As Per NEP 2020

S. Z. S. P. Mandal's
Shri Pancham Khemraj Mahavidyalaya,
Sawantwadi-416510
(Autonomous)
Affiliated to University of Mumbai

Title of the Programme Science

B.Sc. (Zoology)

1. F.Y.B.Sc. 2023-2024
2. S.Y.B.Sc. 2024-2025
3. T.Y.B.Sc. 2025-2026

Syllabus for

Semester I
and
Semester II

Reference: GR dated 16th May 2023 for Credit structure

University of Mumbai

S. Z.S. P. Mandal's

SHRI PANCHAM KHEMRAJ MAHAVIDYALAYA

SAWANTWADI

(An Autonomous College)

DIST: SINDHUDURG- 416 510, MAHARASHTRA

DEPARTMENT OF ZOOLOGY

Syllabus for Approval

Sr. No.	Heading	Particulars
1.	Title of the Course	F. Y. B. Sc. ZOOLOGY (MAJOR COURSE)
2.	Eligibility for Admission	12th Science of all recognized Board
3.	Passing Marks	40%
4.	Ordinance/Regulations (if any)	-
5.	No. of Years/Semesters	Two Semesters
6	Level	UG
7	Pattern	Semester (60:40)
8	Status	Revised
9	To be implemented from Academic Year	From Academic Year 2023-2024

Date: 15/12/2023

Signature
HoD,
Dept. of Zoology

S.Z.S.P. Mandal's

Shri Pancham Khemraj Mahavidyalaya, Sawantwadi

(Autonomous)

Sr. No.	Name	Category	Designation	Signature
1	Dr.Mrs Pratiksha Pradip Sawant	12.5 (1)	HoD/Chairman	
2	Dr. Ganesh Sambhu Margaj	12.5 (2)	Member	
3	Dr. Mrs Shalaka Ramesh Walawalkar		Member	
4	Miss. Ravina Chandrashekhar Gawas		Member	
5	Miss. Saba Ibrahim Naik		Member	
6	Miss. Santoshi Naresh Naik		Member	
			Member	
			Member	
			Member	
			Member	
			Member	
7	Dr. Sunil. Madhukar Gaikwad		Member	
8	Dr. Manoj Maruti Ghughuskar	12.5 (3)	Member	
			Member	
9	Dr. Surekha Manoj Gupta		Member	
		12.5 (4)	Member	
			Member	
10	Dr. Narsinh L. Thakur		Member	
		12.5(5)	Member	
11	Dr. Darshana Subhash Korgaonkar	12.5 (6)	Member	
12	Mr.Mangesh Suhas Mangaonkar	12.5 (7)	Member	

Sr. No.	Headings	Particulars
1	Title of the Program	**Science- Zoology**
2	Eligibility	H.S.C. with Science Stream
3	Duration of the Programme	1- Certificate 2- Diploma 3- Degree 4- Degree (Hons)
4	Scheme of Examination	60 External : 40 Internal Separate passing in External and Internal examination
5	Standard of Passing	40.00%
6	Programme Academic Level	4.5 Certificate 5.0 Diploma 5.5 Degree 6.0 Degree (Hon.)
7	Pattern	Semester Pattern
8	Status	New
9	To Be Implemented from the academic year	4.5 Certificate **2023-2024** 5.0 Diploma **2024-2025** 5.5 Degree **2025-2026** 6.0 Degree(Hon.) **2026-2027**

PREAMBLE:

S. P. K. Mahavidyalaya, Sawantwadi (Autonomous) believes in implementing several measures to bring equity, efficiency and excellence in higher education system in conformity to the guidelines laid down by the University Grants Commission (UGC). In order to achieve these goals, all efforts are made to ensure high standards of education by implementing several steps to enhance the teaching-learning process, examination and evaluation techniques and ensuring the all-round development of learners.

The four-year course in B.Sc. Zoology has been designed to have a progressive and innovative curriculum in order to equip our learners to face the future challenges in the field of higher education. In semesters I and II learners are introduced to the basic areas of Zoology such as Wonders of animal world, Instrumentation and Biotechnology ,Non-chordates and nature studies, Hygiene and common diseases .

In semesters III and IV the course content is made more rigorous by introducing the details of each of the above area like Genetics, Animal physiology , Applied Zoology, Evolution , Scientific research, Cell biology ,Biomolecules ,Embryology, Reproduction , Dairy industry, Sericulture, aquaculture and Pollution In semesters V and VI, course are designed to help in specialization in the core areas of Zoology such as Taxonomy , Invertebrate Zoology , Hematology and Immunology , Histology , Toxicology, Biostatistics,Oesteology, Chick embryology, Chordate animals, Enzymology, Homeostasis, endocrinology, Tissue culture, Molecular biology, Genetic engineering, Wildlife management, and Zoogeography. The practical course has been designed to help the student have a firm grip on the theoretical concepts through relevant experiments in each course.

OBJECTIVES:

- To help learners in developing a scientific attitude through the Zoology curriculum that involves basic and core areas of Zoology along with the recent scientific and technological advancements in applied areas of Zoology To enhance knowledge of Zoology through tutorials and seminars
- To develop practical skills in Zoology using a range of a activities such as projects in experimental Zoology, study tours, Field visits, industrial and research institutes visits.
- To inculcate a research attitude by involving learners in simple research projects review of research articles/papers, participation in scientific events etc.
- To help learners in developing analytical abilities and skills so as to address real world problems
- To help learners to plan a progressive and successful career in Zoology, education and industry.

Program Outcome: After successful completion of this programme learners will be able to

- Develop the knowledge of basic concepts of different branches of science required for postgraduate studies.
- Inculcate the skills useful in science laboratories for pursuing jobs in Industries.

- Introduce learners to the concepts useful for environment protection.
- Follow interdisciplinary approach for developing scientific temperament.
- Identify, formulate and analyze scientific problems and reach concrete solutions for societal benefits.

Program Specific Outcome: After successful completion of this programme (Zoology)learnersare able to

- Develop the knowledge of basic concepts in Zoology
- Inculcate the skills useful in Zoology laboratory.
- Introduce learners to the applied Zoology needs and concepts.
- Identify, formulate and analyze scientific problems and reach concrete solutions for societal benefits using various principles of Zoology.
- Acquire & explore essential skills to succeed in various zoology fields.
- Get a hold on higher educational opportunities like post-graduation in Zoology
- Pursue higher studies in interdisciplinary areas such as biochemistry, genetics, pathology.
- Explore research areas in Zoology and related fields.

Shri Pancham Khemraj Mahavidyalaya, Sawantwadi(Autouomous)

Proposed First Year Curriculum as per NEP 2020

Department of Zoology

Proposed Structure for Major / Minor/OE/VSE/SEC/VEC/IKS/VEC

Semester	Paper Code	Paper Title	Type	Credits
I (Level 4.5)	**S101ZOT (Major)**	Wonders of animal world	**Theory**	**2**
	S102 ZOT (Major)	Instrumentation and Biotechnology	**Theory**	**2**
	S103ZOP (Major)	Practical's based on Paper-I & II	**Practical**	**2**
	S104 ZOT (Minor)	Wonders of animal world	**Theory**	**2**
	S105 ZOT (Minor)	Instrumentation and Biotechnology	**Theory**	**2**
	ZOOE101 (GE/OE)	Ornamental fish aquarium	**Generic Ele**	**2**
	ZOVS101 (VSC)	Experimental Zoology-I	**Voc. Skill**	**2**
	ZOSE101 (SEC)	Fish - Value added products	**Skill Enh.**	**2**
II (Level 4.5)	**S106ZOT (Major)**	Non chordates and Nature studies	**Theory**	**2**
	S107ZOT (Major)	Hygiene and common diseases	**Theory**	**2**
	S108ZOP (Major)	Practical based on Paper- I & II	**Practical**	**2**
	S109ZOT (Minor)	Non chordates and Nature studies	**Theory**	**2**
	S110ZOT (Minor)	Hygiene and common diseases	**Theory**	**2**
	S111ZOP (Minor)	Experimental Zoology - II	**Practical**	**2**
	ZOOE102	Wildlife conservation	**Generic Ele.**	**2**
	ZOOE103	Vermicomposting (T+P)	**Open Ele.**	**2**
	ZOSE102 (SEC)	Aquaculture	**Skill Enh.**	**2**
	ZOIK101	Indian Economic Zoology	**IKS**	**2**

Title of the Programme – B.Sc. Zoology

Letter Grades and Grade points

Semester GPA/Program CGPA/Semester Program	Percentage of Marks	Alpha- sign / letter grade result
9.00-10.00	90.0-100	**O** (Outstanding)
8.00-<9.00	80.0-90.0	**A+** (Excellent)
7.00-<8.00	70.0-80.0	**A** (Very Good)
6.00-<7.00	60.0-70.0	**B+** (Good)
5.50-<6.00	55.0-60.0	**B** (Above Average)
5.00-<5.50	50.0-55.0	**C** (Average)
4.00-<5.00	40.0-50.0	**P** (Pass)
Below <4.00	Below 40.0	**F** (Fail)
AB (absent)		Absent

DEPARTMENT OF ZOOLOGY

Syllabus

Proposed Syllabus for CBCS

F. Y. B. Sc. Major Zoology

Structure of the Course:

The structure of major courses (with codes) for Semester -I and II for F.Y. B.Sc. (Zoology) NEP-2020 is given below MAJOR SUBJECTS

Semester	Course Code	Course title	No of Credits	No of Lectures In Hours
I	**S101ZOT (Major)**	Wonders of Animal world	**2**	**30**
	S102 ZOT (Major)	Instrumentation and Biotechnology	**2**	**30**
	S103ZOP (Major)	Practical's based on Paper-I & II	**2**	**60**

SEMESTER-I

Course Title: - Wonders of Animal World, Biodiversity and its Conservation

Course Code: S101ZOT

(Course I)

Wonders of Animal World, Biodiversity and its Conservation

Unit 1: Taxonomy and classification of Animal Kingdom

Objectives:

- **To introduce students with science of taxonomy and basis of classification of non- chordates**
- **To explain students the importance of role of biomolecules in metabolism.**
- **To make them understand the importance of balanced diet and good health in different stages of life.**

Course Outcomes:-

CO1: Students will understand the importance of classification and basic knowledge of taxonomy based on classification of non- chordates.

CO2 : They will understand the rules of nomenclature.

CO3: The students can study the distinguish features and examples of non chordates.

CO4: The students will study classification of non chordates into different Classes.

Unit I		**Taxonomy and classification of Animal Kingdom**	Credit	L
		Salient features with examples for phyla, sub-phyla and classes	2	10
	I	**Taxonomy and Nomenclature**		
	1.1.1	Taxonomy – Basic concept, definition and objectives		
	1.1.2	Linnean Hierarchy, Binomial Nomenclature		
	1.1.3	Six kingdom classification		
	1.2	**Non chordates- Kingdom Protista Sub-Kingdom Protozoa:**		
	1.2.1	General Characters		
	1.2.2	Classification upto class with distinguishing features and example		
	1.2.3	Sub-phy: Sarcomastigophora: Class Sarcodina eg. Amoeba		
		Class Mastigophora eg: Tyrpanosoma		
		Class Ciliata eg. Opalina		
		Class Phyllopharygea eg. Dysteria		
		Sub-Phylum – Sporozoa Class Aconiodasida eg. Plasmodium		
		Class Conoidasida eg. Sarcocystis		
		Class Aconiodasida eg. Plasmodium		
		Class Conoidasida eg. Toxoplasma		
	1.3.1	**Phylum -Porifera**		
	1.3.2	General Characters		
		Classification upto class with distinguishing features and example		

		Class- Calcarea eg. Leucosolenia		
		Class- Hexactinellida eg. Euplectella		
		Class- Demospongia eg. Euspongia		
	1.4	**Phylum Cnidaria/ Coelenterate:**		
	1.4.1	General Characters		
	1.4.2	Classification upto class with distinguishing features and example		
		Class Hydrozoa eg. Hydra		
		Class Scyphozoa eg. Aurelia		
		Class: Anthozoa eg. Sea anemone		
	1.5	**Phylum Platyhelminthes:**		
	1.5.1	General Characters		
	1.5.2	Classification up to class with distinguishing features and examples		
		Class Trematode eg. Fasciola (liver fluke)		
		Class Cestode eg. Taenia (tapeworm)		
		Class Turbellaria : Planaria		
	1.6	**Phylum Nematoda:**		
	1.6.1	General Characters		
	1.6.2	Classification upto class with distinguishing features and example		
		Class Aphasmida eg. ***Trichinella***		
		Class Phasmida eg. ***Ascaris***		

Unit II: Wonders of Animal World

Course Objectives: To take learners through a captivating journey of hoarded wealth of marvellous animal world.

Course outcomes

CO1 . The students can understand some peculiar characters in animals

CO2. The students will understand mimicry in Animals

CO3. They will study breeding and parental care in animals

CO4. They will also understand bird migration and their types

Unit II		Wonders of Animals World	02	10
	2.1	Echolocation in Bats and cetaceans –Dolphins and Whales		
	2.2	Mechanism of Pearl formation in Mollusca		
	2.3	Bioluminescence in Animals: Noctiluca, Glow worm, Firefly, Angler Fish(Mechanism and use for the animal)		

	2.4	Regeneration in Animals - Earthworm (Annelida) and Lizard (Reptile)		
	2.5	Mimicry in Butterflies and its significance: Great Eggfly and Common Crow, Common Palmfly and Plain Tiger.		
	2.6	Mechanism of Coral formation and types of Coral reefs		
	2.7	Bird migration: Definition, types and factors inducing bird migration		
	2.8	Adaptive features of desert animals: Reptiles (Phrynosoma) and Mammals (Camel)		
	2.9	Breeding and Parental care in:		
	2.9.1	Pisces - Ovo-viviparous (Black Molly/Guppy), Mouth brooders (Tilapia), Brood pouches (Sea horse)		
	2.9.2	Amphibia - Mouth brooders (Darwin's Frog), Egg carriers (Midwife Toad)		
	2.9.3	Mammals - Egg-laying (Duck-billed Platypus), Marsupials (Kangaroo)		
	2.10	Aves: Brood Parasitism (Cuckoo)		

Unit III Biodiversity and its Conservation

To orient learners about rich heritage of Biodiversity of India and make them understand significance of its conservation.

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

	III	**Biodiversity and its Conservation**	**02**	**10**
	2.1	**Introduction to Biodiversity** - Definition, Concepts, Scope and Significance		
	2.2	**Levels of Biodiversity** - Introduction to Genetic, Species and Ecosystem Biodiversity		
	2.3	Introduction of Biodiversity Hotspots- (Western Ghats and Indo-Burma Border)		
	2.4	**Values of biodiversity** - Direct and Indirect use value		
	2.5	**Threats to Biodiversity** - Habitat loss and Man-Wildlife conflict		
	2.6	**Biodiversity conservation and management**		
	2.6.1	Conservation strategies: *in situ*, ex-situ, National parks ,Sanctuaries and Biosphere reserves.		
	2.6.2	Introduction to International efforts : Convention on Biological Diversity (CBD), International Union for Conservation of Nature and Natural Resources (IUCN), United Nations Environment Program World Conservation Monitoring Centre (UNEP-WCMC)		
	2.6.3	National Biodiversity Action Plan, 2002		
	2.6.3	Introduction to Indian Wildlife (Protection) Act, 1972 and Convention for International Trade of endangered species		

Course Title: - Instrumentation and Biotechnology

Course Code: S102ZOT

(Course II)

Instrumentation and Animal Biotechnology

Unit I : Laboratory safety, Units and Measurement (10 L)

Objective: 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.

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

Unit I		**Laboratory safety, Units and Measurement**	**Credit**	**L**
	1.1	**Introduction to good laboratory practices**	**2**	**10**
	1.2	Use of safety symbols: meaning, types of hazards and precautions		
	1.3	Units of measurement:		
	1.3.1	Calculations and related conversions of each: Metric system- length (meter to micrometre); weight (gram to microgram), Volumetric (Cubic measures)		
	1.3.2	Temperature: Celsius, Fahrenheit, Kelvin		
	1.3.3	Concentrations: Percent solutions, ppt, ppm, ppb dilutions, Normality, Molarity and Molality.		
	1.3.4	Biostatistics: Introduction and scope, Sampling and its types, Central Tendencies (mean, median, mode) Tabulation, Graphical representations (Histograms, bar diagrams, pie diagrams).		

Unit II : Animal Biotechnology

Objective: To acquaint learners to the modern developments and concepts of Zoology highlighting their applications aiming for the benefit of human being.

Desired Outcome: 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.

Unit II		**Animal Biotechnology**	**Credits**	**L**
	2.1	**Biotechnology**: Scope and achievements of Biotechnology (Fishery, Animal Husbandry, Medical, Industrial)	**02**	**10**
	2.2	**Transgenesis**: Retro viral method, Nuclear transplantation method, DNA microinjection method and Embryonic stem cell method		
	2.3	Cloning (Swarupa)		
	2.4	Ethical issues of transgenic and cloned animals		
	2.5	**Applications of Biotechnology**:		
	2.5.1	DNA fingerprinting: Technique in brief and its application in forensic science (Crime Investigation)		

	2.5.2	Recombinant DNA in medicines (recombinant insulin)		
	2.5.3	Gene therapy: Ex-vivo and *In vivo,* Severe Combined Immunodeficiency (SCID), Cystic Fibrosis		
	2.5.4	Bread, Beer, Yogurt		
	2.5.5	Green genes: Green Fluorescent Protein (GFP) from Jelly fish valuable as reporter genes used to detect food poisoning.		

Unit III : Instrumentation

Objective: To provide all learners a complete insight about the structure and train them with operational skills of different instruments required in Zoology.

Desired Outcome: Students will be skilled to select and operate suitable instruments for the studies of different components of Zoology of this course and also of higher classes including research.

Unit	III	Instrumentation	credit	L
	3.1	**Microscopy**	2	10
	3.1.1	Construction, principle and applications of dissecting and compound microscope.		
	3.2	**Colorimetry and Spectroscopy** - Principle and applications		
	3.3	**pH** - Sorenson's pH scale, pH meter - principle and applications		
	3.4	**Centrifuge** - Principle and applications (clinical and ultra-centrifuges).		
	3.5	**Chromatography** - Principle and applications (Paper and Adsorption)		
	3.6	**Electrophoresis** - Principle and applications (AGE and PAGE)		

SEMESTER-I

Course Title: Practicals of Paper-I

Course Code:- S103ZOP

1	1. Levels of organization in animal kingdom • Symmetry: asymmetry (amoeba), radial symmetry (starfish), bilateral symmetry (fish/human) • Coelom: acoelomate (T.S of planaria/liverfluke), pseudocoelomate(T.S of ascaris), Coelomate (T.S of earthworm) • Segementation: pseodosegmentation (tapeworm), Metamerism (earthworm) • Cephalization: cockroach- head, prawn/ crab- cephalothorax	
2	Classification from Phylum Protozoa up to Phylum Nematoda Protozoa: Euglena, Amoeba, Paramecium, Plasmodium Porifera: Leucosolenia, bath sponge Coelenterata: Hydra, Obelia colony, Aurelia, sea anemone, Corals – Brain coral, Sea fan Platyhelminthes: Planaria, liver fluke and tapeworm Nemathelminthes: Ascaris (male and female)	
3	Mounting of foraminiferan shells from sand	
4	Study of types of corals- Brain, Organ Pipe, Stag horn, Mushroom	
5	Study of Following • Symbiosis - (Termite and Trychonympha, Hermit crab and sea anemone) • Camoflagfe- (Leaf Insect, Chameleon) • Canibalistic Mate –eating Animals (Spider and Praying Mantis) • Animal Architects (harvester and Baya Weaver Bird) • Bioluminescent Organisms – Noctiluca, Glow worm, Fire fly, Angler fish	
6	Breeding and Parental care in Amphibians – Rhacophorus, Midwife Toad, Darwin's frog, Caecilian	
7	Mounting of scales of fish (placoid, cycloid and ctenoid)	
8	Study of Adaptive radiation in Reptiles - Turtle, Tortoise, Phrynosoma, Draco	
9	Identification of Birds – Coppersmith Barbet, Bulbul, Rose ring Parakeet, Magpie Robbin, Two local Birds	
10	Field Report – To be done in a group of ten students (submission of written / typed report preferably along with photographs/ tables/ graphs.	
11	**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.	
12	Observations of fauna in the field (with reference to theory syllabus). ***Note -The practicals may be conducted by using specimens authorised by the wild such other regulating authorities though it is strongly recommended that the same sh taught by using photographs/audio-visual aids/ simulations / models, etc. as recommen the UGC and as envisaged in the regulations of the relevant monitoring bodies. specimens, however, shall be procured for the purpose of conducting practicals me here-in-above.** **#There shall be at least one excursion/field trip**	

Practical -II

Course Code: S103ZOP

1	a) Interpretation of safety symbols(Toxic, Corrosive, Explosive, Flammable, Skin irritants, Oxidising Agents, Compressed gases, Aspirational Hazards and Biohazardous Infectious materials) b) Study of central tendencies and plotting of bar diagram, Histogram and pie diagram	
2	Identification of Transgenic fish(Trout and salmon) / Cloned animals) Swarupa ,CC Cat and Snappy dog) from Photograph	
3	Extraction of Fruit juice with pectinase from apple/Guava /or any other suitable fruit,	
4	Calculation of pH of three different samples(one each acidic, alkaline and Neutral) using pH paper/ Universal indicator and Confirming the result with pH meter	
5	a) Study of parts of Microscope and their functions b) Techniques of focusing a permanent slide under 10x and 45 x (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	Application of DNA fingerprinting Criminology (Photograph of	

	Electrophoretic pattern to be given for interpretation by the students)	
8	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 results with pH meter.	
9	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	
10	a) Separation of pigments by adsorption chromatography using chalk b) Separation of lipids by TLC	

EXAMINATION PATTERN FOR MAJOR SUBJECTS

- **Continuous Internal Assessment (40 Marks):**

Sr. No.	Particulars	Marks
1	One Assignment.	20
2	One offline class test.	10
3	Active participation in routine class/practical's.	05
4	Overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities	05

- **Semester End Examination (60 Marks):**

Question Paper Pattern

1. These examinations shall be of **Two Hours** duration. Maximum marks **60**.
2. There shall be four questions each of **15 marks**. Questions 1 will be based on **Unit-I , Questions 2** will be based on **Unit-II**. Question 3 will be based on Unit III and Question 4 based on entire syllabus with
3. All questions shall be compulsory with internal choice within the questions. (Each question will be of 7 to 8 **marks** with options.) But question 4 has internal choice of any three **out of six**.
4. Question may be subdivided into sub-questions A, B, C the allocation of marks depends on the weight age of the topic.

Distribution of external 60 marls

Qn.	Sub-Qn	Particulars	Unit	Marks with options	Total Marks for qn
1	**A,B,C**	Answer the following (Attempt **any two out of** three)	**I**	30	15
2	**A,B,C**	Answer the following (Attempt **any two out of** three)	**II**	30	15
3	**A,B,C**	Answer the following (Attempt **any two out of** three)	**III**	30	15
4	**A,B,C D,E,F**	**Write short notes on (Attempt any three out of six)**	**I,II,III**	30	15
		Total		**120**	**60**

- **Semester End Practical Examination (50 marks):**

Scheme of examination:

- There will be no internal assessment for practical.
- A candidate will be allowed to appear for the semester end practical examination only if the candidate submits a certified journal at the time of practical examination of the semester or a

certificate from the Head of the Department/Institute to the effect that the candidate has completed the practical course of that semester of F.Y.B.Sc. Zoology as per the minimum requirement

- The practical examination will be conducted in **TWO SESSIONS** of two hours each practical.
- The learners will be evaluated based on the experiments performed during the examination.
- The questions on slips for the same should be framed in such a way that candidate will be able to complete the task and should be evaluated for the skill and understanding of Zoology

Distribution of marks in practical examination

Sr. No.	**Particulars**	**Marks (50 marks)**
1	Session -I Experiment	30
2	One Practical Writing	10
3	Viva voce	05
4	Certified journal	05
	Total Marks	**50**

Semester-II

Course Title: - Non Chordates-II, Ecology, National parks and Sanctuaries of India

Course Code: -S106ZOT

(Course I)

Unit 1: Non –Chordates-II

AIMS AND OBJECTIVES:

- To introduce students with science of taxonomy and basis of classification of non- chordates
- To explain students the importance of role of biomolecules in metabolism.
- To make them understand the importance of balanced diet and good health in different stages of life.

COURSE OUTCOMES

CO1: Students will understand the importance of classification and basic knowledge of taxonomy based on classification of non- chordates.

CO2 : They will understand the rules of nomenclature.

CO3: The students can study the distinguish features and examples of non chordates.

CO4: The students will study classification of non chordates into different Classes.

Unit I	Unit I	**Taxonomy and classification of Animal Kingdom**	Credit	L
		Salient features with examples for phyla, and classes	2	10
	1.1	**Phylum Annelida**		
	1.1.1	General Characters		
	1.1.2	Classification upto class with distinguishing features and example Class : Polychaeta example Nereis Class Oligochaeta example Earthworm Class Hirudinea example Hirudinaria		
	1.2	**Phylum- Arthropoda**		
	1.2.1	General Characters		
	1.2.1	Classification upto class with distinguishing features and example Class :Crustacea example Crab Class: Insecta example Butterfly Class: Arachnida example Scorpion Class: Myriopoda example Centipede		
	1.2.2	Classification upto class with distinguishing features and example Class : Polychaeta eg Nereis Class Oligochaeta eg Earthworm Class Hirudinea eg Hirudinaria		
	1.3	**1.3 Phylum Mollusca**		

	1.3.1	General Characters		
	1.3.1	Classification upto class with distinguishing features and example Class Aplacophora eg. Chaetoderma Class Polyplacophora eg. Chiton Class Monoplacophora eg. Neopilina Class Gastropoda eg. Aplysia / garden snail Class Pelycypoda eg. Unio/ Donax Class Scaphopoda eg. Dentalium Class Cephalopoda eg. Sepia		
	1.4	**Phylum Echinodermata**		
	1.4.1	General Characters		
	1.4.2	Classification upto class with distinguishing features and example Class Asteroidea eg. Asterias (star fish) Class Ophiuroidea eg. Ophiothrix (brittle star) Class Echinoidea eg. Echinus (sea urchin) Class Holothuroidea eg. Sea cucumber Class Crinoidea eg. Crinoid (sea lily)		
	1.5	Minar Phyla		
	1.6	Phylum Hemichordata General Characters ,Example: Balanoglossus		

Unit II **Unit 2: Ecosystem**

Objective: To impart knowledge of different components of ecosystem and educate about essentials of coexistence of human beings with all other living organisms.

Desired Outcome: 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.

Unit II	**Ecosystem**	Credit	L
2.1	Concept of Ecosystems	2	10
2.1.1	Ecosystem - Definition and components		
2.1.2	Impact of temperature on biota		
2.1.3	Biogeochemical cycles (Water, Oxygen, Nitrogen, Sulphur)		
	Fresh water ecosystem – Lentic and Lotic		
2.1.4	Food chain and food web in ecosystem (Fresh water andGrass land).		
2.1.5	Ecological pyramids - energy, biomass and number		
2.1.6	Animal interactions (commensalism, mutualism, predation, antibiosis, parasitism)		

Aims And Objective: To enlighten learners about the current status of wild life conservation in India in the light of guidelines from different relevant governingagencies vis-à-vis with adversity of poaching and biopiracy.

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

Unit III	**National parks and Sanctuaries of India**	Credit	L
3.1	Concept of Endangered and Critically Endangered species using examples of Indian Wildlife with respect to National Parks and Wildlife Sanctuaries of India (Sanjay Gandhi National Park, Tadoba Tiger Reserve, Corbett National Park, Kaziranga National Park, Gir National Park, Silent Valley, Pirotan Island Marine Park, Keoladeo Ghana National Park, Bandipur Sanctuary	2	10
3.2	Management strategies with special reference to Tiger and Rhinoceros in India		
3.3	Ecotourism		
3.4	Biopiracy		

SEMESTER-II

Course Title: - Nutrition, Public Health And Hygiene

Course Code- S107ZOT

(Course- II)

Unit 1: Nutrition and Health

Objective: To make learners understand the importance of balanced diet andessential nutrients of food at different stages of life.

Desired Outcome: Healthy dietary habits would be inculcated in the life style oflearners in order to prevent risk of developing health hazards in younger generation due to faulty eating habits.

Unit I	**Nutrition and Health**	Credit	L
1.1	Concept of balanced diet, dietary recommendations to a normal adult, infant, pregnant woman and aged	2	10

1.2	Malnutrition disorders – Anemia(B_{12} and Iron deficiency), Rickets, Marasmus, Goiter, Kwashiorkar (cause, symptoms, precaution and remedy).		
1.3	Constipation, piles, starvation, acidity, flatulence, peptic ulcers (cause, symptoms, precaution and remedy).		
1.4	Obesity (Definition and consequences).		
1.5	Importance of fibers in food..		
1.6	Significance of breast feeding.		
1.7	Swine flu (cause, symptoms, precaution and remedy).		
1.8	BMI calculation and its significance.		

Unit II: Public Health and Hygiene

Objective: To impart knowledge about source, quantum and need forconservation of fast depleting water resource and essentials of maintaining proper sanitation, hygiene and optimizing use of electronic gadgets.

Desired Outcome:- Promoting optimum conservation of water, encouragementfor maintaining adequate personal hygiene, optimum use of electronic gadgets,avoiding addiction, thus facilitating achievement of the goal of healthy young India in true sense.

Unit II	**Public Health and Hygiene**	Credit	L
2.1	Definition of Health, the need for health education and healthgoal	2	10
2.1.2	Physical, psychological and Social health issues		
2. 1.3	WHO and its programmes - Polio, Small pox, Malaria and Leprosy (concept, brief accounts and outcome with respect to India).		
2.1.4	Ill effects of self-medication		
2.2	**Water and water supply**		
2.2.1	Sources and properties of water.		
2.2.2	Purification of water, small scale, medium scale and large scale(rapid sand filters)		
2.2.3	Water footprint (concept, brief accounts and significance).		
2.3	**Hygiene**		
2.	Hygiene and health factors at home, personal hygiene, oralhygiene and sex hygiene		
2.4	**Radiation risk**		
2.4.1	Mobile Cell tower and electronic gadgets (data of recommendedlevel, effects and precaution).		
2.5	**Blood bank** – Concept and significance		

UNIT 3: Common Human Diseases and Disorders

Objective: To educate learners about causes, symptoms and impact of stressrelated disorders and infectious diseases.

Desired Outcome: Learners will be able to promptly recognize stress relatedproblems at initial stages and would be able to adopt relevant solutions whichwould lead to psychologically strong mind set promoting positive attitudeimportant for academics and would be able to acquire knowledge of cause, symptoms and precautions of infectious diseases.

Unit II	**Common Human Diseases and Disorders**	Credit	L
3.1	**Stress related disorders**	2	10
3.1.1	Hypertension, Diabetes type II, anxiety, insomnia, migraine,depression (cause, symptoms, precaution and remedy)		
3.2	**Communicable and non-communicable diseases**		
3.2.1	Tuberculosis , Typhoid and Dengue		
3.2.2	Hepatitis (A and B), AIDS, Gonorrhea and Syphilis		
3.2.3	3.2.3**:** Diseases of respiratory system- Asthma, Bronchitis		
3.2.4	Oral Cancer (Discuss cause/causative agents, symptoms, diagnostics,precaution /prevention and remedy)		

SEMESTER II

Practical (Course III)

Couse Code-S108ZOP

1	Classification from Phylum Annelida to Phylum Echinodermata Annelida: Earthworm, Nereis, and leech Arthropoda: Lobster, Crab, butterfly, moth, spider, Centipede, millipede in Mollusca: Chiton, Dentallium, Pila, bivalve,Sepia and Nautilus Echinodermata: Starfish, brittle star, sea urchin,sea cucumber, feather star
2	Minar Phyla Example: Peripatus, Sagitta
3	Phylum Hemichordata : Balanoglossus
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 varieties aerated drink and Tap water
6	Identification and interpretation of aquqtic and terrestrial (grass land) food chain and food web
7	Construction of food chain/food web using given information/data

8	Identification and interpretation of ecological pyramids of energy, biomass and number
9	Construction of different types of pyramid from given data.
	Study of the following: Endangered (Great Indian Bustard, Asiatic lion, Blackbuck, Olive Ridley sea turtle) andcritically endangered species (Slender-billed vulture, Gharial, Malabar civet) of Indian wildlife and state reasons for their decline
10	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 faunaas listed in theory)
	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. **#There shall be at least one excursion**

SEMESTER II

Course Code-S108ZOP

Practical (Course IV)

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	Estimation of maltose from brown/white bread.
4	Moisture content from biscuits or other suitable food products.
5	Food adulteration Test Milk adulterants (starch and glucose), methylene blue reduction Test (MBRT).
6	Adulterants in Cheese, Butter, Jaggery, Ghee, Honey, Iodised Salt.
7	Estimation of protein content of two egg varieties.
8	Study of efficacy of different antacids (any two antacids).
9	Study of Human Parasites Endoparasite – Protozoan (Entamoeba, plasmodium, Helminthes (Ascaria, Wuchereia),Endoparasite (head louse, tick)and Exoparasite (bed bug,Mosquito)
10	First Aid – Demonstration Practical Training for teachers and students to be conducted by the experts from Red corss, Civil defence, Civic authorities by

	individual institute or clustercolleges in rotation
11	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.

EXAMINATION PATTERN FOR MAJOR/MINOR SUBJECTS

- **Continuous Internal Assessment (40 Marks):**

Sr. No.	Particulars	Marks
1	One Assignment.	20
2	One offline class test.	10
3	Active participation in routine class/practical's.	05
4	Overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities	05

- **Semester End Examination (60 Marks):**

Question Paper Pattern

1. These examinations shall be of **Two Hours** duration. Maximum marks **60**.
2. There shall be four questions each of **15 marks**. Questions 1 will be based on **Unit-I , Questions 2** will be based on **Unit-II**. Question 3 will be based on Unit III and Question 4 based on entire syllabus with
3. All questions shall be compulsory with internal choice within the questions. (Each question will be of 7 to 8 **marks** with options.) But question 4 has internal choice of any three **out of six**.
4. Question may be subdivided into sub-questions A, B, C the allocation of marks depends on the weight age of the topic.

Distribution of external 60 marls

Qn.	Sub-Qn	Particulars	Unit	Marks with options	Total Marks for qn
1	**A,B,C**	Answer the following (Attempt **any two out of** three)	**I**	30	15
2	**A,B,C**	Answer the following (Attempt **any two out of** three)	**II**	30	15
3	**A,B,C**	Answer the following (Attempt **any two out of** three)	**III**	30	15

4	**A,B,C D,E,F**	**Write short notes on (Attempt any three out of six)**	**I,II,III**	30	15
		Total		**120**	**60**

- **Semester End Practical Examination (50 marks):**

Scheme of examination:

- There will be no internal assessment for practical.
- A candidate will be allowed to appear for the semester end practical examination only if the candidate submits a certified journal at the time of practical examination of the semester or a certificate from the Head of the Department/Institute to the effect that the candidate has completed the practical course of that semester of F.Y.B.Sc. Zoology as per the minimum requirement
- The practical examination will be conducted in **TWO SESSIONS** of two hours each.
- The learners will be evaluated based on the experiments performed during the examination.
- The questions on slips for the same should be framed in such a way that candidate will be able to complete the task and should be evaluated for the skill and understanding of Zoology

Distribution of marks in practical examination

Sr. No.	**Particulars**	**Marks (50) marks)**
1	Session -I Experiment	30
2	Viva voce	10
3	Certified journal	10
	Total Marks	**50**

Syllabus For
Open Electives (OE)

Objectives:

1. To acquire the knowledge and improve required skills in aquarium setting for ornamental fish rearing.
2. To enhance ornamental fisheries production through farming and conservation of natural resources.
3. To demonstrate and give practical experience in aquarium design, construction and decoration.
4. To apply the knowledge on microbial infection, disease diagnosis and control measures.
5. To rare Honey bees for production of honey.

6.To rare earthworm for vermicomposting for organic farming

7) To conserve Wildlife TRUCTURE OF THE COURSE:

SEMESTER I

Open Elective Courses

OPEN ELECTIVE COURSE CODE	COURSE TITLE	UNIT	TOPICS	CREDITS	NO. OF LECTURES
ZOOE-101	**Ornamental Fish Aquarium**	1	Fundamentals of an aquarium	**2**	**30**
		2	Identification , Breeding and maintenance of important ornamental fishes		
		3	Setting and design of freshwater aquarium , Aeration devices, accessories , filters, Aquatic plants		

SEMESTER II

Open Elective Course

OPEN ELECTIVE COURSE CODE	COURSE TITLE	UNIT	TOPICS	CREDITS	NO. OF LECTURES
ZOOE-102	**Wildlife Conservation**	1	Wildlife in India	**2**	**30**
		2	Wildlife management		
		3	Wildlife conservation		

SEMESTER II

Open Elective Course

OPEN ELECTIVE COURSE CODE	COURSE TITLE	UNIT	TOPICS	CREDITS	NO. OF LECTURES
ZOOE-103	**Vermicomposting**	1	Introduction to vermiculture	**2**	**30**
		2	Earthworm Biology and Rearing		
		3	Vermicompost Technology and Applied vermiculture		

SEMESTER I
Course Title :-Ornamental Fish Aquarium
Open elective (OE)
Course Code :-ZOOE-101

Course Objectives:

- To develop recreational fisheries as a means of earnings for the interested persons who may takeup Aquarium Fisheries as a trade.
- To provide better marketing facilities to the fishermen to eliminate the role of middlemen.
- To acquire the knowledge and improve required skills in aquarium.
- To apply the knowledge on microbial infection, disease diagnosis and control measures.
- To apply information and practical experience in aquarium design, construction and decoration.

Course Outcomes:

On completion of this course, learners will be able to:

CO1: Construct aquarium and rear the ornamental fishes .

CO2: Describe the food, feeding, growth, digestion and respiration in fishes

CO3: Acquire the knowledge on culture and experience better fish survival in his/her aquarium and improve required skills in fish rearing.

CO4: Apply the knowledge on microbial infection, disease diagnosis and control measures.

CO5: Apply information and practical experience in aquarium design, construction and decoration.

Course Contents:

Unit	Description	Lectures
I	**Fundamentals of the Aquarium** 1.1 Types of aquarium 1.2 Aquarium maintenance and equipment's 1.2 Feeding 1.3 Reproduction 1.4 Health and diseases	**10**
II	2.1 Aquarium fishes and Management 2.2 Formulated feed, Its composition and its production . 2.3 breeding and maintenance of ornamental fishes Angel, Danio, Discus, Flower Horn, Gourami, Siamese fighters, Sword tail, Gold fish,Koi	**10**
III	**Aquarium plants and other beautification structure** 3.1 Amezon Sword 3.2 Cork screw 3.3 Ludwigia 3.4 Aquarose 3.5 Combamba 3.6 Pistia	**10**
	Total	**30**

SEMESTER I

Course Title:-Experimental Zoology-I

Course Code-ZOVS101

VSC COURSE CODE	COURSE TITLE	UNIT	TOPICS	CREDITS	NO. OF LECTURES
ZOVS101	**Experimental Zoology -I**	1	Wonders of animal world	**2**	**60**
		2	Classification of Invertebrates		
		3	Laboratory safety , biotechnology and Instrumentation		

Course Objectives:

- To provide knowledge about Experiment in Zoology
- To acquire the skills about practical's in Zoology
- To apply the knowledge about practical's in Classification of animals.

Course Outcomes:

On completion of this course, learners will be able to:
CO1: Acquires skills in Practicals in Zoology
CO2: They can identify species of animals

CO3: Acquire the knowledge of Biotechnology and biostatics

CO4: Apply the knowledge on diseases and their preventions

CO5: Apply information and practical experience in Classification of non chordates animals

Course Contents:

Unit	Description	Lectures
I	2. Levels of organization in animal kingdom • Symmetry: asymmetry (amoeba), radial symmetry (starfish), bilateral symmetry (fish/human) • Coelom: acoelomate (T.S of planaria/liver fluke), pseudo coelomate(T.S of ascaris), Coelomate (T.S of earthworm) • Segementation: pseodosegmentation (tapeworm), Metamerism (earthworm) 3. Cephalization: cockroach- head, prawn/ crab- cephalothorax	**2**
II	2 Classification from Phylum Protozoa up to Phylum Nematoda Protozoa: Euglena, Amoeba, Paramoecium, Plasmodium Porifera: Leucosolenia, bath sponge Coelenterata: Hydra, Obelia colony, Aurelia, sea anemone Platyhelminthes: Planaria, liver fluke and tapeworm Nemathelminthes: Ascaris (male and female	**2**
III	Mounting of foraminiferan shells from sand	**2**
IV	Study of types of corals- Brain, Organ Pipe, Stag horn, Mushroom	**2**
V	Study of Following • Symbiosis - (Termite and Trychonympha, Hermit crab and sea anemone) • Camoflafe- (Leaf Insect, Chameleon) • Canibalistic Mate –eatinAnimals (Spider and Prying Mantis) • Animal Architects (harvester and Baya Weaver Bird) Bioluminescent Organisms – Noctiluca, Glow worm, Fire fly, Angler fish	**2**
VI	Breeding and Parental care in Amphibians – Rhacophorus, Midwife Toad, Darwin's frog, Caecilian	**2**
VII	Mounting of scales of fish (placoid, cycloid and ctenoid)	**2**
VIII	Study of Adaptive radiation in Reptiles - Turtle, Tortoise, Phyronosoma, Draco	**2**
IX	Identification of Birds – Coppersmit Barbet, Bulbul, Rose ring Parakeet,Magpie Robbin,TwolocalBirds	**2**
X	Field Report – To be done in a group of ten students (submission of written / typed report preferably along with photographs/ tables/ graphs.	**2**
XI	a. Interpretation of safety symbols (toxic, corrosive, explosive, flammable, skin Irritant, oxidizing, compressed gases, aspiration hazards and Biohazardous Infectious materials) Study of Central tendencies and plotting of Bar diagram, histogram and pie diagram	**2**
XII	Identification of transgenic fish (Trout and Salmon) / cloned animals (Swarupa, cc cat and Snuppy dog) from photograph	**2**

XIII	a. Extraction of fruit juice with pectinase from apple/guava/or any other suitable fruit Calculation of pH of three different samples (one each acidic, alkaline and Neutral) using pH paper / Universal Indicator and confirming the result with pH meter.	**2**
XIV	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.	**2**
XV	Application of DNA Fingerprinting in criminology (photograph of electrophoretic pattern to be given for interpretation by the students	**2**
XVI	a. Study of parts of microscope and their functions Technique of focussing a permanent slide under 10x and 45x (objectives).	**2**
XVII	a. Dilution of given sample and estimation of OD by using colorimeter. Calculation of concentration from the given OD using formula.	**2**
XVIII	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	**2**
XIX	a. Separation of amino acids from the mixture by paper chromatography. Calculation of Rf value of separated pigments/amino acids from given chromatogram and their identification from standard chart.	**2**
XX	a. Separation of pigments by adsorption chromatography using chalk. b. Seperation of lipids by TLC,	**2**

- **Semester End Practical Examination (50 marks):**

Scheme of examination:

- There will be no internal assessment for practical.
- A candidate will be allowed to appear for the semester end practical examination only if the candidate submits a certified journal at the time of practical examination of the semester or a certificate from the Head of the Department/Institute to the effect that the candidate has completed the practical course of that semester of F.Y.B.Sc. Zoology as per the minimum requirement
- The practical examination will be conducted in **ONE SESSIONS** of two hours each practical.
- The learners will be evaluated based on the experiments performed during the examination.
- The questions on slips for the same should be framed in such a way that candidate will be able to complete the task and should be evaluated for the skill and understanding of Zoology

Distribution of marks in practical examination

Sr. No.	Particulars	Marks (50 marks)
1	Session -I Experiment	30
2	One Experiment writing	10

3	Viva voce	05
4	Certified journal	05
	Total Marks	**50**

SEMESTER- I
Skill Enhancement Course (SEC)

Course title:- Fish- Value added Products

Course code :-(ZOSE-101)

Course Objectives:

- To provide knowledge of fishes .
- To acquire the knowledge and improve required skills in fish- value added products.
- To apply the knowledge about various fish recipes.
- To apply information about fishes their economic values .

Course Outcomes:

On completion of this course, learners will be able to:

CO1: They can acquire knowledge about Fish -value added products.

CO2: They can identify species of fishes and Arthropoda animals for Value added products.

CO3: Acquire the knowledge of fish recipe and sell the fish products in the market.

CO4: They can become a entrepreneur

Course Contents:

Unit	Description	Lectures
I	Value added Products 1.1 Dry salted and smoked product 1.2 Fish/Prawn pickle 1.3 Fish chakli and wafers 1.4 Fish kabab 1.5 Fish cuttlet 1.6 Fish amoti	**10**
II	**Packaging Method for fish products** 2.1 Food packaging 2.2 Packaging materials 2.3 Modify atmosphere Packaging 2.4 Labeling and printing of Packaging materials 2.5 Paper and paper based materials	**10**
III	**Entrepreneurship and marketing** 3.1 Role of government and other organization 3.2 Government schemes 3.3 Science and technology in Entrepreneurship 3.4 Fish market 3.5 Marketing in India	**10**
	Total	**30**

Semester II

Open Elective (OE)

Course Title:- Wildlife Conservation

Course Code:- ZOOE-102`

Course Objectives:

- To preserve the diversity of species or the range of genetic material of world's organisms.
- To ensure to continuous use of species, in fact ecosystems, that support rural communities andurban industries.
- To protects natural habitats of organisms through controlled exploitation.
- To Maintenance of rare species in protected areas such as national parks, sanctuaries etc.,
- To ensure the survival of these species, and to educate people on living sustainably with otherspecies.
- To inspire to choose career options in the field of wild life conservation, research, photographyand ecotourism.

Course Outcomes:

On completion of this course, learners will be able to:

CO1: Analyze wild animals which enhance their interest and love for the nature.

CO2: Categories different types of nature, behavior of animal and contribute their best for its conservation.

CO3: Interpret about the current status of wild life conservation in India and importance of co-existence and conservation of bio-diversity and create awareness about wildlife protection.

CO4: Acquire knowledge and inspire to choose career options in the field of wild life conservation, research, photography and ecotourism.

CO5: Design and conduct survey by learning the behaviors and health status of wildlife.

Course Content:

Unit	Description	Lectures

I	**Wildlife in India** 1.1 Introduction 1.2 Reason for wildlife depletion in India 1.3 Wildlife as a resource 1.4 Wildlife habitat in India	**10**
II	Wild life management 2.1 National and state mammals and birds of India	**10**
	2.2 Protected area concept 2.3 Biosphere reserve in India 2.4 Red databook and conservation status in India 2.5 Wildlife trade and legislation 2.6 Ecological sensitive area	
III	**Wildlife Conservation** 3.1 Wildlife Conservation and approach and limitation . 3.2 Conservation of biodiversity 3.3 National and International efforts for Conservation 3.4 National and International efforts for conservation 3.5 Convention on wetlands of International Importance (Ramsar convention) 3.6 Important projects for the conservation of endangered species in India (project tiger, project elephant, Indian Crocodile Conservation Project etc)	**10**
	Total	**30**

REFERENCES AND ADDITIONAL READINGS

1. M.Kato. The Biology of Biodiversity, Springer.
2. J.C. Avise. Molecular Markers, Natural History and Evolution, Chapman & Hall, New York.
3. E.O. Wilson. Biodiversity, Academic Press, Washington.
4. G.G. Simpson. Principle of animal taxonomy, Oxford IBH Publishing Company.
5. E. Mayer. Elements of Taxonomy.
6. E.O. Wilson. The Diversity of Life (The College Edition), W.W. Northem& Co.
7. B.K. Tikadar. Threatened Animals of India, ZSI Publication, Calcutta.

SEMESTER II

Open elective (OE)

Course Title:- Vermicomposting

Course Code:- ZOOE-103

Course Objectives:

- Students will be able to compost in a limited space and describe the decomposing process.
- The interested students will get the knowledge of composting,
- Students will get the employment,
- They can generate employments,
- They will also turn towards organic farming,
- Will help to maintain the environment pollution free and
- Will get the knowledge of biodiversity of local earthworms.
- The detail of the course is as follows:

Course Outcomes:

On completion of this course,

CO1: Students will understand vermicomposting process.

CO2: Students will able to start vermicomposting unit at their place .

CO3: They can able to sell vermicompost to the farmers and to common people for kitchen garden .

CO4: They will acquire knowledge about rearing of earthworm species.

CO5: They will promote organic farming substitute for chemical fertilizers.

Course Content:

Unit	Description	Lectures
I	**Vermicompost** 1.1 Introduction to vermiculture. definition, meaning, history, economic important,their value in maintenance of soil structure, role as four r's of recycling reduce, reuse, recycle, restore. 1.2 Earthworms role in bio transformation of the residues generated by human activity and production of organic fertilizers. How does nature works. 1.3 The matter and humus cycle (product, qualities). Ground population, transformation process in organic matter. 1.4 Choosing the right worm. Useful species of earthworms. Local species of earthworms. Exotic species of earthworms. omplementary activities of autoevaluation.	**10**
II	**Earthworm Biology and rearing**	**10**
	Key to identify the species of earthworms. 2.1 Biology of ***Eisenia fetida***. 2.2 Taxonomy Anatomy, physiology and reproduction of Lumbricidae. 2.3 Vital cycle of ***Eisenia fetida***: alimentation, fecundity, annual reproducer potential and limit factors (gases, diet, humidity, emperature, PH, light, and climatic factors).Complementary activities of auto evaluation. 2.4 Biology of ***Eudrilus eugeniae***. 2.5 Taxonomy Anatomy, physiology and reproduction of ***Eudrilidae.*** 2.6 Vital cycle of Eudrilus eugeniae: alimentation, fecundity, annual reproducer potential and limit factors (gases, diet, humidity, temperature, PH, light, and climatic factors).Complementary activities of auto evaluation.	

III	**Vermicompost Technology (Methods and Products)** 3.1 Small Scale Earthworm farming for home gardens Earthworm compost for home gardens 3.2Conventional commercial composting Earthworm Composting larger scale 3.3 - Earthworm Farming (Vermiculture), Extraction (harvest), vermicomposting harvest and processing. 3.4 Nutritional Composition of Vermicompost for plants, comparison with other fertilizers 3.5 .Vermiwash collection, composition &use 3.6 Enemies of Earthworms, Sickness and worm's enemies. Frequent problems. How to prevent and fix them.	**10**
	Total	**30**

REFERENCES AND ADDITIONAL READINGS

1. Bhatt J.V. & S.R. Khambata (1959) "Role of Earthworms in Agriculture" Indian Council of Agricultural Research, New Delhi
2. Dash, M.C., B.K.Senapati, P.C. Mishra (1980) " Verms and Vermicomposting" Proceedings of the National Seminar on Organic Waste Utilization and Vermicomposting Dec. 5-8, 1984, (Part B), School of Life Sciences, Sambalpur University, Jyoti Vihar, Orissa.
3. Edwards, C.A. and J.R. Lofty (1977) "Biology of Earthworms" Chapman and Hall Ltd., London.
4. Lee, K.E. (1985) "Earthworms: Their ecology and Relationship with Soils and Land Use" Academic Press, Sydney.

SEMESTER II

Skill Enhancement Course (SEC)

Course Title:-Aquaculture

Course Code:- ZOSE-102

COURSE CODE	COURSETITLE	UNIT	TOPICS	CREDITS	NO. OF LECTURES
ZOSE-102	**Aquaculture**	1	Shell and fish culture	**2**	**30**
		2	Fin fish Culture, Finfish and shell fish pathology		
		3	Farm engineering and Health management		

Course Objectives:

- To provide knowledge about aquaculture to the students.

- To acquire the knowledge and improve required skills in aquaculture and rearing of the fishes
- To apply the knowledge about packaging and marketing
- To apply information about aquaculture and start their own business

Course Outcomes:

On completion of this course, learners will be able to:

CO1: Define, comprehend, scope and significance of aquaculture

CO2: They can identify species of fishes and molluscan animals

CO3: Acquire the knowledge on aquaculture

CO4: Apply the knowledge on aquaculture to reared the fishes, Arthropodan and molluscan animals

CO5: Apply information and practical experience in rearing of fishes and Arthropodan and molluscan animals

Course Contents:

Unit	Description	Lectures
I	Shell fish culture 1.1 Crab culture 1.2 Brackish water prawn 1.3 Pearl oyster culture 1.7 Live feed culture	**10**
II	Fin fish Culture 2.1 ***Lates alcarifer*** 2.2 Mullet 2.3 Milk fish 2.4 Finfish and shell fish pathology	**10**

III	Farm engineering 3.1 Design layout and construct different qua farms 3.2 Construction and design of pond dyke and sluice gate 3.3 Water supply and drainage system 3.4 Design and fabrication of automatic feeder aerator and bio filter 3.5 Health management of fishes	**10**
	Total	**30**

Structure Of The Course:

SEMESTER II

Indian Knowledge System (IKS)

Course Title:- Indian Economic Zoology

Course Code :- ZOIK-101

IKS COURSE CODE	COURSE TITLE	UNIT	TOPICS	CREDITS	NO. OF LECTURES
ZOIK-101	**Indian Economic Zoology**	1	Apiculture	**2**	**30**
		2	Sericulture		
		3	Lac culture		

Course Objectives:

- To provide knowledge about apiculture, sericulture and lac culture to the students.
- To acquire the knowledge and improve required skills in Honeybee, silkworm and lac insect rearing in the students .
- To apply the knowledge about diseases in Honeybee, silkworm and lac insect .
- To apply information about apiculture , sericulture and lac culture in students.

Course Outcomes:

On completion of this course, learners will be able to:

CO1: Define, comprehend, scope and significance of apiculture, sericulture and lac culture

CO2: They can identify species of honey bees silkworm and lac insect .

CO3: Acquire the knowledge on apiculture , sericulture and lac culture and experience better to rare honeybees , silkworm and lac insects.

CO4: Apply the knowledge on lifecycle of . honeybees , silkworm and lac insects

CO5: Apply information and practical experience in rearing of . honeybees, silkworm and lac insects.

Course Contents:

Unit	Description	Lectures
I	**Apiculture** 1. Introduction , brief history and importance of Apiculture 1.2 Methods of Bee-keeping and management 1.3 Introduction to different species of Honey bees use in apiculture 1.8 Advantages and dis advantages of traditional and modern methods of apiculture 1.9 Pest , Bees enemies and diseases 1.10 Economic importance of Apiculture	**10**
II	**Sericulture** 2.1 Introduction and scope of Sericulture 2.2 Variety of silkworm and host plants. 2.3 Life history and rearing of ***Bombyx mori*** 2.4 Harvesting and processing of cocoon 2.5 Reeling and extraction of silk	**10**

	2.6 Disease and control measures. 2.7 Economic importance of Sericulture.	
III	**Lac culture** 3.1 Introduction and scope of Lac culture 3.2 Life cycle of Lac insect 3.3 Extraction of Lac 3.4 Lac products and their uses 3.5 enemies of lac insects 3.6 Economic importance of Lac	**10**
	Total	**30**

EXAMINATION PATTERN FOR OE/IKS/SEC

- **Continuous Internal Assessment (20 Marks):**

Sr. No.	Particulars	Marks
1	One Assignment.	10
2	Departmental Activity	05
3	Overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities	05
	Total	20

Semester End Examination (30 Marks):

Question Paper Pattern

1. These examinations shall be of **One Hour** duration. Maximum marks 30.
2. There shall be Three questions each of **10 marks**. Questions 1 will be based on **Unit-I , Questions 2** will be based on **Unit-II**. Question 3 will be based on Unit III
3. All questions shall be compulsory with internal choice within the questions. (Each question will be of 10 **marks** with options.)
4. Question may be subdivided into sub-questions A, B, C the allocation of marks depends on the weightage of the topic.

Distribution of external 60 marls

Qn.	Sub-Qn	Particulars	Unit	Marks with options	Total Marks for qn
1	**A,B,C**	Answer the following (Attempt **any one out of** three)	**I**	30	10
2	**A,B,C**	Answer the following (Attempt **any one out of** three)	**II**	30	10
3	**A,B,C**	Answer the following (Attempt one **out of** three)	**III**	30	10
		Total		**90**	**30**