Academic Council Meeting No. and Date :8 / September 04, 2023
Agenda Number : 2 Resolution Number : 34, 35/ 2.6, 2.7

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

Syllabus for

Programme Code :BUZO

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

Preamble

I am glad 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 the semester V and semester VI under the quest of 'Autonomy' sanctioned by the University of Mumbai to VPM's B. N. Bandodkar College of Science, Thane.

It is foresighted to involve experts from all the relevant sectors of society to design this syllabus with their valued advice and suggestions. The syllabus has been finalized unanimously by the priory appointed members of the Board of Studies in Zoology Subject which includes industrial technical advice from Reliable Analytical Laboratory which practices the most advance analytical techniques in biological sciences. It gives me great pleasure to involve our meritorious alumni who have successfully made their careers in zoology in this venture.

However, with the constraint of the UGC guidelines in changing the syllabus, it was envisaged to change 20% of the syllabus at the initial phase and has been planned to migrate sly to a metamorphic pattern of the syllabus, which shall eliminate the existent short comings, during forthcoming cycles of syllabus framing.

Also, the syllabus will be framed in accordance with the PG programs of various national and international Universities so that our students will be able to avail their education in them.

Although, due to the guidelines of UGC, the use of animals is excluded from the practical, substituting the same with audiovisual instruction, simulations aids, and the use of ICT to make the syllabus more interesting and interactive. Pedagogy will guide our teachers to know content and objectives along with the desired outcome of every topic.

It is expected that the teaching process is expected to be boosted with exciting outcomes of the syllabus with further improvement and enthusiasm of the teachers. At the initiation, the department introduces the 'Choice-Based Credit System' (CBCS) of teaching-learning, under autonomy. The evaluation process involves 30-20 pattern of theory to ensure continuous learning from the academic year 2025-26, onward**.**

Prof. Dr. Vinda Manjramkar

Chairperson, BOS in Zoology

PROGRAMME OUTCOMES (POs) OF BACHELOR OF SCIENCE (B.Sc.)

The Undergraduate Programmes of Science are intended to cater quality education and attain holistic development of learners through the following programme outcomes:

PO1 - Disciplinary Knowledge

Lay a strong foundation of conceptual learning in science. Instil ability to apply science in professional, social and personal life.

PO2 - Inculcation of Research Aptitude

Ignite spirit of inquiry, critical thinking, analytical skills and problem-solving approach which will help learners to grasp concepts related to research methodology and execute budding research ideas.

PO3 - Digital Literacy

Enhance ability to access, select and use a variety of relevant information e-resources for curricular, co-curricular and extracurricular learning processes.

PO4 - Sensitization towards Environment

Build a cohesive bond with nature by respecting natural resources, encouraging eco-friendly practices and creating awareness about sustainable development.

PO5 - Individuality and Teamwork

Encourage learners to work independently or in collaboration for achieving effective results through practical experiments, project work and research activities.

PO6 - Social and Ethical Awareness

Foster ethical principles which will help in developing rational thinking and becoming socially aware citizens. Build an attitude of unbiased, truthful actions and avoid unethical behaviour in all aspects of life.

Eligibility: 12th Science Pass

Duration: 3 years (Syllabus for Second Year semester I & II)

Mode of Conduct: Offline lectures/ Online lectures

Discipline/Subject: Zoology

Specific Programme: B.Sc. Zoology

Qualification Title: UG certificate

Program Specific Outcomes		
No.	**Outcome**	**Level**
1	Describe the diversity and structural organization of animal life that govern biological systems.	L-1
2	Explain cellular, physiological, genetic, and biochemical processes that regulate the life.	L-2
3	Demonstrate laboratory skills, operate scientific instruments and analyze results.	L-3
4	Examine disease-causing agents, evaluate preventive and control strategies with indigenous knowledge.	L-4
5	Examine disease-causing agents, evaluate preventive and control strategies with indigenous knowledge.	L-5
6	Examine disease-causing agents, evaluate preventive and control strategies with indigenous knowledge.	L-6

Specific Programme: F.Y.B.Sc. (Zoology -Major/ Minor)		
Assessment: Weightage for assessments (in percentage) For Major and Minor		
Type of Course	Formative Assessment / IA	Summative Assessment
Theory	40%	60%

Curriculum Structure for the Undergraduate Programme
F.Y.B.c Zoology

	SEMESTER – I		
Course Code	**Major Course Title**	**No. of Lectures in hrs**	**Credits**
23BUZO1T01	**Biodiversity and its conservation**	**30**	**02**
23BUZO1T02	**Animal biotechnology and instrumentation**	**30**	**02**
23BUZO1P01	**Practical based on 23BUZO1T01 and 23BUZO1T02**	**60**	**02**
Course Code	**Skill enhancement courses title**	**No. of Lectures in hrs**	**Credits**
23BU1SEC05	**Fish dishes**	**45**	**02**
	Total	**165**	**08**
Course Code	**Minor Course Title**	**No. of Lectures in hrs**	**Credits**
23BUZO1T03	**Biodiversity and its conservation**	**30**	**02**
23BUZO1T04	**Animal biotechnology and instrumentation**	**30**	**02**
23BUZO1P02	**Practical based on 23BUZO1T03 and 23BUZO1T04**	**60**	**02**
	Total	**120**	**60**
Course Code	**Generic Course Title**	**No. of Lectures in hrs**	**Credits**
23BUZO1T05	**History of zoology and footsteps to follow**	**30**	**02**
	Total	**30**	**02**

	SEMESTER – II		
Course Code	**Major Course Title**	**No. of Lectures in hrs**	**Credits**
23BUZO2T01	**Population ecology and wildlife management**	**30**	**02**
23BUZO2T02	**Nutrition and public health and hygiene**	**30**	**02**
23BUZO2P01	**Practical based on 23BUZO2T1 and 23BUZO2T2**	**60**	**02**
Course Code	**Skill enhancement courses title**	**No. of Lectures in hrs**	**Credits**
23BU2SEC05	**Bird Identification**	**45**	**02**
	Total	**165**	**08**
Course Code	**Minor Course Title**	**No. of Lectures in hrs**	**Credits**
23BUZO2T03	**Population ecology and wildlife management**	**30**	**02**
23BUZO2T04	**Nutrition and public health and hygiene**	**30**	**02**
23BUZO2P02	**Practical based on 23BUZO2T3 and 23BUZO2T4**	**60**	**02**
	Total	**120**	**06**
Course Code	**Generic Course Title**	**No. of Lectures in hrs**	**Credits**
23BUZO2T05	**Ecosystem and common human diseases and disorders**	**30**	**02**
Total		**30**	**02**

Semester - I

MAJOR COURSE CODE: 23BUZO1T01	(02 Credits)	No of lecture in Hrs. 30
MINOR COURSE CODE: 23BUZO1T03	(02 Credits)	No of lecture in Hrs. 30

Biodiversity and conservation

COURSE OUTCOME		
Students will be wanted to learn OR on completion of this course, students will be able to learn:		
CO1	Illustrate the treasure of biodiversity and its importance.	L1
CO2	Relate different conservation strategies and its management for wild animals.	L1
CO3	Compare the adaptations about the fascinating world of animals.	L2
CO4	Build up the interest and love in zoology by studying the wonderful features in animals.	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO1	3	0	0	0	0	0
CO2	0	0	0	3	0	0
CO3	0	2	0	0	0	0
CO4	0	0	0	2	0	0

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 bioluminescence Noctiluca ,Glow worm, Firefly Angler Fish **Echolocation:** Bats **Cetaceans: Significance with examples** Dolphins, Whales	15

	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)	
II	**Biodiversity and its conservation** **Introduction of Biodiversity:** Definition, Concepts, Scope and Significance **Types of Biodiversity:** Genetic biodiversity,Species 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 reservesNational parks Sanctuaries **Introduction to International efforts:** Convention on Biological Diversity (CBD) International Union for Conservation of Nature and Natural Resources (IUCN) Monitoring Centre (UNEP- WCMC) United Nations Environment Program - World Conservation Introduction to Indian Wildlife (Protection) Act, 1972 Convention for International Trade of endangered species National Biodiversity Action Plan, 2002	**15**

REFERENCES

23BUZO1T01/T03	
1.	Wonders of the Animal World – University Text Book of Zoology, F.Y.B.Sc. Semester I Course 1, V.V. Dalvie, G.B. Raje, P.Sardesai, N.S.Prabhu, University Press.University of Mumbai
2.	Invertebrate Zoology Volume I, Jordan and Verma, S. Chand and Co.Edition 14th ,2009

3.	Vertebrate Zoology Volume II, Jordan and Verma, S. Chand and Co. Edition 14th ,2009
4.	Fundamentals of Ecology, E. P. Odum, Sunders Publication
5.	Fundamentals of Ecology, M. C. Dash, Tata McGraw Hill
6.	Biodiversity, K. C. Agarwal, Agro Botanica Publications
7.	Butterflies of India, Isaac Kehimkar, BNHS Publication

MAJOR COURSE CODE:23BUZO1T02	**(02 Credits)**	**No of lecture in Hrs. 30**
MINOR COURSE CODE: 23BUZO1T04	**(02 Credits)**	**No of lecture in Hrs. 30**

Animal Biotechnology and Instrumentation

COURSE OUTCOME

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

CO1	Build up the knowledge to understand the recent advances in the subject.	L3
CO2	Analyse the applications of biotechnology for the betterment of mankind.	L4
CO3	Develop the skills to select & operate suitable Instrument for the studies.	L3
CO4	Make use of different instruments & its applications.	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO1	0	2	0	0	0	0
CO2	0	3	0	0	0	0
CO3	0	0	0	0	3	0
CO4	0	3	0	0	0	0

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)** **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	**15**
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,Principle and Applications **Vertical electrophoresis** Construction ,Principle and Applications	**15**

REFERENCES	
23BUZO1T02/T04	
1.	Introduction to Practical Biochemistry, David T. Plummer, Tata McGraw Hill Publishing Co. Ltd. Edition 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,Edition 7th ,2012
9.	Microscopy and Cell Biology, V. K. Sharma, Tata McGraw Hill Publishing Co. Ltd.

MAJOR COURSE CODE: 23BUZO1P01	**(02 Credits)**	**No of lecture in Hrs. 60**
Practical based on 23BUZO1T01and 23BUZO1T02		
MINOR COURSE CODE: 23BUZO1P02	**(02 Credits)**	**No of lecture in Hrs. 60**
Practical based on 23BUZO1T03and 23BUZO1T04		

COURSE OUTCOME

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

CO1	Build up the interest in animal science by studying the different features in animals.	L3
CO2	Compare the body organization and the morphological features of the animals.	L3
CO3	Apply the knowledge to understand the various basic qualitative tests.	L3
CO4	Develop the operational skills of handling the different instruments.	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**
CO 1	2	0	0	0	0	0

CO 2	0	2	0	0	0	0
CO 3	0	2	0	0	0	0
CO 4	0	0	0	0	2	0

	Practical I
1.	Mounting of foraminifera shells from sand.
2.	**Study of types of corals:** Brain ,Organpipe, Stag 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, Cycloid and Ctenoid
5.	**Breeding and parental care in Amphibians:** Rhacophorus ,Mid- wife toad, Darwin's frog, Caecilian.
6.	**Study of adaptive radiation in reptiles:** Turtle, Tortoise, Phrynosoma, Draco.
7.	**Identification and differentiation of venomous and non-venomous snakes:** Scales, Fangs and 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 feeding Insect Catching ,Fruit eating, Scavenging
10.	**Identification of birds:** Coppersmith Barbet, Bulbul ,Rose ringed Parakeet, Magpie 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 Ghats Indo-Burma

	Practical 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.

MAJOR COURSE **CODE: 23BU1SEC05**	**(02 Credits)**	**No of lecture in Hrs. 15**
Fish Dishes		
COURSE OUTCOME		
Students will be wanted to learn OR on completion of this course, students will be able to learn:		
CO 1	Importance of nutrients in fish in human diet.	L5
CO 2	Develop small scale business skill.	L3
CO 3	Build up the skills for entrepreneurship.	L3
CO 4	Take part in cooking innovative fish dishes.	L4
Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping		

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	0	0	0	0	0
CO 2	0	0	0	0	3	0
CO 3	0	0	0	0	2	0
CO 4	0	0	0	0	2	0

Unit	Description	No. of Hours
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	

SEC- PRACTICAL	
1	Fish Burger
2	Fish Noodles
3	Fish Curry
4	Fish Cutlet
5	Fish Sandwich
6	Fish Pickles
7	Fish Samosa

REFERENCES

23BU1SEC01

1.	Indian Fish Recipes, Abdul Riaz, Amazon digital Publisher, Edition 1,2001	
2.	Fish The Indian Way, Prasenjit Kumar, Edition 1,2005	
3.	Fish In Nutrition, Nimish Mol Stephen, S Balasundari,S Felix, Astral, Edition 1, 2018	
4.	Fish Indian Style, Atul Kochhar, Bloomsbury Publishing, Edition 1,2016	

	Generic 1	Credits 02
Course code 23BUZO1T05:	**Course title - History of Zoology & Footsteps to follow**	**No of lectures in hrs 30**

COURSE OUTCOME

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

CO 1	Interpret the Value of history of science.	L2
CO 2	Recall the efforts made by earlier Scientist to develop today's Science.	L1
CO 3	List of work of achievements of various leaders and social workers in the field of biological Science.	L1
CO 4	Recall & encourage their original crude Ideas of various leaders from the field of biological science.	L2

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	0	0	0	0	0
CO 2	2	0	0	0	0	0
CO 3	2	0	0	0	0	0
CO 4	2	0	0	0	0	0

	Course: Generic – I	
Unit I	**History of Zoology & Footsteps to follow**	**No. of Lectures**
I	**History of Zoology** **Introduction to the History of Science** Some ancient records of scientific discoveries andinventions **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) **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)	**15**

	Sunder Lal Hora (1896 –1955)	
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**

REFERENCES

23BUZO1T05

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 Google Books, 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

Semester - II

MAJOR COURSE CODE: 23BUZO2T01	CREDIT -02	NO OF LECTURES IN HRS. 30
MINOR COURSE CODE: 23BUZO2T03	CREDIT -02	NO OF LECTURES IN HRS. 30

Population Ecology and Wildlife management

COURSE OUTCOME

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

CO 1	Compare the intrinsic & Extrinsic Mechanism in population	L2
CO 2	Relate different population interaction and human census	L1
CO 3	Compare different national parks and sanctuaries with its flora and fauna	L2
CO 4	Relate management strategies of wild animals in India	L1

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	0	2	0	0	0	0
CO 2	0	3	0	0	0	0
CO 3	0	0	0	3	0	0
CO 4	0	0	0	0	0	2

MAJOR COURSE CODE: 23BUZO2T01	CREDIT -02	NO . OF LECTURES IN HRS. 30

MINOR COURSE CODE :23BUZO2T03	CREDIT -02	NO . OF LECTURES IN HRS. 30

Unit	Description	No. of Hours.
I	**Population Ecology** **Population dynamics** Population density Natality Mortality Fecundity Age structureSex ratio Life tables Survivorship curves	15

	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 formJ – Shaped growth form **Human census (India)** Concept Mechanism Significance	
II	**Wildlife management** **National parks and sanctuaries** Sanjay Gandhi National Park Tadoba National Park Corbett National Park Kaziranga National ParkGir National Park Silent Valley National Park Pirotan Island Marine Park Keoladeo Ghana National ParkBandipur Sanctuary **Wildlife Management strategies in India** Project Tiger Project Rhinoceros **Ecotourism Biopiracy**	**15**

REFERENCES	
23BUZO2T01/23BUZO2T03	
1.	Introduction to Ecology and Wildlife - University Text Book of Zoology, F.Y.B.Sc. Semester II Course 3 2018
2.	Fundamentals of Ecology, Eugene P. Odum and Grey W. Barrett, Brook Cole/ Cengage learning
3.	Fundamentals of Ecology, Brook Cole/ Cengage learning, 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: 23BUZO2T02	**(02 CREDITS)**	**No of lectures in hrs. 30**
MINOR COURSE CODE: 23BUZO2T04	**(02 CREDITS)**	**No of lectures in hrs. 30**

Nutrition and Public health and hygiene

COURSE OUTCOME

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

CO 1	Construct a balanced diet with respect to different age groups.	L3
CO 2	Importance of dietary component to avoid different malnutrition disorders.	L5
CO 3	Importance of health and it's issue.	L5
CO 4	Categories contagious and non-contagious diseases by using WHO guidelines.	L4

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	0	0	0	0	0
CO 2	2	0	0	0	0	0
CO 3	0	0	0	0	0	2
CO 4	0	0	0	0	0	3

MAJOR COURSE CODE: 23BUZO2T02	(02 CREDITS)	No of lectures in hrs. 30
MINOR COURSE CODE: 23BUZO2T04	(02 CREDITS)	No of lectures in hrs. 30

Unit	Description	No. of Hours.
I	**Nutrition and health** **Concept of balanced diet: Dietary recommendations** Normal adult Infant Pregnant woman Aged **Malnutrition disorders:** Causes, symptoms, precaution and remedy Anemia (B12 and Iron deficiency) Rickets Marasmus Goiter Kwashiorkor **Medical conditions:** causes, symptoms, precaution and remedy Constipation 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 Psychological Social **WHO and its Programmes in India** (Concept and outcome) Polio Small pox Malaria Leprosy **Ill effects of self-medication** **Water** Sources Properties Purification of water Small scale Medium scale Large scale **Water footprint (concept and significance)** Hygiene Basic hygiene Hygiene practices **Radiation risk:** Mobile Cell tower	**15**
	Electronic gadgets **Blood bank** Concept and significance	

REFERENCES	
23BUZO2T02/23BUZO2T04	
1.	Common Diseases, Health and Hygiene - University Text Book of Zoology, F.Y.B.Sc. Semester II Course 4, Ramesh Gaonkar, University Press.Mumbai, Edition 3, 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 Kearney and Lenore Arab, Willey Blackwell Publication

MAJOR COURSE CODE: 23BUZO2P01	(02 CREDITS)	No of lecture in Hrs. 60
Practical based on 23BUZO2T01 and 23BUZO2T02		
MINOR COURSE CODE: 23BUZO2P02	**(02 CREDITS)**	**No of lecture in Hrs. 60**
Practical based on 23BUZO2T03 and 23BU4O2T04		

COURSE OUTCOME

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

CO 1	Apply knowledge to understand the population ecology and its dynamics and regulatory factors.	L3
CO 2	List the current status of wildlife conservation in India.	L4
CO 3	Examine the various malnutritional disorders and understand the importance of healthy dietary habits.	L4
CO 4	Identify the major lifestyle diseases and understand the role of diet, exercise and behavioural changes.	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	0	0	0	0	0
CO 2	0	0	0	2	0	0
CO 3	2	0	0	0	0	0
CO 4	2	0	0	0	0	0

Practical I

1	**Interpretation of the given graphs/ tables and comment on pattern of population nature:** Survivorship curve, Life tables
2	**Interpretation of the given graphs/ tables and comment on pattern of population nature:** Fecundity tables Age 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 form 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 vulture Gharial Malabar civet
9	**Study of National parks and sanctuaries** Sanjay Gandhi National Park Tadoba 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 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.** Malaria ,Leprosy
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

MAJOR COURSE CODE:23BU2SEC05	**(02 Credits)**	**No of lecture in Hrs. 15**

Bird Identification

COURSE OUTCOME

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

CO 1	Identify birds by their morphological characters.	L5
CO 2	Examine the habit and habitat of birds	L3
CO 3	List the birds according to their habitat.	L1
CO 4	Identify the characters of birds.	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	0	2	0	0	0	0
CO 2	0	0	0	1	0	0
CO 3	0	0	0	2	0	0
CO 4	0	2	0	0	0	0

Unit	**Description**	**No. of Hours**
I	1. Habit and habitat study of birds 2. Morphological keys of identification (head, beak, neck, feathers, tail, feet, color) 3. Bird calls /Songs 4. Bird nesting	**05**

SEC- PRACTICAL

1	Bird habitat
2	Bird watching
3	Bird Photography
4	Bird Survey
5	Mimicry

REFERENCES	
23BU2SEC01	
1.	The Book of Indian Birds, Salim Ali, Oxford, Edition 13, 2013
2.	Birds of India, Bikram Grewal, Om books International, Edition 1, 2016
3.	Birds of Indian Subcontinent, Richard Grimmett, Bloomsbury India, Edition 1, 2016
4.	Pocket Guide: Birds of India ,Bikram Grewal

	Generic	**Credits 02**
Course code 23BUZO2T05:	**Course title - Ecosystem and Common Human Disease and Disorders**	**No of lectures in hrs 30**

COURSE OUTCOME

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

CO 1	Compare the different concepts of ecology with respect to ecosystem	L2
CO 2	Relationships of different ecosystem based on food chain and food web	L4
CO 3	Relate stress disorders with reference to human	L1
CO 4	Categorise communicable and non-communicable diseases	L3

Grading will be as 3: High(>60%), 2: Moderate(40%-60%), 1: Low(<40%), 0: No mapping

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	0	0	0	2	0	0
CO 2	0	2	0	0	0	0
CO 3	2	0	0	0	0	0
CO 4	0	0	0	0	0	2

	Course: Generic – II	
Unit	**Topics: Ecosystem and Common human diseases and disorders**	**No. of Lectures**
I	**Ecosystem** **Introduction to ecology Concepts of ecology** Environment Population Community Ecosystem Biosphere Ecosystem **Types of ecosystems:** Aquatic: Freshwater Estuarine Marine Terrestrial: Forest Grassland Desert **Structure and composition of ecosystem:** Abiotic components Biotic components **Food chain:** Detritus food chain Grazing food chain **Food web:** Fresh waterGrass land **Energy flow through the ecosystem** **Ecological pyramids:** Number, Biomass, Energy **Concept of eutrophication in lakes and rivers**	**15**
II	**Common human diseases and disorders** **Stress related disorders:** Cause, symptoms, precaution and remedy Hypertension, Diabetes type II ,Anxiety, Insomnia Migraine Depression **Communicable and non-communicable diseases** Tuberculosis, Typhoid, Dengue Hepatitis (A and B), AIDS Gonorrhea, Syphilis **Diseases of respiratory system:** Cause/causative agents, symptoms, diagnostics, precaution /prevention and remedy Asthma, Bronchitis and Oral Cancer	**15**

REFERENCES	
23BUZO2T05	
1.	Fundamentals of Ecology, E. P. Odum, Sunders Publication
2.	Fundamentals of Ecology, M. C. Dash, Tata McGraw Hill
3	Common Diseases, Health and Hygiene - University Text Book of Zoology, F.Y.B.Sc. Semester II Course 4, Ramesh Gaonkar, University Press.Mumbai, Edition 3, 2018
4	A Complete Handbook of Nature Cure, Dr. H. K. Bakru,, Jaico Publishing House.

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

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

	SEMESTER – I	**Course imparts Employability (EM), Entrepreneurship (EN), Skill Development (SD)**			**Course integrates with Professional Ethics (PE), Gender Equity (GE), Human Value (HV), Environmental Sustainability (ES)**			
Course Code	**Major Course Title**	**EM**	**EN**	**SD**	**PE**	**GE**	**HV**	**ES**
23BUZO1T01	Biodiversity and its conservation	--	--	--	--	--	--	√
23BUZO1T02	Animal Biotechnology and instrumentation	√	√	√	√	--	√	--
23BUZO1P01	Zoology Practicals based on 23BUZO1T01 and 23BUZO1T02	√	√	√	√	--	√	√
23BU1SEC05	Fish Dishes (SEC)	√	√	√	√	--	--	--
	Minor Course Title							
23BUZO1T03	Biodiversity and its conservation	--	--	--	--	--	--	√
23BUZO1T04	Animal Biotechnology and instrumentation	√	√	√	√	--	√	--
23BUZO1P02	Zoology Practicals based on23BUZO1T03 and 23BUZO1T04	√	√	√	√	--	√	√
Course Code	**Generic - Course Title**							
23BUZO2T05	History of Zoology & Footsteps to follow (GE)	--	--	--	--	--	√	--
	Total	**05**	**05**	**05**	**05**	**00**	**05**	**04**

	SEMESTER – II	Course imparts Employability (EM), Entrepreneurship (EN), Skill Development (SD)			Course integrates with Professional Ethics (PE), Gender Equity (GE), Human Value (HV), Environmental Sustainability (ES)			
Course Code	**Major Course Title**	**EM**	**EN**	**SD**	**PE**	**GE**	**HV**	**ES**
23BUZO2T01	Population Ecology and Wildlife management	--	--	--	--	√	√	√
23BUZO2T02	Nutrition and public health and hygiene	--	--	--	--	--	√	--
23BUZO2P01	Zoology Practicals based on23BUZO2T01 and 23BUZO2T02	--	--	√	--	√	√	√
23BU2SEC05	Bird Identification (SEC)	√	√	√	√	--	--	√
	Minor Course Title							
23BUZO2T03	Population Ecology and Wildlife management	--	--	--	--	√	√	√
23BUZO2T04	Nutrition and public health and hygiene	--	--	--	--	--	√	--
23BUZO2P02	Zoology Practicals based on 23BUZO2T03 and 23BUZO2T04	--	--	√	--	√	√	√
Course Code	**Generic - Course Title**							
23BUZO2T05	Ecosystem Common Human Disease and disorders (GE)	--	--	--	--	--	√	√
	Total	**01**	**01**	**03**	**01**	**04**	**07**	**06**