The Kelkar Education Trust's
V G Vaze College of Arts, Science and Commerce
(Autonomous)

Syllabus for F.Y.B.Sc.

(June 2020 Onwards)

Program: B.Sc.

Semester – I and II

Course: Zoology

SEMESTER- I

Course Code	Paper Title	Credit
SZO101	Wonders of Animal World, Biodiversity and its Conservation	02
SZO102	Instrumentation and Animal Biotechnology	02
SZOP101	Practical based on Paper I	01
SZOP102	Practical based on Paper II	01

SEMESTER- II

Course Code	Paper Title	Credit
SZO201	Ecology and Wildlife Management	02
SZO202	Nutrition, Public Health and Hygiene	02
SZOP201	Practical based on Paper I	01
SZOP202	Practical based on Paper II	01

1. Syllabus as per Choice Based Credit System

i) Name of the Programme	: F.Y.B.Sc. Zoology
ii) Course Code	:**Semester-1** Course1 and Course 2 **Semester-2** Course 3 and Course 4
iii) Course Title	: Zoology
iv) Semester-wise Course Contents	: Copy of the Syllabus enclosed
v) References and Additional References	: Enclosed in the Syllabus
vi) Credit Structure	
No. of Credits per Semester	03
vii) No. of lectures per Unit	15
viii) No. of lectures per week	06
ix) No. of Tutorial per week	:--
x) No. of practical per week	: 02 (per batch)

2. Scheme of Examination : **Internal Assessment (40 marks):**
Class Test : 20 marks,
Assignment : 15 marks
Class Participation: 05marks
External Assessment (60 marks)
Semester End Exam:
Objectives:12 Marks
Subjective:
12 Marks -One question each from 3 Units / Two questions of 6 Marks each from 3 units
12 Marks -Two questions each from 3 Units (Any 4 out of 6)

3. Special notes, if any	: No
4. Eligibility, if any Admission	: As laid down in the College brochure/ website
5. Fee Structure	: As per College Fee Structure specifications

6. Special Ordinances / Resolutions, if any : No

Programmme: F.Y.B.Sc. **Semester**:I

Course: Zoology-I **Course code**:SZO101

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA) 40 marks					End Semester Examination	Total
L	**T**	**P**	**C**	**CIA-1**	**CIA-2**	**CIA-3**	**CIA-4**	**Lab**	**Written**	
6	-	6	6	20	15	05		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Course Objectives
1. To take learners through a captivating journey of hoarded wealth of marvellous animal world.
2. To orient learners about rich heritage of Biodiversity of India and make them understand significance of its conservation.
3. To teach learners about innovative and novel work of scientists/philosopher/entrepreneurs in the field of biological science
4. To create interest in the diverse field of Zoology and encourage research aspects

COURSE CONTENT			
Unit No.	**Module no.**	**Content**	**Lectures**
		SZO101(Paper I-Course 1): Wonders of Animal World, Biodiversity and its Conservation	
1		**Wonders of Animal World**	**15**
	I II III IV V VI VII VIII IX	**Echolocation in Bats and Cetaceans** - Dolphins and Whales **Mechanism of Pearl formation in Mollusca** **Bioluminescence in Animals:** *Noctiluca*, Glow worm, Firefly, Angler Fish (Mechanism and use for the animal) Regeneration in Animals - Earthworm (Annelida) and Lizard (Reptile) **Mimicry in Butterflies and its significance:** Great Eggfly and Common Crow, Common Palmfly and Plain Tiger. **Mechanism of Coral formation and types of Coral reefs** **Bird migration:** Definition, types and factors inducing bird migration **Adaptive features of desert animals:** Reptiles (Phrynosoma) and Mammals (Camel) **Breeding and Parental care in**: i. Pisces - Ovo-viviparous (Black Molly/Guppy), Mouth brooders (Tilapia), Brood pouches (Sea horse) ii. Amphibia - Mouth brooders (Darwin's Frog), Egg carriers (Midwife Toad) iii. Mammals -Egg-laying (Duck-billed Platypus), Marsupials (Kangaroo) **Aves: Brood Parasitism (Cuckoo)**	
2		**Biodiversity and its Conservation**	**15**
	I II III IV V	**Introduction to Biodiversity:** Definition, Concepts, Scope and Significance **Levels of Biodiversity** – Introduction to Genetic, Species and Ecosystem Biodiversity **Introduction of Biodiversity Hotspots-** (Western Ghats and Indo- Burma Border) **Values of biodiversity** - Direct and Indirect use value **Threats to Biodiversity** - Habitat loss and Man-Wildlife conflict	

	VI	**Biodiversity conservation and management** i. Conservation strategies: *in situ,* ex-situ, National parks, Sanctuaries and Biosphere reserves. ii. Introduction to International efforts: Convention on Biological Diversity (CBD), International Union for Conservation of Nature and Natural Resources (IUCN), United Nations Environment Program - World Conservation Monitoring Centre (UNEP-WCMC) iii. National Biodiversity Action Plan,2002 iv. Introduction to Indian Wildlife (Protection)Act,1972 and Convention for International Trade of endangered species	
3		**Footsteps to follow**	15
	I II III IV V VI VII VIII	**Dr. Hargobind Khorana** (Genetic code) **Dr. Varghese Kurien** (Amul –White revolution) **Dr. Salim Ali** (Ornithologist) **Anna Hazare** (Water Conservation-Ralegan Siddhi) **Baba Amte** (Anandvan) **Kiran Mazumdar Shaw** (Biocon) **Gadre Fisheries** (Surimi) **Rajendra Singh** **Two cases preferably of local importance to the college be additionally taught**	
		Total no. of Lectures	**45**

Beyond the Syllabus
Tutorial Activities: Students' Presentations, Brain storming sessions, Group Discussions, Use of E-learning, Conferences and Hands-on training practicals

List of Experiments	
Sr. No.	**Description**
1	Mounting of foraminiferan shells from sand (any five)
2	Study of types of Corals - Brain, Organ pipe, Stag Horn, Mushroom coral
3	Study of the following; a. Symbiosis (Termite and *Trychonympha*, Hermit crab and Sea anemone, Barnacles and Whales) b. Camouflage (leaf insect, chameleon) c. Cannibalistic mate-eating animals (Giant wood Spider and Praying Mantis) d. Animal architects: Termites, Harvester ant and Baya weaverbird e. Study of bioluminescent organisms – *Noctiluca*, glow worm, fire fly, anglerfish.
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, Insect catching, Fruit eating, Scavenging, Filter feeding), claws (perching, wading, swimming, hopping) in birds
8	**a.** Identification of birds - Coppersmith Barbet, Red vented Bulbul, Rose ringed Parakeet, Magpie Robin, Jungle Babbler, Black Drongo. **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).
	***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. specimens, however, shall be procured for the purpose of conducting practical as here-in-above.** **#There shall be at least one excursion/field trip**

The Kelkar Education Trust's

V G Vaze College of Arts, Science and Commerce (Autonomous)

Semester I: **Wonders of Animal World, Biodiversity and its Conservation** – SZO101(Paper ICourse1) (Internal AssessmentPattern)	
	Marks: 40
1 Class Test : (Based on Theory Unit 1.2and 3)	20marks
2Assignment:	15marks
3 Class Participation and Overall conduct	05Marks

Semester I: **Wonders of Animal World, Biodiversity and its Conservation** – SZO101(Paper ICourse1) (Internal Class Test PaperPattern)	
Duration:	**Marks:20**
Q.1 a) Fill in the blanks: (1 or 2 questions each from Unit1,2,3)	05marks
b) Match the column: (1 or 2 questions eachfromUnit1,2,3) Column A Column B 1. a) 2. b) 3. c) 4. d) 5. e)	05 marks
Write short note on:(Any two) a) Unit1 b) Unit2 c) Unit3	10Marks

Semester I: **Wonders of Animal World, Biodiversity and its Conservation** – SZO101(Paper ICourse1) (Theory PaperPattern)	
Duration: 2 hours	**Marks: 60**
Q.1 a) Fill in the Blanks: (2 questions from each Unit) -a,b,c,d,e,f,g,h	**04 marks**
b) Match the column: (2 questions from each Unit) Column A Column B 1. a) 2. b) 3. c) 4. d) 5. e) 6. f) 7. g) 8. h)	**04 marks**
Q.1 c) Define:/ Answer in one sentence: (One from each Unit)	**04 Marks**
a) Answer the following: (Unit1) OR a) Answer in brief: (Unit1) b) Answer in brief: (Unit1)	**12 Marks** **6Marks** **6Marks**

a) Answer the following: (Unit2) OR c) Answer in brief: (Unit2) d) Answer in brief: (Unit2)	**12 Marks** **6Marks** **6Marks**
Q.4 a) Answer the following: (Unit 3) OR e) Answer in brief: (Unit3) f) Answer in brief: (Unit3)	**12 Marks** **6Marks** **6Marks**
Q.5 Write Short notes on: Any four a) Unit1 b) Unit1 c) Unit2 d) Unit2 e) Unit3 f) Unit4	**12 Marks**

Semester I: **Wonders of Animal World, Biodiversity and its Conservation** – SZO101(Paper ICourse1) (Practical PaperPattern)	
Duration: 2 hours	**Marks: 50**
Q.1 From the given sample mount foraminiferan shells (Minimum five types) OR Mounting of scales (placoid and cycloid/ctenoid) from fishes.	**15 marks**
Q.2 Identify the photograph of the given animals and comment on the type of interaction/speciality. (symbiosis, camouflage, cannibalistic mate eating animals and animal architects,bioluminiscence). Any two	**10 marks**
Q.3 Identify giving reasons - Venomous/Non-venomous snake (from photographs).	**05 marks**
Q.4. Identification (one specimen each) a) Types of corals b) Amphibians-breeding and parental care c) Adaptive radiation in reptiles d) Types of feathers/ claws in birds e) Types of beaks in birds	**10 marks**
Q.5 Field study report (Biodiversity) and viva on it.	**10 Marks**

Course outcome
After the completion of the course, students will able to
CO1 ignite curiosity in the mind of learners, to know more about the fascinating world of animals which would enhance their interest and love for the subject of Zoology.
CO2 appreciate treasure of Biodiversity, its importance and hence will enhance their knowledge pertaining to contribute their best for its conservation.
CO4impulsetothinkdifferentlyandwouldbeencouragedipsofactototheiroriginal crude ideas from the field of biological sciences.
CO5 generate innovative ideas for the subject of Zoology, thus beneficial for creating innovative ideas for research work.

Recommended Resources	
Text Books	Wonders of the Animal World - University Text Book ofZoology, F.Y.B.Sc. Semester I Course 1. V.V. Dalvie, G.B. Raje, P. Sardesai, N.S. Prabhu, University Press.
Reference Books	1. Vertebrate Zoology Volume I- Jordan and Verma , S. Chand and Co. 2. Invertebrate Zoology Volume II- Jordan and Verma , S. Chand and Co. 3. Invertebrate Zoology- T. C. Majupuria , S. Nagin andCo. 4. Chordate Zoology- P. S. Dhami and J. K. Dhami , R.Chand and Co. 5. Invertebrate Zoology- P. S. Dhami and J. K. Dhami , R. Chand and Co. 6. Introduction to Vertebrates- Moore Cambridge University- Low Priced Edition 7. Zoology- S. A. Miller and J. B. Harley, Tata Mc Graw Hill 8. Modern Textbook of Zoology, Invertebrates, R. L. Kotpal 9. Fundamentals of Ecology- E. P. Odum , Sunders Publication 10. Fundamentals of Ecology- M.C.Dash-2nd edition, Tata Mc Graw Hill

11. Essentials of Ecology and Environmental Science - S.V.S Rana
12. Biodiversity- S.V.S Rana- Prentice Hall Publications
13. Modern Biology- V. B. Rastogi
14. Biology of Mollusca- D. R. Khanna
15. A Textbook of Zoology, Vol. II- T. Jeffery Parker and William. A. Haswell- Low Price Publications
16. Ecology and Environment- P. D. Sharma, R. K. Rastogi Publications
17. Introduction to Ecology- R.Dajoz
18. Wildlife Laws and its Impact on Tribes- Mona Purohit, Deep and Deep Publications
19. Biodiversity- K.C. Agarwal- Agro Botanica Publications
20. Butterflies of India – Isaac Kehimkar- BNHS Publication

E-Resources

https://foraminifera.eu/genusdb.php?testform=uniserial&aktion=suchehttps://www.elesapiens.com/educational-contents/info-resource/902/classifying-animals

Programmme: F.Y.B.Sc. **Semester**:I

Course: Zoology-II **Course code**:SZO102

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA) 40 marks					End Semester Examination	Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Written	
6	-	6	6	20	15	05		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Course Objectives

1. To make learners aware of risks involved in handling of different hazardous chemicals, sensitive (electrical/electronic) instruments and infectious biological specimens especially during practical sessions in the laboratory and to train them to avoid mishap.
2. To acquaint learners to the recent approaches, modern developments and concepts of Zoology highlighting their applications aiming for the benefit of human being.
3. To inculcate good laboratory practices in students and train them about scientific handling of important instruments
4. To provide all learners a complete insight about the structure and train them with operational skills of different instruments required in Zoology.

SEMESTER I

Course Content			
Unit No.	**Module No.**	**Content**	**Lectures**
		SZO102 (Paper II Course 2): INSTRUMENTATION and ANIMAL BIOTECHNOLOGY	
1		**Laboratory safety, Units and Measurement**	**15**
	I II III	Introduction to good laboratory practices Use of safety symbols: meaning, types of hazards and precautions Units of measurement**:** i. Calculations and related conversions of each: Metric system- length (meter to micrometer); weight (gram to microgram), Volumetric (Cubic measures) ii. Temperature: Celsius, Fahrenheit, Kelvin iii. Concentrations: Percent solutions, ppt, ppm, ppb dilutions, Normality, Molarity and Molality. iv. Biostatistics: Introduction and scope, Sampling and its types, Central Tendencies(mean,median,mode) Tabulation, Graphical representations (Histograms, bar diagrams, pie diagrams)	
2		**Animal Biotechnology**	**15**
	I II III	**Biotechnology**: Scope and achievements of Biotechnology (Fishery, Animal Husbandry, Medical, Industrial) **Transgenesis**: Retro viral method, Nuclear transplantation method, DNA microinjection method and Embryonic stem cell method **Cloning (Dolly)**	

Unit No.	Module No.	Content	Lectures
	IV	**Ethical issues of transgenic and cloned animals** **Applications of Biotechnology:** i. DNA fingerprinting: Technique in brief and its application in forensic science (Crime Investigation) ii. Recombinant DNA in medicines (recombinant insulin) iii. Gene therapy: Ex-vivo and In-vivo, Severe Combined Immunodeficiency (SCID), Cystic Fibrosis iv. Green genes: Green Fluorescent Protein (GFP) from Jelly fish- valuable as reporter genes used to detect food poisoning.	
3		**Instrumentation**	**15**
	I II III IV V VI VII	**Microscopy** i. Construction, principle and applications of dissecting and compound microscope. **Colorimetry and Spectroscopy** - Principle and applications. **Introduction to GCMS and LCMS** **pH** - Sorenson's pH scale, pH meter - principle and applications. **Centrifuge** - Principle and applications (clinical and ultra-centrifuges). **Chromatography-** Principle and applications (Partition and Adsorption) **Electrophoresis -** Principle and applications (AGE and PAGE) **Electron Microscopy:** Principle, Working and its applications.	
		Total No. of Lectures	**45**

Beyond the Syllabus
Tutorial Activities: Students' Presentations, Brain storming sessions, Group Discussions, Use of E-learning, Conferences and Hands-on training practicals

SZOP102 (SEMESTER-I)
Based on PAPER II Course 2

List of Experiments	
Sr. No.	**Description**
1	a) Interpretation of safety symbols (toxic, corrosive, explosive, flammable,skin irritant, oxidizing, compressed gases, aspiration hazards and Biohazardous infectious material.) b) Study of Central tendencies and plotting of Bar diagram, histogram and pie diagram.
2	Identification of transgenic fish (Trout and Salmon) / cloned animals (Dolly sheep, cc cat and Snuppy dog) from photograph.
3	Extraction of fruit juice with pectinase from apple/guava/or any other suitable fruit
4	Application of DNA Fingerprinting in criminology (photograph of electrophoretic pattern to be given for interpretation by the students)
5	a) Study of parts of microscope and their functions. b) Technique of focusing a permanent slide under 10x and 45x(objectives).
6	a) Dilution of given sample and estimation of OD by using colorimeter. b) Calculation of concentration from the given OD using formula.
7	a) 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. b) Calculation of pH of three different samples(one each acidic,alkaline and neutral) using pH paper/Universal indicator/pH indicator of three water samples.
8	a) Separation of amino acids from the mixture by paper chromatography. b) Calculation of Rf value of separated pigments/amino acids from given chromatogram and their identification from standard chart.
9	a) Separation of pigments by adsorption chromatography using chalk. b) Separation of lipids by Thin Layer Chromatography
	***Note - The practicals may be conducted by using specimens authorized by the wildlife and 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 by the UGC and as envisaged in the regulations of the relevant monitoring bodies. No new specimens, however, shall be procured for the purpose of conducting practicals mentioned here- in-above.**

Semester I: **Instrumentation and Animal Biotechnology** – SZO102 (PaperII-Course2) (Internal AssessmentPattern)	
	Marks: 40
1 Class Test : (Based on Theory Unit 1.2and 3)	20marks
2Assignment:	15marks
3 Class Participation and Overall conduct	05Marks

Semester I: **Instrumentation and Animal Biotechnology** – SZO102 (PaperII-Course2) (Internal Class Test PaperPattern)	
Duration:	**Marks:20**
Q.1 a) Fill in the blanks: (1 or 2 questions each from Unit1,2,3)	05marks
b) Match the column: (1 or 2 questions eachfromUnit1,2,3) Column A Column B 1. a) 2. b) 3. c) 4. d) 5. e)	05 marks
Write short note on:(Anytwo) a) Unit1 b) Unit2 c) Unit3	10Marks

Semester I: **Instrumentation and Animal Biotechnology** – SZO102 (PaperII-Course2) (Theory PaperPattern)	
Duration:	**Marks: 60**
Q.1 a) Fill in the Blanks: (2 questions from each Unit) -a,b,c,d,e,f,g,h	**04 marks**
b) Match the column: (2 questions from each Unit) Column A Column B 1. a) 2. b) 3. c) 4. d) 5. e) 6. f) 7. g) 8. h)	**04 marks**
Q.1 c) Define:/ Answer in one sentence: (One from each Unit)	**04 Marks**
a) Answer the following: (Unit1) OR a) Answer in brief: (Unit1) b) Answer in brief: (Unit1)	**12 Marks** **6Marks** **6Marks**

a) Answer the following: (Unit2) OR a) Answer in brief: (Unit2) b) Answer in brief: (Unit2)	**12 Marks** **6Marks** **6Marks**
Q.4 a) Answer the following: (Unit 3) OR a) Answer in brief: (Unit3) b) Answer in brief: (Unit3)	**12 Marks** **6Marks** **6Marks**
Q.5 Write Short notes on: (Any four) a) Unit1 b) Unit1 c) Unit2 d) Unit2 e) Unit3 f) Unit4	**12 Marks**

Semester I: **Instrumentation and Animal Biotechnology** – SZO102 (PaperII-Course2) (Practical PaperPattern)

Duration: 2 hours	**Marks: 50**
Q.1 Dilute the given sample and estimate the OD using colorimeter (Three dilutions) **OR** Calculate concentration from given OD by formula (3 concentrations) **OR** Find pH of water samples (three) and comment on their chemical nature. **OR** Using red cabbage pH indicator, determine pH of the given samples and comment on their chemical nature **OR** Extract fruit juice using pectinase and compare the result with a set without using pectinase.	**15 marks**
Q.2 Perform experiment for separation of pigments by adsorption chromatography. **OR** Perform experiment for separation of mixture of amino acids by paper chromatography **OR** Calculate R_f value and identify the pigment from chromatogram. **OR** Perform Thin Layer Chromatography (TLC) for separation of lipids	**10 marks**

Q.3 Focus the given slide under 10 X and 45 X and show it to examiner. **OR** Prepare a frequency distribution table / Plot histogram / Pie diagram / Bar diagram from the given data.	**05 marks**
Q.4. Identification: a) Safety Symbols b) Safety Symbols c) parts of compound microscope d) transgenic animals e) DNA fingerprinting)	**10 marks**
Q.5 Viva-voce	**05 Marks**
Q.6 Journal	**05 Marks**

Course outcome
After the completion of the course, students will able to
CO1 work safely in the laboratory and avoid occurrence of accidents (mishaps) which will boost their scholastic performance, knowledge and economy in use of materials/chemicals during practical sessions.
CO2 understand recent advances in the subject and their applications for the betterment of mankind; and that the young minds will be tuned to think out of the box.
CO3 have hands-on-training experience on different instruments, thus can further help them to inculcate applications of instruments in research.
CO4 emphasize on recent advances in the subject and their applications for the betterment of mankind and the young minds will be tuned to think out of the box.

Recommended Resources	
Text Books	
Reference Books	1. 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. 2. Introduction to Practical Biochemistry – David T. Plummer (Tata McGraw Hill Publishing Co.Ltd.) 3. Introductory Practical Biochemistry – S.K. Sawhney and Randhir Singh (Narosa Publishing House) 4. Methods in Biostatistics – B. K. Mahajan,(Jaypee Publications) 5. Microscopy and Cell Biology - V. K. Sharma, (Tata McGraw Hill Publishing Co.Ltd.) 6. Bioinstrumentation – L. Veerakumari, (M.J.P.Publishers) 7. Principles and Techniques of PracticalBiochemistry – Keith Wilson and John Walker, (Cambridge University Press) 8. Biotechnology- Thieman and Pallidino, Pearsonedu. 9. Biotechnology –Glick and Pasternak 10. Biochemistry–Satyanarayana 11.Understanding biotechnology- Aluizio Borem , David Bowe- Low price edition–Pearson Publication 12.A Textbook of Biotechnology – R. C. Dubey, S. Chand Publication. 13.A Manual of Medical Laboratory Technology -A. H. Patel, Navneet Prakashan Ltd. 14.Biological instruments and methodology – Dr. P. K. Bajpai, S. Chand company Ltd. 15.Calculations in Molecular biology and Biotechnology - Frank H. Stephenson, Academic Press.

Programmme: F.Y.B.Sc. **Semester**:II

Course: Zoology-I **Course code**:SZO201

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA) 40 marks					End Semester Examination	Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Written	
6	-	6	6	20	15	05		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Course Objectives

1. To enlighten learners about the current status of wild life conservation in India in the light of guidelines from different relevant governing agencies with adversity of poaching and biopiracy.
2. To emphasize on the taxonomy of animals to study the structural adaptations and evolutionary pattern that depicts its affinities and also highlighting its comparative features.
3. To facilitate the learning of population ecology, its dynamics and regulatory factors important for its sustenance
4. To impart knowledge of different components of ecosystem and educate about essentials of coexistence of human beings with all other living organisms.

COURSE CONTENT			
Unit No.	**Module no.**	**Content**	**Lectures**
		SZO201(Paper I-Course 3): Ecology and Wildlife Management	
1		**Population ecology:**	
	I	Population dynamics i. Population density ii. Natality iii. Mortality iv. Fecundity v. Age structure vi. Sex ratio vii. Lifetables viii. Survivorship curves ix. Population dispersal and distribution patterns x. Niche concept	
	II	Population growth regulation i. Intrinsic mechanism – Density dependent fluctuations and oscillations ii. Extrinsic mechanism- Density independent, environmental and climate factors, population interactions	
	III	Population growth pattern i. Sigmoid ii. J Shaped	
	IV	Human census (India) – Concept, mechanism and significance	
2		**Ecosystem**	**15**
	I	**Ecosystem -** Definition and components	
	II	**Impact of temperature on biota**	
	III	**Biogeochemical cycles** (Water, Oxygen, Nitrogen, Phosphorus, Sulphur)	

	IV V VI VII	**Fresh water ecosystem** – Lentic and Lotic **Food chain and food web in ecosystem** (Fresh water and Grass land). **Ecological pyramids** - energy, biomass and number. **Animal interactions** (commensalism, mutualism, predation, antibiosis, parasitism)	
3		**National parks and Sanctuaries of India**	**15**
	I	**Concept of Endangered and Critically Endangered species using examples of Indian Wildlife with respect to National Parks and Wildlife Sanctuaries of India:** i. Sanjay Gandhi National Park, ii. Tadoba Tiger Reserve, iii. Corbett National Park, iv. Kaziranga National Park, v. Gir National Park, vi. Silent Valley, vii. Pirotan Island Marine Park, viii. Keoladeo Ghana National Park, ix. Bandipur Sanctuary	
	II	**Management strategies with special reference to Tiger and Rhinoceros in India**	
	III	**Ecotourism**	
	IV	**Biopiracy**	

SZOP201 (SEMESTER- II)
Based on PAPER I Course 3

List of Experiments	
Sr. No.	**Description**
1	Interpretation of the given graphs/ tables and comment on pattern of population nature : i. Survivorship curve ii. Lifetables iii. Fecundity tables iv. Age structure v. Sex ratio
2	a) Calculation of Natality, Mortality, Population density from given data b) Estimation of population density by capture recapture method
3	Interpretation of Growth curves (Sigmoid and J shaped)
4	Estimation of hardness from given water sample (tap water v/s well water)
5	Estimation of Free carbon dioxide (Free CO_2) from two different samples- aerated drinks(diluted) v/s tap water
6	Identification and interpretation of aquatic and terrestrial (Grassland) food chains and food webs
7	Construction of food chain/food web using given information/data.
8	a) Identification and interpretation of ecological pyramids of energy, biomass and number b) Construction of different types of pyramid from given data.
9	Study of the following: a) Endangered (Great Indian Bustard, Asiatic lion, Blackbuck, Olive Ridley sea turtle) and critically endangered species (Slender-billed vulture, Gharial, Malabar civet) of Indian wildlife and state reasons for their decline b) Study Biodiversity hotspots using world map (Western Ghats and Indo-Burma) Study of sanctuaries, national parks, biosphere reserves in India with respect to its brand fauna as listed in theory)
	***Note - The practicals may be conducted by using specimens authorized by the wildlife and 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 by the UGC and as envisaged in the regulations of the relevant monitoring bodies. No new specimens, however, shall be procured for the purpose of conducting practicals mentioned here-in-above.** **#There shall be at least one excursion/field trip**

Semester II: **Ecology and Wildlife Management** – SZO201 (Paper I-Course3) (Internal AssessmentPattern)	
	Marks: 40
1 Class Test : (Based on Theory Unit 1.2and 3)	20marks
2Assignment:	15marks
3 Class Participation and Overall conduct	05Marks

Semester II: **Ecology and Wildlife Management** – SZO201 (Paper I-Course3) (Internal Class Test PaperPattern)	
Duration:	**Marks:20**
Q.1 a) Fill in the blanks: (1 or 2 questions each from Unit1,2,3)	05marks
b) Match the column: (1 or 2 questions eachfromUnit1,2,3) Column A Column B 1. a) 2. b) 3. c) 4. d) 5. e)	05 marks
Write short note on:(Any two) a) Unit1 b) Unit2 c) Unit3	10Marks

Semester II: **Ecology and Wildlife Management** – SZO201 (Paper I-Course3) (Theory PaperPattern)	
Duration: 2 hours	**Marks: 60**
Q.1 a) Fill in the Blanks: (2 questions from each Unit) -a,b,c,d,e,f,g,h	**04 marks**
b) Match the column: (2 questions from each Unit) Column A Column B 1. a) 2. b) 3. c) 4. d) 5. e) 6. f) 7. g) 8. h)	**04 marks**
Q.1 c) Define:/ Answer in one sentence: (One from each Unit)	**04 Marks**
a) Answer the following: (Unit1) OR a) Answer in brief: (Unit1) b) Answer in brief: (Unit1)	**12 Marks** **6Marks** **6Marks**

a) Answer the following: (Unit2) OR a) Answer in brief: (Unit2) b) Answer in brief: (Unit2)	**12 Marks** **6 Marks** **6 Marks**
Q.4 a) Answer the following: (Unit 3) OR a) Answer in brief: (Unit3) b) Answer in brief: (Unit3)	**12 Marks** **6 Marks** **6 Marks**
Q.5 Write Short notes on: Any four a) Unit1 b) Unit1 c) Unit2 d) Unit2 e) Unit3 f) Unit4	**12 Marks**

Semester II: **Ecology and Wildlife Management** – SZO201 (Paper I-Course3) (Practical Paper Pattern)	
Duration: 2 hours	**Marks: 50**
Q.1 Estimate Hardness from given water samples and compare the results. **OR** Estimate Free CO_2 from given samples and compare the results.	**15 marks**
Solve the given problems (using statistical approach wherever possible) based on (Any two) i. Natality ii. Mortality iii. Sex ratio iv. Fecundity v. Population density	**10 marks**
Q.3 Identify brand animals (Min. 4) and place them in their respective National parks/ Sanctuaries on the given map quoting reasons for their decline. **OR** Mark National parks and Sanctuaries on the map of India and mention the name of their brand animals stating reason for their decline. (Min. 4) **OR** Identify endangered and critically endangered animals (photographs) one each and state their reason of decline	**05 marks**

Q.4.Study the given information and give answers on the basis of food chain/food web and ecological pyramids. **OR** Prepare food chain/food web and ecological pyramid from the given data and give its significance. **OR** Identify and interpret the given graph/growth curve/age structure and comment on the pattern of population dispersal. **OR** Determine Population density by capture and recapture method.	**10 marks**
Q.5 Viva-voce	**05 Marks**
Q.6. Journal	**05 Marks**

Course outcome
After the completion of the course, students will able to
CO1 choose career options in the field of wild life conservation, research, photography and ecotourism.
CO2 identify and classify animals and thus, gain knowledge about the key to observe species pertaining to their anatomy and behavioural pattern.
CO3 study about nature of animal population, specific factors affecting its growth and its impact on the population of other lifeform
CO4 grasp the concept of interdependence and interaction of physical, chemical and biological factors in the environment

Recommended Resources	
Text Books	Introduction to Ecology and Wildlife - University Text Book of Zoology, F.Y.B.Sc. Semester II Course 3. University Press
Reference Books	1. Fundamentals of Ecology - Eugene P. Odum and Grey W. Barrett, Brook Cole/ Cengage learning 2. Fundamentals of Ecology - M. C. Dash , Tata McGraw Hill company Ltd, New Delhi 3. Ecology - Mohan P. Arora , Himalaya Publishing House 4. Field Biology and Ecology -- Alen H. Bentonand

William E. Werner ,Tata McGraw Hill ltd, New Delhi
5. Ecology and Environment - Sharma P. D ,Rastogi Publication, Mumbai
6. Ecology : Principles and Applications – Chapman J.L , Cambridge University trust
7. Ecology - Subramaniam and Others, Narosa Publishing House
8. Wildlife laws and its impact on tribes - Mona Purohit, Deep and deep Publication
9. Biology - Eldra Solomon, Linda R. Berg and Diana W. Martin, Thomson/ Brooks/ Cole
10. Economic Zoology, Biostats and Animal Behaviour :Shukla, Mathur, Upadhyay, Prasad. Rastogi Publications.

Programmme: F.Y.B.Sc. **Semester**:II

Course: Zoology-II **Course code**:

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA) 40 marks					End Semester Examination	Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Written	
6	-	6	6	20	15	05		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Course Objectives
1. To make learners understand the importance of balanced diet and essential nutrients of food at different stages of life.
2. 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.
3. To educate learners about causes, symptoms and impact of stress related disorders and infectious diseases
4. To impart knowledge of different diseases and create awareness its precautionary measures and treatment amongst the students.

SEMESTER II

COURSE CONTENT			
Unit No.	**Module no.**	**Content**	**Lectures**
		SZO202 (Paper II-Course 4): NUTRITION, PUBLIC HEALTH AND HYGIENE	
1		**Nutrition and Health**	**15**
	I II III IV V VI VII	Concept of balanced diet, dietary recommendations to a normal adult, infant, pregnant woman and aged. Malnutrition disorders – Anemia (B_{12} and Iron deficiency), Rickets, Marasmus, Goiter, Kwashiorkar (cause, symptoms, precaution and remedy). Constipation, piles, starvation, acidity, flatulence, peptic ulcers (cause, symptoms, precaution and remedy). Obesity (Definition and consequences). Importance of fibres in food. Significance of breast feeding. BMI calculation and its significance.	
2		**Public Health and Hygiene**	**15**
	I II III IV	Health i. Definition of Health, the need for health education and health goal. ii. Physical, psychological and Social health issues. iii. WHO and its programmes - Polio, Small pox, Malaria and Leprosy (concept, brief accounts and outcome with respect to India). iv. Ill effects of self-medication. Water and water supply i. Sources and properties of water. ii. Purification of water, small scale, medium scale and large scale (rapid sand filters) iii. Waterborne diseases (concept, brief accounts, pollutants and significance) Hygiene: i. Hygiene and health factors at home, personal hygiene, oral hygiene and sex hygiene. Radiation risk: Mobile Cell tower and electronic gadgets (data of recommended level, effects and precaution).	

	V	Blood bank – Concept and significance	
COURSE CONTENT			
Unit No.	**Module no.**	**Content**	**Lectures**
3		**Common Human Diseases and Disorders**	**15**
	I II	Stress related disorders Hypertension, Diabetes type II, anxiety, insomnia, migraine, depression (cause, symptoms, precaution and remedy) Communicable and non-communicable diseases i. Tuberculosis and Typhoid ii. Hepatitis(A,B,C),AIDS, Gonorrhea and Syphilis iii. Diseases of respiratory system- Asthma, Bronchitis. iv. Oral Cancer (Discuss cause/causative agents, symptoms, diagnostics, precaution /prevention and remedy.	
		Total No. of lectures	**45**

Beyond the Syllabus
Tutorial Activities: Students' Presentations, Brain storming sessions, Group Discussions, Use of E-learning, Conferences, Debates and Hands-on training practicals

SZOP202 (SEMESTER- II)
Based on PAPER II Course 4

List of Experiments	
Sr. No.	**Description**
1	Qualitative estimation of Vitamin C by Iodometric method.
2	Study of microscopic structure of starch granules of different cereals (wheat, maize and jowar).
3	a) Estimation of maltose from brown/white bread. b) Moisture content from biscuits or other suitable food products.
4	Food adulteration Test: a) Milk adulterants (starch and glucose), methylene blue reduction Test (MBRT). b) Adulterants in Cheese, Butter, Jaggery, Ghee, Honey, Iodised Salt.
5	a) Estimation of protein content of two egg varieties. b) Study of efficacy of different antacids (any two antacids).
6	Study of Human Parasites: • Endoparasites – Protozoans (*Entamoeba, Plasmodium*), Helminths(*Ascaris, Wuchereria*), • Ectoparasites (Head louse, tick) and Exoparasites (Bed bug, Mosquito).
7	Screening of anaemic/non-anaemic persons using $CuSO_4$ method.
8	Mounting of *Daphnia* and counting of its heart beats.
9	First Aid – Demonstration Practical Training for teachers and students to be conducted by the experts from Red cross, Civil defence, Civic authorities by individual institute or cluster colleges in rotation.
10	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 practicals may be conducted by using specimens authorised by the wildlife and 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 by the UGC and as envisaged in the regulations of the relevant monitoring bodies. No new specimens, however, shall be procured for the purpose of conducting practicals mentioned here-in-above.**

Semester II: **Nutrition, Public Health and Hygiene** – SZO202 (Paper II -Course4)	(Internal AssessmentPattern)
	Marks: 40
1 Class Test : (Based on Theory Unit 1.2and 3)	20marks
2 Assignment:	15marks
3 Class Participation and Overall conduct	05Marks

Semester II: **Nutrition, Public Health and Hygiene** – SZO202 (Paper II -Course4)	(Internal Class Test PaperPattern)
Duration:	**Marks:20**
Q.1 a) Fill in the blanks: (1 or 2 questions each from Unit1,2,3)	05marks
b) Match the column: (1 or 2 questions eachfromUnit1,2,3) Column A Column B 1. a) 2. b) 3. c) 4. d) 5. e)	05 marks
Write short note on:(Any two) a) Unit1 b) Unit2 c) Unit3	10Marks

Semester II: **Nutrition, Public Health and Hygiene** - SZO202 (Paper II -Course4)	(Theory PaperPattern)
Duration:	**Marks: 60**
Q.1 a) Fill in the Blanks: (2 questions from each Unit) -a,b,c,d,e,f,g,h	**04 marks**
b) Match the column: (2 questions from each Unit) Column A Column B 1. a) 2. b) 3. c) 4. d) 5. e) 6. f) 7. g) 8. h)	**04 marks**
Q.1 c) Define:/ Answer in one sentence: (One from each Unit)	**04 Marks**
a) Answer the following: (Unit1) OR a) Answer in brief: (Unit1)	**12 Marks** **6 Marks**

b) Answer in brief: (Unit 1)	**6 Marks**
a) Answer the following: (Unit2) OR a) Answer in brief: (Unit2) b) Answer in brief: (Unit2)	**12 Marks** **6Marks** **6Marks**
Q.4 a) Answer the following: (Unit 3) OR a) Answer in brief: (Unit3) b) Answer in brief: (Unit3)	**12 Marks** **6Marks** **6Marks**
Q.5 Write Short notes on: Any four a) Unit1 b) Unit1 c) Unit2 d) Unit2 e) Unit3 f) Unit4	**12 Marks**

Semester II: **Nutrition, Public Health and Hygiene**
- SZO202 (Paper II -Course4) (Practical PaperPattern)

Duration: 2 hours	**Marks: 50**
Q.1 Estimate Vitamin C from given sample. **OR** Estimate Maltose content from bread. **OR** Estimate protein content from two different types of eggs.	15 marks
Q.2 Analyse the given food sample and identify food adulterants (any 2 samples). **OR** Evaluate milk quality by Methylene Blue Reduction Test (MBRT). **OR** Determine efficacy of different antacids (any two) on acidic solution.	10 marks
Q.3 Determine moisture content from biscuits/ any other suitable food product. **OR** On the basis of microscopic structure of starch granules identify different cereals (any two). **OR** Detect adulterants present in the given milk sample (any two). **OR**	**05 marks**

Determine whether given blood sample is from anaemic/non-anaemic person using $CuSO_4$ Method and suggest the appropriate diet. Q.4. Mounting of *Daphnia* and counting of its heart beats	**05 Marks**
Q.5 Identification a) One specimen of Protozoan Parasites. b) One specimen of Helminth Parasites. c) One specimen from Ectoparasite d) One specimen from Exoparasite e) One specimen from Endoparasite	
Q.6 Submission of report of Body Mass Index (viva based on it)	**05 Marks**

Course outcome
After the completion of the course, students will able to
CO1 enquire healthy dietary habits in order to prevent risk of developing health hazards in younger generation due to faulty eating habits.
CO2 Promote optimum conservation of water, encouragement for maintaining adequate personal hygiene, optimum use of electronic gadgets, avoiding addiction, thus facilitating achievement of the goal of healthy young India in true sense.
CO3 recognize stress related problems at initial stages and thus can evaluate its remedial measures and its treatment.
CO4 to adopt relevant solutions which will lead to psychologically strong mind set promoting positive attitude important for academics and will be able to acquire knowledge of cause, symptoms and precautions of infectious diseases.

Recommended Resources	
Text Books	Common Diseases, Health and Hygiene - University Text Book of Zoology, F.Y.B.Sc. Semester II Course 4. University Press.
Reference Books	1. Common Diseases, Health and Hygiene - University Text Book of Zoology, F.Y.B.Sc. Semester II Course 4. University Press.

2. Common Medical Symptoms edited - P. J. Mehta National Inblisents and Distributions

3. Parks Textbook of Preventive and Social Medicine K. Park M/S Banarasidas Bhanot Jabalpar.

4. Human Physiology – Volume I – II C. C. Chatterjee, Medical Allied agency, Kolkatta.

5. Parasitology (Protozoology and Helminthoology) - K. D. Chatterjee, Chatterjee Medial Publishers.

6. Nand's handbook of Forensic Medicine and Toxicology – Apurba Nandy, NCBA publication.

7. Essentials of Public Health and Sanitation- Part I and Part II. All India Institute of Local Self Government.

8. Epidemiology and Management for Health Care for all. P.V.Sathe, A. P. Sathe, Popular Prakashan, Mumbai.

9. Textbook of Medical Parasitology- C. K. Jayaram Paniker. Jaypee Brothers.

10. A Treatise on Hygiene and Public Health. -B. N. Ghosh. Calcutta Scientific Publishing Company.

11. Prevention of Food Adulteration, Act 1954. Asian Law House.

12. Clinical Dietetics and Nutrition - F. P. Antia and Philip, Oxford University Press.

13. A Complete Handbook of Nature Cure - Dr. H. K. Bakru, Jaico Publishing House.

14. Dietetics - B. Srilakshmi, New Age International (P) Ltd. Publishers.

15. Nutrition: Principles and Application in Health Promotion - J. B. Lippincott Company. Philadelphia.

16. Are You Healing Yourself Mr. Executive - Dr. R. H. Dastur. IBH Publishing Company.

17. Food Nutrition and Health- Dr. Shashi Goyal, Pooja Gupta,S. Chand Publications.

18. Public Health Nutrition. Edited - Michael J. Gidney, Barrie M. Margetts, John M. Kearney and Lenore Arab. Willey Blackwell Publication.

19. Food and Nutrition – Vol. I and II - Dr. Swaminathan ,Bappco Publication.

20. Textbook of Human Nutrition – Mahtab Bamji, Prahlad Rao.

21. Total Health by Paramjit Rana.

(Dr. S. D. Rathod)
V.C. Nominee

Syllabus Prepared by:
1. Dr. B. B. Sharma, Principal, KET'S V. G. Vaze College (Autonomous), Mulund East, Mumbai
2. Dr. Vinod R. Ragade, Chairperson, Syllabus Committee Head, Dept of Zoology, Associate Professor, KET'S V. G. Vaze College (Autonomous), Mulund East, Mumbai
3. Dr. Kiran Kharat, Assistant Professor, Dept. of Zoology, KET'S V. G. Vaze College (Autonomous), Mulund East, Mumbai
4. Dr. Preetha Achary, Assistant Professor, Dept. of Zoology, KET'S V. G. Vaze College (Autonomous), Mulund East, Mumbai
5. Ms. Veena Menon, Assistant Professor, Dept. of Zoology, KET'S V. G. Vaze College (Autonomous), Mulund East, Mumbai

****