SYLLABI AND SCHEME OF EXAMINATIONS
FOR MINOR COURSES OF
B.Sc. LIFESCIENCES
OFFERED BY DEPARTMENT OF ZOOLOGY

(Based on Curriculum and Credit Framework for UG Programs under NEP)

WITH EFFECT FROM
THE
SESSION 2024-25

MAHARSHI DAYANAND UNIVERSITY
ROHTAK (HARYANA)

SYLLABI AND SCHEME OF EXAMINATIONS FOR MINOR COURSES OF B.Sc. LIFESCIENCES OFFERED BY DEPARTMENT OF ZOOLOGY

Minor Courses (MIC)	TYPE OF PROGRAM			Credits Distribution			Total Credits	Workload			Total Workload	Marks				
	UG LIFESCIENCES	Nomenclature of Course	Course Code	L	T	P		L	T	P		Theory		Practical		Total Marks
	Semester											Internal	External	Internal	External	
MIC 1 @ 4 credits	1	Human Evolution	24ZOO401MI01	2	-	2	4	2	-	4	6	15	35	15	35	100
MIC 2 @ 4 credits	3	DNA fingerprinting	24ZOO402MI01	2	-	2	4	2	-	4	6	15	35	15	35	100
MIC 3 @ 4 credits	5	Introduction to Fisheries	25ZOO403MI01	2	-	2	4	2	-	4	6	15	35	15	35	100
MV 4 @ 4 credits	4	Animal Nutrition	25ZOO404MV01	2	-	2	4	2	-	4	6	15	35	15	35	100
MV 5 @ 4 credits	5	Poultry Farming	26ZOO405MV01	2	-	2	4	2	-	4	6	15	35	15	35	100
MV 6 @ 4 credits	6	Introduction to Vermiculture	26ZOO406MV01	2	-	2	4	2	-	4	6	15	35	15	35	100
MIC 7 @ 4 credits	7	-														
MIC 8 @ 4 credits	8	-														

L: Lecture; T: Tutorial; P: Practical

Note:

1. The Syllabi and Scheme of Examinations (SOE) for Minor (Vocational) Courses for UG Semester 7 and Semester 8 will be same as applicable for Vocational Course in Post Graduate semester 1 and semester 2 respectively.
2. Course coding of Minor courses for Single Major Programs will be applicable for Multidisciplinary Programs/ Multidisciplinary Programs after 2nd semester irrespective of their offering in any semester.
3. The student who selects any Minor Course (MIC) of any discipline in first semester should study the Minor courses (MIC) in the same discipline in the subsequent semesters. However, while exercising the option for choosing Minor Vocational Course MIC (VOC), the student may opt the discipline either related to the discipline of Minor Course or the discipline of Major Course or any other discipline as per his/her choice.

SYLLABI FOR MINOR COURSES OF B.Sc. LIFESCIENCES OFFERED BY DEPARTMENT OF ZOOLOGY

Semester .I.....
Session: w.e.f. 2024-25

Name of Program	**UG Lifesciences**	**Program Code**	**USZOO4**
Name of the Course	**Human Evolution**	**Course Code**	**24ZOO401MI01**
Hours per Week	**6**	**Credits**	**4=(2+0+2)**
Maximum Marks	**100**	**Time of Examinations**	**3hrs**

Note:
Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing short answer type questions from all units. Further, examiner will set two questions from each unit and the candidates will be required to attempt one question from each Unit. All questions will carry equal marks.

Course Learning Outcomes (CLO):
CLO1 explain the evolutionary process, how it works, and how scientists have come to understand the process (specifically to understand ourselves).
CLO2 describe the evolutionary history of our species and the biological bases that are at the foundation of this process.
CLO3 comprehend basic biological knowledge relating to molecular biology, cell reproduction, fundamental principles of micro-and macro-evolutionary theory (especially the role of natural selection), and the intellectual background leading to the development of evolutionary theory.
CLO4 explain from a comparative perspective how humans are related to other primates (and what this implies structurally, physiologically, and behaviorally).

Unit 1:
Origins of Evolutionary Thought: Linnaeus, Wallace/Darwin: Theory of evolution by Natural Selection.

Unit 2:
The forces of evolution and the formation of species. Natural selection, Genetic drift, Gene flow, Founder effect.

Unit 3:
Human variation and race. Human adaptation. Life History. Primate sociality, social behavior and culture: as an insight of the origin of sociality in humans.

Unit 4:
The hominin record. Early hominins and Australopithecus. Evolution of Human behavior Neanderthals and contemporaries

References:
Essentials of Biological Anthropology. Clark Spencer Larsen, W.W Norton & Company, 2019. 4th edition (earlier editions acceptable). ISBN: 9780393667431.

Practical's: based on the theory content

Semester .II.....

Session: w.e.f. 2024-25

Name of Program	UG Lifesciences	Program Code	USZOO4
Name of the Course	DNA fingerprinting	Course Code	24ZOO402MI01
Hours per Week	6	Credits	4=(2+0+2)
Maximum Marks	100	Time of Examinations	3hrs

Note:
Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing short answer type questions from all units. Further, examiner will set two questions from each unit and the candidates will be required to attempt one question from each Unit. All questions will carry equal marks.

Course Learning Outcomes (CLO):
CLO1: The students will get the knowledge of basic structure of DNA molecules
CLO 2. The students will understand of various DNA typing methods.
CLO 3. The students will get knowledge of performing DNA profiling of any biological samples aiming at investigations.
CLO 4. The students will get the application of DNA profiling.
CLO 5. Students will be able to learn practical exposure of DNA fingerprinting

Unit 1:
DNA Profiling: Introduction, History of DNA Typing, human genetics – heredity, alleles, mutations, molecular biology of DNA and RNA, DNA types.

Unit 2:
DNA Polymorphism: VNTR, STR, SNP, Mt DNA, DNA Markers, sequence polymorphism. DNA typing systems- RELP analysis, PCR amplifications.

Unit 3:
DNA profiling methods: Sample collection and preservation for DNA profiling, DNA Extraction, Analysis of SNP, STR, Y-STR. Mitochondrial DNA, evaluation of results, database, quality control, certification and accreditation.

Unit 4:
Forensic applications of DNA Profiling: Applications in disputed paternity cases, child swapping, missing person's identity – civil immigrations, veterinary, wildlife and agriculture cases, legal perspectives – legal standards for admissibility of DNA profiling. New and future technologies: DNA chips, Rapid DNA analyser, imitations of DNA profiling.

References:
1. J.M. Butler, Forensic DNA Typing, Elsevier, Burlington (2005).
2. K. Inman and N. Rudin, An Introduction to Forensic DNA Analysis, CRC Press, Boca Raton (1997).
3. H. Coleman and E. Swenson, DNA in the Courtroom: A Trial Watcher's Guide, GeneLex Corporation, Washington (1994).
4. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013).

Practical's: based on the theory content

Semester .III.....
Session: w.e.f. 2025-26

Name of Program	UG Lifesciences	Program Code	USZOO4
Name of the Course	Introduction to Fisheries	Course Code	25ZOO403MI01
Hours per Week	6	Credits	4=(2+0+2)
Maximum Marks	100	Time of Examinations	3hrs

Note:
Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing short answer type questions from all units. Further, examiner will set two questions from each unit and the candidates will be required to attempt one question from each Unit. All questions will carry equal marks.

Course Learning Outcomes (CLO):
CLO1: Students will be introduced to basic concepts of fisheries biology that will be developed in greater detail in subsequent classes.
CLO2: Students will be exposed to an array of fisheries biology methodologies including study design, sampling techniques, and report writing.
CLO3: Students will gain a perspective of available job opportunities and possible career paths within the fisheries field.

Unit 1:
Introduction - What is fisheries biology? Sampling strategies, Streams: physical sampling Electrofishing in fisheries

Unit 2:
Safety in Fisheries Work, Invasive Species - a growing threat to global fisheries, Climate change impacts on fisheries

Unit 3:
Fish measurement, Lakes & Reservoirs I: physical characteristics & processes, Roles of hatcheries in fisheries management

Unit 4:
Lakes & Reservoirs II: sampling fishes & plankton, Stream and lake reclamation, Fishes: handling & transport

References:
1. APHA (1995) Standard Methods of Examination of Water and Wastewater. American Public Health Association,
AWWA, WCPF, Washington DC.
2. Bardach, JE, Ryther & McLarney, Wo (1972) Aquaculture, New York: Wiley-Interscience. 896pp
3. Gupta S.K. and Gupta P.C. (2006) General & Applied Ichthyology: Fish and Fisheries. S Chand Publications, New
Delhi
4. Jhingran, VG (1983) Fish and Fisheries of India. Hindustan Publishing Corporation (India) 954 pp
5. Khanna, S.S. and Singh, H.R. (2014). Text book of Fish Biology and Fisheries 3rd edn (PB) Narendra Publishing
House, India

Practical's: based on the theory content

Semester .IV.....
Session: w.e.f. 2025-26

Name of Program	UG Lifesciences	Program Code	USZOO4
Name of the Course	Animal Nutrition	Course Code	25ZOO404MV01
Hours per Week	6	Credits	4=(2+0+2)
Maximum Marks	100	Time of Examinations	3hrs

Note:
Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing short answer type questions from all units. Further, examiner will set two questions from each unit and the candidates will be required to attempt one question from each Unit. All questions will carry equal marks.

Course Learning Outcomes (CLO):
CLO1: Students will be able to basic understand the concepts of Animal digestion.
CLO2: Students will be exposed to an array of Food Procurement in animals.
CLO3: Students will also gain a knowledge of Nutritional Requirements in animals.

Unit 1:
Food Procurement: Autotrophs: Photosynthetic and Chemosynthetic; Heterotrophs: Herbivores, Carnivores, Omnivores, Insectivores, Cannibalism, Saprotrophs and Parasitism.

Unit 2:
Organs of Digestion: Mouth/Buccal cavity and its glands; Stomach and its glands, Small intestine and its glands, Large intestine; Liver

Unit 3:
Nutritional Requirements: Balanced diet, Macro-nutrients, Micro- nutrients, Carbohydrates, Proteins, Fats, Water and various related deficiency diseases.

Unit 4:
Energy requirement, Vitamins: Fat soluble and water soluble; various related deficiency diseases. Minerals: and various related deficiency diseases. Obesity and Anorexia.

References:

1. Peter R. Cheeke. Applied animal nutrition: feeds and feeding. First published in 1991
2. Gita Cherian 2023. A Guide to the Principles of Animal Nutrition Author
3. Peter R. Cheeke 2010. Comparative animal nutrition and metabolism .

Practical's: based on the theory content

Semester .V.....
Session: w.e.f. 2026-27

Name of Program	UG Lifesciences	Program Code	USZOO4
Name of the Course	Poultry Farming	Course Code	26ZOO405MV01
Hours per Week	6	Credits	4=(2+0+2)
Maximum Marks	100	Time of Examinations	3hrs

Note:
Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing short answer type questions from all units. Further, examiner will set two questions from each unit and the candidates will be required to attempt one question from each Unit. All questions will carry equal marks.

Course Learning Outcomes (CLO):
CLO1: Understand the field level structure and functioning of Poultry Farming
CLO 2. This course will enlighten the students about the operation of livestock and poultry farming.
CLO 3. It will develop the knowledge of poultry in an operational farm for more profit management, feed requirements etc.
CLO 4. Learning of poultry farming will generate a source of employment opportunities in rural areas and employment to the
farmers.
CLO 5. Will gain all round knowledge of Poultry Farming as a business enterprise rather than as a community profession

Unit 1:
General introduction to poultry farming -Definition of Poultry
Past and present scenario of poultry industry in India.
Breeds, Varieties and Strains,
Life cycle of poultry birds

Unit 2:
Poultry feed management – Principles of feeding
Nutrient requirements for different stages of layers and broilers.
Feed formulation
Methods of feeding.

Unit 3:
Layer Industry in India
Systems of layer farming – Location & Lay out of the farm
Systems of housing –Types of roof, materials, pillars, trusses for poultry house
Management of layers in different systems of rearing.

Unit 4:
Poultry diseases – viral, bacterial, fungal and parasitic (two each); symptoms,
control and management.
Vaccination programme, Cleaning, Disinfection and Fumigation of Poultry Houses

References:
1. Das D, Das B C, Nayak N, Jena B, Sahu A R 2021,"TextBook on Poultry Management" Narendra Publishing House
2. Ghosh N 2015,"Poultry Science And Practice: A Textbook" CBS Publishers & Distributors
3. Prasad Rajeshwar (2010): Poultry Management Alfa Publications.
4. Singh R A 2009," Poultry Production" Kalyani Publishers
5. Shukla, G. S. and Upadhyay, V. B. (2011): Economic Zoology. Rastogi Publications.

Practical's: based on the theory content

Semester .VI.....
Session: w.e.f. 2026-27

Name of Program	**UG Lifesciences**	**Program Code**	**USZOO4**
Name of the Course	**Introduction to Vermiculture**	**Course Code**	**26ZOO406MV01**
Hours per Week	**6**	**Credits**	**4=(2+0+2)**
Maximum Marks	**100**	**Time of Examinations**	**3hrs**

Note:
Examiner will set nine questions and the candidates will be required to attempt five questions in all. Question number one will be compulsory containing short answer type questions from all units. Further, examiner will set two questions from each unit and the candidates will be required to attempt one question from each Unit. All questions will carry equal marks.

Course Learning Outcomes (CLO):
CLO1: Student will get the knowledge of composting
CLO 2. The student will get the knowledge of biodiversity of local earthworms
CLO 3. The student can generate income by supplying worms, vermiwash and vermicompost.
CLO 4. It leads towards organic farming and healthy food.
CLO 5. Student will be trained to identify Earthworms and their use in small vermicompost bin for converting the home waste.

Unit 1:
About Earthworm: Basic body structure of earthworm (General body plan, Prostomium, Peristomium, Metamerism, Cuticle, Setae, Different body pores, Clitellum, Digestive system).

Unit 2:
Earthworm Ecology: Distribution; Food habit and habitat; Ecological requirements: moisture, temperature, pH, organic matter etc.; Ecological categories: Epigeic, Endogeic and Anecic earthworms; Ecosystem services i.e. role played by earthworms in soil ecosystem.

Unit 3:
Reproduction: Hermaphroditism, Copulation and cocoon formation, Cocoon structure, Incubation period of cocoon in vermicomposting earthworms, Fecundity in surface drvelling (epigeic) and soil dwelling (endogeic and anecic) earthworms.

Unit 4:
Vermiculture: Definition, Difference between vermiculture and vermicomposting, Selective features of earthworms for vermiculture and vermicomposting, Method of vermiculture of phytophagous and geophagous earthworm, Utility of vermiculture (protein source for pisciculture, poultry farming, piggery etc., application in vermicomposting).Cleaning, Disinfection and Fumigation of Poultry Houses

References:
1. Dash, M. C. (2012). Charles Darwin's Plough Tool for Vermitechnology. I.K. International Publishing House Pvt Ltd. New Delhi, India.
2. Tripathi, G (2003). Vermiresources Technology Discovery Publishing House, New Delhi.
3. Rajnesh Kumar Sharma and Poonam Bhardwaj (2018). Green Farming- Earthworms and Vermitechnology. RAR

Practical's: based on the theory content