

Course Title: Biodiversity Conservation				
Course code: UES 203	No. of credits: 3	L-T-P: 30-10-10	Learning hours: 45	
Pre-requisite course code and title (if any): None				
Department: Natural and Applied Sciences				
Course coordinator:		Course instructor:		
Contact details:				
Course type: Major		Course offered in: Semester 3		
Course Description This course aims to impart a comprehensive understanding of biodiversity conservation, integrating theoretical knowledge with practical application. It explores the complexities of biodiversity at various levels and examines the multifaceted approaches required for conservation. Through a combination of lectures, hands-on fieldwork, and critical analysis, students will develop a holistic perspective on biodiversity's significance to ecosystem dynamics, and human well-being. Upon completion of the course, the students will acquire interdisciplinary approaches and develop critical thinking to address conservation challenges and provide innovative solutions.				
Course objectives The course aims to build the following basic understanding among students: <ul style="list-style-type: none"> • Understanding of biodiversity's scientific principles within an ecological and socio-economic context. • Practical skills for biodiversity monitoring and conservation, emphasizing innovative and technologies. • Critical thinking and problem-solving skills through the design and implementation of field-based conservation projects. 				
Course content				
Module	Topic	L	T	P
1	Introduction to biodiversity			
	Being an introductory module, this builds a general foundation by highlighting the following basic concepts relevant to biodiversity: Definition of biodiversity, background concepts (taxonomic, spatial levels, endemism), levels of biodiversity (microbial, genetic, species, ecosystem, landscape), drivers of biodiversity, ecosystem functions and biodiversity; indigenous knowledge, and cultural practices in biodiversity conservation	5	0	0
2	Magnitude and distribution of biodiversity			
	This module introduces global biodiversity distribution, hotspots, and variations over time, including Indian context. The contents of this module are as follows: Evolution of biodiversity, overview of ecological communities, number of species worldwide, change in global biodiversity over time; global distribution of biodiversity in the major kingdoms of life through different metrics (species, phylogeny, and biomass); biodiversity hotspots, biodiversity in India	4	2	0
3	Assessment and monitoring of biodiversity			
	This module introduces students to the methods used for assessing biodiversity and monitoring the changes over time. It also introduces students to some of the global biodiversity assessments. The contents of this module are as follows: Millenium ecosystem assessment, global assessment report on biodiversity and ecosystem services (IPBES), indicators for biodiversity assessment, species richness and evenness, alpha beta and gamma diversity, biodiversity indices (Shannon's index, Simpson's index), essential biodiversity variables	5	2	0

	(EBVs), methodologies for assessment and monitoring of different species groups; role of biodiversity informatics and GIS (Geographic Information System) in biodiversity research.			
4	Biodiversity loss and its consequences			
	This module introduces various concepts related to loss of biodiversity - its causes as well as consequences - as covered under following topics: Biodiversity loss: summarising causes and consequences (causes: vulnerability to extinction, habitat fragmentation and destruction, land-use change, climate change, overexploitation, biopiracy, human wildlife conflicts, invasive alien species; consequences: loss of gene pool, loss of ecosystem services, livelihood losses), role of pollution (plastic, chemical, noise, and light pollution) in biodiversity loss	5	0	0
5	Biodiversity conservation strategies			
	This module exposes students to the various concepts and strategies deployed to conserve biodiversity. It also enables them to develop an understanding of the advantages and disadvantages of these strategies as well as the problems currently being faced while implementing these. The contents of this module are as follows: Background: Convention on biological diversity (CBD) and Aichi biodiversity targets, population biology of endangered species, conservation genetics, community, and ecosystem-level interactions Ex-situ conservation: facilities, seed and field gene banks, establishment of new populations, captive breeding, reintroduction, discussion of advantages and disadvantages In-situ conservation: assessment of adequate areas, design, and management of protected areas and protected area network, protected areas in India (biosphere reserves, national parks, wildlife sanctuaries, marine protected areas, Ramsar sites) and their issues, protecting sacred groves, connectivity and corridors, sustainable use of biodiversity, citizen science and community-based conservation efforts	6	3	0
6	Biodiversity and ecosystem restoration			
	This module introduces principles associated with restoration and rejuvenation of biological diversity and practical applications of these principles in various environmental settings as covered under the following topics: Biodiversity and ecosystem restoration: definitions and principles, extent of degradation, tools and methods, restoration of ecological processes and ecosystem functioning, discussion of case studies	5	3	0
7	Field Work			
	Ethical considerations and best practices in field research, field work on different biological communities with simple sampling methods and data analysis; visit to biodiversity parks to better understand eco-restoration; presentation and discussion of results.	0	0	10
	Total	30	10	10
Evaluation criteria				
<ul style="list-style-type: none"> • Minor Test: Written test [at the end of teaching of modules 1, 2 and 3] -- 20% • Major Test: Written test [at the end of the semester, full syllabus] -- 40% • Assignment: 20% • Field report and presentations: 20% 				
Learning outcomes				
Upon completion of the course, the students will be able to:				

- analyze and synthesize core concepts: demonstrate a comprehensive understanding of biodiversity conservation's fundamental principles, critically analyze, and synthesize information from diverse modules to learn about various conservation practices [Minor Test, Major Test]
- gain practical implementation skills: design and execute field-based research projects on biodiversity monitoring, employing contemporary methodologies and technologies [Assignment, Field work]
- develop critical thinking and problem-solving skills: develop skills to articulate their findings [Field report and presentations].

Pedagogical approach

- The course will be delivered through lectures, tutorials, and discussion of case studies.
- The course will also include guided assignments, field work and associated exercises.

Reading resources

- Bharucha, E. (2021). *Textbook of environmental studies for undergraduate courses*. Universities Press.
- Díaz, S., & Malhi, Y. (2022). Biodiversity: Concepts, patterns, trends, and perspectives. *Annual Review of Environment and Resources*, 47, 31-63.
- Gadelha, L. M. R., Jr, de Siracusa, P. C., Dalcin, E. C., da Silva, L. A. E., Augusto, D. A., Krempser, E., Affe, H. M., Costa, R. L., Mondelli, M. L., Meirelles, P. M., Thompson, F., Chame, M., Ziviani, A., & de Siqueira, M. F. (2021). A survey of biodiversity informatics: Concepts, practices, and challenges. *Wiley Interdisciplinary Reviews. Data Mining and Knowledge Discovery*, 11(1).
- Gaston, K. J., & Spicer, J. I. (2003). *Biodiversity: An Introduction (2nd ed.)*. Blackwell Science.
- Groom, M. J., Meffe, G. K., & Carroll, C. R. (2012). *Principles of Conservation Biology (3rd ed.)*. Oxford University Press.
- Krishnamurthy, K. V. (2018). *An advanced textbook on Biodiversity: Principles and practice*. Oxford and IBH Publishing.
- Madhusudan, M. D., & Vanak, A. T. (2023). Mapping the distribution and extent of India's semi-arid open natural ecosystems. *Journal of Biogeography*, 50(8), 1377-1387.
- Magurran, A. E. (1988). *Ecological diversity and its measurement*. Princeton University Press, New Jersey.
- Maiti, P. K., & Maiti, P. (2023). *Biodiversity: Perception, peril and preservation*. PHI Learning.
- Primack, R. B. (2014). *Essentials of conservation biology (6th ed.)*. Oxford University Press.
- Sodhi, N. S., & Ehrlich, P. R. (Eds.). (2009). *Conservation Biology for All*. Oxford University Press.
- Wilson, E. O. (1988). *Biodiversity*. National Academies Press.

Student Responsibilities

The students must prepare with readings suggested during the class and ensure timely assignment submission. They are also expected to participate and further strengthen their understanding of concepts through classroom discussions, field work and case studies.

Course Designed by:

- Dr. Amit Singh, Assistant Professor, Department of Natural and Applied Sciences, TERI School of Advanced Studies, New Delhi

Course Reviewers:

The course is reviewed by following reviewers:

- Dr. Vandana Mishra, Professor, Department of Environmental Studies, University of Delhi, New Delhi
- Dr. Shyam S. Phartyal, Associate Professor, School of Ecology and Environment Studies, Nalanda University, Rajgir
- Dr. Vinod Kumar Garg, Professor, Department of Environmental Science and Technology, Central University of Punjab, Bathinda