M.Sc. Wildlife Science

CHOICE BASED CREDIT SYSTEM (CBCS)
2024-25

Course outline & Syllabus

University of Kota, Kota M.B.S. Marg near Kabir circle, 324005

Rajasthan is a land of stupendous dimensions, which are colourful, exotic, traditional and modern. Rajasthan is fortunate to have richness of natural beauty, flora and fauna accompanied with places of religious, historical and archeological importance. The rich cultural and historical heritage of the state attracts people from other states of India as well as from all over the world. So far tourism in Rajasthan has been attracting domestic and foreign tourists towards its National Parks and Wild Life Sanctuaries in large numbers but looking to the enchanting beauty and splendor of the picturesque forest wealth present in the hills of Aravallis and Vindhyas there is still lot of scope of opening avenues of wildlife tourism related to nature and forests. The forests of Rajasthan have tremendous potential in the tourism sector. The development of "Green Tourism or Eco-tourism" will not only enhance the tourist arrivals in the state but also earn sizable foreign exchange together with employment generation largely in an around forest areas benefitting rural and tribal population of the state.

The state houses tigers, black bucks, chinkara, the sporadic desert fox, the greatly threatened caracal, the Great Indian bustard, gharial, monitor lizard, wild boars, porcupine etc. Exotic traveling birds like the common crane, ducks, coots, pelicans and the rare Siberian cranes, imperial sand grouse, falcons, buzzards herd to this land throughout the bitter chilly winter months. Large characteristic zones strongly demonstrating each of the ecologies have been reserved as vast singular wildlife extents. Rajasthan proudly lays claim to two National Parks, over a dozen Sanctuaries and two Closed Areas.

Kota is very rich in flora and fauna and Mukundara Hills Tiger Reserve is one of the prominent outcomes of the rich biodiversity notified by Govt. of India. The growing need of scientific studies with public awareness in Wildlife Science has triggered University of Kota to initiate the PG degree course as self-financing scheme at Kota (Rajasthan) in the year 2010.

The Wildlife program is a very rigorous program designed to provide the education and experience for being of wildlife professionals. The course is entirely taught by Guest faculty and Extension lectures of specialized experts are conducted to ensure the exposure of the students to the latest research and monitoring skills, techniques and software in their respective fields. Students from all over India are undergoing the course. The students from all the states of India and one NRI student from California US have pursued the course.

Objectives:

Wildlife Science focuses on the biology and management of wild animals, including their ecology and conservation. As a wildlife scientist one will study native and exotic birds, mammals, reptiles and amphibians in natural or created environments, their biodiversity and human-wildlife interactions, and to evaluate wildlife management programs for captive and free-ranging wildlife.

Wildlife Science course enables to develop:

~ Knowledge of wildlife conservation, and a critical understanding of concepts such as sustainability and sustainable development

~ An understanding of the construction and analysis of data sets for different purposes.

~ Practical skills in mapping biodiversity and running spatial analysis to understand and illustrate conservation issues (GIS)

~ An understanding of ecological networks and ecosystem services.

~ An understanding of environmental changes and the consequences.

~ Approaches to habitat recreation.

~ Understanding of socio-political and ethical dimensions of conservation problems.

~ Confidence in use of universally available resources and open-access softwares.

~ Transferable skills necessary for employment.

Course Structure

The M.Sc. course in wildlife science is a two year full time curriculum offered in the form of Choice-based Credit System organized in four semesters of 24 credits each. Each semester is structured into theory papers with lab & field practicals, which will be evaluated during the semester. The first three semesters have four theory papers with four credit each and field and laboratory practical of 08 credits. Each theory paper is sub-divided into 5 Unit. The assignment and practical exercises will also be administered separately by coordinators. (Third semester will also have one specialized paper on research design and for developing pre- proposal for dissertation). The fourth semester is a dissertation programme (field/lab work and data analysis and writing)

There is an equal emphasis on providing theoretical understanding and developing practical skills. Classroom lectures, assignments, group discussions and extended field visits are therefore given equal importance. Each month will have about 20 working days, and each day will have three lecture hours and two practical hours.

An important activity during the course is critical review of published research. In the assignments and presentations the student is expected to provide an overview, synthesis of work done in the past and critical evaluation based on the information that has been gathered. Sixty percent of the credit will be taught as regular class-room teaching and 40% will be interactive learning, which will include seminars, group discussions, assignments, power-point and poster presentations etc**.**

Field Study

In all there will be field tours for Orientation, Techniques, National Park, Wetland field, Conservation Practice and Management. These field studies are compulsory and part of the curriculum and will be conducted during the first three semesters. The students will be required to prepare reports and these will be evaluated during the respective semester.

Assignments and Seminars

Substantial time is made available for assignments and seminars, besides additional time during particular semester. These assignments and seminars will be based on the theory papers in the respective semesters.

Dissertation

Wildlife Science is essentially a field-based subject, and therefore due emphasis is given to this. The entire duration of the fourth semester is allotted for an independent field and or lab based dissertation project. As part of the preparations for the dissertation project students are required to submit a Pre-Proposal of 1000 words by the end of the third semester (Format of pre-proposal will be circulated at the start of the semester). Upon acceptance of their pre- proposal, a detailed proposal needs to be submitted in the first week of beginning of IV Semester. The dissertation will be submitted in the prescribed format within the 16- 18 week.

Attendance

Admitted students have to attend all the lectures, practical and field tours. A minimum of 75% attendance in each semester is required in order to be allowed to appear in the University examination.

Examinations

Evaluation of the theory papers will be both external and internal in the ratio of 70:30 respectively. The theory paper examination for 70 marks will be conducted by University of Kota at the end of each semester. The internal examination for 30 marks will be conducted by the respective paper coordinator. There will be two internal assessment tests each of 15% weight-age, for theory papers in each semester. Each internal assessment test shall be of one hour duration for each paper and shall be taken according to academic calendar notified by the University. For practical papers there will be only one external assessment (100% of maximum marks). There will be no internal examination in the practical paper. The fourth semester examination will be evaluation of the dissertation by external and internal examiners including dissertation presentation and viva-voce including 24 credits.

Students are required to apply in the prescribed application form for appearing in the theory examination and need to pay the necessary examination fees on the date to be notified by the

University. The candidate shall be declared as pass in a semester examination, if he/she secures at least 40% marks in each theory paper separately in external and internal examination and 50% marks in each practical paper at least 50% marks in project/dissertation with 50% aggregate marks in that semester. The semester wise distribution of the courses and papers are given below:

Semester-Wise Distribution of Marks

***University Exam Theory papers 70 marks +Internal Evaluation Theory papers 30marks**

Semester	Details		Marks
1	4 Papers (100 marks each*) Lab and Field Practical		400 200
		Total Marks	**600**
2	4 Papers (100 marks each*) Lab and Field Practical		400 200
		Total Marks	**600**
3	4 Papers (100 marks each*) Lab and Field Practical		400 200
		Total Marks	**600**
4	Dissertation internal Dissertation external Project reports and Viva-Voce		200 200 200
		Total Marks	**600**
	GRAND TOTAL	**New Scheme**	**2400**

In order to qualify for the M.Sc. degree, a student should:

(a) Secure minimum 40% in each theory paper separately in external and internal examination and 50% in practical examinations, with 50% aggregate marks.

(b) Secure minimum 50% in his/her dissertation and viva-voce examinations.

Classification of successful candidates after last semester examination

	Description of Marks Obtained
•	80% and above marks in a paper
•	A candidate who has secured aggregate 60% and above but less than 80% marks
•	A candidate who has secured aggregate 50% and above but less than 60% marks

If a candidate clears any paper(s) prescribed at the Semester Examination after a continuous period of two years, then for the purpose of working out his division the minimum pass marks only viz.40% (50% in the case of practical) shall be taken into account in respect of such papers(s)/ Practical(s) are cleared after the expiry of the aforesaid period of three years; provided that in case to reach the minimum aggregate as many marks out of those actually secured by him will be taken into account as would enable him/her to make up the deficiency in the requisite minimum aggregate.

A total of twelve theory papers (3 hours duration each) are prescribed in (4 in each semester). Field and Lab/Computer practical Examination (5 hrs. duration each) shall be conducted in each semester.

The pattern of examination will be similar as adopted in other. P.G. exams of University of Kota along with by means of dissertations / Project Report / Seminar as prescribed in the syllabus.

Pattern of Q. Paper will follow the adopted scheme i.e. the Q.P. will be divided in three sections A,B, & C. Section 'A" Will contain 10 short answer type questions and all will be compulsory. Section 'B' will contain 10 questions, 2 from each unit. Candidate will be required to attempt 5 questions selecting 1 from each unit. Section 'C' will contain 4 question set from different units. Candidate will be required to attempt any 2 questions. **(Old Scheme)**

Pattern of Q. Paper will follow the adopted scheme i.e. the Q.P. will be divided in to 2 sections A & B Section 'A' will contain 10 short answer type questions (20 marks) and all will be compulsory. Section 'B' will contain 10 questions, 2 from each unit. Candidate will be required to attempt 5 questions selecting 1 from each unit (50 marks).Minimum passing marks28/70. **(New Scheme)**

A candidate may be promoted to III semester if he/she secures at least 40% marks in at least seven out of ten papers (8 theory papers + 2 practical's) prescribed at the I and II semester taken together provided that the aggregate marks in all theory papers of I and II semester taken together is at least 50%. Such candidate shall be required to appear in theory papers in which he/she has secured less than 40% marks of I and II semester along with the theory papers of III and IV (Project) semester respectively, as and when such examinations are held.

A candidate may be promoted to second year if he/she has secured at least 40% marks in each theory paper but has failed to secure 50% marks in aggregate (theory and practical separately). He shall be required to appear in some theory papers of I and II semester so as to make his aggregate at least 50% along with III and IV (Project) semester, whenever examination of these courses are held.

A candidate may be allowed grace marks at maximum two places up to the extent of 1% of the total marks prescribed for that examination.

Eligibility

B.Sc. in Forestry Science

OR

B.Sc. with Chemistry and any one of the following subjects: Anthropology /Bio-Chemistry /Bio-Physics /Bio-Technology /Botany / Chemistry/Computer Science/Nursing/ Veterinary science /Genetics /Mathematics /Micro-Biology/Pharmacy/ Physics/ Statistics/Zoology/Botany or equivalents.

OR

MBBS / BDS / B.Tech or equivalents, from any University recognized by UGC with 50% marks. (For SC/ST/OBC/SOBC is 40%) pose of working out his division the minimum pass marks.

Category-A

Course Structure with Distribution of Marks and Credits for PG subject with Practical component

Year / Semester	Serial Number, Code & Nomenclature of Paper			Duration of Exam	Teaching Hrs/Week & Credit			Distribution of Marks			Min. Pass Marks	
	Number	Code	Nomenclature		L	P	C	Internal Assess.	Sem. Assess.	Total Marks	Internal Assess.	Sem. Assess.
I Year **I Semester**	1.1	Paper-I	Theory	3 Hrs	4	--	4	30	70	100	12	28
	1.2	Paper-II	Theory	3 Hrs	4	--	4	30	70	100	12	28
	1.3	Paper-III	Theory	3 Hrs	4	--	4	30	70	100	12	28
	1.4	Paper-IV	Theory	3 Hrs	4	--	4	30	70	100	12	28
	1.5	Paper-V	Practical –I (Day 1 = Lab Prac. + Day 2 = Field Prac.)	5 Hrs per day	--	16	8	--	100 + 100	200	--	100
	Total				**16**	**16**	**24**	**120**	**480**	**600**	**--**	
I Year **II Semester**	2.1	Paper-VI	Theory	3 Hrs	4	--	4	30	70	100	12	28
	2.2	Paper-VII	Theory	3 Hrs	4	--	4	30	70	100	12	28
	2.3	Paper-VIII	Theory	3 Hrs	4	--	4	30	70	100	12	28
	2.4	Paper-IX	Theory	3 Hrs	4	--	4	30	70	100	12	28
	2.5	Paper-X	Practical –I (Day 1 = Lab Prac. + Day 2 = Field Prac.)	5 Hrs per day	--	16	8	--	100 + 100	200	--	100
					16	**16**	**24**	**120**	**480**	**600**	**--**	
II Year **III Semester**	3.1	Paper-XI	Theory	3 Hrs	4	--	4	30	70	100	12	28
	3.2	Paper-XII	Theory	3 Hrs	4	--	4	30	70	100	12	28
	3.3	Paper-XIII	Theory	3 Hrs	4	--	4	30	70	100	12	28
	3.4	Paper-XIV	Theory	3 Hrs	4	--	4	30	70	100	12	28
	3.5	Paper-XV	Practical –I (Day 1 = Lab Prac. + Day 2 = Field Prac.)	5 Hrs per day	--	16	8	--	100 + 100	200	--	100
	Total				**16**	**16**	**24**	**120**	**480**	**600**	**--**	
II Year **IV Semester**	4.1	Paper-XVI	Dissertation Internal	5 Hrs		--	8			200		100
	4.2	Paper-XVII	Dissertation External	-		--	8			200		100
	4.3	Paper-XVIII	Project Report and Viva	5 Hrs per day		--	8			200		100
										600	**--**	
G.Total										**2400**	**--**	

Note: In full or partial mode, the second/last year may be devoted to Dissertation with Presentation and Viva-Voce/Research Project with Presentation and Viva-Voce/Comprehensive viva-voce or Internship, etc. Each theory paper will be allocated a workload of 4 Hrs. / week and practical component will be allocated a workload of 16 Hrs/week i.e. 1 Hrs/week/credit for theory and 2 Hrs/week/credit for practical.

Semester-I
(Tentative Syllabus 2024-25)

WLS –101: Biogeography, Ecology and Vegetation Science (04 Credits)

Unit - I

Biogeography (0.8 Credit)

Biogeography: Continental drift, bio-geographical realms (8-Afrotropical, Antarctic, Australian, Indomalayan, Nearctic, Neotropical, Oceanian and Palearctic) and 14 Biomes.

Applied biogeography, endemism, refugia. Biogeographic Classification of India.

Dispersal: Ecology of dispersal, barriers, corridors and their importance; threats and solution.

Unit - II

Introduction to Biological Diversity and Evolution (0.8 Credit)

Types of Biodiversity, levels of biodiversity: alpha, beta, gamma diversity, keystone species, umbrella species, flagship species, indicator species, indigenous and introduced / exotic species. Natural selection, Species concept and speciation; phylogenetic, evolutionary and ecological species concepts. Macroevolution, co-evolution.

Unit – III

Fundamentals of Ecology (0.8Credit)

Basic concepts and structure of ecosystems: abiotic and biotic components (Interspecific and intraspecific interaction), energy flow. Trophic equilibrium: food chains, ecological pyramids, food webs, biogeochemical cycles (C, N, O, S, and P cycle): nutrients and minerals. Ecological niche, Concept of productivity: Types of productivity, GPP, NPP, secondary productivity.

Unit-IV

Environmental Pollution (0.8 Credit)

Pollution: Definition, Types, sources Global warming and climate change, green house effect, ozone layer depletion, acid rain, impact and control measures, Environmental monitoring; concept of sustainable development , eutrophication and biomagnification.

Unit- V

Succession and Forest soil (0.8 Credit)

Succession: Primary and secondary succession. Plant succession: Hydrosere, Lithosere, Xerosere; concepts and processes. Forest soils: Classification, Factors affecting soil formation, Physical, Chemical and Biological Properties.

Causes of erosion; Types of erosion (wind and water erosion), Conservation and management of eroded soil/areas. Wind break/shelter belt, sand dunes; reclamation of saline and alkaline soil, water logged soils.

WLS –102: Biology of Indian Wildlife (04 Credits)

Unit – I

Non-Chordates (0.8 Credit)

Major phyla of non chordates – Protozoa to Echinodermata, distinguishing characters; Social organization and economic importance of – Honey bee, Termites, Ants and Silkworm. Preliminary knowledge about Butterflies, Moths, Dragonflies, Scorpions, Spiders.

Unit – II

Ichthyology (0.8 Credit)

Classification (up to order0 of fishes in India.

Ecology and adaptations of fishes in different ecosystems. Economic importance.

Introduction to biology of sport fishes (Mahseer, Trout and common carp).

Difference between elasmobranchs, osteichthyes, Skates, Rays; Threats and conservation perspectives of fish biodiversity of India. Threatened fishes of India.

Methods to study ecology of fish habitat diversity, abundance, growth (with names of methods), commercially important fresh water, brackish and marine fishes of India.

Unit – III

Batracology & Herpetology (0.8 Credit)

Batracology: Taxonomy of amphibians (up to order); characteristics, examples, their role in nature, threats to their existence and conservation measures. Difference between; frog, toad, newt, salamander siren, apoda.

Herpetology: Taxonomy of reptiles (up to order), characteristics, examples, their role in nature, threats to their existence and conservation measures.

Comparative Ecology: Differences among Lizard, Gecko, Agma, Chameleon, Skink and Gila Monster; Turtle, Tortoise and Terrapins; Crocodile, Gharial and Alligator.

Behavioural and Physiological Adaptations - Trampling and Thermoregulation, Aestivation and Hibernation. Role of temperature in sex determination.

Snake Identification: Venomous and non venomous snakes. Characteristics of Indian Krait, Saw-scaled Viper, Russell's Viper and Indian Cobra.

Medical Response to Snake Bites - Types of Venom, Anti-venom Treatments, First Aid and Management of Snake Bite cases.

Unit – IV

Ornithology (0.8 Credit)

Avian classification (up to order) and distribution with special reference to Rajasthan birds. Morphological adaptations in bills and claws. Development of feathers, flight adaptations, plumage and moult, diurnal and nocturnal adaptations; Activities of birds: roosting, calls and songs; methods (with names of methods) for analyzing and recording calls and songs.

Bird Migration and navigation, Impact of migrants on resident species of birds. Threats faced by the avian community, causes of decline of common birds and their control measures. Concept of IBAs (Important bird areas), EBAs (Endemic bird areas) and bird census techniques.

Unit – V

Mammalogy (0.8 Credit)

Characteristics and Classification of mammals (up to order) of Indian sub-continent. Zoogeography of Indian mammals. Morphological adaptations in mammals. Difference between Antelope, deer, cheetah, tiger, leopard, lion, otter, beaver, weasel, mongoose; hedge hog, echidna; rabbit and hare; armadillo, pangolin; primates, New World Monkeys, Old World Monkeys, Greater Apes; Dugong, seals; White footed fox, small Indian fox, African elephant and Asian elephant.

WLS -103: Landscape Ecology, Remote Sensing and Animal Welfare (Credits 04)

Unit – I

Landscape Ecology and Remote Sensing (0.8Credit)

Fundamentals of landscape ecology; basics of cartography, Basics of remote sensing, principal of active and passive remote sensing. Sensors, image interpretation and digital image processing.

Unit –II

GPS and GIS (0.8 Credit)

Global positioning system (GPS): Working principle, advantages, limitations and applications. Geographical information system: data entry and preparation, concept of database and meta data, spatial modelling and data visualization. Concept of electromagnetic spectrum. Types of platforms and scanning systems.

Unit- lll

Forest Protection (0.8 Credit)

Damage to forest: Abiotic and biotic, destructive agencies, insect-pests and disease, prevention and protective measures (chemical and biological control), Effects of air pollution on forests and forest die back. Role of afforestation and forest regeneration in absorption of CO_2, concept of carbon sequestration and carbon credits.

Unit-IV

Legislation and animal welfare (0.8 Credit)

Laws and policies of Zoo: Animal Welfare Legislation in India, Prevention of cruelty to Animals Act 1960, National Zoo Policy, law & rules. Experimentation on animals (control & supervision) Rule 1998.

Unit- V

Watershed Management (0.8 Credit)

Role of micro-organisms in ameliorating (improving) soils; Function of vesicular arbuscular mycorrhiza fungus (VAM) in absorption of nutrients from soil, Concepts of watershed; role of mini-forests and forest trees in overall resource management, forest hydrology, watershed development in respect of torrent control, river channel stabilization, avalanche and landslide control, rehabilitation of degraded areas.

WLS-104 Plant Systematics and Utilization of plants. (04 credits)

Unit –I

Plant Systematics (0.8 Credit)

Introduction to plant systematics, necessity and importance of classification. Basis of Bentham and Hooker's classification, Engler and Prantl classification.

Techniques of vegetation survey and quantifications (with the names of the techniques).

Unit-II

Forest Types (0.8 Credit)

Champion and Seth's classification of Indian forests. Major forest types of Rajasthan (Tropical thorn forest, Tropical dry deciduous forest, Bamboo forest, Central India Subtropical forest, Mixed miscellaneous forest).

Unit-III

Natural Habitats(0.8 Credit)

Deserts - types of deserts (Arid, semi arid, temperate, cold); factors affecting desertification. Grasslands – types of grasslands (Savannah, temperate, tropical, sub-tropical and montane).

Unit-IV

Angiosperm Taxonomy (0.8 Credit)

Brief History, it aim and approaches, fundamental components, Alpha taxonomy, Omega taxonomy, Keys, Botanical nomenclature, Principals and rules. Salient features of international nomenclature including the naming of taxa according there rank.

Unit-V

Phytogeography and Utilization of Plants (0.8 Credit)

Brief idea of Phytogeography: Phytogeographical regions of India with special reference to Rajasthan. Fiber-Cotton, Jute, classification of fibers, History and origin, Important fibers; Distribution/ Types, suitable climate and soil. General account on sources of firewood, timber and bamboos.

PRACTICAL (SEMESTER-I)

WLS-105: Laboratory and Field Practical-I (08 Credits)

Min Pass Marks-100 Max. Marks – 200 marks

(A) Laboratory Practical (Day-1) 5 hours MM: 100 marks

1. Data entry, data summarization, data management, Chart and graph making in Excel.
2. Introduction of GPS, Map making.
3. Linking GPS to map (Topo-sheet) and vice-versa.
4. Map reading and learning the procedure to procure SI map.
5. Data input – Digitization of Maps and Projection, Remote Sensing: Geo-rectification and radiometric correction. Image classification technique for mapping of Earth Resources, Landscape Ecology- Logical and Quantitative Models for Species & Habitat. Map making in QGIS and use of Google earth.
6. Epidermal derivatives; Comparative studies of dentition and skull of different species.
7. Horn / antler identification.
8. Study of pugmark and other indirect evidences of carnivores and herbivores
9. Spotting
10. Practical Record 10 marks
11. Viva Voce 10 marks

(B) Field Practical (Day- 2) 5 hours **MM: 100 marks**

1. Analysis of species diversity in field.
2. Analysis of vegetation types in a specific PA.
3. Analysis of habitat characteristics in a specific PA.
4. Quantification of flora using vegetation sampling methods (Estimation of species dominance, frequency, density using quadrate / plot methods).
5. Identification of venemous and non-venemous snakes.
6. Bird watching and identification of resident and migratory birds (minimum 100 species) with their salient characteristics and use of different bird census techniques.
7. Seminar on assignment.
8. Identification of voice/chirping or sounds of birds.
9. Spotting
10. .Practical Record (10 marks)
11. Viva- Voce (10 marks)

Field Tour

Orientation Tour
Technique Tour

Semester -II

(Tentative Syllabus 2024-25)

WLS-206: Habitat Ecology, Population Ecology and Conservation Biology (04 Credits)

Unit – I

Habitat Ecology (0.8 Credit)

Introduction to Habitat Ecology Ecological & evolutionary perspectives Ecology of major habitats: terrestrial (Deserts, Grasslands, Forests), Wetlands. Habitat diversity: edge, ecotones, interspersion and juxtaposition. Physical and anthropogenic factors influencing terrestrial habitats. Habitat degradation, fragmentation and Successional changes.

Unit-II

Applied Habitat Ecology (0.8 credit)

Inventory, evaluation and monitoring of habitat (land species, water, estuarine water) Availability, quality, palatability of graze and browse. Inventory of unique habitats (name them) and their distribution, Animal sign as indicator of habitat use, use of map overlay approach in habitat evaluation. Monitoring changes in habitat parameters, use and availability of habitat resources.

Unit – III

Population Ecology (0.8 Credit)

Monitoring population and other demographic parameters: r & K selection, carrying capacity, allometry, aging and sexing, life tables. Population dynamics: exponential, logistic and other forms of growth of population, density dependent and independent growth, population simulation, Predator-Prey Dynamics, Population Genetics.

Unit - IV

Advanced Population Ecology (0.8 Credit)

Sampling designs for population estimation, population estimation methods: Distance based sampling methods, mark-recapture for closed population, Indices, modelling occupancy. Bayesian models in abundance estimation (Spatial and Non Spatial).

Unit- V

Census (0.8 Credit)

Census, types of census, methodology of Tiger census, methodology of Lion census, Bird census and Aquatic animal census.

Important conservation projects undertaken in India: Project Tiger, Project Elephant.

Rhino - reintroduction and Cheetah - reintroduction Program.

WLS-207: Animal Behavior and Community Ecology (04 Credits)

Unit – I

Introduction to Animal Behavior (0.8Credit)

Definition and importance of studying animal behavior. Patterns of behavior: aggression territory, communication, feeding, mating, parenting. Basic idea of physiological, neural and hormonal mechanisms of behavior. Darwinian fitness and inclusive fitness concepts. Types of migration, factors governing migration, biological clocks, advantages and disadvantages of migration, flyover and pathways. Techniques in animal behavior studies: sampling methods; ad-libitum, focal animal, all occurrences, sequence, one zero & scan sampling.

Unit-II

Social Behavior in Animal Community (0.8 Credit)

Types of social organizations: Solitary, monogamy, harem forming, territorial male, multi-male/multi-female. Benefits and cost of living in social group, optimal group size. Sociobiology – types of fitness (reproductive success, fitness, Darwinian fitness, inclusive fitness, kin selection, Hamilton rule) Mating strategies, ecological factors, affection bonds, fecundity, Experience and learning behavior, Habituation, conditioned reflex, trial and error learning, latent learning and imprinting, reasoning, intelligence and use of tools.

Unit -III

Behavioral Ecology (0.8 Credit)

Understanding proximate and ultimate mechanisms. Selfishness and altruism. Competition for resources: Sexual selection; parental care. Cooperation and helping in fishes, birds and mammals. Advantage and disadvantage of keeping animals in captivity. Behavioral changes in

captivity. Introduction to PETA (People for the Ethical treatment of animals.

Unit – IV

Community Ecology (0.8 Credit)

Definition and nature of communities; scale and approaches. Community structure, organization and its stability (guilds, resource partitioning, niche, competitive exclusion). Factors governing species diversity. Concept and measurement of niche. Trophic interactions; top-down and bottom-up processes. Null models and their application in ecology. Energy, productivity and its implication for species diversity.

Unit- V

Animal Physiology and Nutritional Ecology (0.8 Credit)

Feeding ecology of herbivores, carnivores, insectivores and omnivores – food selection, quantity, quality (nutritional value), seasonal variations, relation of food with animal condition. Predator- prey interactions. Importance of minerals for animal health, growth and reproduction. Ecology of seed dispersal and seed predation (depredation). Role of animals in pollination.

WLS-208: Wildlife Health and Wildlife Forensics (04 Credits)

Unit -I

Wildlife Health (0.8 Credit)

Introduction to disease and epizootiology, Determinants of disease and disease transmission, Disease and population dynamics. Importance of wildlife health studies in population management, evaluation of animal health and condition through direct observations of free living animals, physical examination of animals and collection of baseline data on health parameters. Quarantine and Quarantine Act.

Unit -II

Common diseases in Indian Wildlife (0.8 Credit)

Review of major viral, bacterial, protozoan, fungal and parasitic diseases of Indian wild amphibians, reptiles, birds and mammals. Non-infectious diseases- nutritional diseases, poisoning, stress, shock, capture myopathy, physical trauma.

Emerging and re-emerging diseases. Zoonoses. Assessment of condition, health nutritional status in free-ranging populations. Disease control operations, Investigation of disease outbreaks including biological sampling and laboratory analysis, Planning and management of wildlife health programmes.

Unit -III

Capture & Handling of Wild Animals (0.8 Credit)

Capture and handling of animals - purpose, restraint techniques, different capture methods and animal barriers. Drug immobilization - drug delivery equipments and accessories. Immobilization drugs - action, dosage, response and side effects, safety measures, complications. Central Zoo Authority (CZA) protocol of Handling and transport of wild animals, designing sledge, crate and holding enclosures.

Unit-IV

Wildlife Health Management (0.8 Credit)

Wildlife-livestock interface and conservation. Biodiversity loss, climate change and its impact on wildlife health. Introduced/Invasive species issues and ecosystem health monitoring. Introduction to the problems of locally over-abundant wild animal population causing damage, control versus conservation, animal damage control techniques; biological, chemical and mechanical. Management of waterholes in wildlife disease control.

Unit -V

Genetics and Wildlife Forensics (0.8 Credit)

Introduction to Bio-molecules-DNA, RNA and Proteins; Central Dogma of Molecular Biology- Replication, Transcription and Translation; Mendelian Genetics- Mendel's Laws; Genetic Code- Characteristics and features of genetic code; Genotyping; Allelic variation; Interpretation of genetic data; Bar coding. Application of genetics for wildlife conservation; Loss of genetic diversity, Resolving taxonomic uncertainties.
Wildlife Forensics- Overview, various forensic protocols for species identification, Molecular markers used in wildlife forensics; Wildlife forensics based on DNA analysis and morphometry; Wildlife crime case studies. Key agencies contributing in wildlife crime enforcement .

WLS-209 Conservation Biology (04 Credits)

Unit- I

Conservation Biology (0.8 Credit)

Concept and introduction to conservation biology with special reference to forest and wildlife management, values of biodiversity and conservation ethics, losses and threats to biodiversity.

Unit-II

Habitat fragmentation (0.8 Credit)

Biological consequences of habitat fragmentation, effects and approaches of habitat fragmentation covering barriers and isolation, crowding effect, local and regional extinction, edge effect, changes in species composition and community, control of invasive species.

Unit-III

Ecological restoration (0.8 Credit)

Significance of ecological restoration, ecosystem level conservation, plants used as avenue trees for shade, pollution control and aesthetics pasture development program, indigenous and local community involvement in conservation.

Unit-IV

In-situ and Ex-situ Conservation (0.8 Credit)

International efforts and Indian initiatives, protected areas in India: sanctuaries, national parks, biosphere reserves, wetlands, mangrooves and coral reefs. Principles and practices of Ex- situ conservation Botanical gardens, field gene banks, seed banks, in vitro repositories, cryo banks. General account of the activities of Botanical survey of India (BSI), National Bureau of Plant Genetic Resources (NBPGR), Indian Council of Agricultural Research (ICAR), Council of Scientific and Industrial Research (CSIR), and Department of Biotechnology (DBT) for conservation. Role of NGOs in conservation. Behavioral differences between in-situ and Ex- situ animals.

Unit-IV

Conservation policy and Law (0.8 Credit)

National Biodiversity policy 1987 and national Biodiversity action plan, 2002.

Convention on biodiversity 1992: Scope and importance, conservation of biological diversity act 2002 and rules.

International: CITES, Convention on Migratory Species (CMS), Endangered species act 1973, Critical animals conservation act 2021.

PRACTICAL (SEMESTER-II)

WLS-210: Laboratory and Field Practical-II (08 Credits)

Min Pass Marks-100 Duration-6 hrs MM – 200 marks

(A) Laboratory Practical (Day- 1) MM: 100 marks

1. Population Estimation data collection and use of software DISTANCE, MARK, PRESENCE and R Program.
2. Understanding of probability distributions curves.
3. Demonstration of equipment used in capturing and handling of wild animals.
4. Major viral, bacterial, protozoan, fungal and parasitic diseases of Indian wild amphibians , reptiles. birds and mammals
5. Pugmark Identification & characterization of common large mammals.
6. Use of different techniques in identification of different parts and products of flora and fauna reported in the wild life trade.
7. Species identification through morphometry of hair and scat identification.
8. Record of treatment of an ill/ injured wild animal.
9. Spotting
10. Practical record (10 marks)
11. Viva voce (10 marks)

(B) Field Practical (Day-2) Duration - 5 hours MM: 100 marks

1. Comparison of several techniques for quantitative habitat survey and mapping. Evaluating habitat availability and utilization. Field visits for habitat evaluation, visit to wetland areas and demonstration of habitat quantification techniques.
2. Field data collection for estimating population abundance of mammals using line transect, occupancy survey and point counts.
3. Methods of behavioral observation: Instantaneous scan, focal animal, all-occurrence and one-zero sampling, collection and analysis of behavioral data on few commonly seen species.
4. Social organisation of mammals: Observation and submission of report.
5. Preparation of Ethograms: time-activity budgets and social interaction matrices.
6. Knowledge of tags, collars, radio-tracking equipments.
7. Biological Sampling, preservation and transport of samples.
8. Presentation on any specific topic from habitat and population ecology.
9. Visit to local Biology Park and record disease, health management practices of various animals.
10. An Approach to rescue of wild animals.
11. Spotting
12. Practical Record (10 marks).
13. Viva- Voce (10 marks).

Field Tour

Orientation Tour

Technique Tour

Semester III
(Tentative Syllabus 2024-25)

WLS-311: Applied Wildlife Science (04 credits)

UNIT-I

Wildlife Management (0.8 Credit)

Management of special habitats; riparian zones, grasslands etc. Analysis of wildlife management problems in plantations and exploited forests. Management plan for Protected Areas: Forest working plans and wildlife management plans. Need for wildlife management planning. Principles of planning, objectives, management zones, theme plans, communications, staff and visitor amenities, monitoring.

UNIT-II

Environmental Impact Assessment and Legislation (0.8 Credit)

Introduction to Environmental Impact Assessment (EIA) and other emerging decision support tools; scope and purpose of EIA. Salient features of important environmental legislations: Water (Prevention and Control of Pollution) Act, 1974; Air (Prevention and Control of Pollution) Act, 1981; Environmental Protection Act, 1986; Forest Conservation Act, 1980; Wildlife Protection Act, 1972; National Green Tribunal Act, 2010; Biological Diversity Act, 2002. National Environmental Clearance Procedures.

UNIT-III

Wildlife Techniques (Wildlife Conservation and Macro histological) (0.8 Credit)

Introduction to Wildlife telemetry: Transmitters (Antenna, Power source) Transmitter attachments (General protocol, collars etc.), Radio tagging, Receivers. Review of radio-telemetry studies in India.

Histological: overview, various forensic protocols for species identification, molecular markers used in wildlife forensic. Wildlife forensics based on DNA analysis and morphometry. Case studies on Wildlife Crime. Key agencies contributing in Wildlife crime enforcement.

UNIT-IV

Human Dimensions in Wildlife Management (0.8 Credit)

Park-people interface, conflict and objectives of human dimension in management; Eco-development – What, why and where; Community participation; conservation development linkage; livelihood analysis; Stakeholders in conservation;/PA-people mutual influence zone analysis and village prioritization for pilot eco-development projects; Project planning, Monitoring and Evaluation.

UNIT-V

Relocation and Rescue of Wildlife (0.8 Credit)

Relocating Wildlife; Study designing, consideration and sample consideration. Protocols of tranquilization for Rescue and rehabilitation, major threats. Study review of habitat utilization by species group; amphibians, Reptiles, small Mammals and large carnivores.

WLS-312: Conservation Practices (04 Credits)

Unit I

Natural Resources: Water and Energy (0.8 Credit)

Introduction to natural resources; Types of Clean and renewable energy mechanism, Details of applications, functioning, advantages and disadvantages: Solar energy, wind energy & atomic energy, bio-gas and hydro-power. Traditional and innovative water harvesting practices. Case studies on successful implementation of renewable energy in rural India.

Unit-II

Natural Resources: Forest(0.8Credit)

Forest as material and service provider: Environmentally sound forest harvesting practices; logging, extraction techniques and principles, transportation systems, storage and sale; Non- Timber Forest Products (NTFPs) - definition and scope; gums, resins, oleoresins, fibres, oil seeds nuts, rubber, canes, bamboos, medicinal plants, charcoal, lac and shellac, katha and tendu leaves.

Present status of composite wood industry in India and future expansion plans. Pulp-paper and rayon; present position of supply of raw material to industry, wood substitution, utilization of plantation wood; problems and possibilities.

Unit- III

Silviculture (0.8 Credit)

General Silvicultural Principles: Ecological and physiological factors influencing vegetation, natural and artificial regeneration of forests; methods of propagation, locality factors; nursery techniques (layout, preparation of beds, seed sowing, tending, water budgeting, hardening, grading, etc.), plantation techniques (planting in pits, direct seed sowing, cutting, planting, etc.).

Major Silvicultural systems (clear felling, coppice with standard system, selection system, etc). Management of silviculture systems in temperate, subtropical, humid tropical, dry tropical and coastal tropical forests with special reference to plantations, choice of species intensive mechanized methods, aerial seeding, thinning.

Unit –IV

Various Dimensions of Ethnology & Restoration Ecology (0.8 Credit)

Ethno botany: medicinal value of plants, NTFPs and uses of non timber plants in protected areas. Traditional values of tribal and local people of protected area. Distribution and botanical features of Indian medicinal and aromatic plants. Factors affecting action and toxicity of drug plants and their chemical constituents.

Introduction to Restoration Ecology: Setting goals for Ecological restorations, analysis of landscapes from degraded to highly valued. Regulatory requirements in ecological restorations. Monitoring and adaptive management in ecological restoration.

Unit- V

Conservation, Breeding and Wildlife Utilization (0.8 Credit)

Captive breeding and Propagation: Founder population, rehabilitation, education, utilization. Role of scientific institutions and NGOs in Conservation Breeding Programmes. Understanding biological requirements of species; design of facilities: food, hygiene, disease control, breeding. Propagation of threatened plants. Case studies on Conservation Breeding Programmes of endangered wild animals in India.

Wildlife Utilization: Non-consumptive and consumptive utilization, their economic benefits. Game ranching and controlled off-take from wild population, rationale, management design, harvesting by management or hunting license in special cases. Wildlife based Tourism - objectives, planning and economics.

WLS-313 Research Methodology (04 Credits)

Unit – I

Introduction to Research (0.8 Credit)

Research Definition; Importance and Meaning of research, Characteristics of research, Types of Research, Steps in research; Identification, Selection and formulation of research problem, Research design, Research questions, Formulation of Hypothesis and Review of Literature.

Unit – II

Sampling Designs of Research (0.8 Credit)

Sampling techniques: Sampling theory, types of sampling, Steps in sampling, Sampling and Non-sampling error, Sample size, Advantages and limitations of sampling. Collection of Data: Primary & Secondary Data; Meaning, Data Collection methods, Relevance, limitations and cautions.

Unit – III

Tools of Research (0.8 Credit)

Quantitative and Qualitative Research Techniques; Survey Techniques and its limitations, Operationalization and Questionnaire Construction, Interview Schedule, Reliability and Validity.

Unit–IV

Proposal and Report writing (0.8 Credit)

Styles and formats of writing proposals for ecological / wildlife conservation projects, Research Report : Types of reports , contents, styles of reporting, Steps in drafting reports, Editing the final draft , Evaluating the final draft. Citation, reference and bibliography.

Unit –V

Basic of Journals and IPR (0.8 Credit)

Difference between research journals and science magzine; qualities of good national and International journals of Wildlife Science. Importance of patent in research and process of getting patent right with special reference to Wildlife.

WLS-314: Application of Biostatistics (4.0 Credit)

Unit -I

Descriptive Bio-statistics (0.8Credit)

Introduction to Bio-statistics and its application in wildlife studies. Definition of some statistical terms (Data, variable, sampling universe, sampling unit, sample size, accuracy and precision). Types of variables and scales of measurements (nominal, ordinal, interval / ration scales).

Unit -II

Data Presentation and Central tendency (0.8 Credit)

Data summarization: frequency tables, curves. Data presentation: Histogram, bar diagram, pie charts, line diagram and scatter plot. Central tendency: mean, median, mode, standard deviation, standard error, Skewness and kurtosis

Unit -III

Advanced Bio-statistics (0.8 Credit)

Introduction to statistical distributions. Normal distribution and its salient features. Introduction to hypothesis testing. Null and Alternative hypothesis. Level of significance. Type I and Type II errors. One tailed and two tailed tests. Parametric and non parametric tests of significance. Data transformation.

Unit -IV

Applied Bio-statistics (0.8 Credit)

Student t-test, Z-test, Mann-Whitney U test, Wilcoxon test for matched pairs. Analysis of variance, one way ANOVA, Krushall Wallis one way ANOVA, Friedman two way ANOVA. Correlation and regression. Spearman Rank correlation coefficient. Coefficient of determination. Significance of r, Chi-square test, Goodness of Fit Test.

Unit-V

Vital statistics and Softwares (0.8Credit)

Vital statistics; Introduction, uses, methods (Registration, Census and Analytical). Measurement of fertility, reproductivity and mortality. Life tables.

Softwares: SPSS, MS-Excel

Online platform for biostatistics: GraphPad Online Tools etc.

PRACTICAL (SEMESTER-III)

WLS-315: Laboratory and Field Practical- (08 Credits)

Min Pass Marks-100 MM – 200 marks

Laboratory Practical (Day- 1) Duration - 5 hours MM: 100 marks

1. Study of different water harvesting practices in Rajasthan and other parts of India.
2. Presentation of Research Paper on specific topics of population estimation, Review of forest working plan and maps. Study of nearby forest and grassland under various management regimes. (Management practices will also be studied in field courses).
3. Scat analysis and Identifying species from hair. Photomicrographs and descriptions of hair characteristics of different classes of wild and domestic mammals.
4. Case study on role of NGOs in conservation programs.
5. Forest as material and service provider- utilization.
6. Radio-telemetry.
7. Spotting
8. Practical record (10marks)
9. Viva voce (10marks)

Field Practical (Day -2) **Duration - 5 hours** **MM – 100 (marks)**

1. Documentation of ethno-botanical flora in any PA in Rajasthan.
2. Study on tiger reintroduction program in any Tiger Reserve (India).
3. Review of ongoing Wildlife projects in India.
4. Visit and report submission on any eco-development society in Rajasthan.
5. Collection of pellet and scats for analysis of food-habits of ungulates and carnivores.
6. Socio-economic Questionnaire Survey in minimum five villages around any PA of Rajasthan.
7. Spotting
8. Practical record (10marks)
9. Viva voce (10marks)

Field Tours

Conservation Practices Tour
Management Practices Tour

FIELD EXERCISES

The following field courses and tours will be undertaken in association with the course unit programme prescribed above.

Semester-I

1. Orientation Tour

Orientation to field biology and natural history.

Observations and collection of study material, wildlife signs and evidences.

2. Techniques Tour (Ecology, Study Techniques, Wildlife week & Vegetation Studies).

Exercise on wildlife population parameters and census methods for various species. Vegetation study. Study on animal ecology.

Semester-II

3. National Park Tour

Visit a well known National Park.

4. Specialized Techniques Tour

Semester-III

5. Conservation Practice and Management Tour

Field tour designed to examine wildlife conservation issues in a variety of ecological situations in a bio-geographic zone of India and designed to understand Wildlife management practices, eco-development applications and field exercises in Protected Areas.

Note- For the trip/tour/visit, 50% amount will be paid by the students.

Semester IV (2024-25)

WLS-416: Presentation of Dissertation and Field Report (24-Credits)

Dissertation will be based on field work on any topic related to wildlife biology/ ecology/ environment / habitat study etc.

* Performa of Dissertation:-

- Prefactory Material
    - Title page
    - Declaration
    - Certificate
    - Acknowledgement
    - Contents
    - List of tables
    - List of figures
- Body of Dissertation
    - Introduction
    - Review of Literature
    - Objectives
    - Materials & Methods
    - Observations
    - Results
    - Discussion
    - Recommendation
    - Bibliography
    - Appendices
    - Report of Plagiarism

Note: - Research Supervisor will be allotted by the concerned Department of University (UOK, Kota).

Day 1 WLS – 416 (A) Presentation of Dissertation

1. Dissertation Internal (08-Credits) 200marks
2. Dissertation External (08Credits) 200marks

Day -2 WLS – 416 (B) Field Reports

Submission of a report with collected material/samples/questionnaire- (08-Credits) 200marks

1. Submit at least 10 photographs of footprints/pugmarks of animals and birds taken during field visits with original details. (30 marks)
2. Case study of at least one village regarding the successful implementation of renewable energy resources. (30marks)
3. Prepare a herbarium file (at least 10 specimen of native vegetation) of your study area including the taxonomic classification. (30marks)
4. Survey of one village and the challenges faced during relocation. (30 marks)
5. Submit a report on 'An approach towards rescue of wild animal.' (30 marks)
6. Viva voce (50 marks)