: 1**

Title of Paper: Laboratory Safety, Units of Measurement, Instrumentation and Animal Biotechnology

Course Code:			
Unit	**Content**	**No. of Lectures**	**Reference Books**
I,II and III	1).Interpretation of safety symbols (toxic, corrosive, explosive, flammable, skin Irritant, oxidizing, Compressed gases, aspiration hazards and Biohazardous infectious material.) 2) Study of Central tendencies and plotting of Bar diagram, histogram and pie diagram. 3) Identification of transgenic fish (Trout and Salmon) / cloned animals (Dolly sheep, cc cat and Snuppy dog) from photograph. 4) Extraction of fruit juice with pectinase from apple/guava/or any other suitable fruit 5) 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. 6) Application of DNA Fingerprinting in criminology (photograph of electrophoretic pattern to be given for interpretation by the students) 7) Study the effect of Papain as meat tenderizer. 8) Study of parts of microscope and their functions. Technique of focusing a permanent slide under 10x and 45x (objectives). 9) Dilution of given sample and estimation of OD by using colorimeter. Calculation of concentration from the given OD using formula. 10) Calculation of pH of three different samples (one each acidic, alkaline and neutral) using pH paper/universal indicator/pH indicator from red cabbage and confirming the result with pH meter. 11) Separation of amino acids from the mixture by paper chromatography. 12) Calculation of Rf value of separated pigments/amino acids from given chromatogram and their identification from standard chart. 13) Separation of pigments by adsorption chromatography using chalk. Separations of lipids by TLC	03 lectures per practical per batch	Practical Reference 1,2,3

*Note –

The practical may be conducted by using specimens authorized by the wild such other regulating authorities though it is strongly recommended that the same should be taught by using photographs/audio-visual aids/ simulations / models, etc. as recommended the UGC and as envisaged in the regulations of the relevant monitoring bodies. Specimen, however, shall be procured for the purpose of conducting practical here-in-above.

#There shall be at least one excursion/field trip

Part 5

The Scheme of Teaching and Examination is as under:

Ist Year Semester – II

Summary

Sr. No.	Choice Based Credit System			Subject Code	Remarks
1	Core Course (**Zoology**)			US-FZO-201 US-FZO-202 US-FZO- P1 US=FZO-P2	NIL
2	Elective Course	Discipline Specific Elective (DSE) Course		-	
		2.1	Interdisciplinary Specific Elective (IDSE) Course	-	
		2.2	Dissertation/Project	-	
		2.3	Generic Elective (GE) Course	-	
3	Ability Enhancement Courses (AEC)			US-FFC	
	Skill Enhancement Courses (SEC)			-	

First Year Semester -II Internal and External Assessment

Detail Scheme

Sr. No.	Subject Code	Subject Title	Periods Per Week						Seasonal Evaluation Scheme				Total Marks
			Units	S. L.	L	T	P	Credit	S. L. E	CT	TA	SEE	

1	USFZO201	Diversity and Wonders of Animal Kingdom, Population Ecology and Wild Life Management	3	20% *	3	0	0	2	10	20	10	60	100
2	USFZO202	Nutrition, Public Health and Hygiene and Common Diseases	3	20% *	3	0	0	2	10	20	10	60	100
3	USFZOP2	Practicals Based on course 3 Practicals Based on course 4			0	0	6	2				100 (80+ 20)	100
	Total Hours / Credit							06	Total Marks				300

***One to two lectures to be taken for CONTINUOUS self -learning Evaluation.**

Ist Year Semester – II Units – Topics – Teaching Hours

S.N	Subject Code	Subject Unit Title		Hours/Lectures	Total No. of hours/lectures	Credit	Tot al Marks
1		I	Diversity and Wonders of Animal Kingdom –II	15	45 L	2	100 (60+40)
		II	Population Ecology	15			
		III	Wild Life Management	15			
2		I	Nutrition and Health	15	45L	2	100 (60+40)
		II	Public health and Hygiene	15			
		III	Common human Diseases	15			
3		I	Practicals based on course 3 of theory	3	45x2= 90L lectures per batch	2	100 (80+10 +10)
		II	Practicals based on course 4 of theory	3			
			TOTAL			6	300

- **Lecture Duration – 45 Minutes = 0 .75 Hours. (45 Lectures equivalent to 33.75 hours)**
- **One Credit =16.87 hours equivalent to 17 Hours**

Part -6 Detail Scheme Theory

Curriculum Topics along with Self-Learning topics - to be covered, through self-learning mode along with the respective Unit. Evaluation of self-learning topics to be undertaken before the concluding lecture instructions of the respective UNIT

Course Code : III		
Unit	**Content**	**No. of Lectures**
I	Animal Diversity II and Wonders of Animal Kingdom 1. Triploblastic coelomate organization: 1.1 : Animals with mantle: Phylum Mollusca ;Pearl Formation 1.2: Animals with enterocoel: Phylum Echinodermata , Phylum Hemichordata 1.3: Phylum Chordata 1..3.1: Subphylum Urochordata 1.3.2: Subphylum Cephalochordata 1.4: Subphylum Vertebrata 1.4.1: Super class: Agnatha- Class Cyclostomata 1.4.2: Super class: Gnathostomata 1.4.2.1: Class Pisces (Cartilaginous and bony fish);Parental Care 1.4.2.2: Class Amphibia ; Parental Care 1.4.2.3: Class Reptilia; Regeneration 1.4.2.4: Class Aves ;Brood Parasitism : Class Mammalia;Parental Care	15
II	**Population Ecology** 2.1Population Dynamics 2.1.1: Population density 2.1.2: Natality .1.3: Mortality .1.42 . 1 . 4 : Fecundity 2.1.5: Age structure 2.1.6 : Sex ratio 2.1.7 : Life tables 2.1.8 : Survivorship curves 2.1.9: Population dispersal and distribution Patterns 2.1.10.Niche concept 2.2 : Population growth regulation 2.2.1. : Intrinsic mechanism – Density dependent fluctuations and oscillations 2.2.2: Extrinsic mechanism- Density independent, environmental and climate factors, population interactions 2.3.: Population growth pattern 2.3.1: Sigmoid 2.3.2: J Shaped 2.4: Human census (India) – Concept, mechanism and	15

	significance	
III	**Wild Life Management** 3.1 : Concept of IUCN Red listed species using examples of Indian Wildlife with respect to National Parks and Wildlife 3.2: 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, Koeladeo Ghana National Park, Bandipur Sanctuary) 3.3:Management strategies with special reference to Tiger and Rhinoceros 3.4 : Ecotourism 3.5 : Biopiracy	15

Self-Learning topics (Unit wise)

Unit	Topics
I	The students will identify one model organism in their vicinity or during a visit and do the detailed investigation on the same with respect to their classification and body organization. Also the students can identify the animal for its economic or environmental importance.
II	The students from their area or Zone of Municipal Office can collect the data on Human Sensex and compare the two consecutive year's data and understand the mechanism of Human Sensex of India.
III	Students can choose a Sanctuary or National Park of Asia other than India and comment on their biodiversity. The students can understand the requisite to declare a place as an Ecotourism spot.

Online Resources

Swayam portal

Fecundity
Red Book Data on endangered species.

Part 3: Detail Scheme Theory

2nd Semester"

Course Code : IV		
Unit	**Content**	**No. of Lectures**
I	**Nutrition and Health** 1.1 : Concept of balanced diet, dietary recommendations to a normal adult, infant, pregnant woman and aged. 1.2 : Malnutrition disorders – Anemia (B12 and Iron deficiency), Rickets, Marasmus, Goiter, Kwashiorkar (cause, symptoms, precaution and remedy). 1.3 : Constipation, piles, starvation, acidity, flatulence, peptic ulcers (cause, symptoms, precaution and remedy). 1.4: Obesity (Definition and consequences). 1.5Importance of fibres in food. 1.6 : BMI calculation and its significance.	**15**
II	**Public Health and Hygiene** 2.1: Health 2.1.1. : Definition of Health, the need for health education and health goal. 2.1.2: Physical, psychological and Social health issues. 2.1.3 : WHO and its programmes - Polio, Small pox, Malaria and Leprosy (concept, brief accounts and outcome with respect to India). 2.1.4 : Ill effects of self-medication. 2.2:Water and water supply 2.2.1: Sources and properties of water. 2.2.2 : Purification of water, small scale, medium scale and large scale (rapid sand filters) 2.2.3 : Water footprint (concept, brief accounts and significance). 2.3: Hygiene: 2.3.1 : Hygiene and health factors at home, personal hygiene, oral hygiene and sex hygiene. 2.4: Radiation risk: 2.4.1: Mobile Cell tower and electronic gadgets (data of recommended level, effects and precaution). 2.5: Blood bank – Concept and significance	15
III	Common Human Diseases 3.1 Stress related disorders 3.1.1 : Hypertension, Diabetes type II, anxiety, insomnia,migraine, depression (cause, symptoms, precaution and remedy)	15

	3.2: Communicable and non-communicable diseases 3.2.1: Tuberculosis , Typhoid and Dengue 3.2.2: Hepatitis (A and B), AIDS, Gonorrhea and Syphilis 3.2.3: Diseases of respiratory system- Asthma, Bronchitis. 3.2.4: Oral Cancer (Discuss cause/causative agents, symptoms, diagnostics, precaution /prevention and remedy) 3.2.5: Swine flu (cause, symptoms, precaution and remedy).	

Self-Learning topics (Unit wise)

Unit	Topics
I	The students will find out the detailed information on the Government initiatives to improve the health status of poor and malnourished children and pregnant women in the state of Maharashtra.
II	The students will have to find out the role and directives of WHO during Epidemic and Pandemic in Country/World level.
III	The students should collect the information by conducting a preliminary survey to understand the Hygiene status of a population for communicable and non – communicable disease considering COVID 19 as an example and collate the data and prepare a report on it.

Online Resources

Swayam portal

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

1. *epgp.inflibnet.ac.in, moocs online courses Biotechnology (261) Paper -09 Animal Cell Biotechnology, Module: 10 Methods of creating Transgenic Animals*
2. *epgp.inflibnet.ac.in, moocs online courses Analytical chemistry/ instrumentation (221) Paper -03 Chromatography Techniques, Module : 01 & 02*

Part - 7

Paper-I Practical **Total Credit: 1**

Title of Paper: Diversity and Wonders of Animal Kingdom, Population Ecology and Wild Life Management

Course Code:			
Unit	**Content**	**No. of Lectures**	**Reference Books**
I,II and III	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 CO2) 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. a) Identification and interpretation of ecological pyramids of energy, biomass and number b) Construction of different types of pyramid from given data. 8. Study of the following: a) Endangered (Great Indian Bustard, Asiatic lion, Blackbuck, Olive Ridley sea turtle) and critically	03 lectures per practical per batch	Practical Reference 1-5

	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) c) Study of sanctuaries, national parks, biosphere reserves in India with respect to its brand fauna as listed in theory)		

*Note –

The practical may be conducted by using specimens authorized by the wild such other regulating authorities though it is strongly recommended that the same should be taught by using photographs/audio-visual aids/ simulations / models, etc. as recommended the UGC and as envisaged in the regulations of the relevant monitoring bodies. Specimen, however, shall be procured for the purpose of conducting practical here-in-above.

#There shall be at least one excursion/field trip

Paper-II-Practical Total Credit: 1

Title of Paper: Laboratory Safety, Units of Measurement, Instrumentation and Animal Biotechnology

Course Code:			
Unit	**Content**	**No. of Lectures**	**Reference Books**
I,II and III	1. Qualitative estimation of Vitamin C by Iodometric method. 2. Study of microscopic structure of starch granules of different cereals (wheat, maize and jowar). a) Estimation of maltose from brown/white bread. b) Moisture content from biscuits or other suitable food products. 3.Food adulteration Test: a) Milk adulterants (starch and glucose), methylene blue reduction Test (MBRT). b) Adulterants in Cheese, Butter, Jaggery, Ghee, Honey, Iodised Salt. 4. a) Estimation of protein content of two egg varieties. b) Study of efficacy of different antacids (any two antacids). 5.Study of Human Parasites 1.Endoparasites - Protozoans (Entamoeba, Plasmodium), Helminths (Ascaris, Wuchereria), Ectoparasites (Head louse, tick) and Exoparasites (Bed bug, Mosquito). 2. Screening of anaemic/non-anaemic persons using CuSO4 method. 3. 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.	03 lectures per practical per batch	Practical Reference 1-5

	4. BMI analysis - Measurement of Height/ Weight and calculation of BMI using formula, preparation and submission of report. (10 students/ group-50 readings/group)		

*Note –

The practical may be conducted by using specimens authorized by the wild such other regulating authorities though it is strongly recommended that the same should be taught by using photographs/audio-visual aids/ simulations / models, etc. as recommended the UGC and as envisaged in the regulations of the relevant monitoring bodies. Specimen, however, shall be procured for the purpose of conducting practical here-in-above.

#There shall be at least one excursion/field trip

Reference Books (Sem I)

USFZO101 Paper 1

1. InVertebrate Zoology, Volume I- Jordan and Verma, S. Chand and Co
2. Invertebrate Zoology- P. S.Dhami and J. K. Dhami , R.Chand and Co.
3. A Textbook of Zoology, Vol.II- T. Jeffery Parker and William. A. HaswellLow Price Publications
4. Ecology and Environment- P. D. Sharma, R. K. Rastogi Publications
5. Introduction to Ecology- R. Dajoz
6. Biodiversity- K.C.Agarwal- Agro Botanica Publications
7. epgp.inflibnet.ac.in, moocs online sourses Environmental Sciences, (530) Paper -03 Biodiversity and conservation, Module : 03, 04,05
8. Wildlife Laws and its Impact on Tribes- Mona Purohit , Deep and Deep Publication
9. epgp.inflibnet.ac.in, moocs online courses Environmental Sciences, (530) Paper -1 Ecosystem structure & amp. And functions, Module : 01,02,03 Ecosystem concept structure, structure and function
10. P.S. Verma and V. K. Agrawal, 2008. Cell biology, genetics, molecular biology, Evolution and Ecology. S. Chand Publications, New Delhi

USFZO102 Paper 2

1. Biochemistry by Harper
2. Bioinstrumentation – L. Veerakumari, (M.J.P. Publishers)
3. Introduction to Practical Biochemistry – David T. Plummer (Tata McGraw Hill Publishing Co. Ltd.)
4. Principles and Techniques of Practical Biochemistry – Keith Wilson and John
5. Biotechnology by Jogdang
6. epgp.inflibnet.ac.in, moocs online courses Biotechnology (261) Paper -09 Animal Cell Biotechnology, Module: 10 Methods of creating Transgenic Animals
7. A Textbook of Biotechnology – R. C. Dubey, S. Chand Publication
8. Introduction to Practical Biochemistry – David
9. T. Plummer (Tata McGraw Hill Publishing Co. Ltd.)
10. Principles and Techniques of Practical Biochemistry – Keith Wilson and John
11. Biological instruments and methodology – Dr. P.K. Bajpai, S. Chand
12. epgp.inflibnet.ac.in, moocs online courses Analytical chemistry/ instrumentation (221) Paper -03 Chromatography Techniques, Module : 01 & 02

USFZOP1 Practical

1. Invertebrate Practical Zoology- P.S.Verma and Agrawal
2. A Manual of Medical Laboratory Technology -A. H. Patel, Navneet Prakashan
3. Biological instruments and methodology – Dr. P. K. Bajpai, S. Chand Co. LTD

Reference Books (Sem II)

USFZO201 Paper 1

1. Vertebrate Zoology Volume I- Jordan and Verma , S. Chand and Co
2. Chordate Zoology- P. S. Dhami and J. K. Dhami , R. Chand and Co.
3. Fundamentals of Ecology- E. P. Odum , Sunders Publication
4. epgp.inflibnet.ac.in Zoology (184) Paper 1: Principles of Ecology Module 8 a and b Life and fecundity table part 1 and 2
5. Essentials of Ecology and Environmental Science - S.V.S Rana
6. Field Biology and Ecology – Alen H. Benton and William E. Werner ,Tata McGraw Hill ltd, New Delhi
7. Ecology - Subramaniam and Others, Narosa Publishing House
8. Economic Zoology, Biostats and Animal Behaviour - Shukla, Mathur,

USFZO202 Paper 2

1. epgp.inflibnet.ac.in moocs online course UG: Diet Management in Health and disease (30)
2. Common Medical Symptoms edited - P. J. Mehta National Inblisents and Distributions
3. Nutrition: Principles and Application in Health Promotion - J. B. Lippincott
4. Moocs online course UG: Diet Management in Health and disease (30)
5. Human Physiology – Volume I – II C. C. Chatterjee, Medical Allied agenc Kolkata
6. Parasitology (Protozoology and Helminthoology) - K. D. Chatterjee

USFZOP2 Practical

1. Economic Zoology, Biostats and Animal Behaviour - Shukla, Mathur, Upadhyay, Prasad. Rastogi Publications.
2. Ecology - Subramaniam and Others, Narosa Publishing House
3. A Treatise on Hygiene and Public Health. -B. N. Ghosh. Calcutta Scientific
4. Prevention of Food Adulteration, Act 1954. Asian Law House.
5. A Complete Handbook of Nature Cure - Dr. H.K. Bakru, Jaico Publishing House

Board of Studies in Faculties of Science & Technology

Board of Studies in ZOOLOGY Subject

1) Name of Chairperson/Co-Chairperson/Coordinator:-
    a. **Dr. Tejashree Shanbhag - Chairperson**

2) Two to five teachers each having minimum five years teaching experience amongst the full time teachers of the Departments, in the relevant subject.
    a. **Dr. Shalini Rai**
    b. **Dr. Aashu Vajpai**
    c. **Dr. Suvarna Sharma**

3) One Professor / Associate Professor from other Universities or professor / Associate Professor from colleges managed by Parent Body; nominated by Parent Body;-
    a. **Dr. Lata Sardesai**

4) Four external experts from Industry / Research / eminent scholar in the field relevant to the subject nominated by the Parent Body;
    a. **Dr. Sasikumar Menon -** Industry Expert
    b. **Dr. Kersi Avari -** Industry Expert
    c. **Dr. Manoj Borkar-** Research Scholar
    d. **Principal Dr. B.B. Sharma –** Academic Scholar
    e.
    f. **Principal Dr. Chhaya Panse**- Academic Scholar

5) Top rankers of the Final Year Graduate and Final Year Post Graduate examination of previous year of the concerned subject as invitee members for discussions on framing or revision of syllabus of that subject or group of subjects for one year.
    a. **Dr. Sudha Savant - Alumni**
    b. **Mr. Akshay Kawale - Alumni**