

	MAHATMA GANDHI UNIVERSITY Kottayam, Kerala Undergraduate Programmes (HONOURS) 2024 Admission Onwards
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SYLLABUS						
SIGNATURE COURSE						
Name of the College	Marthoma College, Kuttapuzha P.O, Tiruvalla					
Faculty/ Discipline	Zoology					
Programme	BSc (Hons) Zoology					
Course Coordinator	Susan Thomas					
Contributors	Dr. Raju Thomas K.					
Course Name	FUNDAMENDALS OF SOIL ECOLOGY					
Type of Course	DSE					
Specialization title	Ecological Sciences					
Course Code	To be prepared by the University					
Course Level	200					
Course Summary	The course explores soil ecological subjects including physical, chemical and biological properties of soils; function of the major groups of soil microorganisms and fauna in soil. It will provide students with a comprehensive view of the interactions of soil organisms with their surrounding environment. The course explores the soil food web, and its roles in energy and nutrient cycling. Students will gain insights into the functioning of major soil components. Through a blend of theoretical knowledge and practical applications students will develop a profound understanding of the ecological dynamics that shape soil environments and ecosystem health.					
Semester	3	Credits			4	Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others	
		4				60
Pre-requisites, if any						

Course Outcomes (CO)

Number of COs		5	
CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Describe the primary aspects of soil.	U	PO4
2	Distinguish concepts of decomposition and soil food webs.	A	PO2, PO5
3	Study of Soil Biodiversity.	A	PO1, PO7
4	Employ strategies to develop and manage soil ecosystem.	AN	PO3, PO9
5	Administer experiments in soil ecology.	AN	PO6, PO8, PO10

*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)

CO-PO Articulation Matrix

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	-	-	-	2	-	-	-	-	-	-
CO 2	-	3	-	-	1	-	-	-	-	-
CO 3	2	-	-	-	-	-	1	-	-	-
CO 4	-	-	2	-	-	-	-	-	3	-
CO 5	-	-	-	-	-	1	-	1	-	3

'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).

Course Content

Content for Classroom transaction (Units)

Module	Units	Course Description	Hrs	CO No.
1	Introduction to Soil			
	1.1	What is soil? Soil components - mineral, soil organic matter, water and air, biota, soil structure and texture. What is a healthy soil? Definition of soil health. Assessment of soil health.	3	["1"]
	1.2	Primary and secondary production in soils - The primary production process; Symbiotic associates of roots; Mycorrhizal structure and function; Actinorhiza, Carbon allocation in the root/ Rhizosphere. Microbial activities in relation to catabolism in soil systems. Roles of soil protists in soils. The microfauna, the mesofauna and macrofauna in soils.	5	["1"]
2	Decomposition and soil food webs			
	2.1	Resource quality, climate, and Litter breakdown; Dynamics of Litter breakdown; Direct measurement of Litter breakdown; Patterns of mass loss during decomposition.	3	["2"]
	2.2	Effects of fauna on Litter breakdown rates; Nutrient movement during decomposition; Nutrient cycling links in soil systems; Role of soil fauna in organic matter dynamics and nutrient turnover.	3	["2"]
	2.3	Faunal impacts in applied ecology - Agroecosystems; Applied ecology in Forested ecosystems. Soil organic matter (SOM) -Living organisms, Fresh and decomposing organic residues, and Resistant; Physical factors influencing decomposition; Limiting factors in decomposition of SOM.	4	["2"]
	2.4	Physiological ecology of soil organisms; Detritivory and Microbivory in soils; Energy available for detrital food chains and web; food web structure and properties.	4	["2"]

Module	Units	Course Description	Hrs	CO No.
3	Soil Biodiversity & Management			
	3.1	Community characteristics and Habitats - Root zone, Litter, Surfaces of soil aggregates and Incorporated organic matter.	3	["3"]
	3.2	Microorganisms - colonial growth forms, mycelial growth forms and Algae. Microfauna - Protozoans, Nematodes, Rotifers, Tardigrades.	4	["3"]
	3.3	Mesofauna - Potworms, Collembolans, Mites, Insect larvae, Symphyla. Macrofauna- Earthworms, Myriapods, Isopods, Mollusks, Insects, Megafauna - Large invertebrates, vertebrates.	5	["3"]
	3.4	Role of Soils in carbon sequestration; Role of soils in the Global Carbon Cycle.	3	["4"]
	3.5	Biological interactions in soils and global change. Ecology of invasive species in soil systems; Soils and Gaia.	4	["4"]
	3.6	Importance of Natural History Collections to informing Global change studies in the future; Soil Ecology in the Third Millennium.	4	["4"]
4	Activity/Experiments			
	4.1	Field collection and study of types of soils (any five):- One Day Field Visit.	3	["5"]
	4.2	Measurement of the temperature of the soil.	1	["5"]
	4.3	Study the texture of the given soil samples.	1	["5"]
	4.4	Estimation of the porosity of different soil samples.	1	["5"]
	4.5	Find out the moisture content of the soil.	1	["5"]
	4.6	Determination of water holding capacity of given soil sample.	2	["5"]
	4.7	Determination of the soil pH.	1	["5"]
	4.8	Isolation of soil organisms (Compare any two types of soils and prepare a report).	3	["5"]
	4.9	Report writing and Debate based on the topic - Soil Ecology in the Third Millennium.	2	["5"]

Teaching and Learning Approach	Classroom Procedure (Mode of transaction) Lecturing and Field Visit, Debate, Assignment, Seminar, Quiz
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Assessment Types	MODE OF ASSESSMENT Mode of Assessment: Theory
	A. Continuous Comprehensive Assessment (CCA) • Theory - 30 Marks Test paper, Seminar, Quiz
	B. End Semester Evaluation (ESE) • Theory - 70 Marks Assessment Methods - Written Duration of Examination - 2.00 Hrs Pattern of examination for Theory - Non-MCQ Different parts of written examination - Part - A , B , C Answer Type: ◦ PART - A ◦ MCQ - (10 out of 10) - $10 \times 1 = 10$ ◦ PART - B ◦ Short answer - (14 out of 16) - $14 \times 2 = 28$ ◦ PART - C ◦ Short Essays - (8 out of 10) - $8 \times 4 = 32$

References

- Barrios E. (1980): Soil Resource: Origin and Behaviour. New York: Springer-Verlag. Brady N.C. and Weil R.R. (2004): Elements of the Nature and Properties of Soils 2nd Edn, USA: Pearson Prentice Hall. Coleman D. Callaham M. and Crossley D. Jr. (2017): Fundamentals of Soil Ecology, 3rd Edn, London: Academic press. David C.C. and Crossely D.A. (1996): Fundamentals of Soil Ecology. Academic Press. San Diego. Jenny H. (1980): Soil Resource: Origin and Behaviour. New York: Springer-Verlag. Odum E.P. and Barrett G.W. (2005): Fundamentals of Ecology 5th Edn, USA: Thomson Brooks/Cole.

Affidavit

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MAHATMA GANDHI UNIVERSITY

Kottayam, Kerala

Undergraduate Programmes (HONOURS) 2024 Admission Onwards

SYLLABUS

SIGNATURE COURSE

Name of the College	Marthoma College, Kuttapuzha P.O, Tiruvalla				
Faculty/ Discipline	Zoology				
Programme	BSc (Hons) Zoology				
Course Coordinator	Susan Thomas				
Contributors	Dr. Letha P Cherian				
Course Name	AN UNDERSTANDING OF RIVERINE ECOLOGY				
Type of Course	DSE				
Specialization title	Ecological Sciences				
Course Code	To be prepared by the University				
Course Level	200				
Course Summary	The course unravels the geomorphological features of the river, its hydrography, extreme likelihood events and the dynamics of riverine ecosystem metabolism. It makes the students understand the impacts of Anthropogenic interferences on the riverine ecosystem, realising the need of monitoring the river's health and their responsibility in national and global river restoration and conservation efforts. The course offers major research areas, career and entrepreneurial possibilities which includes responsible riverine tourism, the cage and pen type culture of economically demanding fishes, availing the state's and national financial aids.				
Semester	4	Credits			Total Hours
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others
		4			
Pre-requisites, if any					

Course Outcomes (CO)

Number of COs		5	
CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Identify the Geomorphological features of the river and the drainage and network pattern.	U	PO2
2	Explain the Hydrography of the river and the extreme likelihood event - flood	AN	PO1
3	Predict entrepreneurial possibilities in the field of sustainable use of river's renewable resources and responsible riverine tourism	E, C, I, S	PO3, PO5, PO6, PO7, PO8
4	Discover the research and career opportunities in Riverine Ecology and River Conservation Biology	U, I	PO2, PO8

Number of COs			5
CO No.	Expected Course Outcome	Learning Domains *	PO No
5	Preparation of a report on field visits to important/nearby rivers, model river restoration projects and responsible river tourism villages and river conservation authorities	A, E, C, I, AP, S	PO5, PO6, PO7, PO8, PO9

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CO-PO Articulation Matrix

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	-	2	-	-	-	-	-	-	-	-
CO 2	3	-	-	-	-	-	-	-	-	-
CO 3	-	-	2	-	3	3	3	3	-	-
CO 4	-	2	-	-	-	-	-	3	-	-
CO 5	-	-	-	-	3	3	2	3	3	-

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Course Content

Content for Classroom transaction (Units)

Module	Units	Course Description	Hrs	CO No.
1		Geomorphological Features of River		
	1.1	Physical setting of the river Catchment/ Watershed, Sub-catchment, Tributary, Streams, Distributaries	2	["1"]
	1.2	Types of Drainage Patterns Stream order - Stream morphology- Cascades, Reach, Rapid, Riffle, Run, Glide, Deep pool, Potholes, Meandering deep channel, Lateral connectivity/ Floodplains Riparian Hydraulic geometry	3	["1"]
	1.3	Longitudinal profile of a river Zonation: Three major areas: upstream/ downstream, channel/ margin, surficial/underground, Sediments and particles transport, riverbed material, size categorisation of riverbed materials	3	["1"]
	1.4	Stream flow, Hydrograph, Flow regime, flow pulse, flow variations. Likelihood of extreme events- flood and landslides, Indicators of Hydrologic Alteration(IHA)	3	["1"]
	1.5	Riverine Ecosystem - Primary producers -Autochthonous and Allochthonous sources, Consumers- Macro invertebrates, grazers, scrapers, shredders, predators, Vertebrates- algivore, detritivore, omnivore, invertivore, piscivore, Ecosystem metabolism Nutrient cycling- River Continuum Concept (RCC) Longitudinal changes in energy inputs and consumer feeding	4	["1"]

Module	Units	Course Description	Hrs	CO No.
2	Threats to the river during the Anthropocene			
	2.1	Rivers in the Anthropocene period- Threats during the Anthropocene period, Effect of land use and stream flow	3	["2"]
	2.2	DPSIR Framework (Drivers -Pressures - System State -Impact -Response) depicting the causal relationship between humans and the river system, Drivers - Population growth and land use change, technological innovations Pressure - pollution, Flow management, habitat degradation, over exploitation, species invasion, climate change, System State- numerous changes in the system state, Impacts - Impacts on biodiversity and altered biogeochemical cycle Responses - Repair, Restore and Protect	7	["2"]
	2.3	Monitoring and assessment of riverine system, Physio-chemical parameters of river- Dissolved oxygen, pH, Salinity, TDS, Conductivity, temperature, total alkalinity, BOD, COD, nitrate, and phosphate. River Rain Monitoring using Rain gauge. River and Rain Monitoring Network (MRRM) – Meenachil River Model. Microbiological assessments Safe limits of river water for drinking and recreational use 3 River restoration and Riverine Ecosystem services	8	["2"]
3	River restoration and Riverine Ecosystem services			
	3.1	Provisioning, regulating, supporting and cultural services offered by the river, Riverfront development, Fish culture in the river - Cage and Pen Culture	4	["3"]
	3.2	What can be done to restore the river? Global, National and local river conservation initiatives Laws for the protection of rivers Convention on Biological Diversity Environmental Protection Act Right of rivers River restoration models - Regional/ Local River restoration model - Meenachil river Peroor, Varattar - Pamba	8	["3"]
	3.3	Major research areas and careers Entrepreneurial possibilities – Aquaculture - cage and pen culture of economically demanding food fishes and ornamental fishes in the river Availing Janakeeya Malsya Krishi (JMK) and Pradhan Mantri Matsya Sampada Yojana (PMMSY) Responsible Tourism - Boating and kayaking	7	["3"]
4	Activity/Experiments			
	4.1	Activity: Short video/ photo/ report of any river visited - River Morphology	2	["4"]
	4.2	Activity: Visit any 2 River Research Institutes/ River Conservation Organisations	4	["4"]
	4.3	Activity: Field visit reports about the cage/ pen culture in rivers, Report of river tourism village visited (Malarikkal tourism village, Kottayam)	2	["5"]

Teaching and Learning Approach	Classroom Procedure (Mode of transaction) Lecturing and Field visits, Seminar, Assignment, Debate, Quiz
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Assessment Types	MODE OF ASSESSMENT Mode of Assessment: Theory
	A. Continuous Comprehensive Assessment (CCA) • Theory - 30 Marks Test paper, Seminar, Quiz
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References

- Waters, T. F. (1996). Stream ecology: structure and function of running waters. Ecology, 77(6), 1953. Letha P Cheriyan. (2023). Meenachil River of Western Ghats, it's Fish Fauna & Conservation issues. Kairali Books Pvt. Ltd. ISBN 978-93-93397-67-3 Stefan, S., Jan, S. (2018). Riverine Ecosystems Management Science for Governing Towards a Suitable Future. Aquatic Ecology. ISBN 978-3-319-73250-3. Davie, T. (2002). Fundamentals of Hydrology. Taylor and Fransis e-Library. ISBN 0- 203-93366. Dudgeon, D. (2000). Riverine biodiversity in Asia: A challenge for conservation biology. Hydrobiologia, 418, 1-13. 10.1023/A:1003998519910 Dudgeon, D. (2010). Prospects for sustaining freshwater biodiversity in the 21st century: linking ecosystem structure and function. Current Opinion in Environmental Sustainability, 2, 422-30. Naiman, R.J., Melillo, J.M., Lock, M.A., Ford, T.E., & Reice, S.R. (1987). Longitudinal patterns of ecosystem processes and community structure in a subarctic river. Continuum Ecology, 68, 1139-115. Cheriyan, L. P., Appukuttan, A., & Oommen, M. (2023). Geographic Information System-based Analysis of Fish Diversity Trends of River Meenachil, Southern Western Ghats, Kerala. Current World Environment/Current World Environment, 18(1), 311- 330. Poff, N.L., Allan, J.D., Bain, M.B., Karr, J.R., Prestegard, K.L., Richter, B.D., Sparks, R.E., & Stromberg, J.C. (1997). The natural flow regime. Bioscience, 47, 769-784. Poff, N.L., & Ward, J.V. (1989). Implications of Stream flow variability and predictability for lotic community structure: A regional analysis of streamflow patterns. Canadian Journal of Fisheries and Aquatic Sciences, 46, 1805-1818. 10.1139/f89-228.

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SYLLABUS					
SIGNATURE COURSE					
Name of the College	Marthoma College, Kuttapuzha P.O, Tiruvalla				
Faculty/ Discipline	Zoology				
Programme	BSc (Hons) Zoology				
Course Coordinator	Susan Thomas				
Contributors	Mr. Alex P Zecharia				
Course Name	Advanced Ecological Concepts				
Type of Course	DSE				
Specialization title	Ecological Sciences				
Course Code	To be prepared by the University				
Course Level	300				
Course Summary	This course delves into the intricate and advanced principles of ecology, focusing on the complex interactions and processes that govern ecosystems. It aims to provide students with a deeper understanding of ecological theory, methodologies, and applications, equipping them with the knowledge to address ecological challenges and contribute to sustainable environmental management.				
Semester	5	Credits			4
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others
		4			
Pre-requisites, if any					
					Total Hours 60

Course Outcomes (CO)

Number of COs		4	
CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Understanding of key ecological principles, including ecosystem structure, function, and dynamics.	U	PO1, PO6
2	Demonstrate and analysis of comprehensive knowledge of advanced ecological theories and principles, including population dynamics, community structure, and ecosystem processes.	A, AN	PO1, PO2, PO9, PO10
3	Develop skills in ecological data collection, analysis, and interpretation using statistical and computational tools.	AN, S	PO2, PO4, PO10
4	Apply ecological theories to analyze and solve real-world environmental problems.	A, AN, S	PO2, PO3, PO8

*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)

CO-PO Articulation Matrix

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	2	-	-	-	-	2	-	-	-	-
CO 2	2	3	-	-	-	-	-	-	1	1
CO 3	-	1	-	1	-	-	-	-	-	2
CO 4	-	2	1	-	-	-	-	1	-	-

'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).

Course Content

Content for Classroom transaction (Units)

Module	Units	Course Description	Hrs	CO No.
1	Introduction to Advanced Ecology			
	1.1	Review of fundamental ecological concepts. Historical development and milestones in ecology. Scope and importance of advanced ecological studies.	3	["1"]
2	Demographic Techniques and Population Patterns, Community Ecology and Species Interactions			
	2.1	Techniques are used to quantify population density, patterns of spacing, clumped, uniform, or random. Fragmented habitats affect spatial dispersion. Metapopulations.	6	["2"]
	2.2	Population ecology: population growth models (exponential, logistic), density dependence, and population. Life history strategies: reproductive strategies include reproduction in a single event or continuous breeding. R and K selection.	6	["2"]
	2.3	Relative abundance, Berger-Parker index, Simpson Index, Shannon index, Tokeshi's niche models. Species richness and Community Services.	6	["2"]
	2.4	Competition and Coexistence, Facilitation, Predation, Herbivory, Parasitism.	6	["2"]
3	Landscape Ecology, Ecological Modelling, Statistics, Conservation Ecology and Climate Change			
	3.1	Principles of landscape ecology, Habitat fragmentation and landscape connectivity, Spatial patterns and ecological processes, Geographic Information Systems (GIS) in landscape analysis	4	["3"]
	3.2	Introduction to ecological models (deterministic and stochastic models), Population viability analysis (PVA), Ecological simulation and modelling tools (R). (Brief description only)	3	["3"]
	3.3	Principles of conservation biology, Biodiversity hotspots and conservation strategies, Climate change impacts on ecosystems and species, Adaptation and mitigation strategies.	4	["3"]
	3.4	Climate System and Global Change: Earth's climate system and energy balance, Greenhouse gases and the greenhouse effect, Climate change indicators and evidence.	3	["3"]
	3.5	Effects on biodiversity and ecosystems: Alterations in species distribution and phenology, Ocean acidification and sea-level rise, Socio-economic impacts and vulnerability assessment	4	["3"]

Module	Units	Course Description	Hrs	CO No.
4	Activity			
	4.1	Mark-recapture method to estimate population size (Calculation only).	3	["4"]
	4.2	Basic sampling methods	2	["4"]
	4.3	Field trip to observe wildlife and ecological interactions. (Zoo, animal rehabilitation centre). Report writing	5	["4"]
	4.4	On a geographic map of India, locate & demarcate major sanctuaries / national parks of Kerala.	2	["4"]
	4.5	Camera traps, radio telemetry, and GPS (Spotters).	3	["4"]

Teaching and Learning Approach	Classroom Procedure (Mode of transaction) Lecturing and Field Visit, Seminar, Assignment, Debate, Quiz
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References

- The Development of International Principles and Practices of Wildlife Research Management by Stephen H. Berwick and U. B. Sahania National Parks of Madhyapradesh by S. K. Tiwari Endangered Animals of India and their Conservation by S. M. Nair Peter Stilling, co-author of Biology by Brooker et al., ecology global insite McGraw-Hill Education, 2011.

Suggested Readings

- Conservation Biology" by Andrew S. Pullin Climate Change Biology" by Lee Hannah Essentials of Ecology and Environmental Science" by S.V.S. Rana

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Faculty/ Discipline	Zoology				
Programme	BSc (Hons) Zoology				
Course Coordinator	Susan Thomas				
Contributors	Mr. Alex P Zecharia				
Course Name	Forest science conservation and management				
Type of Course	DSE				
Specialization title	Ecological Sciences				
Course Code	To be prepared by the University				
Course Level	300				
Course Summary	This course explores the principles and practices involved in the study of wildlife ecology, conservation, and management. It emphasizes understanding the relationships between wildlife species and their habitats, the impacts of human activities, and the strategies used to conserve and manage wildlife populations.				
Semester	6	Credits			4
Course Details	Learning Approach	Lecture	Tutorial	Practical	Others
		4			
Pre-requisites, if any					
					Total Hours
					60

Course Outcomes (CO)

Number of COs			4	
CO No.	Expected Course Outcome	Learning Domains *	PO No	
1	Understand the fundamental concepts and history of wildlife ecology in India, including ecosystem structure, function, and species interactions	U, E	PO1, PO4	
2	Role of wildlife management, importance of biodiversity. Branches of wildlife Biology. Techniques use in wildlife management	AN, S	PO2, PO6	
3	Wildlife management initiatives in India, and know the Indian forest and conservation. Invasive species. Use habitat management techniques to enhance the quality and availability of wildlife habitats. Understand the current research area, understanding the local bird species and technologies used in wildlife research.	U, AN	PO6, PO7, PO8	
4	Develop practical skills in identifying, handling, observing ecological roles, and field survey techniques.	AN, S	PO9, PO10	

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CO 1	2	-	-	2	-	-	-	-	-	-
CO 2	-	2	-	-	-	1	-	-	-	-
CO 3	-	-	-	-	-	2	1	2	-	-
CO 4	-	-	-	-	-	-	-	-	2	2

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Course Content

Content for Classroom transaction (Units)

Module	Units	Course Description	Hrs	CO No.
1	Introduction to Wildlife Ecology			
	1.1	The ancient history of wildlife in India, and its present status. Scope of wildlife biology. Wildlife Behavior and Adaptations: Behavioral ecology basics, Seasonal movements (migration, hibernation), Reproductive strategies.	7	["1"]
	1.2	Wildlife ecology: Mountain ecosystems (Zonation with altitude (alpine, subalpine, montane, Climate and biodiversity variations with elevation, Endemism and ecological fragility, Human impacts: tourism, grazing, climate change). Food Webs and Energy Flow: Consumption, assimilation, and production efficiencies are measures of ecological efficiency. Intraspecific and interspecific relationships. Dispersal and factors influencing dispersal. Population analysis and interpretations. Effects of man's involvement on wildlife.	8	["1"]
2	Wildlife management Concepts and principles			
	2.1	Wildlife management Concepts and principles; planning and execution. Habitat evaluation – physical and remote sensing. Habitat conservation and protection. Capture and marking technique for census and treatment – bird rings and radio collars.	4	["2"]
	2.2	Wildlife in India. Economically important and Endangered species of fish (Ichthyology), Amphibians, Reptiles, (Herpetology), Birds (Ornithology), and Mammals (Mammalogy). Bird migration, nesting, and bird watching.	7	["2"]
	2.3	Habitat management and restoration, Population estimation methods, Use of GIS and remote sensing in wildlife studies Human-wildlife conflict mitigation.	4	["2"]
3	Wildlife Conservation and Forestry			
	3.1	Administrative Setup for Wildlife Conservation, State, governmental. Statuary bodies (IBWL, BNHS, ZSI, WWF, etc). Wildlife protection Act (1972), Rules, regulations, and Punishment, "Red Data Book". Six Schedules.	5	["3"]
	3.2	List & location of Zoos, Sanctuaries, Parks, and Biosphere reserves of India. Role of these in preservation and conservation management. Rehabilitation programmes (eg. Project Tiger). National parks – Khaziranga, Gir, Bandhavgarh, Kanha, Guindy, Corbett, etc. Marine National Parks – Mannar, Kutch, Point Kalimer, etc. Sanctuaries – Periyar, Mudumalai, Vedanthangal, Bhandipur, etc. Zoos – Mysore, Trivandrum, Hyderabad, etc. (Brief details only)	5	["3"]
	3.3	Effect of Invasive species in wildlife management. Forestry and Sylviculture Major vegetation types in India – classification, characteristics, composition, and distribution.	5	["3"]

Module	Units	Course Description	Hrs	CO No.
4	Activities			
	4.1	Major viral, bacterial, protozoan, fungal, and parasitic diseases of Indian wild mammals, birds, amphibians, and reptiles. (Two each)	3	["4"]
	4.2	Equipment used in the capture and handling of wild animals.	2	["4"]
	4.3	Bird watching and identification of resident and migratory birds (minimum 30 species) with their salient characteristics and use of different bird census techniques.	3	["4"]
	4.4	Visit to the wildlife research centers and a detailed report on functions and current research projects.	5	["4"]
	4.5	Mapping & Spatial Analysis; ArcGIS / QGIS, Google Earth Pro. SMART (Spatial Monitoring and Reporting Tool). (use in research/ description only)	2	["4"]

Teaching and Learning Approach	Classroom Procedure (Mode of transaction) Lecture and Field visits, Seminar, Quiz, Debate, Assignment
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Assessment Types	MODE OF ASSESSMENT Mode of Assessment: Theory
	A. Continuous Comprehensive Assessment (CCA) • Theory - 30 Marks Test paper, Seminar, Group project, Quiz
	B. End Semester Evaluation (ESE) • Theory - 70 Marks Assessment Methods - Written Duration of Examination - 2.00 Hrs Pattern of examination for Theory - Non-MCQ Different parts of written examination - Part - A , B , C Answer Type: ◦ PART - A ◦ MCQ - (10 out of 10) - $10 \times 1 = 10$ ◦ PART - B ◦ Short answer - (14 out of 16) - $14 \times 2 = 28$ ◦ PART - C ◦ Short Essays - (8 out of 10) - $8 \times 4 = 32$

References

- The Development of International Principles and Practices of Wildlife Research Management by Stephen H. Berwick and U. B. Sahania Ecology of a changing planet by Mark B. Bush Human impact on ecosystem by Trivi and O'Hore National Parks of Madhya Pradesh by S. K. Tiwari Endangered Animals of India and their Conservation by S. M. Nair. Peter Stilling, co-author of Biology by Brooker et al., ecology global insight McGraw-Hill Education, 2011

Affidavit

- We, Marthoma College, Kuttapuzha P.O, Tiruvalla and Susan Thomas, agree to permit the use of our proposed course syllabus by other faculty members within the same discipline for course delivery at their respective institutions.
- We, Marthoma College, Kuttapuzha P.O, Tiruvalla, agree to appoint a new course coordinator for the proposed Ecological

Sciences in the event of the unavailability of the currently nominated coordinator. This appointment will ensure the continued coordination of course delivery, assessments, and all related academic responsibilities necessary for the successful implementation of the specialization, for as long as the college offers this programme.

- We, Marthoma College, Kuttapuzha P.O, Tiruvalla and Susan Thomas, declare that no part of this signature course submitted here for approval has been taken from the course content developed by, or from any of the course titles prepared by, the BoS/expert committee in the same discipline under our University.

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