UNIVERSITY OF RAJASTHAN, JAIPUR

SYLLABUS

(Three/Four Year Undergraduate Programme)

B. Sc. (Zoology Multidisciplinary)

I to VI Semester

Subject: Zoology

2024-25

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Name of University	**University of Rajasthan, Jaipur**
Name of Faculty	**Science**
Name of Discipline	**ZOOLOGY**
Type of Discipline	**MDC**
List of Programme were offered as Minor Discipline	**Not Applicable**
Offered to Non-Collegiate Students	**Yes**

SEMESTER-WISE PAPER TITLES WITH DETAILS

				ZOOLOGY	**Credits**			
#	**Level**	**Semester**	**Type**	**Title**	**L**	**T**	**P**	**Total**
1.	5	I/II	MDC	**MDC-ZOO-51T-101 CLASSICAL ZOOLOGY**	4	0	0	4
2.	6	III/IV	MDC	**MDC-ZOO-63T-201-ETHOLOGY, EVOLUTION, ECOLOGY AND WILDLIFE**	4	0	0	4
3.	7	V/VI	MDC	**MDC-ZOO-75T-301-APPLIED ZOOLOGY**	4	0	0	4

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Examination Scheme for EoSE

CA – Continuous Assessment
EoSE – End of Semester Examination

Regular Students

Type of Examination	Course Code and Nomenclature	Duration of Examination		Maximum Marks		Minimum Marks	
Theory	MDC-ZOO-51T-101 CLASSICAL ZOOLOGY	CA	[1] Hrs	CA	[20] Marks	CA	[8] Marks
		EoSE	[3] Hrs	EoSE	[80] Marks	EoSE	[32] Marks
Theory	MDC-ZOO-63T-201- ETHOLOGY, EVOLUTION, ECOLOGY AND WILDLIFE	CA	[1] Hrs	CA	[20] Marks	CA	[8] Marks
		EoSE	[3] Hrs	EoSE	[80] Marks	EoSE	[32] Marks
Theory	MDC-ZOO-75T-301- APPLIED ZOOLOGY	CA	[1] Hrs	CA	[20] Marks	CA	[8] Marks
		EoSE	[3] Hrs	EoSE	[80] Marks	EoSE	[32] Marks

The question paper will consist of **two** parts **A&B**.

PART-A: 20 Marks
Part A will be compulsory having 10 very short answer-type questions (with a limit of 20 words) of two marks each.

PART-B: 60 Marks
Part B of the question paper shall be divided into four units comprising question numbers 2-5. There will be one question from each unit with internal choice. Each question will carry 15 marks.

Non-Collegiate Students

Type of Examination	Course Code and Nomenclature	Duration of Examination		Maximum Marks		Minimum Marks	
Theory	MDC-ZOO-51T-101 CLASSICAL ZOOLOGY	EoSE	[3] Hrs	EoSE	[100] Marks	EoSE	[40] Marks
Theory	MDC-ZOO-63T-201- ETHOLOGY, EVOLUTION, ECOLOGY AND WILDLIFE	EoSE	[3] Hrs	EoSE	[100] Marks	EoSE	[40] Marks

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Theory	**MDC-ZOO-75T-301-APPLIED ZOOLOGY**	**EoSE**	**[3] Hrs**	**EoSE**	**[100] Marks**	**EoSE**	**[40] Marks**

The question paper will consist of **two** parts **A&B**.

PART-A: 20 Marks
Part A will be compulsory having 10 very short answer-type questions (with a limit of 20 words) of two marks each.

PART-B: 80 Marks
Part B of the question paper shall be divided into four units comprising question numbers 2-5. There will be one question from each unit with internal choice. Each question will carry 20 marks.

Syllabus
MDC-ZOO-51T-101 CLASSICAL ZOOLOGY
I/II-Semester - [ZOOLOGY]

Semester	**Code of the Course**	**Title of the Course/Paper**				**NHEQF Level**	**Credits**
I/II	**MDC-ZOO-51T-101**	**Classical Zoology**				**5**	**4**
Level of Course	**Type of the Course**	**Credit Distribution**			**Offered to NC Student**	**Course Delivery Method**	
		Theory	**Practical**	**Total**			
5	**MDC**	**4**	**0**	**4**	**Yes**	**Lectures: 60**	
List of Programme Codes in which Offered as Minor Discipline		Not Applicable					
Prerequisites		XII Pass					

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Objectives of the Course:	The learning objectives of this course are as follows: • Develop a comprehensive understanding of the taxonomy fundamentals through historical and modern classification principles. • Examine different levels of biological organization from cellular to organ systems. • Gain insights into invertebrate and vertebrate diversity, including classification and ecological roles. • Understand key physiological processes in digestion, respiration, circulation, and more. • Learn about species concepts and classification systems within the five-kingdom model.

MDC-ZOO-51T-101 CLASSICAL ZOOLOGY

Unit-I

Historical Perspective and Principles of Classification: Overview of Early Classification Systems and Modern Concepts of Taxonomy; Basic Principles of Classification: Hierarchy, Nomenclature, Identification, and Classification

4 Hrs.

Taxonomic Nomenclature and Classification System: Binomial Nomenclature and Its Rules; International Code of Zoological Nomenclature (ICZN); Artificial, Natural, and Phylogenetic Classification Systems; Five-Kingdom Classification (Monera, Protista, Fungi, Plantae, Animalia); Species Concept: Morphological, Biological, Phylogenetic

4 Hrs.

Levels of Organization and Body Plans: Cellular Organization (Unicellular, Multicellular); Tissue and Organ Level Organization; Body Symmetry (Radial, Bilateral); Germ Layers (Diploblastic, Triploblastic); Body Cavity (Acoelomate, Pseudocoelomate, Coelomate); Segmentation (Metamerism) **4 Hrs.**

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Basis of Zoological Classification: Morphological, Anatomical, Cytological, Biochemical, Physiological, Behavioral, and Ecological Characters **3 Hrs.**

Unit-II

Outline Classification of Invertebrates: From Protozoa to Echinodermata **2 Hrs.**

Life Cycle and Reproduction: Brief Overview of Paramecium, Sycon, Obelia, Taenia solium, Ascaris, Earthworm, Cockroach, Pila, and Starfish **9 Hrs.**

Social Organization in Invertebrates: Understanding the Social Structures in Invertebrates **2 Hrs.**

Economic Importance of Invertebrates: The Role and Significance of Invertebrates in Various Sectors **2 Hrs.**

Unit-III

Agnatha, Pisces, and Amphibia**:** General Characteristics of Agnatha; Classification of Cyclostomes up to Class; Chondrichthyes and Osteichthyes; Amphibia: Origin of Tetrapoda (Evolution of Terrestrial Ectotherms); General Characteristics and Classification up to Order; Parental Care in Amphibia **7 Hrs**.

Reptilia and Aves**:** General Characteristics and Classification up to Order in Reptiles; General Characteristics and Classification up to Order in Aves **4 Hrs.**

Mammals: General Characteristics and Classification up to Order; Affinities of Prototheria; Distribution of Vertebrates in Different Realms **4 Hrs.**

Unit-IV

Digestive and Excretory Mechanism: Mechanism of Digestion in Various Parts of the Alimentary Canal; Types of Nitrogenous Excretory End Products; Functional Architecture of Nephron; Mechanism of Urine Formation **4 Hrs.**

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Respiratory and Circulatory Systems: Mechanism and Control of Breathing; Exchange of Gases; Transportation of Oxygen and Carbon Dioxide in Blood; Composition and Functions of Blood; Structure and Function of Heart **4 Hrs.**

Nervous and Muscular Systems**:** Functional Architecture of a Neuron and Its Types; Origin and Propagation of Nerve Impulse; Functional Architecture of Skeletal Muscles; Mechanism of Muscle Contraction. **3 Hrs.**

Endocrine System: Secretions and Functions of Endocrine Glands: Pituitary, Adrenal, Thyroid, Parathyroid, Pancreas, Testis, and Ovary 4 Hrs.

Suggested Books and References

1. Biology, N.A. Campbell, J.B. Reece, & L.A. Urry, 2008, Pearson.
2. Vertebrate Life, F.H. Pough, C.M. Janis, & J.B. Heiser, 2005, Pearson.
3. Mammalogy: Adaptation, Diversity, Ecology, G.A. Feldhamer, L.C. Drickamer, J.F. Merritt, & S.H. Vessey, 2007, Johns Hopkins University Press.
4. Gastropods: Morphology and Anatomy, C.P. Hickman et al., 2008, Academic Press.
5. Modern Textbook of Zoology – Vertebrates, R.L. Kotpal, 2016, Rastogi Publications.
6. The Life of Vertebrates, J.Z. Young, 2004, Oxford University Press.
7. Invertebrate Zoology, Ruppert, Fox, & Barnes, 2004, Cengage Learning, India.
8. Biology of the Invertebrates, J.A. Pechenik, 2015, McGraw-Hill Education.
9. The Invertebrates: A New Synthesis, R.S.K. Barnes, P. Calow, P.J.W. Olive, D.W. Golding, & J.I. Spicer, 2002, Blackwell Science.
10. A Review of Medical Physiology, William F. Ganong, 2005, McGraw Hill.
11. Text Book of Animal Physiology, Veer Bal Rastogi, Kedarnath Ramnath, Meerut.
12. Eckert Animal Physiology, David R., Burggren Wand French K, 2001, W.H. Freeman & Company, New York.

Suggested E-resources:

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1. https://www.ncbi.nlm.nih.gov/books/NBK279393/
2. https://youtu.be/I6xrTOYnhG0
3. https://youtu.be/rQDsAI9uDyI
4. https://youtu.be/Hx8mXeRtOlo
5. https://youtu.be/vA26UI_htIU
6. https://onlinecourses.swayam2.ac.in/cec19_bt02/preview
7. https://onlinecourses.nptel.ac.in/noc20_bt42/preview (Animal Physiology)
8. Virtual Labs (http//www.vlab.co.in)

Course Learning Outcome:

- Grasp the fundamental principles of classification, including binomial nomenclature, and differentiate between artificial, natural, and phylogenetic classification systems.
- Examine cellular, tissue, and organ-level organization, body symmetry, germ layers, body cavities, and segmentation across various organisms.
- Study the classification, life cycles, and ecological roles of invertebrates and vertebrates, from protozoa to mammals, understanding their evolutionary significance.
- Gain insights into the mechanisms of digestion, respiration, circulation, and excretion, alongside the functional architecture of the nervous and muscular systems.
- Understand the roles and physiological impact of major endocrine glands, such as the pituitary, adrenal, thyroid, and pancreas, on the body's functioning.

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Syllabus

MDC-ZOO-63T-201 ETHOLOGY, EVOLUTION, ECOLOGY AND WILDLIFE

III/IV-Semester - [ZOOLOGY]

<table>
<tr><th>Semester</th><th>Code of the Course</th><th colspan="4">Title of the Course/Paper</th><th>NHEQF Level</th><th>Credits</th></tr>
<tr><td>III/IV</td><td>MDC-ZOO-63T-201</td><td colspan="4">Ethology, Evolution, Ecology and Wildlife</td><td>6</td><td>4</td></tr>
<tr><td rowspan="2">Level of Course</td><td rowspan="2">Type of the Course</td><td colspan="3">Credit Distribution</td><td rowspan="2">Offered to NC Student</td><td colspan="2" rowspan="2">Course Delivery Method</td></tr>
<tr><td>Theory</td><td>Practical</td><td>Total</td></tr>
<tr><td>6</td><td>MDC</td><td>4</td><td>0</td><td>4</td><td>Yes</td><td colspan="2">Lectures: 60</td></tr>
<tr><td colspan="2">List of Programme Codes in which Offered as Minor Discipline</td><td colspan="6">Not Applicable</td></tr>
<tr><td colspan="2">Prerequisites</td><td colspan="6">II/III Semester</td></tr>
<tr><td colspan="2">Objectives of the Course:</td><td colspan="6">The learning objectives of this course are as follows:
• Understand ecological interactions between organisms and their environment.
• Gain knowledge of population, community, and ecosystem ecology.
• Explore major ecosystems and biogeographical zones.
• Learn about wildlife conservation, threats, and protection strategies.
• Study animal behavior, social organization, and the process of evolution.</td></tr>
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MDC-ZOO-63T-201-ETHOLOGY, EVOLUTION, ECOLOGY AND WILDLIFE

Unit-I

Introduction to Animal Behavior: History, Concepts, Sign Stimulus, Fixed Action Pattern (FAP), Action-Specific Energy (ASE), Innate Releasing Mechanism (IRM) **4 Hrs.**

Learning in Animals: Definition and Types of Learning; Pheromones **3 Hrs.**

Biological Clocks: Introduction, Types, and Significance of Biological Clocks **3 Hrs.**

Parental Behavior and Social Organization: Patterns and Types of Parental Care; Properties and Advantages of Social Grouping, Social Groups of Monkeys **3 Hrs.**

Communication and Aggression: Auditory, Tactile, Visual, and Chemical Communication; Types and Causes of Aggression **2 Hrs.**

Unit-II

Historical Perspectives on Evolution**:** Lamarckism and the Theory of Inheritance of Acquired Characters, Pre-Darwinian Concepts of Life, Darwin's Voyage on the HMS Beagle **3 Hrs.**

Natural Selection and Evolution: The Driving Force of Evolution; Concept of Species, Speciation, and Isolation **4 Hrs.**

Genetic Drift, Gene Flow, and Migration: Understanding Evolutionary Mechanisms **4 Hrs.**

Mutations: Sources of Genetic Variations and Their Role in Evolution **4 Hrs.**

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Unit-III

Basic Concepts, Definitions, and Scope of Ecology**:** Organization Levels of Ecological Systems, Concept of Limiting Factors **3 Hrs.**

Population Characteristics and Community Organization: Structure and Organization of Communities, Species Interactions, Ecological Succession, and Climax Community **4 Hrs.**

Structure of Ecosystems: Biotic and Abiotic Components, Food Chains, Food Webs, Ecological Pyramids; Types of Ecosystems with Special Reference to India **4 Hrs.**

Biogeographical Zones of India: Types of Forest and Grasslands in India **4 Hrs.**

Unit-IV

Definition and Significance of Wildlife: Ecological Balance, Ecosystem Services, Economic, Cultural, and Recreational Values **4 Hrs.**

Threats to Wildlife:habitat destruction, degradation, fragmentation, overexploitation, poaching, pollution, climate change, illegal wild life trade **2 Hrs.**

Wildlife Conservation Strategies: Protected Areas and Reserves: National Parks, Wildlife Sanctuaries, and Biosphere Reserves; Captive Breeding, and Reintroduction Programs **5 Hrs.**

Emerging Technologies in Wildlife Conservation: Use of Drones, GPS, and Remote Sensing; Careers in Wildlife Studies **4 Hrs.**

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Suggested Books and References

1. Ecology and Environment, P.D. Sharma, Rastogi Publications.
2. Fundamentals of Ecology, E. Odum, Cengage India Private Limited.
3. Animal Behaviour, R. Mathur, Publisher Not Provided, Rastogi Publications.
4. Evolutionary Biology: Concepts and Applications, Douglas J. Futuyma.
5. Evolutionary Analysis, Scott Freeman & Jon C. Herron.
6. Why Evolution is True, Jerry A. Coyne, Popular Science.

Course Learning Outcome:

- Study animal behavior, learning processes, biological clocks, communication, and social organization.
- Grasp the principles of evolution, natural selection, speciation, and the role of genetic variation in evolutionary processes.
- Understand ecological concepts, community organization, and ecosystem structures.
- Explore biogeographical zones, forest and grassland types, and the significance of wildlife in maintaining ecological balance.
- Analyze threats to wildlife and conservation strategies, including emerging technologies and career opportunities.

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Syllabus

MDC-ZOO-75T-301 APPLIED ZOOLOGY

V/VI-Semester - [ZOOLOGY]

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
V/VI	MDC-ZOO-75T-301	Applied Zoology				7	4
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
7	MDC	4	0	4	Yes	Lectures: 60	
List of Programme Codes in which Offered as Minor Discipline		Not Applicable					
Prerequisites		III/IV Semester					
Objectives of the Course:		The learning objectives of this course are as follows: • Understand the fundamentals of microbiology, including the classification and structure of microorganisms. • Explore the significance of microorganisms in health, environmental, and industrial contexts. • Learn about major bacterial, viral, protozoan, and helminth diseases affecting humans. • Study the principles of animal husbandry and its role in human welfare. • Gain knowledge of specialized agricultural practices like lac culture, apiculture, sericulture, pearl culture, and					

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	vermiculture.

MDC-ZOO-75T-301-APPLIED ZOOLOGY

Unit-I

Overview of Microbiology: Definition and history of microbiology, Structure, Characteristics and classification of microorganisms: Bacteria, Viruses, Fungi, Protozoa, and Algae; Normal human flora, Vaccination, Importance of microbiology in health, environment, and industry **5 Hrs.**

Protozoan and Helminth diseases: Entamoeba, Trypanosoma, Leishmania, Plasmodium, Wuchereria, and Dracunculus. **5 Hrs.**

Arthropods as Disease Vectors: Malaria, Dengue, Filariasis, Japanese Encephalitis, and Plague. **5 Hrs**.

Unit-II

Bacterial Diseases:Tuberculosis, Strep Throat, Pneumonia, Whooping Cough, Urinary Tract Infection (UTI), Gonorrhea, Syphilis**,** Cholera, Diphtheria, Tetanus**,** Anthrax, Leprosy, Meningitis. **8 Hrs.**

Viral Diseases: Influenza (Flu), Common Cold, COVID-19, HIV/AIDS, Hepatitis (A, B, C), Measles, Chickenpox, Human Papillomavirus (HPV) Infections, Dengue Fever, Polio, SARS (Severe Acute Respiratory Syndrome). **7 Hrs.**

Unit-III

Animal husbandry: Livestock production and management (dairy farming, poultry farming, fish farming, etc.), the role of animal husbandry in human welfare (dairy, meat, medicine, fibre, manure, etc.) **5 Hrs.**

Lac culture: Elementary idea of Plant host and Life cycle of lac insect, management of culture industry, by-products **5 Hrs.**

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Apiculture: Bee species, social organization and the life cycle of honeybees, artificial bee hives, management of beekeeping, by-products **5 Hrs.**

Unit-IV

Sericulture: Introduction to sericulture, Species of silkworms, Life cycle of silkworms Silk production, Techniques in silk farming, Management of silkworms. **5 Hrs.**

Pearl Culture: Species of pearl oysters, Life cycle of pearl oysters, Pearl farming techniques and By-products of pearl culture **5 Hrs.**

Vermiculture: Life cycle of earthworms, Vermicomposting techniques, Setting up vermiculture bins, Maintenance, and management of vermiculture systems, Benefits and applications of vermiculture. **5 Hrs**

Suggested Books and References

1. Economic Zoology, Biostatistics and Animal behaviour S. Mathur, Rastogi Publications.
2. Economic Zoology, Shukla G.S. & Upadhyay V.B., Rastogi Publications.
3. Perspectives in Indian Apiculture. Mishra R C Allied scientific publ. Bikaner India 1999.
4. A Textbook of Applied Entomology, Srivastava, K. P., Publ. Kalyani Publishers, New Delhi. 1988.
5. Text Book of Applied Entomology Vol. I & II by K. P. Srivastava.
6. General Applied Entomology by B V David and T N Anathakrishnan.
7. Ahsan J and Sinha SP: A Hand book on Economic Zoology. 9' edition S. Chand & Co. Ltd., 1981.
8. Prescott's Microbiology by Joanne.M.Willey,Linda Sherwood,Christoppher J. Woolverton,2017. McGraw-Hill Education, Meerut.
9. Microbiology -concepts and applications: Micheal Joseph Pelczar,Eddie Chin Sun Chan,Noel R. Krieg. McGraw-Hill Education, Meerut

Course Learning Outcome:

- Classify and describe the structure and characteristics of various microorganisms, including bacteria, viruses, fungi, protozoa, and algae.

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- Identify and explain the causes, symptoms, and basic treatments of common bacterial and viral diseases.
- Recognize the importance of normal human flora and the role of vaccination in disease prevention.
- Demonstrate an understanding of livestock management and the production processes in dairy, poultry, fish farming, and other animal husbandry practices.
- Apply knowledge of specialized agricultural techniques in lac culture, apiculture, sericulture, pearl culture, and vermiculture for sustainable development.

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