KANNUR UNIVERSITY

SCHEME AND SYLLABUS

FOR

POSTGRADUATE PROGRAMME

(M.Sc. DEGREE COURSE)

IN

FORESTRY (WILDLIFE MANAGEMENT)

UNDER

CHOICE BASED CREDIT AND SEMESTER SYSTEM
(OBE – Outcome Based Education – system)

With effect from 2023 admission

KANNUR UNIVERSITY
M.Sc. FORESTRY (WILDLIFE MANAGEMENT)
Curriculum for Choice Based Credit and Semester System for Postgraduate Programme in Affiliated Colleges -2023
(OBE – Outcome Based Education – system)

Kannur University introduced Outcome Based Education (OBE) in the curriculum for undergraduate students in 2019. Expanding OBE to the Postgraduate curriculum and syllabus from the academic year 2023 onwards demonstrates the university's commitment to further improving the learning experience for its students across different academic levels. This move is to enhance the academic rigour and relevance of the Postgraduate programmes, better preparing the students for their future careers and challenges. Outcome based education is an educational methodology where each aspect of education is organized around a set of goals (outcomes). Students should achieve their goal by the end of the educational process. Throughout the educational experience, all students should be able to achieve their goals. It focuses on measuring student performance through outcomes. The OBE model aims to maximize student learning outcomes by developing their knowledge & skills. The key to success in outcome-based education is clarity, for both teachers and students to understand what's expected of them. Outcome-based education aims to create a clear expectation of results that students must achieve. Here, the outcome includes skills, knowledge and attitude. In addition to understanding what's expected, outcome-based education also encourages transparency. The basic principle of outcome-based education is that students must meet a specific standard to graduate. Hence, no curve grading is used in outcome-based education, and instead, teachers are free to experiment with any methodology they feel is best.

Mission statements

- To produce and disseminate new knowledge and to find novel avenues for application of such knowledge.
- To adopt critical pedagogic practices which uphold scientific temper, the uncompromised spirit of enquiry and the right to dissent.
- To uphold democratic, multicultural, secular, environmental and gender sensitive values as the foundational principles of higher education and to cater to the modern notions of equity, social justice and merit in all educational endeavours.

- To affiliate colleges and other institutions of higher learning and to monitor academic, ethical, administrative and infrastructural standards in such institutions.
- To build stronger community networks based on the values and principles of higher education and to ensure the region's intellectual integration with national vision and international standards.
- To associate with the local self-governing bodies and other statutory as well as non-governmental organizations for continuing education and also for building public awareness on important social, cultural and other policy issues.

Programme Outcomes (POs):

Programme outcomes can be defined as the objectives achieved at the end of any specialization or discipline. These attributes are mapped while a student is doing graduation and determined when they get a degree.

PO 1. Advanced Knowledge and Skills: Postgraduate courses aim to provide students with in-depth knowledge and advanced skills related to their chosen field. The best outcome would be to acquire a comprehensive understanding of the subject matter and develop specialized expertise.

PO 2. Research and Analytical Abilities: Postgraduate programmes often emphasize research and analytical thinking. The ability to conduct independent research, analyze complex problems, and propose innovative solutions is highly valued.

PO 3. Critical Thinking and Problem-Solving Skills: Developing critical thinking skills is crucial for postgraduate students. Being able to evaluate information critically, identify patterns, and solve problems creatively are important outcomes of these programs.

PO 4. Effective Communication Skills: Strong communication skills, both written and verbal, are essential in various professional settings. Postgraduate programs should focus on enhancing communication abilities to effectively convey ideas, present research findings, and engage in academic discussions.

PO 5. Ethical and Professional Standards: Graduates should uphold ethical and professional standards relevant to their field. Understanding and adhering to professional ethics and practices are important outcomes of postgraduate education.

PO 6. Career Readiness: Postgraduate programs should equip students with the necessary skills and knowledge to succeed in their chosen careers. This includes practical skills, industry-specific knowledge, and an understanding of the job market and its requirements.

PO 7. Networking and Collaboration: Building a professional network and collaborating with peers and experts in the field are valuable outcomes. These connections can lead to opportunities for research collaborations, internships, and employment prospects.

PO 8. Lifelong Learning: Postgraduate education should instill a passion for lifelong learning. The ability to adapt to new developments in the field, pursue further education, and stay updated with emerging trends is a desirable outcome.

Program-Specific Outcomes (PSOs) of M. Sc. Forestry (Wildlife Management) program.

After the successful completion of M. Sc. Forestry (Wildlife Management) program, the students shall be able to:

PSO1: Develop a strong foundation in forestry concepts, including forest ecosystems, biodiversity, habitat assessment, and sustainable management practices, contributing to holistic natural resource management strategies.

PSO2: Acquire a deep understanding of wildlife ecology, behavior, and conservation principles, enabling them to effectively manage and conserve diverse wildlife populations and their habitats.

PSO3: Master modern techniques for forest and wildlife monitoring, population assessment, habitat restoration, and mitigation of human-wildlife conflicts, enhancing their ability to address real-world challenges.

PSO4: Understand the fundamental aspects of biostatistics, bioinformatics tools, and biophysical principles, which will aid in the analysis of relevant biological situations and the development of intellectual skills on biological data and database analysis.

PSO5: Allows learners to develop a deep connection with nature and refine their observation skills, ultimately leading to more accurate and confident identifications of wild flora and fauna.

Eligibility for Admission

The eligibility criteria for admission to the M.Sc. Forestry programme shall be as follows;

Qualification: A bachelor's degree in Life Science related subjects (Core) such as Forestry, Botany, Plant Science, Zoology, Biotechnology, Microbiology, Biochemistry, Environmental Science, Veterinary Science, Agriculture allied subjects, or any other degrees recognized as equivalent thereof, from a recognized university with not less than 50% marks or equivalent grade. A weightage of 25% of the index marks shall be given to the B.Sc Forestry holders while preparing the rank list of the applicants.

Age and other criteria: As per the Kannur University PG Regulations on Admission.

Duration of the Programme:

The duration of the M.Sc. Forestry (Wildlife Management) shall be of 2 years consisting of 4 Semesters. Each Semester consists of a minimum of 450 contact hours distributed over 90 working days.

Structure of the Programme:

The total credits required for successful completion of the programme is 80. Core courses have a total credit of 68 and elective courses carry 12 credits.

Core Courses: Core courses are compulsory courses designed to meet the core requirement of providing a basic and advanced understanding of the discipline.

Open Elective Courses: Open elective courses (4 credits) are offered in the third semester of the program. An open elective course is chosen generally from an unrelated discipline to enhance the general exposure outside the main discipline. The students pursuing M. Sc. Forestry (Wildlife Management) have to opt for Open Elective courses offered by other Departments based on their interests. The scope of the Open Elective Courses is to effectively enhance horizontal mobility across diverse disciplines.

Discipline-Specific Elective Courses*:* Discipline-Specific Elective courses are offered by the Department to enhance the flexibility of selection of an area of specialization from a pool of courses. These courses are considered specialized or advanced with respect to M. Sc. Forestry (Wildlife Management) program and provide extensive exposure in the area chosen. A total of 6 Elective courses are offered by the Department of which a student has to complete two courses from the chosen area in the fourth semester of the program.

Project Work / Master's Dissertation

There shall be a project work with dissertation (6 credits) to be undertaken by all students. Project dissertation work is a major component involving application of knowledge in solving/analysing/exploring a real-life situation/problem. The dissertation entails fieldwork, lab work, report, presentation and viva voce. Project dissertation shall be done under the supervision of a faculty member of the department as per the curriculum. A candidate may, however, in certain cases be permitted to work on the project in an industrial/research organisation on the recommendation of the Head of the Department and with permission of the Head of the Institution. In such cases, one of the teachers from the department concerned shall be the supervisor/internal guide and an expert from the industry/research organisation concerned shall act as co-supervisor/external guide. Project Dissertation shall be submitted two weeks before the commencement of ESE of fourth semester. Belated and incomplete projects will not be entertained. Dissertation on project shall be prepared as per the guidelines given in the Kannur University PG regulation 2023.

Forestry EduTour

Each student shall undergo practical training and field works at the areas/institutes given in the course outline, and make detailed reports. Each student shall maintain a field diary to record the observations. The student should submit the field diary for internal evaluation. Each student shall submit a report based on his/her field diary and the report shall be evaluated by the external examiner at the end of the fourth semester.

EVALUATION:

Course Evaluation:

The evaluation scheme for each course shall contain two parts

a) Continuous Evaluation (CE)
b) End Semester Evaluation (ESE)

20% weightage shall be given to the Continuous Evaluation (CE) and 80% weightage shall be for the End Semester Evaluation (ESE)

Continuous Evaluation (CE):

The allocation of marks for each component under Continuous Evaluation shall be in the following proportions. There is no pass minimum insistence on Continuous Evaluation marks.

Theory			Practical		
Components	**Weightage**	**Marks**	**Components**	**Weightage**	**Marks**
Test Paper	60%	9	Practical Test	40%	6
Assignments/ seminars/ viva/	20%	3	Record	40%	6
Book / article review	20%	3	Submissions	20%	3
Total	100%	15 Marks	Total	100%	15 Marks

To ensure transparency of the evaluation process, the continuous evaluation marks awarded to the students in each component of each course in a semester shall be notified on the notice board at least three days before the commencement of End Semester Evaluation. There shall not be any chance for improvement in Continuous Evaluation. Only the total CE marks awarded to a candidate in each course need to be sent to the university by the Principal of the colleges concerned. The College shall maintain the academic record of each student registered for the course, with the details of the marks awarded to each component of Continuous Evaluation of courses with the signatures of the students, course teacher and HoD which shall be preserved in the college for a period of six years from the last date of the End Semester Examination of the semester concerned and shall be made available to the University for inspection as and when required. Complaints if any with regard to the Continuous Evaluation shall be submitted by the student to the Course Teacher first. If the student feels that justice is denied, she/he can submit appeal to the Head of the Department and thereafter to the Principal of the College. The Department Council/ College Council shall consider the complaint and ensure that assessments are done by the teacher in a just and fair manner. In case the student is not satisfied with the decision at the college level, further appeal/complaints may be submitted by the student to the Controller of Examinations, Kannur University for being placed before the University Level Committee for consideration.

End Semester Evaluation (ESE)

End Semester Evaluation carries 80% of total marks. The End Semester Evaluation in theory courses is to be conducted with question papers set by external experts. The evaluation of the answer scripts shall be done by examiners appointed by the University based on a well-defined Scheme of valuation and answer keys provided by the University. After the End Semester Evaluation, only marks are to be entered in the answer scripts. Marks secured for End Semester

Evaluation only need to be communicated to university. All other calculations including grading are done by the university by the Chairperson of the Board of Examiners. The End Semester Evaluation in practical courses shall be conducted by two examiners (one internal and one external) appointed by the University. End Semester Evaluation of all semesters will be conducted in centralized valuation camps immediately after the examination. All question papers shall be set by the university.

Project Evaluation: Project evaluation shall be conducted at the end of the fourth semester as per the following general guidelines or by the guidelines framed by the Board of Studies concerned:
Evaluation of the Project Report shall be done under Mark System.

The evaluation of the project will be done in two stages:

a) Continuous Evaluation (Supervising Teachers will assess the project and award internal Marks)
b) End Semester Evaluation (External Examiner appointed by the University)

Marks secured for the project will be awarded to candidates, combining the Continuous Evaluation and End Semester Evaluation marks.

The Continuous Evaluation to End Semester Evaluation components is to be taken in the ratio 1:4.

a. The allocation of marks for each component under Continuous Evaluation shall be in the following proportions

Continuous Evaluation (20 Marks)	
Components	**Percentage**
Punctuality	20
Use of Data	20
Scheme/Organization of Report	40
Viva voce	20

b. The allocation of marks for each component under End Semester Evaluation shall be in the following proportions

End Semester Evaluation (80 Marks)	
Components	**Percentage**
Relevance of the Topic	10
Presentation of facts/ figures/ language style/ diagrams etc	40
Findings and recommendations	20
Viva-Voce	30

c. **Viva Voce:** There shall be a comprehensive viva voce at the end of the programme covering questions from all courses of the programme including project work. The candidate shall present one copy of the Dissertation on the project before the Viva-voce board. The viva voce shall be conducted by two external examiners.

Pass Conditions:

a. Appearance for Continuous Evaluation (CE) and End Semester Evaluation (ESE) are compulsory and no grade shall be awarded to a candidate if she/he is absent for CE/ESE or both.

b. A minimum of grade point 4 is needed for the successful completion of a project work. The student should get a minimum of 40 % marks of the aggregate and 40% separately for ESE and 10% CE for a pass in the project.

Evaluation of Forestry EduTour

Evaluation of Forestry EduTour shall be done under Mark System in two stages. Internal Assessment by the supervising teacher and External Evaluation by the examiner appointed by the University. The internal to external components is to be taken in the ratio 1:4. Assessment of different components may be taken as below.

Internal Assessment (10 Marks)		
Components	Percentage of marks	Marks
Field Involvement	50	5
Field Diary	50	5
Total	100	10
External Assessment (40 Marks)		
Components	Percentage of marks	Marks
Report	75	30
Viva-Voce	25	10
Total	100	40

Pass Conditions:

a. Participation in forestry educational tours is indispensable

b. Submission of the Field Diary, Report and presence of the student for viva-voce are compulsory for the evaluation. No marks shall be awarded to a candidate if she/he fails to submit the Report for external evaluation.

c. The student should get a minimum of 40% marks for pass in Forestry EduTour, and there shall be no improvement chance for the Marks obtained. In an instance of the inability of obtaining a minimum of 40% marks, the field works must be re-done and the report should be re-submitted along with subsequent exams through parent department.

PROGRAMME STRUCTURE – M.Sc. FORESTRY (WILDLIFE MANAGEMENT)

Sem.	Course Code	Course Title	Marks			Hrs/week		Credit
			CA	ESE	Total	T	P	
I	MSFOR01C01	Forests and Biogeography	15	60	75	3	2	4
	MSFOR01C02	Dendrology and Vegetation Analysis	15	60	75	4	3	4
	MSFOR01C03	Forest Ecology	15	60	75	4	3	4
	MSFOR01C04	Fundamentals of Wildlife Science	15	60	75	4	2	4
	MSFOR01C05	Practical I	15	60	75	-	-	4
	TOTAL		**75**	**300**	**375**	**15**	**10**	**20**
II	MSFOR02C06	Nursery Techniques and Plantation Forestry	15	60	75	4	2	4
	MSFOR02C07	Forest Biometry	15	60	75	4	3	4
	MSFOR02C08	Conservation Biology and Captive Wildlife Management	15	60	75	3	2	4
	MSFOR02C09	Research Methodology and Biostatistics	15	60	75	4	3	4
	MSFOR02C10	Practical II	15	60	75	-	-	4
	TOTAL		**75**	**300**	**375**	**15**	**10**	**20**
III	MSFOR03C11	Wildlife Management and Monitoring Techniques	15	60	75	3	2	4
	MSFOR03C12	Forest Health and Protection	15	60	75	3	2	4
	MSFOR03C13	Forest Resource Management and Utilization	15	60	75	3	2	4
	MSFOR03C14	Global Change Ecology and Ecosystem Resilience	15	60	75	3	2	4
	MSFOR03O 01/02/03	Open Elective (Multi-Disciplinary)	15	60	75	3	2	4
	TOTAL		**75**	**300**	**375**	**15**	**10**	**20**
IV	MSFOR04E 01/02/03	Elective I	15	60	75	3	2	4
	MSFOR04E 04/05/06	Elective II	15	60	75	3	2	4
	MSFOR04C15	Forestry EduTour	10	40	50	-	-	2
	MSFOR04C16	Practical III	15	60	75	-	-	4
	MSFOR04C17	Project Dissertation & Viva Voce	20	80	100	-	15	6
	TOTAL		**75**	**300**	**375**	**6**	**19**	**20**
GRAND TOTAL					**1500**			**80**

Elective Courses

Sem.	Course	Course Code	Course Title	Hrs/week		Credit
				T	P	
III	Open Elective	MSFOR03O01	Ecotourism and Wildlife Photography	3	2	4
		MSFOR03O02	Conservation Laws and EIA	3	2	4
		MSFOR03O03	Ethnobiology	3	2	4
IV	Elective I	MSFOR04E01	Wildlife Forensics	3	2	4
		MSFOR04E02	Ecological Informatics	3	2	4
		MSFOR04E03	Invertebrate ecology	3	2	4
	Elective II	MSFOR04E04	Wetland Ecology	3	2	4
		MSFOR04E05	Restoration Ecology	3	2	4
		MSFOR04E06	Behavioral Ecology	3	2	4

KANNUR UNIVERSITY

SCHEME AND SYLLABUS

FOR

CORE COURSES

OF

M.Sc. FORESTRY (WILDLIFE MANAGEMENT)

UNDER

CHOICE BASED CREDIT AND SEMESTER SYSTEM
(OBE – Outcome Based Education – system)

With effect from 2023 admission

MSFOR01C01 – FORESTS AND BIOGEOGRAPHY

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Basic knowledge on the forest biomes of the world and forest types in India
- Basic understanding of the biomes of the world, zoogeographic regions of the world and biogeographic zones of India
- Classify forests based on their composition
- Understand the threats and conservation challenges in Indian forests

Module I: ***Introduction to Forests and Forestry:*** Definitions of a forest. Evergreen and deciduous trees. Classification of forests. Important role of forests. Definition and branches of Forestry. History and evolution of scientific forest management in India. Pre-independence and post-independence scenarios of Indian forestry.

Module II: ***Forests and Biogeography of the World:*** Theory of Continental Drift. Zoogeographic regions of the world. Terrestrial and water biomes of the world. Distribution, characteristic features, and life forms of the forest biomes of the world: temperate coniferous forests, subtropical deciduous forests and tropical evergreen forests.

Module III: ***Forests and biogeography of India:***Biogeographic zones of India**.** Natural history and significance of Western Ghats. Satpura hypothesis, the affinity of Western Ghats with North East. Champion and Seth classification of forest types in India. Distribution and Characteristic features of wet evergreen forests, semi-evergreen forests, moist deciduous forests, littoral and swamp forests and dry deciduous forests in India.

Module IV: ***State of the Forests:*** Important role of forests – productive, protective, regulatory and recreational roles. Threats and conservation challenges to forests in India. Critical analysis on The State of the World's Forests by FAO, State of the Forest reports by FSI.

Practicals: -

1. Visit a forest area and identify the forest type(s)
2. Visit evergreen and deciduous forest types and study the species composition
3. Visit a mangrove forest and study the zonation of mangrove flora
4. Map the biogeographic zones of India
5. Map the zoogeographic regions of the world

References: -

1. *Agarwal, W.P. Forests in India. Oxford and I.B.H*
2. *Khanna, L.S.1989. Principles and Practice of Silviculture. KhannaBandhu, Dehra Dun. 473 p*

3. *Kishwan, J., Pandey, D., Goyal A. K. and Guptha A. K. 2007. India's Forests. MoEF. New Delhi*
4. *Mather, A.S. 1990. Global forest resources. Belhaven, London*
5. *P.R. Sinha, V.B. Mathur and B. C. Sinha. 2009. India's Green Book. Wildlife Institute of India*
6. *Paul, L. Tropical forestry Hand Book. Springer Verlag Publications New York (2Vol)*
7. *Persson, R. 1992. World forest resources. Periodical experts, New Delhi.*
8. *Raj, A. J. and Lal S. B. 2013. Forestry – Principles and Applications. Scientific Publishers, New Delhi*
9. *S. A. Sha. Forestry for people. ICAR, New Delhi*
10. *Sahoo A. K. 2011. The Text Book of Forest Ecology, Biodiversity and Conservation. Indian Books and Periodicals. New Delhi.*
11. *Singh, V. Forest environment and biodiversity. Daya Publishing House, Delhi*
12. *State of the Forest Reports. Forest Survey of India, MoEF, Govt. of India*
13. *Tewari, D.N. Biodiversity and forest genetic resources. Published by International Book Distributions, Dehra Dun.*

***

MSFOR01C02 DENDROLOGY AND VEGETATION ANALYSIS

Hours per week: 4+3 **Credit: 4**

Course Outcomes:

- Identify trees using spot characters
- Understand sampling and analysis methods used in vegetation science
- Measure or estimate vegetation attributes using different field techniques
- To understand vegetation structure, composition and function

Module I. ***Plant Taxonomy:***Classification of flowering plants- Principles, Outlines, Merits and Demerits of Bentham and Hooker system of plant classification. Classification based on molecular systematics - APG I to APG IV. Merits and demerits of phylogenetic classification. Molecular data for phylogenetic analysis and identification- Acquisition and analysis of DNA sequence data- Polymerase Chain Reaction; DNA barcoding.

Module II. ***Taxonomy of forest trees****:* Systematic position, diagnostic features, floral formula, economic importance and important members of the following families- Annonaceae, Clusiaceae, Dipterocarpaceae, Sterculiaceae, Tiliaceae, Rutaceae, Meliaceae, Sapindaceae, Anacardiaceae, Leguminosae (Subfamilies: Fabaceae, Caesalpiniaceae, Mimosaceae), Rhizophoraceae, Combretaceae, Myrtaceae, Rubiaceae, Verbenaceae, Sapotaceae, Apocynaceae, Bignoniaceae, Lamiaceae, Lauraceae, Santalaceae, Euphorbiaceae and Casuarinaceae

Module III: ***Qualitative analyses of communities:*** Structural analysis of communities – species area curve method – transect and quadrate - density- abundance - frequency- dominance and IVI. Remote sensing as a tool for vegetation analysis, NDVI, land use – land cover mapping.

Module IV: ***Forest Biomass estimation:*** Forest biomass and its measurement- Above ground biomass, below ground biomass, carbon content of biomass, forest carbon sequestration, emission trading, Classification of increment, CAI and MAI, increment percentage, yield table, Enumeration of growing stock- definition, objects, kinds of enumeration.

Practicals: -

1. Workout of plant specimens and description of vegetative and reproductive characters of families mentioned in the syllabus.
2. Training in the identification of pants using relevant literatures, herbaria and digital tools
3. Study of various taxa of a genus, determining key characters and preparation of keys at species level.
4. Field visit for familiarization with and study of vegetation type(s) and flora(s) and training in collection and preservation methodologies.
5. Vegetation sampling - Transect method -quadrate method
6. Determine the minimum size of the quadrat by species area-curve method.
7. Estimation of IVI using quadrate / plot method

8. Development of allometric equation for the biomass of important species
9. Assessment of carbon-stock.
10. Calculation of CAI, MAI and Increment Percent

Submission: Herbarium collection of any 20 trees belonging to the families mentioned in the syllabus

References: -

1. *Datta, S. C. 1988. Systematic Botany. Wiley Eastern Limited, New Delhi.*
2. *Davis, P. H. and Heywood, V. H. 1963. Principles of Angiosperm Taxonomy. Princeton, NJ: Van Nostrand.*
3. *Jain S. K. and R. R. Rao. 1977. Handbook of Field and Herbarium Methods. Today and Tomorrow's Printers and Publishers. New Delhi*
4. *Johnes, S. B. and Luchsinger, A. E. 1987. Plant Systematics. McGraw-Hill. London.*
5. *Johri, R. M and SnehLata. 2005. Taxonomy- 1 (Systematics and Morphology). Sonali Publications*
6. *Johri, R. M and SnehLata. 2005. Taxonomy- 2 (Polypetalae). Sonali Publications*
7. *Johri, R. M and SnehLata. 2005. Taxonomy- 3 (Gamopetalae). Sonali Publications*
8. *Judd, W. S., Campbell, C. S., Kellogg, E. A., Stevens, P. F., Donoghue, M. J. 2008. Plant Systematics – A Phylogenetic Approach. Sinauer Associates, Inc., Sunderland, Massachusetts USA.*
9. *Kent, M. and Coker, P., 1992: Vegetation Description and Analysis: A Practical Approach. New York: John Wiley and Sons.*
10. *Lawrence, G.H.M. 1967. Taxonomy of Vascular Plants. Oxford & IBH, New Delhi.*
11. *McCune, B. and Grace, J., 2002: Analysis of ecological communities. Gleneden Beach, Oregon: MjM Software Design*
12. *Michael, P. 1984. Ecological Methods for Field and Laboratory Investigations. Tata McGrawHill Pub. Co. New Delhi, 404p*
13. *Mishra. S. R. 2010. Textbook of Dendrology. Discovery Publishing House Pvt. Ltd. New Delhi.*
14. *Mueller-Dombois, L. D. and Ellenberg, H., 1974: Aims and Methods of Vegetation Ecology. Boca Raton: CRC Press.*
15. *Naqshi, R. 1993. An Introduction to Botanical Nomenclature. Scientific Publishers. Jodhpur.*
16. *Pandey S. N. and S. P. Mishra. 2008. Taxonomy of Angiosperms. Ane Books India, New Delhi.*

***

MSFOR01C03 - FOREST ECOLOGY

Hours per week: 4+3 **Credit: 4**

Course Outcomes:

- Understand the concepts in population and community ecology
- Explain the theories and models in succession
- Understand the ecological functions of different forest layers and their roles in nutrient cycling, energy flow, and habitat provision
- Identify the major forest types of Kerala

Module I: ***Population Ecology:*** Population dynamics- population size, population density, population distributions, population structure, population interactions, population growth model- exponential and logistic growth, r/k strategies, survivorship curves, population factors- top-down control, and bottom-up control, Trophic cascades.

Module II: ***Ecological Succession:*** Succession: definition and Classification- based on stages of development, ecosystem factors, nature of deposits, based on substrate. Process of succession- nudation, invasion, competition & coaction, reaction, and stabilization. Models in succession – facilitation, inhibition, and tolerance, Succession theories – mono climax theory, climatic climax, and subordinate communities- disclimax, sub climax, pre-climax, post-climax, poly climax theory- edaphic climax, biotic climax. climax pattern theory, communities in geographical gradients- individualistic hypothesis and interactive hypothesis.

Module III: ***Community Ecology:*** Community dynamics, Qualitative characters- physiognomy, stratification, profile diagram, life forms- Raunkiaer's system of classification, phenology, periodicity, aspection, sociability – Braun Blanquet approach,

Module IV: ***Forest types of Kerala and Western Ghats:*** Forest types in Kerala based on revised classification of Champion and Seth – Characteristics, vegetation structure, and species composition of major forest types of Kerala- 1A/C3, 1A/C4, 1/E2, 1/2S1, 2A/C2, 3B/C1, 3B/C2, 4B/TS2, 4C/FS1, 4C/FS2, 4E/RS1, 5A/C3, 6A/C1, 11A/C1, 11A/DS2, Forest types of Western Ghats based on Gadgil and Meher-Homji classification- biogeographic provinces and potential maximum vegetation types.

Practicals: -

1. Vegetation structure and species composition of major forest types in Kerala
2. Create a profile diagram of forest ecosystem
3. Study the frequency of species in a given area and compare the frequency distribution with Raunkiaer's standard frequency diagram.
4. Measurement of biomass and productivity
5. Quantification of litter production and decomposition

6. Estimation of species abundance by line transect, belt transect method, quadrate method

References: -

1. *Champion, H.G and Seth, A.K. 2005. Revised survey of the forest types of India. Natraj publishers. 404 p.*
2. *Gadgil, M and Meher-Homji, V.M. 1990. Ecological diversity. In: Conservation in developing countries: problems and prospects. Daniel, J.C, and Serrao, J.S (eds). Bombay Nature History Society, Bombay, and Oxford University Press, Bombay, p. 175-198.*
3. *Michael P. 1990. Ecological Methods for Field and Laboratory Investigations. Tata McGraw-Hill Pub.Co. New Delhi, 404p*
4. *Misra KC. Manual of Plant Ecology. Oxford & IBH Pub Co. New Delhi. 491p*
5. *Odum, E.P. 1996. Fundamentals of Ecology. Natraj Publishers, Dehra Dun 574p.*
6. *Saggwal, S.S. 2021. Forest Ecology. Scientific Publishers, India. 368p*

***

MSFOR01C04 – FUNDAMENTALS OF WILDLIFE SCIENCE

Hours per week: 4+2 **Credit: 4**

Course Outcomes:

- Understand the process of evolution and early radiation of life on earth.
- Acquire the basic knowledge on mammalogy, ornithology, herpetology and ichthyology
- Understand the importance and values of wildlife
- Identify common birds, mammals, reptiles and amphibians

Module I: ***Introduction to Wildlife Science:*** Geological time scale and the evolution of life. History of evolutionary thought; natural selection and speciation. Concept of species. Detailed classification of Chordata. Definition and values of wildlife. Characteristics of wildlife in different biomes and zoogeographic regions of the world.

Module II: ***Mammalogy and Indian mammals:*** Characteristics of class mammalia. Classification of mammals and the detailed account on mammalian orders of Indian sub-continent: Primata, Carnivora, Proboscidea, Perissodactyla, Artiodactyla, Pholidota, Rodentia, Eulipotyphla, Scandentia, Lagomorpha, Chiroptera, Cetaceae and Sirenia. Zoogeography of Indian mammals.

Module III: ***Herpetology and Ichthyology:*** Herpetology and the major reptiles and amphibians of India with special reference to Western Ghats. Breeding biology of reptiles and amphibians. Role of temperature in sex determination in reptiles. Identification of venomous and nonvenomous snakes. Snake bites, Venom, Anti-venom, First Aid and Management of snake bite cases. Conservation problems and challenges of herpetofauna of Indian sub-continent. Methods for herpetofauna ecological studies. Classification and diversity of major groups of fishes in India. Ichthyogeography of freshwater fishes of India. Ecology and adaptation of fishes in different ecosystems. Threats and conservation challenges of fishes in India. Methods for ecological studies of fishes.

Module IV: ***Ornithology:*** Ornithology and brief knowledge on bird morphology. Avian classification and distribution with special reference to Indian birds. Morphological, physiological and anatomical adaptations in birds. Types of feathers, bills and claws. Bird ecology and behaviour – feeding, nesting and parental behaviour, locomotion, communication, and reproductive behaviour - courtship displays, territory, and mating behaviour. Types of bird flight and flight adaptations. Bird migration – reasons, patterns and mechanics of migration. Threats faced by the avian community. Bird conservation and management in India. Important Bird areas and Ramsar sites.

Practicals: -

1. Study of characteristics of wildlife in different biogeographic zones of India
2. Field identification of larger mammals of the orders Primata, Carnivora, Proboscidea, Perissodactyla, Artiodactyla, Pholidota, and Lagomorpha
3. Morphological features of various families under order chiroptera
4. Field identification small mammals of Rodentia and Eulipotyphla
5. Visit to different bird habitats viz. forests, wetlands, shore areas, urban areas etc. and field identification of birds.
6. Field identification of reptiles and amphibians of Western Ghats
7. Study on venomous and nonvenomous snakes
8. Study of feathers, beak and leg types of different groups of birds.
9. Birds skin preparation.
10. Acquaintance with the online citizen science platforms for bird monitoring.

References: -

1. *Daniel JC. 1980. Book of Indian reptiles. OUP*
2. *Dasmann, R.F. 1982. Wildlife Biology. Wiley Pub. New York.*
3. *Gee EP. 2000. The wildlife of India. Harper Collins Publication.*
4. *Grimmet, R. Inskipp T and Inskipp, I. 2000. Pocket Guide to the of Birds of Indian subcontinent. Christopher Helm series.*
5. *Indraneil Das. 1987. Turtles and Tortoises of India, OUP*
6. *Johnsingh AJT. (Ed.). 2003. The Mammals of South Asia: Ecology, Behaviour and Conservation.Permanent Black.*
7. *Neelakantan,K.K. 1984. "KeralathilePakshikal". Kerala Sahithya Academy, Thrissur. 584pp.*
8. *Prater, S.H. 1971. The Book of Indian Animals. Oxford University press, Bombay.*
9. *Ranjit Daniels. Freshwater Fishes of Peninsular India. Indian Academy of Sciences*
10. *VivekMenon. 2003. Field Guide to Indian Mammals. Penguin Books, India.*
11. *Whitaker R and Ashok Captain. 2004. Snakes of India: The Field Guide. Draco Books, Chennai.*

***

MSFOR02C06 - NURSERY TECHNIQUES & PLANTATION FORESTRY

Hours per week: 4+2 **Credit: 4**

Course Outcomes:

- Develop skills in seed processing, nursery techniques and plantation management
- Understand management activities done in different plantations across the world
- Select trees species for different afforestation programmes
- Understand the major pests and disease affecting plantations and its management

Module I: ***Seed Technology***: Importance of seed in Nursery Establishment - Planning seed collection- Methods of seed collection. Fruit and seed handling - Seed processing for nursery sowing- methods of extraction. Seed storage- definition- purpose. Seed dressing and pelleting. Seed testing - definition- ISTA rules. Germination evaluation- germination testing in nursery. Emerging trends in tropical seed technology.

Module II: ***Nursery Techniques:*** Scope of Nursery technology in relation to plantation forestry. Nursery establishment - site selection – planning, and layout of nursery area. Pre-sowing treatments. Containerized nursery technique - advantages, disadvantages - root deformations - container designs and types/root trainers and rooting media. Methods for field handling and planting. Nursery practices for important plantation species.

Module III: ***Plantation Forestry*****:** Importance and status of plantation in India and world. Purpose of plantation, factors determining scale and rate of plantation, land suitability and choice of species. Various Steps in plantation and its management- planning, preliminary site preparation, planting programme (time of planting, spacing and pattern, planting methods). Emerging concepts in plantation forestry: mixed plantation, continuous cover forests. Plantation forestry for climate change mitigation- carbon forestry. Ecological factors and long term productivity. Sustainable yield from plantations.

Module IV: ***Plantation pests and diseases***- Major pest and disease in plantations -sanitation and control measures. IPM and INM in plantations. Case studies in plantations of teak, mahogany, eucalyptus, casuarina, poplars, acacias, pine, silver oak, gmelina, sandal, bamboo. Wasteland afforestation, Industrial Plantations, Mixed plantations.

Practicals:

1. Introduction and identification of modern equipment and tools used in nursery;
2. Planting geometry and calculation of planting stock/ seed requirement
3. Seed Quality testing
4. Study the morphological description and field identification characteristics of trees seeds and seedlings.
5. Planting and stand management practices of Multipurpose trees(MPTs) and Bamboos
6. Field Visit to Forest plantations and wood logs.

References:

1. *Baldwin HI. 1942. Forest Tree Seed of the North Temperate Regions. Periodical Experts Book Agency, Delhi.*
2. *Bedell PE. 1998. Seed Science and Technology: Indian Forestry Species. Allied Publisher Limited.*
3. *Chaturvedi AN. 1994. Technology of Forest Nurseries. Khanna Bandhu.*
4. *Chin HF and Roberts EH. 1980. Recalcitrant crop seeds. Tropical Press Sdn. Bhd. Malaysia.*
5. *Dutta M and Saini GC. 2010. Forest Tree Improvement and Seed Technology.*
6. *Dwivedi AP. 1993. A Text Book of Silviculture. International Book Distributors, Dehradun.*
7. *Dwivedi AP. 1993. Forestry in India. Suya Publ.*
8. *Evans J. 1982. Plantation Forestry in the Tropics. Clarendon Press,Oxford.*
9. *Khanna, L.S. (1989). Principles Practice of Silviculture. Khanna Bandhu, New Delhi, 473p.*
10. *Kumar V. 1999. Nursery and Plantation Practices in Forestry. Scientific Publ.*
11. *Luna RK. 1989. Plantation Forestry in India. International Book Distributors.*
12. *Ram Prakash, Chaudhari DC & Negi SS. 1998. Plantation and Nursery Techniques of Forest Trees. International Book Distributors.*
13. *Smith DM, Larson BC, Ketty MJ & Ashton PMS. 1997. The Practices of Silviculture-Applied Forest Ecology. John Wiley & Sons.*

***

MSFOR02C07 - FOREST BIOMETRY

Hours per week: 4+3 **Credit: 4**

Course Outcomes:

- Understand and carry out measurements of individual trees and forest stands
- Familiarize forest sampling and inventory techniques
- Estimate of growth and yield obtained from forest stands
- Determine the site quality of different forests

Module I: ***Measurement of tree parameters:*** Diameter and girth measurements, Standard rules governing breast height measurements- instruments used for girth and diameter measurements, measurement of bark thickness-bark gauge. Tree height definitions- Total height, bole height, commercial bole height, crown length and crown height, Measurement of tree height- ocular, non-instrumental and instrumental methods. Tree stem form- form factor types, form height, form quotient, form class

Module II: ***Volume measurement of trees:*** Volume of standing trees, volume of logs-Smalions formula, Hubers formula, Newton's formula, Quarter girth formula, Volume tables- Classification and preparation of volume tables.

Module III: ***Forest Sampling Techniques:*** Kinds of enumeration, choices of kinds of enumeration, kinds of sampling – random sampling- simple random sampling, stratified random sampling, multi-stage sampling, multi-phase sampling, sampling with varying probability-list sampling, non-random sampling- selective sampling, systematic sampling, sequential sampling, sampling errors, and non-sampling errors. Kinds of sampling units- fixed area and point sampling units. Horizontal and vertical point sampling.

Module IV: ***Measurement of forest stands:*** crop diameter, crop height, crop age, crop volume, estimation of growth and yield prediction in a forest stand, stand structure, growth of stand-methods of determining the past growth of stand, methods of predicting the future growth of stands- stand density, canopy density, crown competition factor, maximum crown area, site quality evaluation- yield table- contents, kinds, preparation and uses, stand table- definition and uses.

Practicals: -

1. Measurement of tree height using various instruments
2. Measurement of tree girth using various instruments
3. Measurement of tree diameter using various instruments
4. Measurement of bark thickness using various instruments
5. Estimation of canopy cover using spherical densiometer.
6. Calculation of the volume of felled trees and standing trees
7. Preparation of volume tables

8. Determination of site quality

References: -

1. *Chapman, H.H and Meyer, W.H. 2008. Manual of Forest Mensuration: Methods and Techniques, Asiatic publishing house, 522p.*
2. *Chaturvedi A, N, and L.S Khanna, 1982. Forest Mensuration, International Book Distributors, Dehradun, 403p.*
3. *Chaturvedi A, N, and L.S Khanna, 2011. Forest Mensuration and Biometry, Khanna Bandhu, Dehradun, 364p.*
4. *Heindjik, D. 1975. Forest Assessment, International Book Distributors, 349 p.*
5. *Kangas, A and Maltamo, M. 2006. Forest Inventory: Methodology and Applications, Managing Forest Ecosystems. Springer 340 p.*
6. *Shiver, B.D and Borders, B.E. 1996. Sampling techniques for Forest Resource Inventory. John Wiley and Sons, 356 p.*

***

MSFOR02C08 – CONSERVATION BIOLOGY AND CAPTIVE WILDLIFE MANAGEMENT

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Understand the importance of biodiversity and its uses and values.
- Describe the major threats to biodiversity and the causes of species extinction.
- Evaluate the effectiveness of different conservation strategies and approaches.
- Analyze and apply conservation tools and techniques in practical situations.

Module I: ***Principles of Conservation Biology and Biodiversity:*** Definition, principles and scope of conservation biology. Early school of thoughts in conservation biology. Biodiversity – definition, levels, uses and values. Spatial classification of biodiversity – Alpha, Beta and Gamma diversity. Measures of diversity, richness, evenness. India as a mega biodiversity nation. Endemism, rarity and extinction of species. Extinction processes and rates – causes of extinction. Ethics in conservation biology. Environmental justice and equity.

Module II: ***Conservation Genetics:*** Phylogenetics and species delineation. Phylogenetic diversity and conservation. Population density and inbreeding – genetic drift. Population habitat viability analysis. Assessing cryptic diversity and DNA barcoding. Conservation consequences of hybridization.

Module III: ***In situ Conservation and Protected Areas:*** *In situ* conservation measures. Protected areas – concept and design. Protected area network in India. National Parks, Wildlife Sanctuaries, Community Reserves and Conservation Reserves. Conservation efforts - Worldwide and in India. MAB programme and Biosphere reserves. Major conservation projects. NTCA and tiger conservation in India. IUCN redlist categories and criteria.

Module IV: ***Ex situ Conservation and Captive Wildlife Management:*** *Ex situ* conservation measures. Zoological Gardens in India. Objectives and types of zoo. Conservation through captive breeding and reintroduction of endangered wild animals. Conservation breeding Management Plans, Role of scientific institution and NGOs in Conservation Breeding Programmes. Understanding biological requirements of species; design of facilities: food, hygiene, disease control, breeding. Case studies on Conservation Breeding Programme of endangered wild animals in India. Central Zoo Authority and its guidelines on the zoological gardens in India. Nutrition and health care of captive wildlife according to CZA. Capture and handling of animals - purpose, restraint techniques, different capture methods and animal barriers. Drug immobilization - drug delivery equipment and accessories. Immobilization drugs - action, dosage, response and side effects, safety measures, complications. CZA protocol of handling and transport of wild animals, designing sledge, crate and holding enclosures.

Practicals: -

1. Conduct a field survey and estimate the Simpson's and Shannon-weiner diversity indices, Berger-parker dominance index , quantitative and qualitative similarity indices.
2. Visit to local Zoo and record disease, health management practices of various animals.
3. Demonstration of equipment used in capturing and handling of wild animals.
4. Major viral, bacterial, protozoan, fungal and parasitic diseases of Indian wild mammals, birds, amphibian and reptiles.
5. Calculation of Minimum Viable Population
6. Calculation of inbreeding coefficient
7. Visit a protected area and evaluate the effectiveness of conservation programmes implemented.

References: -

1. *Hunter, L.M. and Gibbs, J.P. (2006). Fundamentals of Conservation Biology, 5th Edition. Wiley-Blackwell Publications, New Jersey, USA. 516 pp.*
2. *Primack, R.B. 1993. Essentials of Conservation Biology. Soiner, MA.*
3. *Piank, E.R. 1981. Competition and niche theory. In Theoretical Ecology. May (ed).*
4. *Pielou, E.C. 1975. Ecological Diversity. Wiley Interscience Pub.*
5. *Magurraan ,A. (1983). Ecological diversity, University press Cambridge*
6. *Wildlife Ecology and Management, by W.L.Robinson & E.G.Bolen. Mc.Millan Publ. Comp. New York.*
7. *Managing Protected Areas in Tropics, by J.K.Mackinnon, Natraj Publ. Dehradun.*
8. *Sahoo A. K. 2011. The Text Book of Forest Ecology, Biodiversity and Conservation. Indian Books and Periodicals. New Delhi.*

***

MSFOR02C09 - RESEARCH METHODOLOGY AND BIOSTATISTICS

Hours per week: 4+3 **Credit: 4**

Course Outcomes:

- Understand the various research methods and techniques
- Develop the ability to formulate research questions and objectives
- Acquire skills in data analysis
- Interpret Statistical Results

Module I: ***Introduction to Research:*** Novelty, Originality, Organized Method of Investigation, and Communication of Problem, Data, Method, and Results.Types of Research- Theoretical, Empirical, Experimental. Modes of Inquiry and Inquiring Systems: Hypothetico-deductive and Empirical-inductive modes.Research Topic, Problem, Questions, Objectives, and Scope Research Methodology, Methods, Tools, and Techniques. Research Ethics, Plagiarism and Their Prevention.

Module II: ***Research Documentation:***Elements of Preparing a Paper and a Thesis- Title, Abstract, Keywords, Acknowledgements, Symbols and Abbreviations, Introduction, Literature Review, Materials and Methods, SI Units, Mathematical Materials, Graphical and Tabular Presentation, Results and Discussion, Conclusion, Interpretation, Generalization, Scope for Future Work, Citations and List of References, and Appendixes.

Module III: ***General Statistical Methods:***Scales of measurement, important variables of forestry sector. Probability distributions (Binomial, Poisson, Normal). Correlation and regression: SimpleandRank, correlations.Linear and nonlinear regressions, parabolic, exponential, power and logarithmic functions. Tests of significance – t, F, z, and $\chi 2$, testing significance of correlation and regression coefficients, analysis of variance (ANOVA) – one way and two-way classification with single and more than one cell frequency.

Module IV: ***Design of Experiments:*** Principles of experimental designs, Completely Randomized Design (CRD), Randomized Block Design (RBD), Latin Square Design (LSD), Row- Column (alpha) designs, Split Plot and Strip Plot Designs. Sampling – Theory and applications. Simple Random, Sampling (with and without replacement), Stratified Random Sampling, Double sampling, Multistage sampling, Cluster sampling.

Practicals: -

1. Preparation of Questionnaires and collecting data.
2. Citing information gathered from different media.
3. Paraphrasing an article
4. Oral presentation of a Research report.
5. Problems on probability-fitting of binomial distribution
6. Fitting of linear regression models for prediction
7. Fitting of Poisson distribution , problems on normal distribution

8. Computation of correlations
9. Tests of significance – t, F, z, Chi –square test, test of goodness of fit – test of independence of attributes in a contingency table - computation of mean – square contingency
10. Analysis of variance-construction of ANOVA table of one-way classified data.
11. Analysis of variance-construction of ANOVA table of two-way classified data.
12. Selection of simple random sample – estimation of parameters – sample size Determination
13. Selection of stratified random sample–equal, proportional and Neyman's allocation in stratified sampling
14. Lay out and analysis of CRD, Lay out and analysis of RBD
15. Analysis of data from 2^n factorial experiments in RBD. Formation of Yate's table calculation of main effects and interaction effects.

References: -

1. *Ackott, R.L. and Sasieni, M.W. 1984. Fundamentals of operational research. Wiley Eastern, New Delhi*
2. *Anderson, R.L. and Bancroft, T.A. 1952. Statistical Theory in Research. Mc.Graw Hill Book Co.,NewYork.*
3. *Cochran,W. Gand Cox, G.M. 1958. Experimental designs. Wiley, New York*
4. *Das, M.N. and Giri, N.C. 1986. Design and analysis of Experiments. Wiley Eastern Ltd., New Delhi.*
5. *Goon, A.M., Gupta, M.K. and Dasgupta, B. 1983. Fundamentals of Statistics. Vol.1. The World Press Pvt. Ltd., Calcutta.*
6. *Gupta, S.C., and Kapoor, V.K. 2014. Fundamentals of Applied Statistics. Sultan Chand & Sons; Fourth edition*
7. *Hawkins, C. and Sorgi, M. (Ed.). 1984. Research - How to Plan, Speak and write about it. Narosa Publishers, New Delhi*
8. *Hillway, T. 1964. Introduction to Research, 2nd ed., Boston: Houghton Mifflin.*
9. *Kothari, C. R. 2009. Research methodology: Methods and Techniques. Viswa Prakashan New Delhi.*
10. *Thomas, C George. 2020. Research Methodology and Scientific Writing 2nd Edition.*
11. *Verma, R.K. and Verma Gopal. 1988. Methodology and Technique of Research. Arnold Publishers, New Delhi.*

***

MSFOR03C11 - WILDLIFE MANAGEMENT AND MONITORING TECHNIQUES

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Understand the principles and goals of Wildlife Management
- Assess and monitor wildlife populations using appropriate techniques.
- Evaluate and implement habitat management strategies for wildlife conservation.
- Analyze the impacts of hunting, trapping, and predator control on wildlife populations.

Module I: Introduction to Wildlife Management: Definition, objectives, and scope of wildlife management. Historical development and key milestones in wildlife management in India. Challenges and contemporary issues in wildlife management.

Module II: Wildlife Monitoring and Population Assessment: Wildlife census – Purpose and techniques. Direct and indirect methods. Direct methods – Line transect for direct sighting, Total count, block counts, road side counts, water hole count. Indirect methods – strip transects for indirect evidences of tracks and signs, dung count method for elephants and gaur, pug mark census. Use of camera traps, Sherman traps, mist nets, harp traps, drones, molecular tools, acoustic tools. Radio telemetry and tracking studies. Visual tagging, marking, PIT tags and ringing in birds. Mark-recapture methods and statistical modeling. Distance sampling and estimating animal densities and abundance. Designing occupancy surveys and data collection. Estimating species occurrence and detection probabilities.

Module III: Habitat Management for Wildlife: Habitat requirements and management strategies for different species. Landscape-level conservation planning and habitat connectivity. Importance and need for restoration of wildlife corridors. Use of geospatial tools for habitat suitability analysis. Zoning of protected areas.

Module IV: Human Dimensions in Wildlife Management: Reasons for human-wildlife conflicts. Impacts of human activities on wildlife populations. Wildlife habitat destruction and emerging zoonoses. Conflict resolution and mitigation of human-wildlife conflicts. Culling as a wildlife management tool. Management strategies for wildlife in national parks and reserves. Ecodevelopment – Community participation and conservation development linkage. Ecotourism and its role in wildlife conservation. Balancing visitor access and wildlife protection.

Practicals: -

1. Field exercise on wildlife census techniques - direct methods
2. Field exercise on wildlife census techniques - indirect methods
3. Field study on tracks and signs
4. Field exercise on camera trap survey

5. Survey for small mammals using Sherman traps
6. Bat monitoring using harp traps, mist nets and bat detectors
7. Estimation of population using Mark-recapture method.
8. Estimation of bird species richness by Mckinnon's method.

References: -

1. Sutherland, W.J. and Krebs, C.J., 1997. Ecological census techniques. *Trends in Ecology and Evolution*, *12*(2), pp.81-81.
2. Karanth, K.U. and Nichols, J.D. eds., 2002. *Monitoring tigers and their prey: a manual for researchers, managers, and conservationists in tropical Asia*. Centre for Wildlife Studies.
3. Donnelly, M.A., Guyer, C., Juterbock, E.J. and Alford, R.A., 1994. Techniques for marking amphibians. *Measuring and monitoring biological diversity: standard methods for amphibians*.
4. Rajesh, G. 1989. Fundamentals of Wildlife Management. Justice Home, Allahabad.
5. Sukumar, R., 1992. *The Asian elephant: ecology and management*. Cambridge University Press.
6. Singh, L. A. K. 2000. Tracking Tigers: Guidelines for estimating wild tiger populations using the 'Pugmark Technique': Revised Edition. WWF Tiger Conservation Programme.

***

MSFOR03C12 - FOREST HEALTH AND PROTECTION

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Identify various forest pests in plantations and natural forests
- Identify various diseases in plantations and natural forests
- Understand the concept of forest health
- Discuss the management of forest fire

Module I: Forest Health: Introduction and Definitions of Forest Health. Characteristics of a Healthy Forest. Forest Health Problems- symptoms and possible causes. Current Health Status of the World's Forests. Influence of Forest Management and other human activities on Forest Health: Case Studies. Forest Health Monitoring Networks, Forest Health Risk Rating, and Mapping. Invasive Alien Species (IAS) and its management.

Module II: Forest Pest Management: Insect pest-induced loss assessments in Forest nurseries and forest plantations in India. Important insect pests of forest nurseries, forest plantations, avenue trees, seeds of major forest trees, and their management.

Module III: Forest Disease Management: Disease-induced loss assessments in Forest nurseries and Forest plantations in India. Important diseases of forest Nurseries, forest plantations, avenue trees, and their management. Mycoflora of seeds and their management. Principles of diseases management, Development of disease management system. Modeling forest diseases.

Module IV: Forest Fire Management: Causes and Impacts of forest fire on ecosystem. Forest fire incidences in different forest types**,** Fire management strategies, advanced tools for fire-fighting, modern methods of forest fire control, Forest fire management cycle, Fire risk zone mapping and modeling, MoEFCC Report on strengthening forest fire management in India, Integrated Forest Protection scheme and IFMS, Forest fire monitoring programmes of FSI- Fire Alert system (FAST) and Large Forest Fire (LFF) monitoring.

Practical

1. Disease assessment (incidence and severity) in nursery seedlings
2. Pest assessment (incidence and severity) in forest nurseries
3. Pest assessment (incidence and severity) in forest plantations
4. Familiarize various forest fire management strategies of KFD
5. Assessment of impacts due to forest fire
6. Identification and management of Invasive Alien Species in nearby forest
7. Determination of health index of natural forests

References

1. Fuller, M. 1991. Forest Fires: An Introduction to Wildland Fire Behavior, Management, Firefighting, and Prevention. John Wiley and Sons, 238 p.
2. Joint Report by Ministry of Environment, Forest, and Climate Change, GOI and World Bank, 2018. Strengthening Forest fire management in India. 234 p.
3. Khanna, L.S. 2015. Forest Protection, Khanna Bandhu, Dehradun, 232 p.
4. Parthasarathy, S., Thiribhuvanamala, G., Muthulakshmi, P and K. Angappan. 2021. Diseases of forest trees and their management. CRC press. 388 p.
5. Robert L Edmonds, James K Agee, and Robert I. Gara, 2011. Forest Health and Protection. McGraw-Hill publishers. 648 p.
6. Speight, M. R and Wylie, F.R. 2012. Insect pests in Tropical Forestry. CABI publishing. 376 p.

***

MSFOR03C13 - FOREST RESOURCE MANAGEMENT AND UTILIZATION

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Understand the structure, composition, and functioning of forest ecosystems
- Develop forest management plans considering ecological, economic, and social factors
- Understand the principle, process and schemes of forest certification
- Get basic knowledge of ecosystem services evaluation

Module I: Forest Management: Ecological, Social and Economical pillars of management, Criteria and Indicators, Sustainable Forest Management-Bhopal-India Process, Criteria and indicators for SFM. Progressive yield concept and meaning. Normal Forest: definition and concept; Yield regulation –type, basis of yield regulation

Module II: Forest certification: Forest certification schemes, standards, agencies. status of forest certification in India. Marketing of certified forest products- Timber and Non-timber Forest Products. Green Building Standards and Certification Systems. Mechanisms of benefit sharing, Eco-certification, Intellectual Property Rights and Geographic Indications, Forest Stewardship Council, Landscape labelling. Case studies on certification and geographical indications.

Module III: Forest Ecosystem Valuation: Ecosystem Services -basics, importance, history of ES and natural capital. Quantification and Valuation- Direct and indirect approaches. Valuation methods- Market price-based approach, productivity and cost-based approaches, stated preference approaches. Challenges in valuation.

Module IV: Forest Working Plan: Forest planning, evaluation and monitoring tools and approaches for integrated planning; multipurpose development of forest resources and forest industries development; working plans and working schemes, their role in nature conservation, biodiversity and other dimensions; preparation and control. Divisional Working Plans, Annual Plan of operations.

Practicals: -

1. Visit to different forest divisions to study the various stand management aspects including thinning, felling and sale of timber.
2. Visit to forest plantation- Working Plan field exercises.
3. Visit to Working Plan Division- field exercises for data collection for working plan in natural forest
4. Exercise on assessment of growing stock and stock mapping.

References:-

1. Balakathiresan, S. 1986. *Essentials of Forest Management*, Nataraj Publishers. Dehra Dun.
2. Desai, V. 1991. *Forest Management in India–Issues and Problems*. Himalaya Pub. House, Bombay.
3. Edmunds, D and Wollenberg, E. 2003. *Essentials of Forest Management*. Natraj Publishers, Dehra Dun.
4. Jeffers .JN.R. 1978. *An Introduction to System Analysis with Ecological Application*. Edward Arnold.
5. National Working Plan Code 2014. MoEF, New Delhi.
6. Negi, S.S. 1984. *Scientific Management of Forest*. Bishen Singh Mahendra Pal Singh, Dehradun. 123 p.
7. Newman, E.I. 2000. *Applied Ecology*. Blackwell Scientific Publisher, U.K.
8. Osmaston, F.C. 1984. *The management of Forests*. International Book distributors, Dehra Dun, India
9. Paulo E.L.D. and Nunes. 2014. *Handbook on the Economics of Ecosystem and Biodiversity*. E-book.
10. Prakash, R. 1986. *Forest Management*. International Book distributors, Dehra Dun, India
11. Recknagel, A.B. and Bentley, J. 1985. *Forest Management*. International Book distributors, Dehra Dun, India
12. Sander J, Nicolas D and Hans K. 2014. *Ecosystem Services: Global Issues and Local Practices*. First Edition. Elsevier Publications.

***

MSFOR03C14 - GLOBAL CHANGE ECOLOGY AND ECOSYSTEM RESILIENCE

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- To make students aware of scenario of climate change and to provide exposure on resilience of species in nature
- To develop a thorough grasp of the processes by which communities, ecosystems, and living things are adapting to climate change
- To connect closely with the main literature and choose subjects at the cutting edge of global change study
- To develop communication skills for science and familiarize oneself with techniques and instruments for forecasting future reactions to climatic change.

Module I: ***Global Change Ecology:*** Introduction and overview of global change ecology, earth climate system, greenhouse gases, and greenhouse gas effect, resources and the global commons, Human population, energy, patterns of consumption & emissions, global carbon cycle, Global ecology of CH_4 and N_2O, Our future climate: global and regional predictions.

Module II: ***Impacts of Change:*** Climate change impacts on plants and animals, Climate change impact on biodiversity and communities, Impacts of climate change on ecosystem and resources - Climate change and water resources, Impact of global warming on aquatic life Marine Impacts and Acidification, Coral bleaching and diseases.

Module III: ***Assessing Impacts and Vulnerabilities*****:** Understanding Vulnerability: Key concepts of Sensitivity and Vulnerability; Methods of Vulnerability Assessment; Indicators of vulnerability and livelihood; Climate sensitivity analysis; Uncertainties in prediction and detection; Vulnerabilities and adaptation practices in forestry, agriculture, soil & land, water resources; Measures for heat waves, coastal inundation – cities – critical infrastructure; Global Policy on Climate and Adaptation.

Module IV: ***Resilience:*** Introduction, why resilience, resilience and stability of ecological systems, resilience of terrestrial ecosystems, regime shift, resilience and biodiversity in ecosystem management. Ecosystem/biodiversity management under global change, climate change politics and negotiations: Case studies.

Practicals:-

1. Monitoring Sea surface temperature and its effect on coral bleaching
2. Questionnaire survey on Vulnerability Assessment and Climate sensitivity analysis in various urban and rural landscapes
3. Inundation studies across different coastal areas of Kannur

4. Monitoring the impacts of urban green islands on global climate change

References:

1. Rathinasamy, M, Chandramouli S. Phanindra K.B.V.N. Uma Mahesh 2018, Resources and Environmental Engineering II: Climate and Environment
2. Parry, ML et al. Climate change 2007: Impacts, Adaptation and Vulnerability, Cambridge University Press.
3. Patt, A et al. 2009 Assessing Vulnerability to global environmental change: making research useful for adaptation decision making policy, Earth scan London.
4. Climate Change and Biodiversity; By Thomas E. Lovejoy, Lee Jay Hannah Published by Yale University Press, 2006 ISBN 0300119801, 80300119800 418 pages.
5. William H. Schlesinger. 1997. Biogeochemistry: An Analysis of Global Change. Academic Press, San Diego, CA. 2nd edition. Available at the Bay Tree Bookstore.
6. Global Environmental Change: Research Pathways for the Next Decade, National Research Council, 1999.
7. Our Common Journey: A Transition toward Sustainability, National Research Council, 1999.
8. Shifting plant phenology in response to global change. Trends in ecology & evolution, 22(7), Cleland, E.E., Chuine, I., Menzel, A., Mooney, H.A. and Schwartz, M.D., 2007.pp.357-365.
9. Shifts in phenology due to global climate change: the need for a yardstick. Proceedings of the Royal Society B: Biological Sciences, 272(1581), Visser, M.E. and Both, C., 2005, pp.2561-2569.
10. Regional decline of coral cover in the Indo-Pacific: timing, extent, and subregional comparisons. PLoS one, 2(8), Bruno, J.F. and Selig, E.R., 2007, p.e711.

***

MSFOR04C15 - FORESTRY EDUTOUR

Hours per week: Nil **Credit: 2**

Course Outcomes:

- Familiarize the flora and fauna of different forest types of the states/parts of India
- Understand the research activities of various research institutes, and other organizations related to forestry research in the state and other parts of India
- Understand the management practices to be followed in protected areas, zoos, and other captive breeding centres
- Exposure to various National/heritage monuments as part of the National Integration Activity.

Modules

- Visit natural forests of the states/parts of India to familiarize the structure, species composition and identify the forest types
- Visit to protected areas (wildlife sanctuaries or National parks) to familiarize the wildlife management practices
- Visit an ecotourism site to identify visitor satisfaction level, estimate the tourism carrying capacity, develop an alternate ecotourism product plan with existing facilities in the area, and conduct a stakeholder analysis
- Visit state/national research institutes to get exposure to the research activities and conservation efforts ongoing in the field of forestry.
- Visit zoos, wildlife safari, and captive breeding centres of states/parts of India to study the animal behaviors, breeding programs, and other conservation activities of the institutes.
- Visit various national heritage monuments of state or parts of India as part of the National Integration Activity

***

KANNUR UNIVERSITY

SCHEME AND SYLLABUS

FOR

ELECTIVE COURSES

OF

M.Sc. FORESTRY (WILDLIFE MANAGEMENT)

UNDER

CHOICE BASED CREDIT AND SEMESTER SYSTEM
(OBE – Outcome Based Education – system)

With effect from 2023 admission

MSFOR03O01 - ECOTOURISM AND WILDLIFE PHOTOGRAPHY

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Understand the different forms and categories of tourism.
- Understand the objectives and principles of ecotourism
- Demonstrate a comprehensive understanding of the principles and techniques of wildlife photography and framing techniques to create visually compelling wildlife images.
- Select and effectively utilize appropriate gear and equipment for different wildlife photography scenarios and apply post-processing and image editing techniques to enhance and refine wildlife photographs while maintaining authenticity.

Module I: ***Ecotourism Fundamentals and Concepts:*** Tourism-definition and history- Forms and categories of tourism. Classification of tourism. Dimensions and basic components of tourism. Ecotourism-definition and elements of ecotourism. Principles and objectives of ecotourism. Potential of ecotourism in India. Forms of ecotourism- hard and soft ecotourism. Stakeholders in ecotourism. Organizations and NGO's promoting ecotourism. Environmental and social impacts of ecotourism. Ecotourism and sustainable development.

Module II: ***Ecotourism in protected area:*** Planning ecotourism in protected areas-Carrying capacity and Zoning, Ecotourism in important protected areas of India- Keoladeo National Park, Kanha National Park, Sundarbans Tiger Reserve, Jim Corbett National Park, Periyar Tiger Reserve, Wayanad Wildlife Sanctuary, Parambikkulam Tiger Reserve, Thenmala Ecotourism and Bandipur National Park.

Module III: ***Basic elements of Wildlife Photography:*** Photography and overview of wildlife photography as a genre. Essential gear and equipment for wildlife photography: Workings of different kinds of cameras and lenses. Use of light and speed for different kinds of photographs, motion photography: Camera settings and exposure for wildlife. Basic rules for composing good wildlife and nature photography. Ethical considerations in wildlife photography. Using photography as an effective tool for conservation story telling.

Module IV: ***Post-Processing and Image Editing:*** Introduction to post-processing software for wildlife photography. Adjustments for exposure: techniques for fine-tuning exposure and brightness, Color: Understanding color correction and white balance adjustments, contrast Enhancing, Sharpening techniques to emphasize fine details, textures, and features, and minimizing distractions Preserving authenticity and ethical considerations in post-processing. Storytelling and Portfolio Development.

Practicals:-

1. List out the major ecotourism destinations in Kerala
2. Visit an ecotourism site and carry out stakeholder analysis and social impact assessment
3. Estimation of carrying capacity (PCC, RCC and ECC) for a tourism destination
4. Prepare an ecotourism plan for a nearby destination
5. Specialized Wildlife Photography: Bird photography techniques, Macro photography, Nocturnal and low-light photography, artificial lighting and long-exposure photography at night.
6. Developing a narrative and storytelling approach in wildlife photography: Creating a compelling wildlife photography portfolio
7. Hands-on editing exercises using post-processing softwares: Adobe Lightroom, Adobe Photoshop, Capture One, GIMP.

References:-

1. Hosetti, B.B. 2007. Ecotourism development and management, Pointer publishers, Jaipur. 358p
2. Honey, M. 2008. Ecotourism and Sustainable development. Island Press. 551p.
3. Chiranjeev, A. 2008. Ecotourism planning and Development. JnanadaPrakashan.
4. Chiranjeev, A. 2008. Ecological, Social and Cultural aspects of Ecotourism. JnanadaPrakashan.
5. Chiranjeev, A. 2008. Concept of tourism. JnanadaPrakashan.
6. Aaradhana, S. 2009. Indian tourism, Wildlife tourism and Ecotourism. JnanadaPrakashan. 288p
7. John and Barbara Gerlach. 2012. Digital Wildlife Photography. Routledge. 224p.

***

MSFOR03O02 - CONSERVATION LAWS AND EIA

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Understanding the evolution of environmental laws in India, their scope and applicability.
- Explain the role of law and legal institutions in the conservation and management of natural resources.
- Understand the laws and policies at the national and international level relating to the environment
- Acquire skills needed for interpreting laws and judicial decisions

Module I: ***Forest, Wildlife, and Biodiversity related laws*****:** Evolution and Jurisprudence of Forest and Wildlife laws; Colonial forest policies; Forest policies after independence. Statutory framework on Forests, Wildlife and Biodiversity: IFA, 1927; WLPA, 1972; FCA, 1980; Biological Diversity Act, 2002; Forest Rights Act, 2006, WLPA (amendment-2020). National Water Policy and Kerala state policy. Pollution Control Boards. Judicial remedies and procedures Marine laws of India; Coastal zone regulations. Legal framework on Air pollution: Air Act,1981; EPA, 1986.

Module II: ***Environment protection laws:*** Legal framework on environment protection-Environment Protection Act as the framework legislation–strength and weaknesses; National Green Tribunal. Legal framework: EPA and rules made thereunder; introduction to international law; sources of international law; law of treaties; signature, ratification. Evolution of international environmental law: International Agencies: CITES, TRAFFIC, UNFCC. International Conventions: Ramsar Convention, The Basel Convention, The Montreal Protocol, International Tropical Timber Agreement. Convention on Biological Diversity 1992 (CBD) Cartagena Protocol on Bio-Safety 2000 (CPB)

Module III: ***Environmental Impact Assessment (EIA):*** Concepts of EIA, history of EIA, definition, and types of EIA, Environmental Impact Assessment and Environmental Impact Statement; EIA in the project cycle, EIA Notification, and legal and regulatory framework. Public consultation and participation in EIA process. EIA guidelines and review process. EIS formulation. New approaches to EIA and SEA (strategic environmental assessment).

Module IV: ***Methods in EIA:*** Screening and Scoping in EIA – Drafting of Terms of Reference, Baseline monitoring: air; water; noise; land and soil, microclimate, biodiversity, geology, hydrology, and hydrogeology. Baseline monitoring of Socio-economic environment – Identification of Project Affected Personal – Rehabilitation and Resettlement Plan-Economic valuation of Environmental impacts – Cost-benefit Analysis

Practicals:-

1. Visit to Protected Areas and Divisional Forest Office to observe and familiarize implementation of different forest laws
2. Visit to different project sites and interaction with rehabilitees.
3. Prepare a model Environment Management Plan for the given project.
4. Familiarize Environmental Impact Assessment
5. Cost-benefit Analysis

References:

1. Baden Powell, B.H. 2002. Manual of Jurisprudence for Forest Officers. Materials, and Statutes, Oxford University Press.
2. Dutta, R. and Yadav, B. 2012. Supreme Court on Forest Conservation. Universal Law Publishing Co., New Delhi, India.
3. Forest Laws of Kerala, 1975. Ganesh Publications, Kochi.
4. Handbook of Environment, Forest and Wildlife Protection laws in India 1998. Natraj Publishers, Dehra Dun.
5. Joy, P. P. 2012. Set up your criminal practice. Swamy Law House, Ernakulam.
6. Roy P Thomas. 2011. Manual of forest laws in Kerala 3rd Edition. Em tee en Publications.
7. Shetty, B. J. 1985. A Manual of Law for Forest Officers, Sharda Press, Mangalore.
8. Divan, S.and Rosencranz, A. 2001. Environmental Law and Policy in India. Cases.
9. Takwani, C. K. T and Thakker, M. C. 2012. Takwani Criminal Procedure. Lexis Nexis Butterwarths, Wadhwa, Nagpur.
10. Varghese, M. I. 2012. Treatise on Forest Laws of Kerala. Swamy Law house, Ernakulam.

***

MSFOR03O03 - ETHNOBIOLOGY

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Analyze the relationships between human societies, biodiversity, and the environment.
- Assess the impacts of globalization and cultural change on traditional ecological knowledge.
- Evaluate the importance of ethnobiology in conservation and sustainable resource management.
- Recognize the ethical considerations and challenges in ethnobiological research and practice.

Module I: Ethnobiology and Traditional Ecological Knowledge: Definition, scope, and historical development of ethnobiology. Interdisciplinary nature of ethnobiological research. Cultural and ecological perspectives in ethnobiology. Traditional Ecological Knowledge- Definition-scope- Indigenous and local communities as custodians of TEK-Case studies showcasing TEK in different cultural contexts-Ethical considerations in accessing and utilizing TEK.

Module II: Ethnoecology and Biocultural Diversity: Interactions between culture, language, and biodiversity**.** Biocultural diversity hotspots and their significance**.** Indigenous conservation practices and community-based management**.** Role of ethnoecology in sustainable development**.** Bioprospecting- Challenges and controversies. Community-based approaches to conservation and benefit sharing. Collaborative research models and partnerships with indigenous communities.

Module III: Indigenous Knowledge Systems and Climate Change: Indigenous knowledge and adaptation strategies in the face of climate change. Indigenous perspectives on climate justice and environmental activism. Indigenous-led initiatives for climate change mitigation and resilience. Collaborative research and policy partnerships for climate action.

Module IV: Emerging Trends in Ethnobiology: Current debates and future directions in ethnobiology research**.** Integration of traditional and scientific knowledge systems**.** Innovations in ethnobiological data collection and analysis**.** Ethnobiology as a bridge between academia, indigenous communities, and policy.

Practicals:-

1. Visit to various tribal hamlets and document their local health traditions.
2. Ethnobotanical Surveys among local communities to document traditional plant knowledge, including the identification, uses, and preparation methods of plants for medicinal, culinary, or other purposes.
3. Collection and documentation of Traditional Ecological Knowledge

4. Ethnoecological Assessments
5. Studies on primitive tribes of Kerala

References

1. Anderson, E.N., 2011. *Ethnobiology*. Wiley-Blackwell Publications.
2. Bawa, K.S. and Nair, R. K. N., 2006. (Ed.). *Traditional Wisdom and Biodiversity Conservation in India*. Ashoka Trust for Research in Ecology and the Environment.
3. Gary Martin, 2011 (Ed.). *Ethnobiology for the Future: Linking Cultural and Ecological Diversity for Resilience and Sustainability*. Arizona University Press.
4. Jain, A.K., and Rastogi, R.P. 2010. *Ethnobiology in Human Welfare.* Capital Publishing Company.
5. Luisa Maffi and Ellen Woodley, 2010. *Ethnobiology and Biocultural Diversity*. Routledge Publications.
6. Rai, M. K., Arora, S. and Sharma, B. K. 2017. *Ethnobotany: Principles and Applications*. CABI India
7. Ulysses Paulino Albuquerque, 2005. *Ethnobiology: An Introduction.* Timber Press.

***

MSFOR04E01 - WILDLIFE FORENSICS

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Demonstrate a critical understanding of practical and ethical issues relating to the application of conservation genetics and wildlife forensics.
- Plan, apply and interpret the outputs of appropriate research and forensic techniques.
- Understand the basics of Wildlife Crime Investigation with Forensic Trace Collection, documentation and presentation of evidence in a courtroom.
- Understand the main theoretical and practical skills of personnel who investigate wildlife crimes.

Module I: ***Wildlife Forensics Fundamentals and Concepts:*** Overview of wildlife forensics and its significance, History and key milestones in the field. Forensic science principles and their application to wildlife cases Understanding the legal framework and regulations related to wildlife crime.

Module II: ***Species Identification and Crime Investigation Techniques:*** Methods for species identification (morphology, physical, anatomical, histological and chemical), protein based (electrophoretic- SDS-PAGE, Iso-electric focusing, Capillary electrophoresis etc.), immunological (AGID, ELISA etc.), DNA- based methods (hybridization, RFLP, AFLP etc.). Taxidermy techniques. Crime scene management and evidence collection: preservation and submission of clinical and autopsy samples, preservation and despatch of carcasses for autopsy. Introduction to forensic tools and equipment used in wildlife crime investigation. Forensic photography and documentation of evidence. Chain of custody and preservation of biological samples.

Module III: ***Forensic Genetics in Wildlife:*** Principles of forensic genetics and its application to wildlife cases. DNA extraction, amplification, and analysis techniques DNA profiling and individual identification methods. Molecular markers used in wildlife forensics. Wildlife population genetics and its role in conservation efforts. Key agencies contributing in wildlife crime enforcement.

Module IV: ***Forensic Pathology and Necropsy Procedures:*** Introduction to wildlife forensic pathology, forensic toxicology, forensic entomology and its applications in wildlife cases. Necropsy techniques and protocols for wildlife examinations. Identification of causes of death, injuries, and trauma. Identification and analysis of toxic substances in wildlife samples. Effects of toxins on wildlife health.

Practicals:-

1. Use of different techniques in identification of different parts and products of flora and fauna reported in the wildlife trade.
2. Species identification through morphometry: Identification of feathers, fur, scales, and bones
3. Collection, preservation and transport of samples
4. Techniques in preservation and despatch of morbid specimens in vetero-legal cases
5. Immunological method – AGID, ELISA
6. DNA extraction, amplification and sequencing: DNA profiling and individual identification methods
7. Identification of causes of death, injuries, and trauma in wildlife.

References:-

1. Butler, J.M., 2011. Advanced topics in forensic DNA typing: methodology. Academic press.
2. Huffman, Jane E., and John R. Wallace. 2012, Wildlife forensics: methods and applications. John Wiley & Sons,
3. Cooper, J.E. and Cooper, M.E., 2013. Wildlife forensic investigation: principles and practice. CRC press.
4. Linacre, A. ed., 2009. Forensic science in wildlife investigations. CRC press.
5. Dash, H.R., Shrivastava, P., Mohapatra, B.K. and Das, S. eds., 2018. DNA fingerprinting: Advancements and future endeavors. Springer.

***

MSFOR04E02 - ECOLOGICAL INFORMATICS

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Develop analytical, decision making, and data modelling skills
- Impart computational and informatics skills
- Understand application of various AI techniques to real world problems from an environmental perspective
- Develop spatial data manipulation and handling skills

Module I: ***Ecological Data Analytics & Modelling:*** Identifying key terms of ecological data - Data Preprocessing. Basic concept of ecological modelling; Types of ecological modelling - Deterministic, Stochastic, Theoretical model, Simulation model, Dynamic model, Structural dynamic model and Static model; Concepts of Equilibrium point, Limit cycle, Period doubling, Chaos, Persistence, Hopf bifurcation and different aspects of Stability of the system such as Local stability, Global stability and Asymptotic stability; example case study of theoretical model.

Module II: ***Machine Learning :*** The Machine Learning Processes; Python libraries for Machine Learning. Major machine learning techniques - Making data ready for Machine learning. Supervised v/s Unsupervised learning. Regression: Simple linear, multiple linear and non-linear regression; Classification: K Nearest Neighbors, Decision Trees, Support Vector Machines; Clustering: K Mean Clustering, Hierarchical Clustering, DBSCAN Clustering.

Module III: ***Environmental Data and Information Management :*** Biodiversity Data completeness Analysis: Primary Biodiversity Occurrence data, data aggregation, basic aspects of biodiversity data, spatial, temporal and taxonomic explorations, assessing completeness Building Biodiversity Knowledge Graphs. Applications of AI in Biodiversity and Ecology: Intro to Artificial Intelligence and allied fields, basic terminology, Applications of AI, Case studies

Module IV : ***Remote Sensing and Geographic Information System:*** Principles of Remote Sensing-applications of Remote Sensing in ecological studies. Spatial Data Analysis: Vector data analysis, Raster data analysis - Modelling of spatial Phenomena, spatial interpolation: deterministic and stochastic models, global and local models, regression model, Inverse Distance Weighted (IDW), Triangulated Irregular Network (TIN), splines, geostatistical approach: kriging, semivariograms.

Practicals:-

1. Data loading from different formats- Data pre-processing techniques- Data visualization
2. Machine learning model creation: Theoretical dynamic Model of continuous population
3. Introduction to Image processing software and RS data collection

4. Understanding band combinations and image visualizations
5. From spectra to indices: Estimation of various indices: Image Classification
6. Working with Google Earth Engine
7. Georeferencing and Digitization

References:-

1. Fundamentals of Ecological Modelling, Jørgensen & Fath,, 2011
2. Modeling Biological Systems: Principles and Applications, Haefner, 2005
3. Machine Learning using Python, Wei-Meng Lee, Wiley, 2019.
4. Introduction to meta-analysis. John Wiley & Sons, Chichester, Borenstein, M., Hedges. L. V., Higgins, J. P. T. and Rothstein, H. R. (2009).
5. Artificial Intelligence, Elaine Rich, Kevin Knight and Shivashankar B Nair, Tata McGraw Hill, 2009.
6. Introduction to Artificial Intelligence and Expert Systems, Dan W. Patterson, Pearson Education, 1990.
7. Introduction to Remote Sensing, J B Campbell and R H Wynne,The Guildford Press, 2011.
8. Remote sensing and Image Interpretation, T.M. Lillesand and R.W. Kiefer, Wiley Publications, 2003
9. Principles of Geographical Information Systems for Land Resources Assessment, P.A. Burrough, Oxford University, 1986.
10. Principles of Geographical Information Systems,O Huisman and Rolf A. de By, ITC, The Netherlands, 2001.

***

MSFOR04E03 - INVERTEBRATE ECOLOGY

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Understand the evolution and diversification of invertebrates
- Understand the role of invertebrates in ecosystem stability and functioning
- Develop skills for the field sampling techniques for studying invertebrates
- Critically analyse research gaps and challenges for invertebrate conservation

Module I: Evolution and Diversification of Invertebrates: Invertebrates- Definition, classification and evolutionary history. Major invertebrate phyla and their characteristics- Arthropoda, Mollusca, Annelida, Cnidaria, Echinodermata and Porifera- Sensory structures, Defensive mechanisms, Reproduction and development, Adaptations and survival strategies: Defensive mechanisms, mimicry, and camouflage.

Module II: Role of Invertebrates in Ecosystem Stability and Functioning: The ecological importance of invertebrates in various ecosystems- as Keystone species, Pollinators, Seed dispersers and Indicator species. Trophic relationships and ecological dynamics- Predation, herbivory, and parasitism. Trophic Cascades and Food Webs. Nutrient cycling: Decomposers and detritivores.

Module III Field sampling techniques of invertebrates: Importance of field studies in invertebrate research- Ethical considerations and safety guidelines- Essential Field Equipment and Tools- Field surveys and assessment methods- Invertebrate Collection Techniques- Active and Passive Collection Methods- Handling and Ethical Treatment of Specimens-Preservation Techniques.

Module IV Conservation of Invertebrates

Threats to invertebrate biodiversity: Habitat loss, pollution, and climate change- Case studies of endangered and vulnerable invertebrate species- Conservation strategies and initiatives- In-situ- Ex Situ Conservation and Captive Breeding. Future Prospects and Research in Invertebrate Biology

Practicals:-

1. Study on morphology and anatomy of major invertebrate phyla
2. Collection and preservation of representative members of major invertebrate phyla
3. Field sampling and survey techniques of invertebrates
4. Visit to various In-situ- Ex Situ Conservation and Captive Breeding sites of invertebrates

References:-

1. Brusca, R.C., Moore, W. & Shuster, S.M. 2016. Invertebrates. Sinauer Associates, Inc.
2. Collins, N.M. 1988. The Conservation of Insects and their Habitats. Academic Press.
3. Drummond, F.A., and Stubbs, C.S. 2003. Sampling Techniques for Forest Lepidoptera: Caterpillars and Adults. Forest Health Technology Enterprise Team, USDA Forest Service.
4. Hickman, C.P., et al. 2018. "Integrated Principles of Zoology." McGraw-Hill Education.
5. Module II: Role of Invertebrates in Ecosystem Stability and Functioning
6. New, T.R. 2005. Invertebrate Conservation and Agricultural Ecosystems." Cambridge University Press.
7. Pechenik, J.A. 2014. Biology of the Invertebrates. McGraw-Hill Education.
8. Polis, G.A. & Winemiller, K.O. 1996. Food Webs: Integration of Patterns & Dynamics. Chapman and Hall.
9. Ruppert, E.E., Fox, R.S., and Barnes, R.D. 2003. Invertebrate Zoology. Cengage Learning.
10. Samways, M.J. 1994. Insect Conservation Biology. Springer.
11. Thomas, J.A., and Settele, J. 2010. Butterflies in a Changing World: Ecology and Conservation. Springer.

***

MSFOR04E04 - WETLAND ECOLOGY

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Understand the definition, classification, and importance of wetlands.
- Describe the physical, hydrological and ecological characteristics of wetland ecosystems.
- Analyze the biogeochemical processes and nutrient cycling in wetland environments.
- Evaluate the impacts of human activities on wetland ecosystems and propose conservation strategies.

Module I: Wetland formation and hydrology: Wetlands- Definition-classification – distribution- functions and services. Geological processes shaping wetland landscapes. Wetland hydrology and water regimes. Wetland types based on hydrological characteristics. Nutrient cycling in wetland ecosystems.

Module II: Wetland biodiversity: Vegetation zonation and communities in wetlands. Floral diversity and wetland plant adaptations. Mangroves – diversity, ecological, and protective roles. Wetland faunal diversity - Migratory birds and waterfowl, herpetofauna, odonates, and other aquatic invertebrates.

Module III: Wetland Ecosystem Services: Wetland functions and values -physical, biological, cultural, recreational and economic values. Nutrient cycling in wetlands. Carbon storage and sequestration. Role of wetlands in water purification. Flood control and stormwater management.

Module IV: Wetland Conservation and Management - Threats to wetlands. Conservation issues of Indian wetlands. Sustainable tourism practices in wetlands. Wetland restoration and conservation strategies. Legal and policy frameworks for wetland protection. Global initiatives for conservation of wetland. Ramsar convention - Criteria for Identification of Ramsar site. The Montreux Record and Wetlands of International Importance.

Practical

1. Visit various wetlands and study the vegetation types and faunal diversity.
2. Wetland Hydrological Assessment and workout the Water Quality Index.
3. Study the floral diversity and zonation of a mangrove ecosystem
4. Monitoring the flow rate of water entering and leaving wetland systems
5. Prepare an ecotourism plan for a wetland area.
6. Prepare a restoration plan for a degraded wetland ecosystem

References

1. Babu, C.R., Priyadershini, M. R. B. and Ramesh, B.R. 2019. *Wetland Ecosystems of India:*

A Guide to Conservation, Restoration, and Management. Oxford University Press India.
2. Ganapati, T. and Ramachandran, S. 2009. *Wetland Ecology and Management: Case Studies from South Asia.* Springer
3. Ganapati, T., Ramachandran, S. and Anuradha, R. 2012. *Wetland Conservation and Management: Case Studies from South Asia.* Springer.
4. John A. Kadlec and R. John Richardson, 2009. *Wetland Ecology: Principles and Applications*. CRC Press
5. Julie B. Zimmerman, Kent W. Thornton, and Michael R. Penn. 2015. *Wetland Plants: Biology and Ecology*.
6. Krishna, K.R. and Santhosh, A.V. 2014. *Wetlands: Environmental Gradients, Boundaries and Buffers*. Daya Publishing House
7. Nick Davidson, Franck Poly, and Robert A. Francis (Editors) 2006. *Wetland Ecology and Management: Case Studies*. Springer
8. Paul A. Keddy 2010. *Wetland Ecology: Principles and Conservation*. Cambridge University Press
9. Ralph W. Tiner, 2010. *Wetland Indicators: A Guide to Wetland Formation, Identification, Delineation, Classification, and Mapping.* CRC Press
10. William J. Mitsch and James G. Gosselink, 2014. *Wetland Ecosystems*. Wiley.

***

MSFOR04E05 - RESTORATION ECOLOGY

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Develop skills in tackling various ecosystem disturbances
- Understanding about the restoration of degraded ecosystems
- Develop an integrated approach in ecological restoration programmes
- Understand the importance and need of successful restoration programmes

Module I: Introduction to restoration ecology: Definition, Need, and Approaches- Passive and Active restoration, Types of ecological restoration- natural regeneration, revegetation, rehabilitation, partial restoration, and complete restoration. Value of ecosystems- cultural, supporting, provisioning, and regulating values. Ecosystem Functioning – energy flow, nutrient cycling, and trophic interactions. Ecosystem stability- resistance and resilience.

Module II: Ecosystem disturbances: Ecosystem disturbances – Disturbance regime, Factors determining the scale of disturbances- magnitude, frequency, duration, abruptness, and return interval. Intermediate disturbance hypothesis, Disturbances due to fire, habitat fragmentation, forest degradation, erosion, pollution, desertification, mining, dams, pollution, overhunting, sand dune destabilization, and invasive species.

Module III: Restoration of ecosystems: Restoration of degraded ecosystems- Species compatibility, Alternative stable states, Regime shift by disturbances, Assembly rules in restoration, Ecosystem thresholds, Ecosystem filters, Restoration of soil – Phytoremediation methods- phytovolatilization, phytodegradation, phytostimulation, phytostabilization, phytofiltration, and phytoextraction – continuous process and Induced process. Bioremediation: ex-situ methods- biopiling, landfarming, composting, biofilter and in-situ methods- bioventing, biosparging, bioslurping, biostimulation and bioaugmentation. Restoration of aquatic ecosystems- wetlands, lakes and rivers, Restoration of ecosystems by controlling invasive alien species, Restoration of mining and quarry areas, Restoration of sand dunes, Landscape restoration approaches, and Forest restoration.

Module IV: Management of restoration areas- setting goals, planning, action plan, adaptive management, monitoring, aftercare, and final assessment. Integrated restoration efforts- case studies of forest restoration at national and global level, Bon challenge, Decision making in ecological restoration.

Practical

1. Visit the degraded sites and assess the ground conditions
2. Determination of soil and water quality of degraded sites

3. Prepare a restoration plan for a degraded area
4. Prepare an action plan for the management of restored sites

References:-

- Andre F Clewell and James Aronson, 2013. Ecological restoration (2nd edition): Principles, Values and Structure of an Emerging Profession. Island Press, 336p.
- Evelyn A Howell, John A Harrington, and Stephen B Glass, 2011. Introduction to Restoration Ecology. Island Press, 436p.
- Govind prasad, 2012. Restoration and Conservation Ecology, Discovery Publishing Pvt. Ltd, 202 p.
- Greippson, S. 2011. Restoration Ecology, Jones and Bartlett Learning, 408 p.

***

MSFOR04E06 - BEHAVIOURAL ECOLOGY

Hours per week: 3+2 **Credit: 4**

Course Outcomes:

- Understand the key concepts and theories in behavioral ecology.
- Describe the evolutionary processes shaping animal behavior.
- Analyze and interpret animal behavior in the context of ecological interactions.
- Apply scientific methods to study animal behavior and conduct field observations.
- Evaluate the adaptive significance of different behavioral strategies

Module I: Introduction to Animal Behaviour: Ethology, Comparative Psychology and Neurobiology. The proximate/ultimate dichotomy in studying animal behaviour. Innate behaviour in animals; kinesis, taxis, reflex and fixed action patterns. Biological Rhythms. Learned behaviour in animals: imprinting, habituation, conditioning, logical reasoning and trial and error learning.

Module II: Evolutionary Basis of Behavior: Natural selection and adaptation. Genetic basis of behavior. Life history strategies and trade-offs. Habitat selection and resource acquisition. Co-evolution: prey-predator and host-parasite coevolution.

Module III: ***Social and reproductive behaviour in animals:*** Social organisation in Vertebrates**.** Prey/predator relationships and predator avoidance behaviour. Red Queen hypothesis and the evolution of sexual behaviour. Sexual conflict and sexual selection. Territoriality and courtship behaviour. Significance of territories. Parental care and mating systems. Selfishness and altruism: Kin selection, mutualism and reciprocity. Dispersal behaviour. Foraging Behaviour. Optimal foraging theory and other models. Types and functions of animal communication.

Module IV: ***Adaptations in Animals:*** Structural adaptations in animals and its evolutionary significance. Behavioral adaptations in wild animals – aestivation, hibernation, torpor, diapause, migration and group hunting. Ecogeographical rules of adaptations and variation in animals.

Practicals: -

1. Methods of behavioral observation; Instantaneous scan, focal animal, all-occurrence and one-zero sampling,
2. Collection and analysis of behavioural data on some common availability species.
3. Preparation of ethograms. Time-activity budgets and social interaction matrices.
4. Radio-telemetry methods of studying activity patterns.
5. Behavioral observations on wild and captive animals.

References: -

1. Alcock, J. (2005) Animal Behaviour: An Evolutionary Approach (8th edn.).

SinauerAssociates, Inc.
2. Krebs. J.R. (1993). An introduction to behavioural ecology. Blackwell Publishing.
3. Davis, N. B., Krebs, J. R. and West, S.A. (2012) An Introduction to Behavioural Ecology (4th edn.). Wiley-Blackwell.
4. Manning, A. and Dawkins, M. S. (1997) An Introduction to Animal Behaviour. Cambridge University Press.
5. Morton E.S. and B. Stutchbury. (2001). Behavioural ecology. Academic Press

***

KANNUR UNIVERSITY

MODEL QUESTION PAPERS

FOR

M.Sc. FORESTRY (WILDLIFE MANAGEMENT)

UNDER

CHOICE BASED CREDIT AND SEMESTER SYSTEM
(OBE – Outcome Based Education – system)

With effect from 2023 admission

END SEMESTER EVALUATION

Evaluation in outcome-based education is designed to measure the attainment of specific learning outcomes. It involves aligning assessments with the outcomes. using criterion-referenced assessment methods, providing continuous feedback, and evaluating the effectiveness of the overall educational programme. By focusing on clear outcomes and providing regular feedback, evaluation in outcome-based education supports student learning and helps improve the quality of education. Outcome evaluation goes beyond assessing individual knowledge and comprehension and focuses on the broader application and integration of knowledge, skills, and attitudes. In outcome evaluation, learners arc expected to demonstrate their ability to critically analyze and evaluate the overall impact and effectiveness of what they have learned or the programme they have participated in.

The end semester examination is based on Bloom's taxonomy criteria (1956), both in the case of theory and practical given as follows;

COGNITIVE LEVEL: BLOOM'S TAXONOMY OF EDUCATIONAL OBJECTIVES

The cognitive domain of learning involves mental operations or thinking skills. There are six major categories in the Cognitive Domain of Bloom's Taxonomy (1956). The levels and the verbs used for stating specific behavioral learning outcomes are listed below.

KNOWLEDGE (Remembering) Recall terms, facts, and details without necessarily understanding the concept	COMPREHENSION (Understanding) Summarize and describe main ideas in own words without necessarily relating it to anything	APPLICATION (Transferring) Apply or transfer learning to own life or to a context different than one in which it was learned	ANALYSIS (Relating) Breaking material into parts, describe patterns and relationships among parts	SYNTHESIS (Creating) Creating something new by combining parts to form a unique solution to a problem	EVALUATION (Judging) Express own opinion, judge or value based on expressed criteria, ideas, methods,....
Count	Associate	Apply	Analyze	Adapt	Accept
Define	Classify	Build	Categorize	Assemble	Appraise
Draw	Convert	Calculate	Compose	Combine	Assess
Identify	Describe	Classify	Debate	Compare	Compare/Contrast
Label	Differentiate	Compare	Detect	Compose	Critique
List	Discuss	Complete	Diagram	Create	Determine
Locate	Distinguish	Contrast	Differentiate	Design	Evaluate
Name	Estimate	Construct	Distinguish	Formulate	Facilitate
Outline	Explain	Demonstrate	Group	Generalize	Grade
Point	Interpret	Illustrate	Infer	Integrate	Judge
Quote	Match	Modify	Investigate	Invent	Justify
Recite	Paraphrase	Operate	Prioritize	Organize	Measure
Record	Predict	Practice	Relate	Plan	Rank
Repeat	Recognize	Relate	Research	Prepare	Recommend
Select	Select	Report	Separate	Prescribe	Reject
State	Summarize	Solve	Sort	Revise	Select
Write	Translate	Use	Transform	Specify	Test
What is the definition of ... Can you recite ... When ... Where... Who was ... How many...	In your own words, explain... What steps are required.. Describe the kinds of...	Give an example that has affected you... If alive today, what do you think he would do about...	What factors distinguish... In what ways... How would life be different if...	How can you put these ideas into action... Predict... When these concepts are linked I see...	In your opinion, ... Choose between ... and defend your answer...
PART A		**PART C**		**PART B**	

QUESTION PAPER PATTERN

Part	Cognitive level	No. of Questions	No. of Questions to be answered	Mark for each question	Total
A	Remembering, Understanding	6	5	3	15
B	Creative, Judging	5	3	6	18
C	Application, Analysis	5	3	9	27
TOTAL MARKS					**60**

KANNUR UNIVERSITY

MODEL QUESTION PAPER

I semester MSc. Forestry (Wildlife Management) Degree Examination

MSFOR01C01- Forests and Biogeography

Time: 3Hrs **Maximum Marks: 60**

Part A – ***Answer any FIVE questions. Each question carries 3 marks*** **(5 X 3 = 15)**

1. Define forestry. List the branches of forestry.
2. Classification of forests based on growing stock
3. Differentiate temperate and tropical forests
4. Characteristic features of fresh water swamp forests
5. Define biome and list the major biomes of the world
6. What is the significance of the Western Ghats in terms of geography and biodiversity?

Part B- ***Answer any THREE questions. Each question carries 6 marks*** **(3 x 6=18)**

7. Critically analyze the state of India's forests during the last decade
8. Compare the pre-independence and post-independence scenarios of Indian forestry
9. India needs to focus on expanding the tree cover outside forests – justify.
10. Prioritize the action to be taken for the conservation of forests in India
11. How can you differentiate a shola forest from other evergreen forests?

Part C- ***Answer any THREE questions. Each question carries 9 marks*** **(3 x 9=27)**

12. How the Satpura Hypothesis contributed to our understanding of the distribution of flora and fauna in Indian subcontinent?
13. Explain the concept of continental drift and how it relates to the formation of mountain ranges like the Western Ghats?
14. Discuss the impact of deforestation on regional and global climate patterns. What strategies can be implemented to mitigate these effects?
15. Following the Champion and Seth Classification of Forest types in India, describe the forest types seen in the Kerala part of Western Ghats.
16. Give a detailed account on the biogeographic zones of India with a neat diagram.

KANNUR UNIVERSITY

MODEL QUESTION PAPER

I semester MSc. Forestry (Wildlife Management) Degree Examination

MSFOR01C02- Dendrology and Vegetation Analysis

Time: 3Hrs **Maximum Marks: 60**

Part A – ***Answer any FIVE questions. Each question carries 3 marks*** **(5 X 3 = 15)**

1. Explain the key principles and outlines of the Bentham and Hooker system of plant classification. Mention some of its merits and demerits.
2. Describe the different versions of molecular systematics classification, including APG I to APG IV.
3. Define DNA barcoding and provide an overview of its significance in the field of taxonomy and species identification.
4. What is the Polymerase Chain Reaction (PCR), and how is it used in the acquisition and analysis of DNA sequence data for phylogenetic analysis?
5. Explain the systematic position, diagnostic features, and economic importance of the following families: - Dipterocarpaceae, Myrtaceae and Apocynaceae
6. Discuss the methods used for the structural analysis of communities, including species-area curves, transects, and quadrates.

Part B- ***Answer any THREE questions. Each question carries 6 marks*** **(3 x 6=18)**

7. Imagine you are a taxonomist tasked with classifying a newly discovered plant species. Describe the creative process you would follow to determine its systematic position and characteristics.
8. Analyze the role of remote sensing in vegetation analysis and land use-land cover mapping.
9. Critically evaluate the concept of forest carbon sequestration and its importance in mitigating climate change.
10. Suppose you are in charge of a wildlife conservation project in a forest ecosystem. Propose a creative plan for maintaining biodiversity while ensuring sustainable resource use.
11. Judge the significance of diversity indices, including Simpson's Index, Shannon-Weiner Index, and Berger Parker Dominance Index, in assessing ecological communities. Compare and contrast their applications.

Part C- ***Answer any THREE questions. Each question carries 9 marks*** **(3 x 9=27)**

12. Apply your knowledge of forest biomass estimation to explain the concepts of above-ground biomass, below-ground biomass, and carbon content of biomass.
13. Analyze the concept of emission trading as a mechanism for carbon management in forests. Discuss its potential benefits and challenges in the context of sustainability.

14. Given a set of forest inventory data, calculate the Classification of Increment (CI), Current Annual Increment (CAI), and Mean Annual Increment (MAI). Explain how these metrics can inform forest management decisions.
15. Apply your understanding of the concept of growing stock enumeration to describe its objectives and different kinds of enumeration methods. Discuss the importance of accurate growing stock data for sustainable forestry.
16. You are tasked with conducting a remote sensing-based land cover mapping project in a forested area. Outline the step-by-step process you would follow, including data acquisition, analysis, and interpretation.

KANNUR UNIVERSITY

MODEL QUESTION PAPER

I semester MSc. Forestry (Wildlife Management) Degree Examination

MSFOR01C03- Forest Ecology

Time: 3Hrs **Maximum Marks: 60**

Part A – ***Answer any FIVE questions. Each question carries 3 marks*** **(5 X 3 = 15)**

1. Explain various stages of succession
2. Outline the characters of Southern Tropical Wet evergreen forests
3. Discuss the models in succession
4. Describe the qualitative characters used in the assessment of vegetation
5. Define population? What are the factors affecting population size?
6. What are the characteristics of a forest community

Part B- ***Answer any THREE questions. Each question carries 6 marks*** **(3 x 6=18)**

7. What trophic cascade happens when an apex predator from a marine ecosystem becomes extinct?
8. Compare the vegetation characteristics of forest type $4B/TS_2$ and $4C/FS_2$
9. Prepare an outline for the assessment of vegetation using the Braun-Blanquet method
10. Specify the characteristics, vegetation structure and major species of southern montane wet temperate forests
11. Compare the characteristics of r and k selected species

Part C- ***Answer any THREE questions. Each question carries 9 marks*** **(3 x 9=27)**

12. Discuss the characteristic features and species composition of the forest type 4C/FS1.
13. Categorize various life forms based on the Raunkiaer system of classification
14. How the forests of Western Ghats were classified according to Meher-Homji classification system.
15. Make a comparison of various theories of succession
16. Analyze the characteristics and species composition of major tropical forest types of Kerala.

KANNUR UNIVERSITY

MODEL QUESTION PAPER

I semester MSc. Forestry (Wildlife Management) Degree Examination

MSFOR01C04 – Fundamentals of Wildlife Science

Time: 3Hrs **Maximum Marks: 60**

Part A – ***Answer any FIVE questions. Each question carries 3 marks*** **(5 X 3 = 15)**

1. List the major zoogeographic regions of the world.
2. Describe the characteristics of class mammalia
3. Differentiate Perissodactyla and Artiodactyla
4. Name six mammal species endemic to Western Ghats
5. List the species of primates seen in the Western Ghats
6. Explain the courtship behaviour in birds.

Part B- ***Answer any THREE questions. Each question carries 6 marks*** **(3 x 6=18)**

7. Critically analyze the conservation challenges of herpetofauna of the Indian subcontinent
8. How a bird can keep on in the same direction during its long-distance migratory flight?
9. Compare the characteristic features of reptiles and amphibians.
10. Give a detailed analysis of the threats and conservation challenges of fishes in India.
11. How can you give first aid and manage a snake bite case?

Part C- ***Answer any THREE questions. Each question carries 9 marks*** **(3 x 9=27)**

12. How can you differentiate the species of rodentia from eulipotyphla and lagomorpha
13. What makes the birds anatomically and physiologically adapted for flight.
14. Why do some birds involve in long distance migration? What patterns of migration exhibit by birds?
15. How the vertebrates are classified?
16. What is the significance of clutch size and litter size in animals? Explain the advantages of the reproductive peculiarities of lagomorpha.

KANNUR UNIVERSITY

MODEL QUESTION PAPER

I semester MSc. Forestry (Wildlife Management) Degree Examination

MSFOR01C05 – Practical I

(Forests and Biogeography, Dendrology and Vegetation Analysis, Forest Ecology, Fundamentals of Wildlife Science**)**

Time: 3Hrs **Maximum Marks: 60**

1. Workout and solve the problem **A,** include graphs figures and tables. (1 X 8=8)
   (Steps, description, figures, graphs and table- 6, Result- 2)
2. Identify and write the family/order of **B1** to **B10** (10 X 1= 10)
3. Identify the family and write spot characters **C & D.** (2 X 3= 6)
   (Identification- 1, Note- 2)
4. Write the functions of **E** and **F**, and give an example of the bird species. (2 X 4 =8)
   (Identification – 1, Note - 2, Example - 1)
5. Construct the CAI and MAI curves from **G** and mark the rotation age**.** (1 X 5=5)
6. Write the methodology for **H.** (1 X 5=5)
7. Solve problem **I**, draw the histogram, and compare with Raunkiaer's standard frequency diagram. (1 X 7=7)
8. Spot identification of **J, K, L, M** and **N** (5 X 1=5)
9. Viva-voce 6 marks

Key to the Specimen

1. **A -** IVI
2. **B1** to **B10**– Birds/Mammals/Reptiles and Amphibians.
3. **C, D** – Plant specimen of the family given in the syllabus
4. **E,F -** Beak/leg/feather/nest types in birds
5. **G –** Tabular data for CAI and MAI
6. **H** – field methods of vegetation analysis
7. **I** – Field data for frequency distribution
8. **J, K, L, M, N** – Any specimens related to the topics for practical I

KANNUR UNIVERSITY

MODEL QUESTION PAPER

II Semester MSc Forestry (Wildlife Management) Degree Examination

MSFOR02C06 - Nursery Techniques and Plantation Forestry

Time: 3Hrs **Maximum Mark: 60**

Part A - *Answer any FIVE questions*. Each question carries 3 marks (5 x 3 = 15)

1. Define the importance of seeds in nursery establishment and outline the key factors to consider when planning seed collection.
2. Describe the methods used for seed collection, fruit and seed handling, and seed processing for nursery sowing.
3. Explain the concept of seed storage and its purpose in seed technology. Discuss the factors that influence seed storage conditions.
4. What is seed dressing and pelleting? Provide examples of when and why these techniques are used in seed technology.
5. Define seed testing and explain the ISTA rules governing it. How is germination testing conducted in a nursery setting?
6. Discuss emerging trends in tropical seed technology and their potential impact on nursery establishment and plantation forestry.

Part B - *Answer any THREE questions*. Each question carries 6 marks (6 x 3 = 18)

7. Describe the process for planning the establishment of a nursery for a specific plantation species.
8. Analyze the advantages and disadvantages of containerized nursery techniques.
9. Evaluate the role of plantation forestry in climate change mitigation. What are the ecological factors that influence long-term productivity in plantations?
10. Judge the importance of mixed plantations and continuous cover forests in modern forestry practices. How do these concepts contribute to biodiversity conservation and sustainable yield?
11. Propose a strategy for integrated pest management (IPM) and integrated nutrient management (INM) in a plantation setting.

Part C - *Answer any THREE questions*. Each question carries 9 marks (9 x 3 = 27)

12. Apply your knowledge of seed technology to plan the collection and processing of seeds. Describe the steps involved in seed collection, handling, processing, and storage.
13. Analyze the factors that influence the choice of species and land suitability for plantation forestry.
14. Describe sanitation and control measures for effective pest and disease management.
15. Apply your understanding of plantation pests and diseases to identify major pests and diseases in a plantation of a chosen species.
16. Develop a detailed plan for establishing an industrial plantation of a high-value timber species, including species selection, site preparation, and sustainable management practices.

KANNUR UNIVERSITY

MODEL QUESTION PAPER

II semester MSc. Forestry (Wildlife Management) Degree Examination

MSFOR02C07- Forest Biometry

Time: 3Hrs **Maximum Marks: 60**

Part A – ***Answer any FIVE questions. Each question carries 3 marks*** **(5 X 3 = 15)**

1. Name the instruments used for girth and diameter measurements
2. Explain the quarter girth formula
3. Define (a) Form quotient (b) Form height (c) Form class
4. What are the uses of stand table
5. List out non-sampling errors in horizontal sampling
6. Discuss Metzger's theory

Part B- ***Answer any THREE questions. Each question carries 6 marks*** **(3 x 6=18)**

7. Write in detail about the preparation of the general volume table
8. Specify the standard rules governing breast height measurements
9. How can we determine the volume of logs
10. Write the method of determining the past growth of stands
11. Write the method of determining the future growth of stands

Part C- ***Answer any THREE questions. Each question carries 9 marks*** **(3 x 9=27)**

12. What are the various categories of sampling, and compare the different sampling units?
13. Illustrate with a diagram how to measure the mean height of the stand using vertical sampling.
14. What are the different categories of yield table? Explain the method of preparation of the yield table
15. Write the classification of volume tables. Explain the method of preparation of the local volume table
16. Illustrate with a diagram how to measure the height of trees using geometric principles method

KANNUR UNIVERSITY

MODEL QUESTION PAPER

II semester MSc. Forestry (Wildlife Management) Degree Examination

MSFOR02C08 – Conservation Biology and Captive Wildlife Management

Time: 3Hrs **Maximum Marks: 60**

Part A – ***Answer any FIVE questions. Each question carries 3 marks*** **(5 X 3 = 15)**

1. Define conservation biology. What are the principles of conservation biology?
2. Levels of biodiversity
3. Differentiate National Parks and Wildlife Sanctuaries
4. What is 50/500 rule for maintaining genetic diversity?
5. List the major conservation projects and initiated year in India
6. List the IUCN redlist categories

Part B- ***Answer any THREE questions. Each question carries 6 marks*** **(3 x 6=18)**

7. India is a mega biodiversity nation – justify.
8. Applications of phylogenetics in conservation biology.
9. How the inbreeding leads to a reduction in the genetic quality of a population.
10. In what situations we can recommend the in-situ and ex-situ conservation actions?
11. How the Extent of Occurrence and Area of Occupancy of a species determine its survival?

Part C- ***Answer any THREE questions. Each question carries 9 marks*** **(3 x 9=27)**

12. Explain in detail the success stories of any two conservation breeding programmes
13. Analyze the role of scientific institution and NGOs in Conservation Breeding Programmes
14. How can we safely handle and translocate a problematic animal?
15. The procedure of carrying out redlist assessment. Which are the IUCN criteria?
16. History and development of tiger conservation in India.

KANNUR UNIVERSITY

MODEL QUESTION PAPER

II Semester MSc Forestry (Wildlife Management) Degree Examination

MSFOR02C09 - Research Methodology and Biostatistics

Time: 3Hrs Maximum Mark: 60

Part A - *Answer any FIVE questions*. Each question carries 3 marks (5 x 3 = 15)

1. Explain the organized method of investigation and the importance of effectively communicating problem, data, method, and results in research.
2. Differentiate between theoretical, empirical, and experimental research. Provide examples of each type of research.
3. Discuss the two primary modes of inquiry, the hypothetico-deductive and empirical-inductive modes.
4. Describe the components of research documentation, including the elements typically found in a research paper or thesis.
5. Explain the significance of research ethics and how to prevent plagiarism in academic research.
6. Define and elaborate on the terms "research topic," "problem," "questions," "objectives," and "scope."

Part B - *Answer any THREE questions*. Each question carries 6 marks (6 x 3 = 18)

7. Imagine you are starting a new research project in forestry. Describe the creative process you would follow to identify a research problem, develop research questions, and determine the scope of your study.
8. Analyze the elements of a well-structured research paper or thesis, with a focus on the importance of literature review, graphical and tabular presentation, and the scope for future work.
9. Evaluate the applications of different types of probability distributions (Binomial, Poisson, and Normal) in forestry research. Provide examples of situations where each distribution is relevant.
10. Judge the effectiveness of various correlation and regression methods in analyzing forestry data.
11. Propose a research study in forestry where you would apply tests of significance (t, F, z, and $\chi 2$), and ANOVA. Explain the research question, the choice of tests, and the expected outcomes.

Part C - *Answer any THREE questions*. Each question carries 9 marks (9 x 3 = 27)

12. Apply your knowledge of scales of measurement to a forestry scenario, identifying important variables.

13. Analyze a set of forestry data and perform simple and rank correlations as well as linear and nonlinear regressions. Explain how the results can be interpreted in the context of the study.
14. Given a research project, design a suitable experiment using principles of experimental designs (e.g., CRD, RBD, LSD). Justify your choice of design and discuss potential sources of bias.
15. Apply the principles of sampling theory to a forestry study. Design a sampling plan, choosing from different sampling methods, and explain how it ensures representative data collection.
16. Imagine you are conducting research in a forested area. Describe how you would apply cluster sampling to efficiently collect data on tree density and species diversity.

KANNUR UNIVERSITY

MODEL QUESTION PAPER

II semester MSc. Forestry (Wildlife Management) Degree Examination

MSFOR02C10 – Practical II

(Nursery Techniques and Plantation Forestry, Forest Biometry, Conservation Biology and Captive Wildlife Management, Research Methodology and Biostatistics**)**

Time: 3Hrs **Maximum Marks: 60**

1. Workout and solve the problem **A,** include graphs figures and tables. (Steps, description, figures, graphs and table- 8, Result- 2)	(1 X 10=10)
2. Workout the given problem **B**	(1X5= 5)
3. Workout the given problem **C.**	(1 X 5 =5)
4. Calculate the inbreeding coefficient of "X" from the diagram **D**	(1X 5 =5)
5. Workout the given problem **E**	(1 X 5=5)
6. Workout the given problem **F**	(1 X 5=5)
7. Workout the given problem **G**.	(1 X 5=5)
8. Identify **H** and **I**	(2 X 2=4)
9. Identify **J** and write the aim and procedure	(5 X 1=5)
10. Spot identification of **K, L, M, N** and **O**	(5 X 1=5)
11. Viva-voce	6 marks

Key to the Specimen

1. **A -** One way ANOVA/Two-way ANOVA
2. **B** – Tests of significance – t, F, z, Chi –square test/ Computation of correlations/Layout and analysis of CRD/Layout and analysis of RBD.
3. **C** – Calculation of planting stock/ seed requirement
4. **D –** Pedigree diagram
5. **E –** Calculation of DBH/GBH/Volume of log/Volume of standing trees/tree height
6. **F** – Simpson's / Shannon-weiner diversity index/Jaccards/ morisita-horn similarity index
7. **G** – Problem on population estimation using capture-mark-recapture
8. **H, I** – Track and signs of wild animals/ pugmark reading
9. **J –** Instruments used for topics under forest biometry / field equipment used for wildlife census techniques
10. **K, L, M, N, O** – Any equipment/implements/apparatuses/specimens related to the topics for practical I