As per the NEP 2020

Zoology

(Minor Syllabus)

(Effective from Academic Year 2024-2025 onwards)

Pandit Deendayal Upadhyaya Shekhawati University

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Semester	Course Code	Course Title	Contact Hrs per Week			Credits	Weightage (%)		
			L	T	P		CWS	MTE	ETE
I	24BZO5101M	Structure and Function of Non-Chordate	2	0	0	2	10	20	70
II	24BZO5201M	Structure and function of Chordates	2	0	0	2	10	20	70
III	24BZO6301M	Human Physiology	4	0	0	4	10	20	70
IV	24BZO6401M	Economic Zoology	4	0	0	4	10	20	70
V	24BZO7501M	Cell Biology & Classical Genetics	4	0	0	4	10	20	70
VI	24BZO7601M	Immunology	4	0	0	4	10	20	70
VI	24BZO7602M	Ecology and Evolutionary Biology	4	0	0	4	10	20	70

Semester – I

Objectives:
The course Objectives to provide students with a basic understanding of:
Basis of classification,
Salient Feature and Life cycle of prominent example
Different physiological body processes of invertebrates
Larval forms of invertebrates

Learning outcomes-Students can understand:
The basis of classification of non-chordate, Learn the systematics and biology of nonchordates through their adaptive features. 2. Study the functional biology of nonchordates through their body organization. 3. Comprehend identification of species and their evolutionary relationships.

Course Title:	Structure & Function of Non-Chordate	Course Code: 24BZO5101M
Total Lecture hour 30		Hours
Unit I	Five Kingdom Concept of classification Classification of Animal Kingdom upto Classes with prominent examples Basis of classification (brief account)-: Symmetry, Coelom, Segmentation, Embryogeny and level of organization	9
Unit II	Salient feature and life cycle of Amoeba, Plasmodium, Sycon, Hydra/ Obelia, Economic importance of Protozoan and Coral reefs,	7
Unit III	Salient Feature and life cycle of Tapeworm, Ascaris, Earthworm, Economic importance of Helminthes, Apiculture, Sericulture. Disease caused by mosquito and House fly, Ticks and mites.	9
Unit IV	Salient feature and Life cycle of Pila, Pinctada (Pearl Culture,) Star fish, Basic Character of Hemichordate and its body Adaptation.	5
Suggestive Readings:		

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1	Invertebrates Zoology Authors, E.L. Jorden and P.S. Verma
2	Modern text book of Zoology invertebrates, Author R.L. Kotpal
3	Economic Zoology, RastogiPublishers Authors, Shukla and Upadhyaya (2002).
4	Invertebrate structure and function. ; Barrington E.J.W. Thomas Nelson & Sons Ltd. London.

Semester – II

Outcome of the course: At the end of the course the student will be able to:

- Understands silkworms rearing and their products.
- Gain knowledge in Bee keeping equipment and apiary management.
- Acquaint knowledge on dairy animal management, the breeds and diseases of cattle and learn the testing of egg and milk quality.
- Acquaint knowledge about the culture techniques of fish and poultry.
- Acquaint the knowledge about basic procedure and methodology of Vermiculture.
- Learn various concepts of lac cultivation.
- Students can start their own business i.e. self-employments.
- Get employment in different applied sector

Course Title:	**Structure and function of Chordates**	**Course Code: 24BZO5201M**
Total Lecture hour 30		**Hours**
Unit I	Origin and general characters of Chordata phylum. Classification and characters of Lower Chordates, general characters of Agnatha.	**8**
Unit II	**Fishes:** General characters and classification up to Class level. Types of scales and fins of fishes, migration and parental care in fishes. **Amphibians:** General characters, *Ranatigrina* as type study, parental care, neoteny and paedogenesis.	**8**
Unit III	**Reptilia:** General characters and Identification of poisonous and non-poisonous snakes, biting mechanism of snakes. **Aves:** General characters and Study of *Columba* (Pigeon), Flight adaptations & bird migration.	**7**
Unit IV	**Mammalia:** General characters and classification up to order level, Study of rabbit. Economic importance of mammals.	**7**
Suggestive Readings:		
1	Evolution of Chordate Structure by H.S. Smith. Publisher: Hold Rinchart and Winstoin Inc. New York.	
2	Students Text Book of Zoology, Vol. II by AA Sedgwick. Publisher: Biblio Life.	
3	Comparative anatomy of vertebrates by CG Kent. Publisher: McGraw Hill, NY.	
4	Outlines of Comparative Autonomy of Vertebrates by JS Kingsley. Publisher: Central Book Depot. Allahabad.	

Semester - III

Course outcome:

- Understand the process of digestion, absorption and respiration along with the control mechanism.
- Understand the process of blood and lymph circulation along with the process of coagulation.
- Understand the structure of heart and cardiac cycle along with its control mechanism.
- Understand the process of Impulse generation and conduction as well as the role of endocrine system in physiology.

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- Understand the structure and function of muscles.
- Understand the process of excretion and control of blood pressure to maintain homeostasis.

Course Title:	Human Physiology	Course Code: 24BZO6301M
Total Lecture Hours 60		Hours
Unit I	**Digestion and Respiration:** **Digestion:** Mechanism of digestion & absorption of carbohydrates, Proteins, Lipids and nucleic acids, along control of digestive juices secretion. **Respiration:** Exchange of gasses, Transport of O2 and CO2, Control mechanism of respiration.	14
Unit II	**Circulation:** Composition of blood, blood corpuscles: structure and function, Structure of heart: Cardiac output, cardiac cycle, Control mechanism of heartbeat. Lymphatic system.	14
Unit III	**Neuro-endocrine:** Mechanism of generation & propagation of nerve impulse, structure of synapse, synaptic conduction. Types of hormone, Structure and function of different endocrine glands: Hypothalamus-pituitary, thyroid, parathyroid, pancreas, gonads and adrenal. Hypo & Hyper-secretions.	16
Unit IV	**Muscle Physiology:** Structure of skeletal muscle: contractile and non-contractile components, mechanism of contraction. **Osmoregulation and Homeostasis:** Excretion: modes of excretion, structure of kidney, Mechanism of urine formation. Hypertonic and hypotonic urine excretion.	16
Suggestive Readings:		
1	Tortora, G.J. and Derrickson, B.H. (2016). Principles of Anatomy and Physiology, 15th edition, John Wiley & Sons, Inc.	
2	Guyton, A.C. and Hall, J.E. (2011). Textbook of Medical Physiology, XII Edition, Harcourt Asia Pvt. Ltd/ W.B. Saunders Company. Philadelphia	
3	Linda, S.C. (2018) BRS Physiology, Wolters Kluwer, Philadelphia	
4	Shu-Xin Zhang (1999). An Atlas of Histology, Springer Science, New York.	

Semester – IV

Course outcome:

- Understands silkworms rearing and their products.
- Gain knowledge in Bee keeping equipment and apiary management.
- Acquaint knowledge about the culture techniques of poultry.
- Acquaint the knowledge about basic procedure and methodology of Vermiculture.
- Learn various concepts of perl culture.
- Students can start their own business i.e. self-employments.
- Get employment in different applied sector

Course Title:	Economic Zoology	Course Code: 24BZO6401M
Total Lecture Hours 60		Hours
Unit I	**Apiculture:** Species of honey bees in India, life cycle of *Apisindica*• Colony organization, division of labour and communication • Bee keeping as an agro based industry; methods and equipment: indigenous methods, extraction appliances, extraction of honey from the comb and processing • Chemical	15

	Nature of Bee venom, honey and bees wax and their uses • Pests and diseases of bees and their management	
Unit II	**Sericulture:** History and present status of sericulture in India • Species of Silk in India • Mulberry cultivation • Morphology and life cycle of *Bombyxmori*• Silkworm rearing techniques: Processing of cocoon, reeling, types of silk • Silkworm diseases-pests and their control.	**15**
Unit III	**Vermiculture:** Scope of Vermiculture. • Types of earthworms. •indigenous and exotic species of Earthworms. • Methodology of vermicomposting: containers for culturing, raw materials required, preparation of bed, environmental pre-requisites, feeding, harvesting and storage of Vermicompost. • Advantages of vermicomposting. Diseases and pests of earthworms.	**15**
Unit IV	**Pearl culture:** History and scope of pearl culture in India, Types of Species, Methods of pearl culture, harvesting of pearl culture. Pest of pearl culture. Product and importance of Pearl. **Poultry Farming:** Types of breeds and their rearing methods • Feed formulations for chicks • Nutritive value of egg and meat. • Disease of poultry and control measures.	**15**

Suggestive Readings:

1	Eikichi, H. (1999). Silkworm Breeding (Translated from Japanese). Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
2	Roger, M (1990). The ABC and Xyz of Bee Culture: An Encyclopedia of Beekeeping, Kindle Edition.
3	Shukla and Upadhyaya (2002). Economic Zoology, Rastogi Publishers Meerut.
4	YadavManju (2003). Economic Zoology, Discovery Publishing House.

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Semester V
Cell Biology & Classical Genetics

Course Objectives

1. To introduce the fundamental concepts of cell biology, including prokaryotic and eukaryotic cell structure and membrane dynamics.
2. To understand the structure and function of major cellular organelles and the mechanisms of cell division.
3. To provide a comprehensive understanding of Mendelian genetics and its extensions, including non-Mendelian inheritance patterns.
4. To explore the molecular basis and types of genetic mutations and chromosomal aberrations.
5. To develop analytical skills to relate cellular structures and genetic principles to biological functions and hereditary phenomena.

Course outcomes:
Upon successful completion of this course, students will be able to:

1. Differentiate between prokaryotic and eukaryotic cells and describe the fluid mosaic model of the plasma membrane.
2. Explain the structure and function of major organelles and distinguish between mitosis and meiosis.
3. Apply Mendelian principles and analyse inheritance patterns involving dominance, co-dominance, multiple alleles, and sex-linked traits.
4. Classify gene mutations and chromosomal aberrations with appropriate examples.
5. Integrate cellular and genetic concepts to explain biological processes and variations in living organisms.

Course Title:	**Cell Biology & Classical Genetics**	**Course Code: 24BZO7501M**
Total Lecture hour: 60		**Hours**
Unit I	Basic Concept of Cell: Structure of prokaryotic cell (E. coli), Difference between prokaryotic and eukaryotic cells, Plasma membrane: Structure (Fluid mosaic model) and function of plasma membrane.	**15**
Unit II	Cell organelles: Structure and function of Mitochondria, Nucleus, Golgi complex, Endoplasmic Reticulum, Ribosomes. Cell Division: Mitosis and meiosis.	**15**
Unit III	Mendelian Genetics and its Extension: Principles of Mendelian inheritance, Incomplete dominance and co-dominance, Multiple alleles.	**15**
Unit IV	Sex-linked, Sex- influenced and Sex-limited inheritance. Types of gene mutations (classification), Types of chromosomal aberrations (classification with one suitable example of each).	**15**

Reference and Reading Books:

1. Cooper, G.M. and Hausman, R.E. (2009). The Cell: A Molecular Approach. 5th Edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
2. Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments, 6th Edition, John Wiley & Sons. Inc. 3. Singh, S. P., & Tomar, B. S. (2008). Cell biology. Rastogi Publications, Meerut, India.
3. Cooper, G. M., Hausman, R. E., & Hausman, R. E. (2007). The cell: a molecular approach (Vol. 4). Washington, DC: ASM press.
4. Gupta, P.K. (2010). Cytogenetics. Rastogi Publications, Meerut, India

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Semester VI

Immunology

Course Objectives:

1. Understand the fundamental principles and historical development of immunology.
2. Identify and describe the components and functions of the immune system, including immune cells and organs.
3. Explain the nature of antigens, antibodies, and the mechanisms of antigen-antibody interactions.
4. Distinguish between different types of immunity and immune responses.
5. Comprehend the basis of blood group compatibility, transfusion biology, and immune disorders.

Course Objectives:

After successful completion of the course, students will be able to:

1. Describe the structure and functions of innate and adaptive immunity.
2. Identify the primary and secondary lymphoid organs and their roles in immune response.
3. Classify antigens and antibodies and explain their interactions in immune mechanisms.
4. Evaluate immune responses, including humoral, cell-mediated, and abnormal immune responses such as autoimmunity.
5. Apply knowledge of immunology to real-world contexts such as transfusion medicine, vaccine development, and disease diagnosis.
6. Understand the principles and applications of vaccines and immunization.

Course Title:	**Immunology**	**Course Code: 24BZO7601M**
Total Lecture hour: 60		**Hours**
Unit I	Introduction-Scope of immunology- Historical perspectives - Immunohematology- blood groups, blood transfusion, Rh-incompatibilities; Types of immunity- innate and acquired immunity.	**15**
Unit II	Anatomy of lympho-reticular system- primary and secondary lymphoid organs; Cells of the immune system.	**15**
Unit III	Antigens- Types, properties, antigenic determinants, haptens, adjuvants. Immunoglobins- types, structure and properties, Monoclonal and polyclonal antibodies; Antigen-antibody interactions. Vaccines- types, toxoids, antitoxins.	**15**
Unit IV	Immune responses- Primary and secondary immune response- Cell mediated and humoral immune responses, Immune responses against tumors, Immunologic tolerance and disorders, autoimmune diseases.	**15**

Reference Books:

1. Kuby Immunology – Judith A. Owen, Jenni Punt, Sharon Stranford
2. Janeway's Immunobiology – Kenneth Murphy, Casey Weaver
3. Roitt's Essential Immunology – Peter Delves, Seamus Martin, Dennis Burton, Ivan Roitt
4. Immunology – Richard Coico, Geoffrey Sunshine
5. Essential Immunology – Ivan M. Roitt

Semester VI
Ecology and Evolutionary Biology

Course Objectives:

1. To introduce the core principles and levels of ecological organisation, including autecology and synecology.
2. To understand ecosystem structure and dynamics, including food chains, food webs, and energy flow.
3. To explore strategies for wildlife conservation, with emphasis on Indian laws and tiger conservation efforts.
4. To provide a foundation in the theories of the origin of life and major concepts in evolutionary biology.
5. To analyse patterns of animal distribution through zoogeographical realms and understand biogeographical classification.

Course outcomes:

Upon successful completion of this course, students will be able to:

1. Explain the fundamental concepts of ecology and describe various ecological levels and processes.
2. Identify and compare ecological components such as food chains, webs, and pyramids, and assess energy flow through ecosystems.
3. Evaluate in situ and ex-situ conservation strategies and interpret the Wildlife Protection Act (1972).
4. Analyse classical and modern evolutionary theories, including Lamarckism, Darwinism, and Neo-Darwinism.
5. Describe global zoogeographical realms and explain the distribution of key fauna across different biogeographic regions.

Course Title:	**Ecology and Evolutionary Biology**	**Course Code: 24BZO7602M**
Total Lecture hours: 60		**Hours**
Unit I	Introduction to Ecology: Autecology and Synecology, Levels of organisation. Ecosystem: Food chain: Detritus and grazing food chains, Food web, Energy flow through the ecosystem, Ecological pyramids.	**15**
Unit II	Wildlife Conservation (in situ and ex-situ conservation). Management strategies for tiger conservation; Wildlife Protection Act (1972).	**15**
Unit III	Life's Beginnings: Origin of Life, Chemogeny, Biogeny. Theory and concept of evolution: Lamarckism, Darwinism and Neo-Darwinism.	**15**
Unit IV	Zoogeography: Zoogeographical realms, distribution of common fauna in different realms.	**15**
Reference and Reading Books:		

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1. Odum, E. P. (2004). Fundamentals of Ecology (5th ed.). Brooks/Cole.
2. Dash, M. C. (2001). Fundamentals of Ecology. Tata McGraw-Hill.
3. Rastogi, V. B. (2005). Ecology and Environmental Biology. Rastogi Publications.
4. Verma, P. S., & Agarwal, V. K. (2009). Environmental Biology. S. Chand & Company.
5. Kapoor, V. C. (2008). Theory and Practice of Animal Taxonomy and Biodiversity. S. Chand & Company.
6. Kotpal, R. L. (2006). Modern Textbook of Zoology: Vertebrates. Rastogi Publications.
7. Strickberger, M. W. (2005). Evolution. Jones & Bartlett Publishers.