

Anekant Education Society's

TULJARAM CHATURCHAND COLLEGE

OF ARTS, SCIENCE & COMMERCE, BARAMATI.

(AUTONOMOUS INSTITUTE)



SYLLABUS

SECOND YEAR B.Sc. ZOOLOGY

ACADEMIC YEAR 2023-2024

SEMESTER - IV

तुळजाराम चतुरचंद महाविद्यालय, बारामती

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**TULJARAM CHATURCHAND COLLEGE OF ARTS, SCIENCE &
COMMERCE, BARAMATI.
AUTONOMOUS**

Scheme of Course Structure (CBCS)

Faculty of Science

Department of Zoology

SEMESTER- III

Class: S.Y.B.Sc.

Pattern: 40 (IA) + 60 (EA)

Sr. No.	Code	Paper	Paper Title	Credit	Exam	Marks
1	USZL 231	Theory	Animal Systematics and Diversity – III	3	I / E	40 + 60
2	USZL 232	Theory	Applied Zoology- I	3	I / E	40 + 60
3	USZL 233	Practical	Zoology Practical-III	2	I / E	40 + 60

SEMESTER- IV

Sr. No.	Code	Paper	Paper Title	Credit	Exam	Marks
1	USZL 241	Theory	Animal Systematics and Diversity - IV	3	I / E	40 + 60
2	USZL 242	Theory	Applied Zoology- II	3	I / E	40 + 60
3	USZL 243	Practical	Zoology Practical-IV	2	I / E	40 + 60

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I A* - Internal Assessment
E A* - External Assessment

SYLLABUS (CBCS) FOR S. Y. B. Sc. ZOOLOGY (w. e. f. June, 2023)

Name of the Program: B.Sc. Zoology
Class: S.Y. B.Sc.
Course Name: Animal Systematics and Diversity-IV
Number of Credits: 03

Program Code: USZL
Semester: IV
Course Code: USZL 241
Number of Lectures: 48

Learning Objectives:-

- Provide students with a comprehensive understanding of Reptilia, Aves, and Mammals classes, enabling them to differentiate between examples within each class and sub-class effectively.
- Explore reptile adaptations, including desert survival and venomous apparatus.
- Equipping students with knowledge for snake bite first aid and antivenin administration.
- Investigate bird migration, feather structure, beak and feet modifications, and the unique vocal organ.
- Gain insights into egg-laying mammals, aquatic mammals, and flying mammals,
- Explore the diversity of reproductive strategies and ecological niches within the Mammalia class.
- Enhancing knowledge of fish biology and anatomy, including external features, digestive, circulatory, respiratory, nervous, sensory, and reproductive systems.

Learning Outcomes:-

After completion of this course students will -

- CO1: confidently identify and distinguish examples within the Reptilia, Aves, and Mammals classes based on key morphological and ecological characteristics.
- CO2: explain the diverse adaptations of reptiles for desert survival, including thermoregulation, water conservation, and specialized feeding mechanisms.
- CO3: demonstrate proper snake bite first aid procedures and understand the principles of antivenin administration, recognizing the importance of responsible action in emergency situations.
- CO4: explain the structure and function of feathers, beaks, and feet modifications in birds, relating them to specific flight patterns, feeding strategies, and habitat preferences.
- CO5: identify and differentiate between egg-laying mammals, aquatic mammals, and flying mammals, highlighting their unique adaptations and ecological niches.
- CO6: accurately identify and describe the external features of various fish species, including their body shape, fins, scales, and sensory organs.
- CO7: explain the structure and function of the major internal systems in fish.

UNIT	SUB UNITS	SYLLABUS	NO. OF LECTURES
1. General characters and classification of following classes and their sub-classes with two examples of each			(12 L)
	1.1	Reptilia	4
	1.2	Aves	4
	1.3	Mammals	4
2. General topics:			(16 L)
	2.1	Desert adaptations in reptiles, poison apparatus, snake venom, First aid and treatment of snake bite, Antivenin	6
	2.2	Bird migration, structure of feathers, beak and feet modifications in birds, Syrinx in birds	5
	2.3	Egg laying mammals, aquatic mammals, flying mammals.	5
3. Study of <i>Labeo rohita</i>			(20L)
	3.1	Systematic position, Habit and habitat	2
	3.2	External characters and sexual dimorphism	2
	3.3	Digestive system, food, feeding and physiology of digestion	4
	3.4	Circulatory & Respiratory system in brief.	4
	3.5	Nervous system.	2
	3.6	Sense organs	3
	3.7	Reproductive systems (male & female)	3

REFERENCES

1. Blackwelder, R. E. (2019). Handbook of Animal Diversity. CRC Press.
2. Jordan, E. L., & Verma, D. P. (2018). Chordate zoology. S. Chand & Company Pvt. Ltd.
3. Kotpal, R. L. (2010). Modern text book of zoology: vertebrates. Rastogi Publications.
4. Mayr, E. (1997). This is biology: The science of the living world. Universities Press.
5. Prasad, S. N., & Kashyap, V. (1991). A Textbook of Vertebrate Zoology. New Age International.

Course Articulation Matrix of USZL 241: Animal Systematics and Diversity-IV **Weightage: 1: Partially related, 2: Moderately related, 3: Strongly related**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	2	1	1	1	2	1	1	2
CO2	3	2	1	2	2	2	2	3	2
CO3	2	2	2	1	1	2	3	1	1
CO4	3	2	1	2	2	2	1	2	2
CO5	3	2	1	2	2	2	2	3	2
CO6	3	2	1	2	2	2	1	3	2
CO7	3	2	1	2	2	2	1	3	2

PO1: Disciplinary Knowledge

All of the COs are directly mapped to PO1 because they require students to have strong understanding of key concepts and practices in taxonomy and zoology. For example, CO1 requires students to have an in-depth understanding of taxonomic principles and key morphological characteristics for classification.

PO2: Critical Thinking and Problem Solving

All of the COs are directly mapped to PO2 because they require students to apply critical thinking and problem-solving skills. For example, CO3 requires students to analyze bite symptoms to assess severity and makes informed decisions on first aid actions and antivenin administration.

PO3: Social Competence

All of the COs are directly mapped to PO3 because they require students to interact with others in a professional and effective manner. For example, CO3 requires students develop communication skills to educate others about snake bite prevention, first aid, and responsible behavior in snake-inhabited areas.

PO4: Research-related skills and Scientific temper

All of the COs are directly mapped to PO4 because they require students to apply the principles of scientific research to their work. For example, CO4 encourage students to observe, collect the data and critical thinking about bird morphology and its connection to ecological roles.

PO5: Trans-disciplinary knowledge

All of the COs are directly mapped to PO5 because they require students to apply knowledge from different disciplines to solve problems in the field of zoology. For example, CO4 requires students to integrate with ecology, evolution, and biomechanics for understanding bird adaptations.

PO6: Personal and professional competence

All of the COs are directly mapped to PO6 because they require students to demonstrate the personal and professional skills that are essential for success in the field of zoology. For example, CO6 requires students to develop skills in field observation and data collection.

PO7: Effective Citizenship and Ethics

All of the COs are directly mapped to PO7 because they require students to uphold the ethical standards in zoology. For example, CO6 requires students to promote responsible fishing practices and awareness of the importance of fish biodiversity in aquatic ecosystems.

PO8: Environment and Sustainability

All of the COs are directly mapped to PO8 because they require students to be aware of the environmental and sustainability implications of their work. For example, CO7 requires students to focus on minimizing impact of environmental changes and pollutants on fish physiology and the importance of protecting aquatic ecosystems.

PO9: Self-directed and Life-long learning

All of the COs are directly mapped to PO9 because they require students to develop the skills necessary for self-directed and lifelong learning. For example, CO7 provides foundation for further exploration of mammalian diversity, evolution, and conservation research.



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SYLLABUS (CBCS) FOR S. Y. B. Sc. ZOOLOGY (w. e. f. June, 2023)

Name of the Program: B.Sc. Zoology
Class: S.Y. B.Sc.
Course Name: Applied Zoology-II
Number of Credits: 03

Program Code: USZL
Semester: IV
Course Code: USZL 242
Number of Lectures: 48

Learning Objectives:-

- To disseminate information on economic aspects of zoology like apiculture, sericulture.
- To encourage young learners for self-employment.
- To comprehend the functioning of apiculture sericulture industry and its scope in India.
- To study the honey bee species and bee products
- To study the varieties of silk-worms and host plants.
- To critically study the life history and rearing of *Bombyx mori*.
- To study the post harvesting processes in sericulture

Learning Outcomes:-

Students will be able to-

CO1: acquire sound knowledge on different components of sericulture & bee keeping industry

CO2: identify different honey bee & silkworm species.

CO3: explain the tools & techniques used in apiculture & sericulture.

CO4: illustrate the diseases of honey bee & silkworm.

CO5: understand the economic importance of apiculture & sericulture.

CO6: get acquaint about communication system among the casts in the colony.

CO7: understand the post harvesting processes in sericulture.

UNIT	SUB UNITS	SYLLABUS	NO. OF LECTURES
1. Apiculture			(24 L)
	1.1	An introduction to Apiculture, Systematic position of honey bee, Study of habit, habitat and nesting behavior of <i>Apis dorsata</i> , <i>Apis indica</i> , <i>Apis florea</i> , <i>Apis mellifera</i> and <i>Trigona species</i>	03
	1.2	Morphology of honey bee - Head & Abdomen, wax glands, sting apparatus, scent gland, mechanism if sting	02
	1.3	Life cycle, Colony organization and division of labour, Polymorphism	02
	1.4	Bee behaviour and bee communication.	03
	1.5	Bee keeping equipments : a) Bee box (Langstroth type) b) Honey extractor c) Smoker d) Bee-veil e) Gloves f) Hive tool g) Bee Brush h) Queen excluder	02
	1.6	Bee keeping and seasonal management.	02
	1.7	Bee products (collection methods, composition and uses: a) Honey b) Wax c) Bee Venom d) Propolis e) Royal jelly f) Pollen grains	04
	1.8	Diseases and enemies of Bees: a) Bee diseases – Protozoan, Bacterial, Fungal – with two examples. b) Bee pests – Wax moth (Greater and Lesser), Wax beetle. c) Bee Enemies – Bee eater, King crow, Wasp, Lizard, Bear, Man.	04
	1.9	Floral calendar	02

2. Sericulture			(24 L)
2.1	An Introduction and its scope , Study of different types of silk moths, their distribution and varieties of silk produced by Mulberry, Tassar, Eri and Muga silk worms in India.	03	
2.2	External morphology and life cycle of Bombyx mori.	02	
2.3	Cultivation of mulberry (moriculture): a) Varieties for cultivation, b) Rainfed and irrigated mulberry cultivation – Fertilize schedule, Prunning.	04	
2.4	Harvesting of mulberry: a) Leaf plucking b) Branch cutting c) Whole shoot cutting.	02	
2.5	Quality of silk, factors influencing the quality of silk, market value, commercial aspects	03	
2.6	Silk worm rearing: a) Types of rearing b) Rearing house c) Rearing techniques d) Important diseases and pests.	05	
2.7	Post-harvest processing of cocoons: a) Harvesting and Preparation of cocoons for marketing b) Stiffling, Sorting, Storage, Deflossing and Riddling c) Cocoon cooking, Reeling and Rereeling, Washing and Polishing.	03	
2.8	By-products of sericulture industry and their applications.	02	

REFERENCES

1. Shukla, G. S., & Upadhyay, V. B. (2010). Economic zoology. Rastogi Publications.
2. Pillay TVR & Kutty MN. 2005. Aquaculture- Principles and Practices. Blackwell.
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6. Bee and Bee Keeping, 1978, Roger A. Morse, Conell University Press, London.
7. The Behaviour & Social Life of Honey Bees, C.R. Ribbandas, Dover Publication inc. New York.
8. Principal of Sericulture, 1994. Hisao Arguo, Oxford & Co.
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10. FAQ Manual of Sericulture. Vol I Mulberry Cultivation, Vol II Silkworm Rearing. Central Silk Board, Bangalore.
11. Biology of Insects- 1992 Saxena C. Oxford and IBH Publishing Co. New Delhi. Bombay. Calcutta
12. A Text Book of Entomology- 1974 Mathur V. K. and Upadhyay K Goel Printing press, Barani.
13. Bee and Bee Keeping- Roger A. Morse, Conell University Press London

Course Articulation Matrix of USZL 242: Applied Zoology –II

Weightage: 1: Partially related, 2: Moderately related, 3: Strongly related

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	1	2	2	1	2	1	2	2
CO2	3	2	1	1	1	2	1	2	2
CO3	3	2	2	2	1	2	3	2	1
CO4	3	2	1	2	1	2	2	2	2
CO5	3	2	2	1	2	3	2	1	2
CO6	3	2	1	2	1	1	1	1	2
CO7	3	2	1	2	1	2	1	2	2

PO1: Disciplinary Knowledge

All of the COs are directly mapped to PO1 because they require students to have strong understanding of key concepts and practices in applied zoology. For example, CO1 requires students to have an in-depth understanding of various aspects like mulberry cultivation, silkworm rearing, honeybee management, honey production, processing, and marketing.

PO2: Critical Thinking and Problem Solving

All of the COs are directly mapped to PO2 because they require students to apply critical thinking and problem-solving skills. For example, CO4 requires students to analyze disease symptoms and environmental factors to identify potential causes and implement appropriate control measures.

PO3: Social Competence

All of the COs are directly mapped to PO3 because they require students to interact with others in a professional and effective manner. For example, CO5 requires students develop communication skills to educate others about the economic significance of these industries and their contribution to rural livelihoods.

PO4: Research-related skills and Scientific temper

All of the COs are directly mapped to PO4 because they require students to apply the principles of scientific research to their work. For example, CO4 encourage students to observe, collect the data and analysis of disease outbreaks for informing prevention and control strategies.

PO5: Trans-disciplinary knowledge

All of the COs are directly mapped to PO5 because they require students to apply knowledge from different disciplines to solve problems in the field of zoology. For example, CO4 requires students to integrate with veterinary science and microbiology for understanding disease mechanisms and control methods.

PO6: Personal and professional competence

All of the COs are directly mapped to PO6 because they require students to demonstrate the personal and professional skills that are essential for success in the field of zoology. For example, CO6 provides essential knowledge for making informed decisions about starting or managing beekeeping and sericulture businesses.

PO7: Effective Citizenship and Ethics

All of the COs are directly mapped to PO7 because they require students to uphold the ethical standards in zoology. For example, CO6 requires students to promote fair trade practices, ethical treatment of workers and animals, and sustainable resource utilization within the industry.

PO8: Environment and Sustainability

All of the COs are directly mapped to PO8 because they require students to be aware of the environmental and sustainability implications of their work. For example, CO4 requires students to focus on assessing environmental factors influencing disease outbreaks and the importance of sustainable practices for maintaining healthy bee populations and silkworm production.

PO9: Self-directed and Life-long learning

All of the COs are directly mapped to PO9 because they require students to develop the skills necessary for self-directed and lifelong learning. For example, CO7 provides foundation for further exploration of disease research, prevention strategies, and sustainable beekeeping and sericulture practices.

SYLLABUS (CBCS) FOR S. Y. B. Sc. ZOOLOGY (w. e. f. June, 2023)

Name of the Program: B.Sc. Zoology
Class: S.Y. B.Sc.
Course Name: Zoology Practical - IV
Number of Credits: 02

Program Code: USZL
Semester: IV
Course Code: USZL 243
Number of Practicals: 10

Learning Objectives:-

- To understand and classify various animals, including reptiles and birds into their respective taxonomic classes based on their characteristics and features.
- To examine analyze the adaptations in birds' beaks and feet.
- To provide insights into fish morphology and anatomy.
- To explore the life cycles and unique characteristics of important insects like the honey bee and silk moth.
- To gain practical knowledge of beekeeping
- To gain practical knowledge of sericulture.
- To conduct a hands-on project that investigates the economics of beekeeping and sericulture, and creates a short project report with visuals.

Learning Outcomes:-

Students will -

- CO1: develop a comprehensive understanding of the classification of animals, enabling them to identify and differentiate between different classes and species based on key features and characteristics.
- CO2: acquire knowledge of the adaptations in birds' beaks and feet and will be able to relate these adaptations to their feeding habits and habitats.
- CO3: gain practical skills in studying the external characters, digestive systems, and brains of fish, providing insights into the anatomical and physiological aspects of aquatic life.
- CO4: become familiar with the life cycles and anatomical structures of Honey bees and Bombyx mori, along with their importance in agriculture and ecology.
- CO5: develop a comprehensive understanding of bee biology, behavior, and their roles within the hive, facilitating effective hive management and sustainable practices.
- CO6: Gain a comprehensive understanding of the silk production process, including silk fiber extraction, spinning, weaving, and the various stages involved in silk fabric manufacturing.
- CO7: develop practical expertise in beekeeping and sericulture and also be able to analyze the economic aspects of these activities through their project report.

Sr. No.	Title of the Practical	E/D
1	To study the classification with reasons the following animals: Class: Reptilia- Turtle, Garden lizard, <i>Draco</i> , Cobra, Rat snake,	(D)
2	To study the classification with reasons the following animals: Class: Aves- Sparrow, Crow, Wood pecker, Parrot Class: Mammalia- Kangaroo, Rabbit, Mongoose,	(D)
3	Study of beak and feet modifications in birds	(D)
4	Study of External characters and digestive system of <i>Labeo rohita</i> / Any locally available bony fish	(E)
5	Study of Brain of <i>Labeo rohita</i> :	(E)
6.	Temporary preparation of- a) Cycloid scales from <i>Labeo rohita</i> b) Eye ball muscles in <i>Scoliodon</i>	(E)
7.	Study of life cycle of Honey bee	(D)
8.	Temporary mountings of mouth parts, thoracic appendages (legs and wings) and sting apparatus of Honey bee	(E)
9.	Study of various bee-keeping equipments (Any five equipments):	(D)
10.	Study of: a) bee-products, b) bee-pests, d) bee-enemies or Measure the body size (length of body and wing size)	(D/E)

11.	a) Study of life cycle of <i>Bombyx mori</i> . b) Study of any five equipments in Sericulture c) Handicrafts made from cocoons	(D)
12	Submission of short project report on Economics of Bee keeping/sericulture (Activity based practical) (With necessary pictures).	(E)
13	Compulsory visit to biodiversity spot/sea shore/apiculture/sericulture farm and submit report of the same.	(E)
*D- Demonstration; E- Experiment.		

- **Practical No. 13 is Compulsory, from remaining any 9 practicals be conducted.**
- **Maintenance of good laboratory record (Journal) along with visit report by the student is mandatory.**

Course Articulation Matrix of USZL 243: Zoology Practical - IV
Weightage: 1: Partially related, 2: Moderately related, 3: Strongly related

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	3	1	2	2	1	2	1	2	2
CO2	3	2	1	2	2	2	1	2	2
CO3	3	2	1	2	2	2	1	3	2
CO4	3	2	1	2	2	2	2	3	2
CO5	3	2	2	2	1	3	2	1	2
CO6	3	2	1	2	2	2	2	3	2
CO7	3	2	2	1	2	3	2	1	2

PO1: Disciplinary Knowledge

All of the COs are directly mapped to PO1 because they require students to have strong understanding of key concepts and practices in zoology. For example, CO1 requires students of taxonomic systems, key morphological features, and ecological characteristics for classifying animals across various classes and species.

PO2: Critical Thinking and Problem Solving

All of the COs are directly mapped to PO2 because they require students to apply critical thinking and problem-solving skills. For example, CO3 requires students to analyze relationship between anatomical features and physiological functions in different fish species, explaining their adaptations to aquatic environments.

PO3: Social Competence

All of the COs are directly mapped to PO3 because they require students to interact with others in a professional and effective manner. For example, CO5 requires students develops communication skills to educate others about beekeeping practices and the importance of honeybee health.

PO4: Research-related skills and Scientific temper

All of the COs are directly mapped to PO4 because they require students to apply the principles of scientific research to their work. For example, CO5 encourage students to observe, collect the data and analysis of bee behavior and hive dynamics for research and improved management practices.

PO5: Trans-disciplinary knowledge

All of the COs are directly mapped to PO5 because they require students to apply knowledge from different disciplines to solve problems in the field of zoology. For example, CO6 requires students to integrate with with textile technology, engineering, and biomaterials science for developing new methods and materials in silk production.

PO6: Personal and professional competence

All of the COs are directly mapped to PO6 because they require students to demonstrate the personal and professional skills that are essential for success in the field of zoology. For example, CO7 provides essential

knowledge for making informed decisions about starting or managing beekeeping and sericulture businesses.

PO7: Effective Citizenship and Ethics

All of the COs are directly mapped to PO7 because they require students to uphold the ethical standards in zoology. For example, CO7 requires students to promote fair trade practices, ethical treatment of workers and animals, and sustainable resource utilization within the industry.

PO8: Environment and Sustainability

All of the COs are directly mapped to PO8 because they require students to be aware of the environmental and sustainability implications of their work. For example, CO4 requires students to focus on understanding the environmental footprint of different silk production methods and the importance of sustainable practices for resource conservation.

PO9: Self-directed and Life-long learning

All of the COs are directly mapped to PO9 because they require students to develop the skills necessary for self-directed and lifelong learning. For example, CO7 provides foundation for further exploration of disease research, prevention strategies, and sustainable beekeeping and sericulture practices.



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