Academic Council Meeting No. and Date : 8 / September 04, 2023
Agenda Number : 2 Resolution Number : 34, 35 / 2.6, 2.27

Vidya Prasarak Mandal's
B. N. Bandodkar College of Science (Autonomous), Thane

Syllabus for

Programme : Bachelor of Science

Specific Programme : Zoology

(Major/Minor/Generic)

[F.Y.B.Sc. Zoology]

Level 4.5

CHOICE BASED GRADING SYSTEM

Revised under NEP

From academic year 2023 - 2024

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Eligibility:

Passed 12th standard (HSC) of Maharashtra State Board / CBSE / ICSE board with Mathematics as one of the subject.

Duration : 3 years (level 4.5)

Mode of Conduct:

Laboratory practicals / Offline lectures / Online lectures

Eligibility For certificate if exit at level 4.5

Name of the Degree course: FY.B.Sc Zoology

CREDIT 06 MAJOR

PREAMBLE

It gives me an immense pleasure to introduce this modified syllabus to the department of Zoology to pursue wise and able aspects of the subject to be instilled in the students of semester I and semester II under the quest of National Education Policy (NEP) by the Govt. of India-2020 to our institution B. N. Bandodkar College of Science, Thane (Autonomous) affiliated to the University of Mumbai to be implemented from academic year 2023-24.

It is foresighted to involve experts from all the relevant sectors of the society to design this syllabus with their valued advice and suggestions. The syllabus has been finalized unanimously by prior appointed the members of Board of Studies in Zoology Subject which include the industrial technical advice from Reliable Analytical Laboratory known for practices of most advance analytical techniques in biological sciences. The process involves meritorious alumni of the institution and a faculty from outside college.

The syllabus has been designed referring numerous national and international syllabi of the zoology subject; combination of certain topics to retain exact nature of zoology along with preserving the interest of NEP, stringently. The F.Y.B.Sc Zoology course is divided into two for semester I and semester II. Each semester will contain a separate syllabus for 'major', 'minor' and 'generic' component and shall be taught accordingly. Major component will quench the demand of high interest on the pupils for pursuing the subject up to higher levels of the program. The learning of various zoological skills is also incorporated in the generic and elective components.

Although, due to the guidelines of UGC, use of animals is excluded from the practicals, substituting the same with audiovisual instruction, simulations aids and use of ICT to make syllabus more interesting and interactive. Pedagogy will guide our teachers to know content and objectives along with desired outcome of every topic. The syllabus will include a question bank and answer keys for students in addition to the questionnaires, which will be an integral part of the syllabus. It is expected that the teaching process with exciting results of the curriculum will be boosted by further improvements and the enthusiasm of the teachers.

Dr. Sudesh D. Rathod
Chairperson, BoS Zoology
VPM's B. N. Bandodkar College of Science (Autonomous), Thane

PEDAGOGY

First year B.Sc. 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 their career procurements in a particular field. The syllabus committee in the subject of Zoology for F.Y.B.Sc. Class has designed this syllabus with a view that it is most appropriate time when we transform our traditional closed classroom teaching learning practices to more of field and activity based studies, the correct methodology for the study of biological Sciences. It is intended, to orient the students about ecosystem, bio- diversity, wildlife conservation and management with the help of models, photographs, movies, documentaries, charts and use of ICT and then take learners to the field to have realistic experiences. This will enable them to get true insight about the endurance of animal life in relation to human activity inducing sentiment of love, care and protection in the young mind and heart leading to understanding the importance of coexistence and conservation of biodiversity. Interaction with the officials of the wildlife protection force should be allowed to get basic knowledge about the relevant acts through lectures that create awareness about these issues and to make best use of the knowledge in their own interest as well as for the nation. Instrumentation and Animal Biotechnology component would initiate academia- industry interface and should be edified in collaboration with expertise from relevant research institutes and industrial establishments by inviting them as guest speakers or through industrial visits, hands on training and instrumentation at commercial level. Population ecology needs to be explained in the context with diversity and dynamism of animal population. Experts from the field of nutrition and health can be invited to enlighten learners on the topics of nutritional value of food, balanced diet, ill-effects of eating junk food and aerated drinks. Medical professionals, relevant NGOs may be engaged to educate students regarding myths, precautionary measures, immunization drives of common diseases, ill-effects of self-medication and stress, significance of BMI through a series of programmes. History of science component would initiate the students regarding discovery and invention of science. Students will get knowledge about landmark of advent of human in ancient world. Museum visit will also be useful. In section like Footsteps to follow students will get motivated from dignitaries by watching their films and recorded videos of their interviews. Internal assessment is also an essential component of evaluation of the students. It engages students in a continuous learning process. Teachers also get to know their students' know-how both in theory and practical. It will help to improve their subject understanding and comprehensive ability of the subject. Internal assessment will include project work/field studies, reports of excursion/conferences attended, quiz, photography/ model making assignments, doing open learning courses, peer-to-peer learning, and instrument maintenance and volunteering by students.

Prof. Vinda Manjramkar
Vice Principal, BoS Zoology Member
VPM's B. N. Bandodkar College of Science (Autonomous), Thane

VPM's B.N. Bandodkar College of Science (Autonomous), Thane

Curriculum Structure for the Undergraduate Degree Programme
F.Y.B.Sc Zoology

	SEMESTER – I		
Course Code	**Major Course Title**	**No. of Lectures in hrs.**	**Credits**
23BUZO1T1	Biodiversity and its conservation	**30**	**02**
23BUZO1T2	Animal biotechnology and instrumentation	**30**	**02**
23BUZO1P1	Practical based on BNBUSZO1T1 and BNBUSZO1T2	**60**	**02**
23BU1SEC7	Food dishes	**45**	**02**
	Total	**165**	**08**
Course Code	**Minor Course Title**	**No. of Lectures in hrs**	**Credits**
23BUZO1T3	Biodiversity and its conservation	**30**	**02**
23BUZO1T4	Animal biotechnology and instrumentation	**30**	**02**
23BUZO1P2	Practical based on 23BUZO1T3 and 23BUZO1T4	**60**	**02**
	Total	**120**	**06**
Course Code	**Generic - Course Title**	**No. of Lectures in hrs**	**Credits**
23BUZO1T5	History of zoology and footsteps to follow	**30**	**02**
	Total	**30**	**02**

Optional Electives Semester 1 -Interdisciplinary Sciences			
23BUID1T6	**Soft skills and personality development-I**	**30**	**2**
	Total	**30**	**2**
Semester 1 - (AEC)			
23BUEN1T8	**Basic English Learning course**	**30**	**2**
	Total	**30**	**2**
Semester 1 - Indian Knowledge System			
23BUIK1T9	• The Ancient Indian Social Structure. -1	**30**	**2**
	Total	**30**	**2**

	SEMESTER – II		
Course Code	**Major Course Title**	**No of Lectures in hrs**	**Credits**
23BUZO2T1	Population ecology and wildlife management	**30**	**02**
23BUZO2T2	Nutrition and public health and hygiene	**30**	**02**
23BUZO2P1	Practical based on **23BUZO2T1 and 23BUZO2T2**	**60**	**02**
23BU2SEC7	Bird Identification	**45**	**02**
	Total	**165**	**08**
Course Code	**Minor Course Title**	**No. of Lectures in hrs**	**Credits**
23BUZO2T3	Population ecology and wildlife management	**30**	**02**
23BUZO2T4	Nutrition and public health and hygiene	**30**	**02**
23BUZO2P2	Practical based on **23BUZO2T3 and 23BUZO2T4**	**60**	**02**
	Total	**120**	**06**
Course Code	**Generic Course Title**	**No. of Lectures in hrs**	**Credits**
23BUZO2T5	Ecosystem and common human diseases and disorders	**30**	**02**
Total		**30**	**02**
Optional electives Semester 2-Interdisciplinary sciences			
23BUID2T6	**Soft skills and personality development-II**	**30**	**2**
	Total	**30**	**2**
Course Title Semester 2 (AEC)			
23BUEN2T8	**Scientific *English writing***	**30**	**2**
	Total	**30**	**2**
Semester 2- Indian Knowledge System			
23BUIK2T9	The Ancient Indian Social Structure.- 2	**30**	**2**
	Total	**30**	**2**

Note: AEC, IKS, Open elective syllabus view separately.

Semester - I

VPM's B.N. Bandodkar College of Science (Autonomous), Thane

Curriculum Structure for the Undergraduate Degree Program

F.Y.B.Sc. ZOOLOGY

SYLLABUS – SEMESTER I

MAJOR COURSE CODE: 23BUZO1T1	**(02 Credits)**	**No of lecture in Hrs. 30**
MINOR COURSE CODE: 23BUZO1T3	**(02 Credits)**	**No of lecture in Hrs. 30**

Biodiversity and Its Conservation

Program Specific Outcome:

PSO1: Through this course, learner will have a captivating journey of hoarded wealth of marvelous animal world. 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.

PSO2: Learners would appreciate treasure of Biodiversity, its importance and hence would contribute their best for its conservation Rich heritage of Biodiversity of India and make them understand significance of its conservation.

COURSE OUTCOME

Students will be wanted to learn OR on completion of this course, students will be able to learn:

CO1: Wonders of animal world

To know more about the fascinating world of animals in which would enhance their interest and love for the subject of Zoology.

CO2: Biodiversity and its conservation

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

Outline of Syllabus: (per session plan) for major and minor

Unit	Description	No. of Hours. /per week	No. of Hours
	Theory	**02**	
I	Wonders of Animal World	01	15
II	Biodiversity and its conservation	01	15
	Practical	**02**	**60**
		Total	**120**

Unit	Description	No. of Hours.
I	**Wonders of Animal World Corals:** Types of coral reefs ,Mechanism of Coral formation **Mechanism of Pearl formation in Mollusca** **Regeneration in Animals:** Earthworm (Annelida) ,Lizard (Reptile) **Mimicry in Butterflies and its significance:** Great Egg fly and Common Crow Common Palm fly and Plain Tiger **Bioluminescence in Animals: Significance with examples** Mechanism of bioluminescenceNoctiluca ,Glow wormFirefly, Angler Fish **Echolocation:** Bats **Cetaceans: Significance with examples** - Dolphins,Whales **Bird migration:** Types of bird migration , Factors inducing bird migration **Adaptive features of desert animals:** Reptiles (Phrynosoma),Mammals (Camel) **Breeding and Parental care in:Pisces:** Ovo-viviparous (Black Molly/Guppy) Mouth brooders (Tilapia) Brood pouches (Sea horse) **Amphibian** - Mouth brooders (Darwin's Frog),Egg carriers (Midwife Toad) , **Aves**- Brood Parasitism (Cuckoo) **Mammals:** Egg-laying (Duck-billed Platypus)Marsupials (Kangaroo)	15
II	**Biodiversity and its conservation** **Introduction of Biodiversity:** Definition, Concepts, Scope and Significance **Types of Biodiversity:** Genetic biodiversitySpecies biodiversity, Ecosystem biodiversity **Biodiversity Hotspots:** Western Ghats ,Indo- Burma Border **Values of biodiversity:** Direct and Indirect values **Threats to Biodiversity:** Habitat loss , Man-Wildlife conflict **Biodiversity conservation and management:** **Conservation strategies:** In situ ,Ex-situ , Biosphere reserves , National parks Sanctuaries **Introduction to International efforts:** Convention on Biological Diversity (CBD) , International Union for Conservation of Nature and NaturalResources (IUCN) ,Monitoring Centre (UNEP-WCMC) , United Nations Environment Program - World ConservationIntroduction to Indian Wildlife (Protection) Act, 1972 Convention for International Trade of endangered speciesNational Biodiversity Action Plan, 2002	15
To develop scientific temper and interest by exposure through industrial visits andstudy/educational tours is recommended in each semester.		

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	"The Unsung Man of Science – Ram Brahma	Sanyal" Pandey, Shakunt	Science Reporter. 51 (8): 53–55		2014
2	Zoo and Aquarium History: Ancient Animal Collections to Zoological	Kisling, V. N.	CRC Press. ISBN 0- 8493-2100-X GoogleBooks		2001
3	"The Late Dr. Sunder Lal Hora (1896- 1955): an appreciation, together with a complete list of his scientific writings"	Roonwal, M.L.			1956
4	"Sunder Lal Hora" (PDF)	Silas, E.G.	Copeia (2): 134– 136. JSTOR 1440452		1956
5	Natural history paintings. In Indian painting for the British	Archer Mildred & W.G. Archer	Oxford, Oxford University Press 1770–1880, pp. 91– 98		1955
6	Bird study in India: its history and its importance	Ali, S.	ICCR, New Delhi		1979
7	Wonders of the Animal World – University Text Book of Zoology, F.Y.B.Sc. Semester I Course 1	V.V. Dalvie, G.B. Raje, P. Sardesai, N.S.Prabhu	University Press. University of Mumbai	3rd	
8	Invertebrate Zoology Volume I	Jordan and Verma	S. Chand and Co.	14th	2009
9	Vertebrate Zoology Volume II	Jordan and Verma	S. Chand and Co.	14th	2009
10	Fundamentals of Ecology	E. P. Odum	Sunders Publication		
11	Fundamentals of Ecology	M. C. Dash	Tata McGraw Hill		
12	Biodiversity	K. C. Agarwal	Agro Botanica Publications		
13	Butterflies of India	Isaac Kehimkar	BNHS Publication		

MAJOR COURSE CODE: 23BUZO1T2	(02 Credits)	No of lecture in Hrs. 30
MINOR COURSE CODE: 23BUZO1T4	(02 Credits)	No of lecture in Hrs. 30

Animal Biotechnology and Instrumentation

Program Specific Outcome:

PSO3: 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. Infectious biological specimens, modern developments and concepts of Zoology highlighting their applications aiming for the benefit of human being, operational skills of different instruments required in Zoology.

PSO4: 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.

COURSE OUTCOME

Students will be wanted to learn OR on completion of this course, students will be able to learn:

CO3: Animal Biotechnology
Will understand recent advances in the subject and their applications for the betterment of mankind.

CO4: Instrumentation
Will be skilled to select and operate suitable instruments for the studies of different components of Zoology.

Outline of Syllabus: (per session plan)

Unit	Description	No. of Hours. /per week	No. of Hours
	Theory	**02**	
I	Animal Biotechnology	01	15
II	Instrumentation	01	15
	Practical	**02**	**60**
		Total	**120**

Unit	Description	No. of Hours.
I	**Animal Biotechnology** **Scope and achievements of biotechnology** Fishery Animal Husbandry Medical **Transgenesis:** Retro viral method Nuclear transplantation method DNA microinjection method Embryonic stem cell method **Cloning (Dolly)**	**15**

	Ethical issues of transgenic and cloned animals **Applications of biotechnology:** DNA fingerprinting technique Application in forensic science (Crime Investigation) Recombinant DNA in medicines (recombinant insulin) **Gene therapy:** Ex-vivo In vivo Severe Combined Immuno Deficiency (SCID) Cystic Fibrosis **Green genes:** Green Fluorescent Protein (GFP) from Jelly fish	
II	**Instrumentation** **Microscopes** - Dissecting microscope Construction and Principle Applications Compound microscope -Construction and Principle Applications **Colorimeter-** Construction and Principle Applications Spectrophotometer: Construction and Principle Applications **PH meter-** Sorenson's pH scale Construction and Principle Applications **Centrifuge-** Construction and Principle- Applications Chromatography Construction and Principle- Applications Electrophoresis **Horizontal electrophoresis** Construction and Principle Applications **Vertical electrophoresis**- Construction and Principle Applications	15
To develop scientific temper and interest by exposure through industrial visits andstudy/educational tours is recommended in each semester.		

MAJOR COURSE CODE: 23BUZO1P1	(02 Credits)	No of lecture in Hrs. 60
MINOR COURSE CODE: 23BUZO1P2	(02 Credits)	No of lecture in Hrs. 60

PRACTICAL – Part I	
1	Mounting of foraminifera shells from sand.
2	**Study of types of corals:** Brain ,Organ pipeStag Horn ,Mushroom coral
3	**Mimicry in Butterflies:** Great Egg fly and Common Crow ,Common Palm fly and Plain Tiger
4	**Mounting of scales of fish:** Placoid,CycloidCtenoid
5	**Breeding and parental care in Amphibians:** Rhacophorus Mid-wife toad, Darwin's frogCaecilian
6	**Study of adaptive radiation in reptiles:**Turtle Tortoise PhrynosomaDraco
7	**Identification and differentiation of venomous and non-venomous snakes:** Scales Fangs, Bite marks
8	**Study of types of feathers in birds:** Contour Filoplume,Down **Study of types of Claws in birds:** Perching Wading Swimming Hopping
9	**Study of types of beaks and feeding in birds:** Nectar feedingInsect catchingFruit eating Scavenging
10	**Identification of birds** Coppersmith BarbetBulbul Rose ringed ParakeetMagpie Robin Two local birds
11	**Study of camouflage:**Leaf insect Chameleon **Study of Bioluminescence:** Noctiluca Glow worm Fire fly Angler fish
12	**Study of Cannibalistic mate-eating animals:** Spider,Praying Mantis
13	**Study of Symbiosis association:** Termite and Trychonympha Hermit crab and sea anemone
14	**Study of animal architects:**Termites ,Harvester ant Baya weaverbird
15	**Study Biodiversity hotspots using world map:** Western GhatsIndo-Burma
	PRACTICAL- Part II
1	Estimation of moisture content of biscuits.
2	Extraction of fruit juice with pectinase from Apple/Guava or any other suitable fruit.
3	Estimation of protein content from the variety of eggs.
4	Testing of adulterants in milk using Methylene Blue Reduction Test (MBRT).
5	Food adulteration test to check adulterants in:Cheese, Butter, Ghee
6	Food adulteration test to check adulterants in:Jaggery , Honey Iodized Salt.
7	Identification of transgenic fish and cloned animals.

8	Application of DNA fingerprinting in criminology.
9	Identification of green genes.
10	Study of microscope.
11	Working of pH meter.
12	Study of colorimeter.
13	Separation of amino acids from the mixture by paper chromatography.
14	Separation of pigments from the mixture by chalk chromatography.
15	Study of electrophoresis.

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Introduction to Practical Biochemistry	David T. Plummer	Tata McGraw Hill Publishing Co. Ltd.	3rd	2001
2	A Manual of Medical Laboratory Technology	H. Patel	Navneet Prakashan Ltd.		
3	Biological instruments and methodology	Dr. P. K. Bajpai	S. Chand company Ltd.		
4	Basic Laboratory Techniques, Instrumentation and Biotechnology- University Text Book of Zoology, F.Y.B.Sc. Semester I Course 2	V.V. Dalvie, R. G. Deshmukh, R. D'souza and H.U. Shingadia	University Press.		
5	Calculations in Molecular biology and Biotechnology	Frank H. Stephenson	Academic Press.		
6	Understanding biotechnology, Low price edition	Aluizio Borem, David Bowe	Pearson Publication		
7	Principles and Techniques of Practical Biochemistry,	Keith Wilson and John Walker	Cambridge University Press		
8	Biochemistry	Jeremy Berg, Lubert Stryer	W. H. Freeman and company, NY	7th	2012
9	Microscopy and Cell Biology,	V. K. Sharma	Tata McGraw Hill Publishing Co. Ltd.		

Semester – II

MAJOR COURSE CODE: 23BUZO2T1 MINOR COURSE CODE: 23BUZO2T3	CREDIT -02	NO LECTURES IN HRS. 30

Population Ecology and Wildlife Management (02 CREDITS)

Program Specific Outcome:

PSO5: This course will facilitate the learning of population ecology, its dynamics and regulatory factors important for its sustenance, different components of ecosystem and educate about essentials of coexistence of human beings with all other living organisms.

PSO6: Current status of wild life conservation in India in the light of guidelines from different relevant governing agencies vis-à-vis with adversity of poaching and bio-piracy.

COURSE OUTCOME

Students will be wanted to learn OR on completion of this course, students will be able to learn:

CO5: Population Ecology

To study about nature of animal population, specific factors affecting its growth and its impact on the population of other life form.

CO6: Wildlife Management

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

Outline of Syllabus: (per session plan)

Unit	Description	of Hours. /per week	No. of Hours
	Theory	**02**	**30**
I	**Population Ecology**	1	15
II	**Wildlife Management**	1	15
	Practical	**2**	**60**
		TOTAL	**120**

MAJOR COURSE CODE: 23BUZO2T1 MINOR COURSE CODE: 23BUZO2T3	CREDIT -02	NO LECTURES IN HRS. 30

Unit	Description	No. of Hours.
I	**Ecology** **Population dynamics**Population density, Natality Mortality ,Fecundity Age structureSex ratio Life tables Survivorship curves, Population dispersal and distribution patterns Niche concept **Population growth regulation** **Intrinsic mechanism:** Density dependent fluctuations and oscillations **Extrinsic mechanism:** Density independent environmental and climatic factors **Population interactions** Population growth pattern S-shaped or Sigmoid growth form J – Shaped growth form **Human census (India)** Concept Mechanism	**15**
II	**Wildlife Management** **National parks and sanctuaries** Sanjay Gandhi National Park Tadoba National Park Corbett National Park Kaziranga National Park Gir National Park Silent Valley National Park Pirotan Island Marine Park Keoladeo Ghana National Park Bandipur Sanctuary **Wildlife Management strategies in India** Project Tiger ,Project Rhinoceros**Ecotourism** **Biopiracy**	**15**

To develop scientific temper and interest by exposure through industrial visits and study/educational tours is recommended in each semester.

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Introduction to Ecology and Wildlife - University Text Book of Zoology, F.Y.B.Sc. Semester II Course 3.		University mumbai	3rd	2018

2	Fundamentals of Ecology	Eugene P. Odum and Grey W. Barrett	Brook Cole/ Cengage learning		
3	Fundamentals of Ecology	M. C. Dash	McGraw Hill company Ltd, New Delhi		
4	Field Biology and Ecology	Alen H. Benton and William E. Werner	McGraw Hill company Ltd, New Delhi		
5	Economic Zoology, Biostatistics and Animal Behaviour	Shukla, Mathur, Upadhyay, Prasad.	Rastogi Publications.		

MAJOR COURSE CODE: 23BUZO2T2	**(02 CREDITS)**	**No of lectures in hrs. 30**
MINOR COURSE CODE: 23BUZO2T4	**(02 CREDITS)**	**No of lectures in hrs. 30**

Nutrition and Public Health And Hygiene

Program Specific Outcome:

PSO7: This course will make learners understand the importance of balanced diet and essential nutrients of food at different stages of life,

PSO8: Source, quantum and need for conservation of fast depleting water resource and essentials of maintaining proper sanitation, hygiene and optimizing use of electronic gadgets.

COURSE OUTCOME

Students will be wanted to learn OR on completion of this course, students will be able to learn:

CO7: Nutrition and Health

Will inculcate Healthy dietary habits.

CO8: Public health and Hygiene

Promoting optimum conservation of water, encouragement for maintaining adequate personal hygiene, optimum use of electronic gadgets.

Outline of Syllabus: (per session plan)

Unit	Description	Credits	No of lectures in hrs
	Theory	**02**	**30**
I	**Nutrition and Health**	01	15
II	**Public health and Hygiene**	01	15
	Practical	**02**	**60**
		Total	**120**

MAJOR COURSE CODE: 23BUZO2T2	(02 CREDITS)	No of lectures in hrs. 30
MINOR COURSE CODE: 23BUZO2T4	(02 CREDITS)	No of lectures in hrs. 30

Unit	Description	No. of Hours.
I	**Nutrition and Health** **Concept of balanced diet: Dietary recommendations** Normal , adultInfant Pregnant womanAged **Malnutrition disorders:** causes, symptoms, precaution and remedy Anemia (B12 and Iron deficiency) Rickets, Marasmus, Goiter Kwashiorkor **Medical conditions:** causes, symptoms, precaution and remedyConstipation Piles Starvation Acidity Flatulence Peptic ulcers **Obesity** **Importance of fibers in food** **Significance of breast feeding** **Swine flu** **BMI calculation and its significance**	15
II	**Public health and Hygiene Health** Factors that influence health Health education, Health goal **Health issues** Physical PsychologicalSocial **WHO and its Programmes in India** (Concept and outcome)Polio Small pox Malaria Leprosy **Ill effects of self-medication** **Water** Sources Properties Purification of waterSmall scale Medium scale Large scale **Water footprint (concept and significance)** Hygiene Basic hygiene Hygiene practices **Radiation risk:** Mobile Cell towerElectronic gadgets **Blood bank** Concept and significance	15

To develop scientific temper and interest by exposure through industrial visits and study/educational tours is recommended in each semester.

MAJOR COURSE CODE: 23BUZO2P1	Credit 2	No of lectures in hrs 30
MINOR COURSE CODE: 23BUZO2P3	Credit 2	No of lectures in hrs 30
PRACTICAL- Part I		
1	**Interpretation of the given graphs/ tables and comment on pattern of populationnature:** Survivorship curve, Life tables	
2	**Interpretation of the given graphs/ tables and comment on pattern of populationnature:** Fecundity tablesAge structure Sex ratio	
3	**Calculation of:** Natality Mortality	

4	Estimation of population density by capture recapture method.
5	**Interpretation of growth curves:** S-shaped or Sigmoid growth for J shaped growth form
6	Human census (India)
7	**Endangered species: State reasons for their decline** Great Indian Bustard,Asiatic lion Blackbuck,Olive Ridley sea turtle
8	**Critically endangered species: State reasons for their decline** Slender-billed vultureGharial Malabar civet
9	**Study of National parks and sanctuaries** Sanjay Gandhi National ParkTadoba National Park
10	**Study of National parks and sanctuaries** Gir National Park Pirotan Island Marine Park
11	**Study of National parks and sanctuaries** Silent Valley National Park Keoladeo Ghana National Park
12	Prepare a report on Project Tiger.
13	Prepare a report on Project Rhinoceros.
14	Prepare a report on Ecotourism.
15	Prepare a report on Biopiracy.

PRACTICAL Part II	
1	Qualitative estimation of Vitamin C by Iodometric method.
2	Study of microscopic structure of starch granules of different cereals.
3	Estimation of maltose from brown/white bread.
4	Screening of anemic/non-anemic persons.
5	Study of efficacy of antacids.
6	**Study of malnutrition disorders.** Rickets Marasmus
7	**Study of malnutrition disorders.** Goiter Kwashiorkor
8	**Study of blood groups.**
9	**Study of human diseases.** Polio Small pox
10	**Study of human diseases.** MalariaLeprosy
11	**Study of lifestyle disease:** Obesity
12	Estimation of sugar from two different samples of aerated drinks.
13	BMI analysis - Measurement of Height/ Weight and calculation of BMI using formula.
14	Estimation of hardness from given water sample (tap water v/s well water)
15	Estimation of Free carbon dioxide (Free CO2) from two different samples-aerated drinks(diluted) v/s tap water

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Common Diseases, Health and Hygiene - University TextBook of Zoology, F.Y.B.Sc. Semester II Course 4.	Ramesh Gaonkar	University Press. Mumbai	3rd	2018
2	Clinical Dietetics and Nutrition	F. P. Antia and Philip	Oxford University Press		
3	A Complete Handbook of Nature Cure	Dr. H. K. Bakru	Jaico Publishing House		
4	Textbook of Medical Parasitology.	C. K. Jayaram Paniker	Jaypee Brothers.		
5	Nutrition: Principles and Application in Health Promotion		J. B. Lippincott Company Philadelphia		
6	A Treatise on Hygiene and Public health	B. N. Ghosh	Calcutta Scientific Publishing Company		
7	Are You Healing Yourself Mr. Executive?	Dr. R. H. Dastur	IBH Publishing Company		
8	Public Health Nutrition. Edited	Michael J. Gidney, Barrie, M. Margetts, John M. Kearney and Lenore Arab	Willey Blackwell Publication		

Generic Courses

	SEMESTER - I Generic 1	Credits 02
Course code 23BUZO1T5:	**Course title -** **History of Science and Footsteps to Follow**	**No of lectures in hrs 30**

Program Specific Outcome:

PSO1: Enrich the history of science and its progress from ancient times. A special highlights included on history of zoology with reference to the national and international Zoologists.

PSO2: Innovative and novel work of scientists/philosopher/entrepreneurs in the field of biological sciences.

COURSE OUTCOME

Students will be wanted to learn OR on completion of this course, students will be able to learn:

CO1: History of zoology

To understand the value of the history of the opted subject and to realize as to how big effortsare made by earlier scientists to develop today's science.

CO2: Footsteps to follow

To think differently and would be encouraged ipso facto to their original crude ideas from the field of biological sciences.

Outline of Syllabus: (per session plan)

Unit	Description	Credit	No of lectures in Hrs
	Theory	**02**	
I	History of zoology	01	15
II	Footsteps to follow	01	15
		Total	30

	Course: Generic – I	
Paper – I	**History of Zoology and Footsteps to Follow**	
Sr. No.	**Topics**	**No. of Lectures**
Unit – I	**History of zoology** **Introduction to the History of Science** Some ancient records of scientific discoveries and inventions **Historical advances of World Zoology** Ancient Zoology , Medieval Zoology,Modern Zoology **Notable Scientist of Zoology** Aristotle (382 BC – 322 BC) Robert Hooke (1635 – 1703) Carl Linnaeus (1707 – 1778) Charles Darwin (1809 – 1882) Alfred Russell Wallace (1823 – 1931)	**15**

	History of Zoology in India Ancient Indian Zoology Veda to Mrig-pakshi Shastra **Indian Zoologists** Varahamihira (505 AD) Ram Brahma Sanyal (1858–1908) Salim Ali (1896–1987) C. R. Narayan Rao (1882 –1960) Sunder Lal Hora (1896 –1955)	
Unit – II	**Footsteps to follow** **Dr. Hargobind Khorana**(Genetic code) **Dr. Varghese Kurian**(Amul –White revolution) **Anna Hazare**(Water Conservation-Ralegaon Siddhi) **Baba Amte**(Anandvan) **Kiran Mazumdar Shaw**(Biocon) **Gadre Fisheries**(Surimi) **Rajendra Singh**(Water man of India)	**15**
	SEMESTER - II **Generic 1**	**Credits 02**
Course code **23BUZO2T5:**	**Course title -** **Ecosystem and Common Human Diseases and Disorders**	**No of lectures in hrs 30**

Program Specific Outcome:

PSO1: 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.

PSO2: The learners will acquire the knowledge of common human diseases and disorders Which are stress and lifestyle related with facts and figures.

COURSE OUTCOME

Students will be able tolearn:

CO1: Ecosystem

Recall the importance of different biotic, abiotic components of the ecosystem and relate it to environment protection and conservation issues. Compile different interactions among the interspecific and intraspecific species.

CO2: Common human Diseases and disorders

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.

Outline of Syllabus: (per session plan)

Unit	Description	Credit 02	No of lectures in Hrs
	Theory	02	
I	**Ecosystem**	01	15
II	**Common human Diseases and disorders**	01	15
		Total	30

	Course: Generic – 2	**No. of Lectures in hrs**

Paper – I	Ecosystem and Common human diseases and disorders	30
	Ecosystem	
Unit – I	**Ecology** **Introduction to ecology-Concepts of ecology,** Environment, Population Community ,EcosystemBiosphere ,Ecosystem **Types of ecosystems:** Aquatic FreshwaterEstuarine Marine Terrestrial Forest Grassland Desert **Structure and composition of ecosystem:** Abiotic componentsBiotic components **Food chain:** Detritus food chain Grazing food chain**Food web:** Fresh waterGrass land **Energy flow through the ecosystemEcological pyramids:** NumberBiomassEnergy **Concept of eutrophication in lakes and rivers**	
Unit – II	**Common human diseases and disorders** **Stress related disorders:** Cause, symptoms, precaution and remedyHypertension , Diabetes type II,Anxiety Insomnia Migraine Depression **Communicable and non-communicable diseases** Tuberculosis,Typhoid Dengue, Hepatitis (A and B)AIDS GonorrheaSyphilis **Diseases of respiratory system:** Cause/causative agents, symptoms, diagnostics,precaution /prevention and remedy Asthma Bronchitis. Oral Cancer	**15**

Evaluation Pattern

The performance of the learner will be evaluated in two components.

1. The first component will be a Continuous Assessment with a weightage of 40% of total marks per course.
2. The second component will be a Semester end Examination with a weightage of 60% of the total marks per course.

The allocation of marks for the Continuous Assessment and Semester end Examinations is as shown below:

A. Details of Continuous Assessment (CA/IA) 40% of the total marks per course:

Continuous Assessment	Details	Marks
Component 1 (CA-1)	Class Test/ Assignment/ Viva voce/	**20**
Component 2 (CA-2)	Class Test/ Assignment/ Viva voce/	**20**

B. Details of Semester End Examination (External)

60% of the total marks per course. Duration of examination will be two and half hours.

EVALUATION SCHEME			
Assessment: Weightage for assessments (%)			
Assessment	**Marks/Course**	**Total Marks**	**Credits**
External	**30**	**60**	**02 per course = 04**
Internal	**20**	**40**	
Practical	**25**	**50**	**02**

SKILL ENHANCEMENTCOURSES

TOTAL CREDITS FOR EACH COURSE: 2
DURATION: 45 HRS

Mode of Conduct: Offline lectures / Online lectures / Hybrid mode.

Objectives of this course are as follows:(SEM-I Fish dishes)

- To understand the importance of fish in diet
- To understand small scale business skill

Program Specific Outcome

By the end of the programme, learners will be able to prepare home scale nutritious food which may further help in constructing and developing his business.

Objectives of this course are as follows:(SEM-II Bird identification)

- To identify birds by various morphological characters.
- To understand habit and habitat of birds.
- Program Specific Outcome
  By the end of the programme, learners will be able to identify birds and can work inNGO involved in nature care.

CREDIT DISTRIBUTION & PRE-REQUISITE OF THE COURSE

	SEMESTER I	
Course Code	**Course title**	**Lecture in hours**
23BU1SEC7	Fish dishes	**15**
	Practical based on 23BU1SEC7	**30**
	TOTAL	**45**
	SEMESTER II	
23BU2SEC7	Bird identification	**15**
	Practical based on 23BU2SEC7	**30**
	TOTAL	**45**

Course Code: 23BU1SEC7	Course Title **Fish dishes**	Credits 2	No. of hours

Objectives of this course are as follows:(SEM-1 fish dishes)

- To understand the importance of fish in diet
- To understand small scale business skill

Program Specific Outcome

By the end of the programme, learners will be able to prepare home scale nutritious food which may further help in constructing and developing his business.

Unit I :	**1.** Selection of fish for dishes **2.** Various types of ingredients **3.** Methods for preparation **4.** Nutritional value **5.** To Study Processed(Salting, Drying, Frozen ,Canning) fish **6.** Healthy ways to cook fish	**15**
	Practical course code: 23BU1SEC7	**30**
Practical	1. Fish Burger 2. Fish Noodles 3. Fish Curry 4. Fish Fingers 5. Fish Cuttlet 6. Fish Rolls 7. Fish Nuggets 8. Fish Samosa 9. Fish Sandwich 10. Fish Pickles	

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Indian Fish Recepies	Abdul Riaz	Amazon digitalpublisher	1	2021
2	Fish The Indian Way	Prasenjeet kumar	Prasenjeet Kumar	1	2015
3.	Fish In Nutrition	Nimish Mol Stephen , S Balasundari ,SFelix	Astral	1	2018
4.	Fish Indian Style	Atul Kochhar	BloomsburyPublishing	1	2016

Course Code: 23BU2SEC7	Course Title **Bird identification**	Credits2	No. of hours

Objectives of this course are as follows:(SEM-2 Bird identification)

- To identify birds by various morphological characters.
- To understand habit and habitat of birds.

Program Specific Outcome

- By the end of the programme, learners will be able to identify birds and can work in NGO involved in nature care.

Unit I :	1. Habit and habitat study of birds 2. Morphological keys of identification(head , beak , neck,feathers, tail, feet,colour, 3. Bird calls /Songs 4. Bird nesting	**15**
	Practical Course Code: 23BU2SEC7	**30**
Practical:	1. Bird habitat 2. Bird watching 3. Bird Photography 4. Bird Survey 5. Mimicry	

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	The Book of Indian Birds	Salim Ali	Oxford	13	2003
2.	Birds of India	Bikram Grewal	Om books International	1	2016
3	Birds of Indian Subcontinent	Richard Grimmett, Carol Inskipp,Tim Inskipp	BloomsburyIndia	1	2016

Evaluation Scheme

Examination scheme and mode:

Total Marks: 50

Internal Assessment Total: 10 Marks

Theory exam: 15Marks

Practical exam: 25 Marks

**The Internal Assessment for the course may include Class participation, Assignments, Classtests, Projects, Field Work, Presentations, amongst others as decided by the faculty.