

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 - III

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

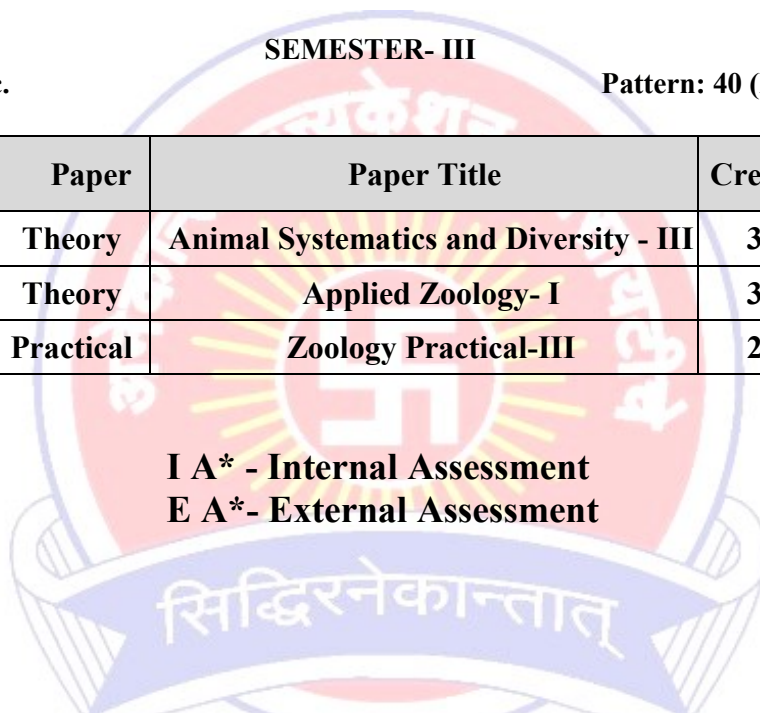
SEMESTER- III

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

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



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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: Animal Systematics and Diversity-III

Number of Credits: 03

Program Code: USZL

Semester: III

Course Code: USZL 231

Number of Lectures: 48

Course Objectives:-

- Distinguish between different classes with highlighting distinct characteristics.
- Assessment of special biological processes in organisms.
- Examination of cockroach anatomy and physiology.
- Assess the ecological roles and economic importance of the studied invertebrates.
- Acquire taxonomic knowledge to identify and classify unknown invertebrates.
- Assess the evolutionary adaptations and biological strategies displayed by different invertebrate groups.
- Explore the behavioral patterns in organisms.

Course Outcomes:-

Student will be able to-

- CO 1: distinguish distinct characteristics of various invertebrate classes, facilitating precise classification and identification.
- CO 2: assess and analyze specific biological phenomena in invertebrates.
- CO 3: comprehensively examine the anatomy and functionality of cockroach systems.
- CO 4: critically evaluate the ecological roles and economic importance of studied invertebrates.
- CO 5: acquire taxonomic knowledge essential for identifying and classifying unknown invertebrates.
- CO 6: evaluate and interpret the evolutionary adaptations and biological strategies exhibited by diverse invertebrate groups.
- CO 7: explore and analyze behavioral patterns in various invertebrate species.

UNIT	SUB UNITS	SYLLABUS	NO. OF LECTURES
1. Salient features and classification upto classes of the following: (any two examples from each class)			(12 L)
	1.1	Arthropoda: - Crustacea, Arachnida, Insecta, Myriapoda and Onychophora.	4
	1.2	Mollusca: - Aplacophora, Gastropoda, Scaphopoda, Pelecypoda, and Cephalopoda	4
	1.3	Echinodermata:- Asteroidea, Ophuroidea, Holothuria, Echinoidea, and Crinoidea	4
2. General topics:			(22 L)
	2.1	Insects: Metamorphosis, Mouthparts, Mimicry, Bioluminescence and Economic importance	8
	2.2	Cephalopods: Nervous system and camouflage	6
	2.3	Echinoderms: Autotomy and regeneration, water vascular system and locomotion	8
3. Biology of cockroach			(14 L)
	3.1	Systematic position, habit and habitat	1
	3.2	External morphology and sexual dimorphism	1
	3.3	Digestive system	2
	3.4	Circulatory system	2

	3.5	Respiratory system	2
	3.6	Reproductive system	2
	3.6	Nervous system	2
	3.7	Sense organs	2

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2. Kotpal, R. L. (1998). Zoology Phylum (Annelida, Mollusca, Arthropoda, Minor Phyla).
3. Kotpal, R. L. (1990). Echinodermata. Rastogi Publications.
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9. Pechenik, J. A. (2010). Biology of the Invertebrates (No. 592 P3).

Course Articulation Matrix of USZL 231: Animal Systematics & Diversity-III **Weightage: 1: Partially related, 2: Moderately related, 3: Strongly related**

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

PO1: Disciplinary Knowledge

All of the course outcomes (COs) are directly mapped to PO1 because it requires students to acquire and apply knowledge about invertebrate classification and identification.

PO2: Critical Thinking and Problem Solving

CO2 and 6 are directly mapped to PO2 because they require students to require not just knowledge but also analytical skills to assess phenomena, evaluate adaptations, and solve problems related to invertebrate biology.

PO3: Social Competence

CO3 and 4 are directly mapped to PO3 because they focus on the social and economic relevance of invertebrates, promoting social awareness.

PO4: Research-related skills and Scientific temper

CO2 and 5 are directly mapped to PO4 because they involve research elements like data analysis, interpretation, and critical thinking, essential for scientific investigations in the field.

PO5: Trans-disciplinary knowledge

CO1 directly mapped to PO5 because they require students to draw connections with other disciplines like ecology, evolution, and genetics.

PO6: Personal and professional competence

COs are also directly mapped to PO6 because they contribute to personal and professional growth through skill development, knowledge building, and critical thinking.

PO7: Effective Citizenship and Ethics

CO 7 is directly mapped to PO7 because studying animal behavior promotes ethical considerations towards living organisms and responsible interaction with the environment.

PO8: Environment and Sustainability

CO 4 directly mapped to PO8 because understanding the ecological roles and economic importance of invertebrates fosters appreciation for environmental sustainability and responsible resource management..

PO9: Self-directed and Life-long learning

All of the COs are also directly mapped to PO9 because analyzing evolutionary adaptations encourages curiosity, independent exploration, and continuous learning about the natural world.



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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-I

Number of Credits: 03

Program Code: USZL

Semester: III

Course Code: USZL 232

Number of Lectures: 48

Course Objectives:-

- Understand the fundamentals of fisheries and aquaculture.
- Gain comprehensive knowledge of freshwater pearl culture.
- Develop an understanding of Lamellidans spp. morphology, anatomy, and their role in pearl formation.
- Master the different implantation techniques in pearl culture.
- Gain knowledge of post-operative care and marketing in pearl culture.
- Develop an understanding of Integrated Pest Management in agriculture crops.
- Gain knowledge of dairy science

Course Outcomes:-

Student will be able to-

CO1: demonstrate comprehensive knowledge of the foundational principles and practices in fisheries and aquaculture.

CO2: attain mastery in freshwater pearl culture techniques.

CO3: develop a comprehensive understanding of Lamellidans spp., exploring their morphology, anatomy, and their pivotal role in the formation of pearls.

CO4: acquire proficiency in various implantation methods used in pearl culture.

CO5: gain an understanding of post-operative care for molluscs post-implantation and knowledge of marketing strategies for cultured pearls.

CO6: develop a comprehensive understanding of integrated pest management techniques.

CO7: attain proficiency and comprehensive knowledge in dairy science.

UNIT	SUB UNITS	SYLLABUS	NO. OF LECTURES
1. Fisheries:			(08 L)
	1.1	Introduction to fisheries and aquaculture	1
	1.2	Different types of ponds used in fish farming: Nursery pond, rearing pond and grow out ponds	2
	1.3	Introduction to composite fish farming of Indian major carps (Biology of fish (Rohu, Catla and Mrigal), seed rearing, nutrition and feeding habits)	3
	1.4	Fish transport and preservation: a) Salting b) Chilling (Use of insulated containers, etc.) c) Freezing d) Canning	2
2. Freshwater Pearl Culture:			(18 L)
	2.1	<ul style="list-style-type: none"> • Introduction to pearl culture • Global and national status of pearl culture • Significance of pearl culture 	2

	2.2	Soil and water management <ul style="list-style-type: none"> • Soil and water quality standards • Soil and water quality management (Cat clay/pyrite soil, seepage and its control) • Zero water exchange system (water filtration devices, aeration, chlorination, ozonization and radiation) • Organic and inorganic fertilizers 	4
	2.3	Morphology and biology of Lamellidans spp. <ul style="list-style-type: none"> • Morphology • Anatomy: Alimentary canal and associated structures 	2
	2.4	Formulation and preparation of artificial feeds for larval rearing	2
	2.5	Implantation techniques in Pearl Culture <ul style="list-style-type: none"> • Surgical procedures in pearl culture • Beads insertion • Nucleus implantation • Graft tissue preparation 	4
	2.6	Post-operative care and marketing <ul style="list-style-type: none"> • Post-operative care. Precautionary measures of pearl culture • Quality improvement • Caring of implanted bivalve • Harvesting of pearl • Sorting of pearl • Marketing and economics concerned with pearl culture 	4
3. Integrated Pest Management in Agriculture Crops			(05 L)
	3.1	Introduction to insect pests in agriculture crops	2
	3.2	Pest control practices in brief: <ul style="list-style-type: none"> • Physical control (Define scope) • Mechanical control • Biocide based control • Biological control (Pheromones traps and others) 	3
4. Introduction to Dairy Science			(17 L)
	4.1	Role of dairy development in rural economy	2
	4.2	Study of important indian cattle breeds used in dairy: Deoni, Khillari, Red Kandhari, Malvi, Hariyana, Nagpuri buffalo and Murrha buffalo	4
	4.3	Exotic breeds: Jersey and Holstein	1
	4.4	Milk Processing Technology: <ul style="list-style-type: none"> • Composition of milk and quality parameters • Cleanliness and hygiene of milk production • Filtration and pasteurization • Cooling, chilling, packaging and storage 	6
	4.5	Introduction to milk products	4

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17. Shrivastava, J. S. M. (2008). Dairy Development In The New Millennium (The Second White Revolution). Deep and Deep Publications.

Course Articulation Matrix of USZL 232: Applied Zoology-I 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	2	1
CO2	3	2	1	2	1	2	1	1	1
CO3	3	2	1	2	1	1	1	1	1
CO4	3	2	1	1	1	2	1	1	1
CO5	2	2	2	1	2	2	1	1	1
CO6	3	3	2	2	2	2	2	3	2
CO7	3	2	2	2	2	2	2	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 fisheries and aquaculture. For example, CO2 requires students to In-depth knowledge of pearl formation, implantation methods, and pearl care.

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 to analyze fish populations, manage ponds, and select appropriate aquaculture techniques. For example, CO2 requires students to analyze post-operative issues, implements corrective measures, and evaluates pearl quality for marketing.

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, CO6 requires students to develop skills to educate others about IPM methods and promote their adoption in communities.

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, CO3 encourage students to observe, collect the data and potential for further research in pearl culture.

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 applied zoology. For example, CO4 requires students to integrate with ecology, environmental science, and agricultural economics for sustainable pest management.

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 applied zoology. For example, CO7 requires students to develop skills in animal husbandry, recordkeeping, data analysis, and operating milk processing equipment.

PO7: Effective Citizenship and Ethics

All of the COs are directly mapped to PO7 because they require students to uphold the ethical standards in applied zoology. For example, CO6 requires students to promote responsible pesticide use, environmental protection, and sustainable agricultural practices.

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, CO6 requires students to focus on minimizing environmental impact of pest control and promoting sustainable agriculture.

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, CO3 provides foundation for further learning and exploration in Lamellidan biology and pearl formation.

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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: Zoology Practical - III

Number of Credits: 02

Program Code: USZL

Semester: III

Course Code: USZL 233

Number of Practicals: 10

Learning Objectives:-

- Develop the ability to classify organisms to their respective class based on specific characteristics.
- Gain in-depth knowledge of morphology, anatomy and physiology of cockroach through practical study and analysis.
- Acquire practical skills in temporary and permanent mountings of insects.
- Develop expertise in taxonomic identification, feeding habits, and economic importance of specific fish.
- Acquire knowledge of dairy science.
- Understand the nature of damage caused by specific insect pests
- Acquire knowledge of milk quality analysis.

Learning Outcomes:-

Student will be able to-

CO1: identify and classify organisms to their respective classes based on key morphological characteristics.

CO2: explain the anatomical structures and physiological processes of the cockroach.

CO3: skillfully master temporary and permanent mounting techniques for preparing insect specimens for preservation and identification.

CO4: accurately identify common fish species based on their taxonomic characteristics.

CO5: evaluate the nutritional value of dairy products and their role in human health and diet.

CO6: identify and characterize the types of damage caused by specific insect pests in agricultural crops and stored products.

CO7: interpret milk quality analysis results and their implications for milk processing, safety, and consumer health.

Sr. No.	Title of the Practical	E/D
1	Classification of following taxa to their 'class level' with reason: Phylum Arthropoda (Butterfly and Scorpion) Phylum Mollusca (<i>Pila</i> and Octopus) Phylum Echinodermata (Sea star and Feather star)	(D)
2	Culturing of cockroach (Activity based)	
3	Study of morphology, sexual dimorphism and digestive system of cockroach	(E)
4	Study of nervous system of cockroach	(E)
5	Study of reproductive system of cockroach	(E)
6.	Temporary / Permanent mountings of a) Cornea b) Thoracic spiracles c) Gizzard	(E)
7.	Taxonomic identification, feeding habit and economic importance of following fish: a) Rohu b) Catla c) Mrigal	(D)

8.	Study of insect pests with respect to marks of identification, nature of damage and control measures a) Jowar stem borer b) Lemon butterfly	(D)
9.	Extraction of casein from milk and its confirmatory test	(E)
10.	Measurement of density of milk using different samples by Lactometer	(E)
11.	Estimation of primary productivity in aquatic ecosystem by using Light and dark bottle method	(E)
12	Submission of short project report on Economics of Aquaculture / Pearl culture / Dairy / Assessment of economic impact of various pests on crop (Activity based practical)	(D)
13.	Compulsory visit to Biodiversity park / Dairy farm /Aquaculture farm. (Submission of detailed visit report is compulsory).	(E)
*D- Demonstration; E- Experiment.		

Course Articulation Matrix of USZL 233: Zoology Practical-III
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	1	2	1	1	2
CO3	2	2	1	1	1	3	1	1	1
CO4	3	2	2	2	2	2	2	3	2
CO5	3	2	2	2	2	2	2	2	2
CO6	2	2	2	2	2	2	2	3	2
CO7	3	2	2	2	2	3	2	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 taxonomy and applied 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 select appropriate mounting method based on specimen size, fragility, and purpose of preservation.

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, CO4 requires students develops communication skills to educate others about fish species, their importance, and conservation efforts.

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, CO3 encourage students to observe, collect the data and critical thinking about pest populations and their impact on agriculture.

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 applied zoology. For example, CO4 requires students to integrate with food science, chemistry, and public health for understanding milk quality and its impact on human health.

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 applied zoology. For example, CO6 requires students to develop skills in field observation, damage assessment, and communication for pest control implementation.

PO7: Effective Citizenship and Ethics

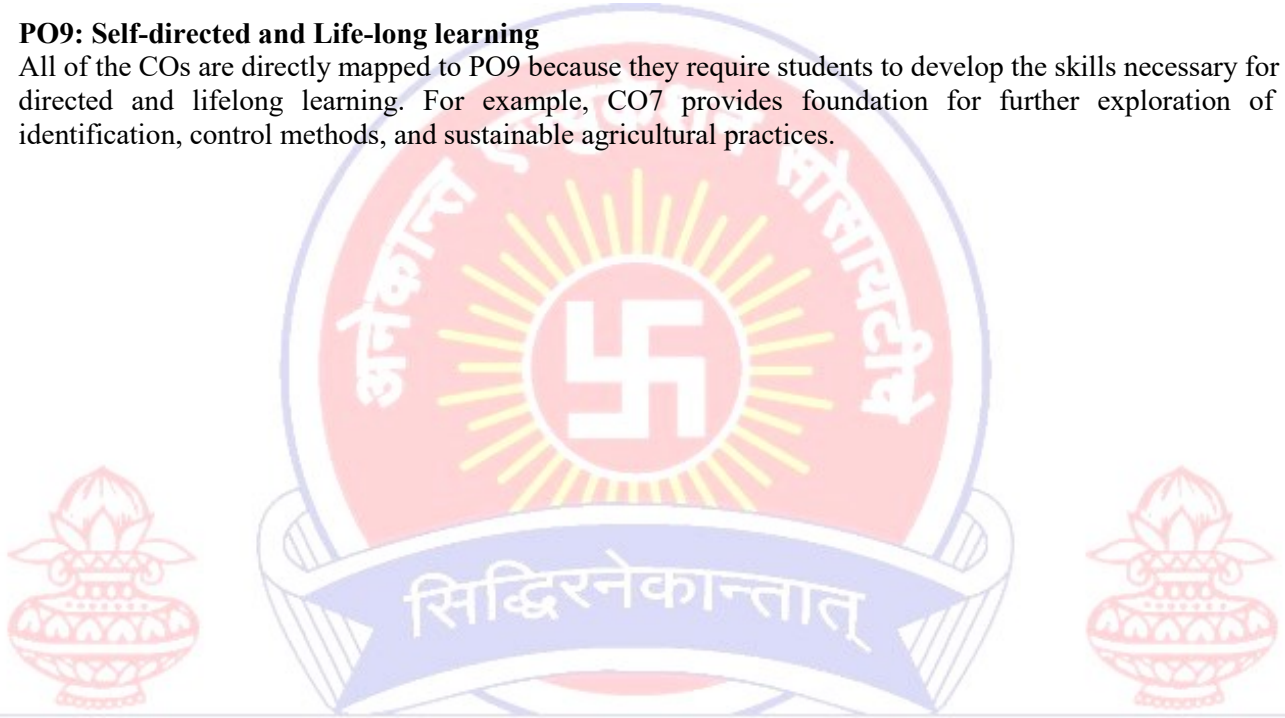
All of the COs are directly mapped to PO7 because they require students to uphold the ethical standards in zoology. For example, CO6 requires students to promote responsible pesticide use, environmental protection, and sustainable agricultural approaches.

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, CO6 requires students to focus on minimizing environmental impact of pesticides and promoting sustainable agriculture.

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 pest identification, control methods, and sustainable agricultural practices.



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