DEPARTMENT OF ENVIRONMENTAL SCIENCE

Category-I

SEMESTER - V

BSC (H) ENVIRONMENTAL SCIENCE

DISCIPLINE SPECIFIC CORE COURSE – 13 (DSC-EVS-13): BIODIVERSITY AND CONSERVATION

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
DSC-EVS-13: BIODIVERSITY AND CONSERVATION	4	2	0	2	Class XII pass	NA

Learning objectives

The Learning Objectives of this course are as follows:

- Provide fundamental principles of origin and distribution of biodiversity and its conservation
- Examine major threats to biodiversity and their impacts on ecosystems and human well-being
- Investigate the methods and strategies for conserving biodiversity, including protected areas, and sustainable management practices.
- Develop critical thinking skills and to apply scientific principles to the analysis of biodiversity and conservation issues
- Appreciate the paradigm “think globally, act locally” for a sustainable common future of humankind

Learning outcomes

After this course, students will be able to:

- Assess biodiversity and determine its significance for ecological processes
- Explain the underlying factors of generating biodiversity on Earth
- Analyze major threats to biodiversity and its links with human well-being.
- Apply scientific principles to the analysis of biodiversity and conservation issues and evaluate the methods and strategies for conserving biodiversity

- Communicate effectively about biodiversity and conservation issues to both scientific and non-scientific audiences.

SYLLABUS OF DSC-EVS-13

Theory (02 Credits: 30 lectures)

UNIT – I Levels of biological organization and biodiversity patterns (2½ Week) (5 lectures)
From genes to ecosystems; tree of life; history of character transformation; organic evolution through geographic time scale; species concept – what's in a name?; how many species are there on earth?; concept and types of speciation.

Spatial patterns: latitudinal and elevational trends in biodiversity; temporal patterns: seasonal fluctuations in biodiversity patterns; importance of biodiversity patterns in conservation.

UNIT – II Biodiversity estimation (2½ Week) (5 lectures)
Sampling strategies and surveys: floristic, faunal, and aquatic; qualitative and quantitative methods: scoring, habitat assessment, richness, density, frequency, abundance, evenness, diversity, biomass estimation; community diversity estimation: alpha, beta and gamma diversity; molecular techniques: RAPD, RFLP, AFLP; NCBI database, BLAST analyses.

UNIT – III Importance of biodiversity (2 Week) (4 lectures)
Economic values – medicinal plants, drugs, fisheries and livelihoods; ecological services – primary productivity, role in hydrological cycle, biogeochemical cycling; ecosystem services – purification of water and air, nutrient cycling, climate control, pest control, pollination, and formation and protection of soil; social, aesthetic, consumptive, and ethical values of biodiversity.

UNIT – IV Threats to biodiversity (2½ Week) (5 lectures)
Natural and anthropogenic disturbances; habitat loss, habitat degradation, and habitat fragmentation; climate change; pollution; hunting; over-exploitation; deforestation; hydropower development; invasive species; land use changes; overgrazing; man wildlife conflicts; consequences of biodiversity loss; Intermediate Disturbance Hypothesis.

UNIT – V Conservation of Biodiversity (3½ Week) (6 lectures)
In-situ conservation (Biosphere Reserves, National Parks, Wildlife Sanctuaries); Ex-situ conservation (botanical gardens, zoological gardens, gene banks, seed and seedling banks, pollen culture, tissue culture and DNA banks), role of local communities and traditional knowledge in conservation; biodiversity hotspots; IUCN Red List categorization – guidelines, practice and application; Red Data book; ecological restoration; afforestation; social forestry; agro forestry; joint forest management; role of remote sensing in management of natural resources; Conservation planning.

UNIT – VI Biodiversity in India (2½Week) (5 lectures)
India as a mega diversity nation; phytogeographic and zoogeographic zones of the country; forest types and forest cover in India; fish and fisheries of India; impact of hydropower development on biological diversity; status of protected areas and biosphere reserves in the country; National Biodiversity Action Plan.

Practicals/Hands-on Exercises – based on theory (02 Credits: 60 hours)

1. Practice and learn different field survey methods to assess and monitor biodiversity
2. Field trip to a local conservation area to assess the plant and animal diversity
3. Identify threatened and endangered species in a given
4. Assess variations in biodiversity with different types of ecosystems around
5. Estimate biodiversity indices and comparison of biodiversity levels in different locations
6. Determine magnitude of infestation of invasive species and their possible impacts on native species in a given ecosystem
7. Identify and investigate pollinators of selected plant species in a given ecosystem
8. Study the effects of habitat fragmentation or degradation on population of selected species
9. Analyze the conservation strategies and their effectiveness in protecting biodiversity in given natural and restored ecosystems
10. Identify and document economically important species in a given ecosystem
11. Undertake field trip to a local garden/ecosystem to observe different plant species and their adaptations to their environment
12. Analyse the effects of land use change on biodiversity of a given area
13. Investigate the coexistence or competition among species in a given area and based on literature suggest the possible underlying biotic interactions
14. Develop conservation planning for target species and make informed decisions for biodiversity conservation.

Teaching and learning interface for theoretical concepts

To achieve the course objectives and match with the contents, a wide range of teaching and learning tools will be employed, including (a) Formal lectures; (b) Interactive sessions using visual aid; (c) Case study analyses; (d) Hypothetical scenario building; (e) Group discussion on key topics; and (f) documentary screening and critical analyses.

Essential/recommended readings

- Primack, R.B. (2017). Essentials of Conservation Biology (Sixth Edition). Sinauer Associates.
- Gaston, K.J. (2016). Biodiversity: An Introduction (Third Edition). Wiley-Blackwell.
- Wilson, E.O. (2016). Half-Earth: Our Planet's Fight for Life. Liveright Publishing Corporation.
- Kareiva, P., & Marvier, M. (2017). Conservation Science: Balancing the Needs of People and Nature (Second Edition). Roberts and Company Publishers.
- Koh, L.P., & Wilcove, D.S. (2016). Conservation for a New Era: Integrated Conservation Science for the 21st Century. Oxford University Press.

Suggestive readings

- Lovejoy, T.E. (2019). Biodiversity and Climate Change: Transforming the Biosphere. Yale University Press.
- Pimm, S.L. (2018). The Value of Everything: How to Save the World by Making it

Wealthier. PublicAffairs.
- Simberloff, D. (2013). The Ecology of Invasions by Animals and Plants. University of Chicago Press.
- Tallis, H. (2018). The Nature of Conservation: A Race Against Time. Island Press.
- Wilson, E.O. (2016). Half-Earth: Our Planet's Fight for Life. Liveright Publishing Corporation.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.