## DISCIPLINE SPECIFIC ELECTIVE COURSE (DSE 01)

**Credit distribution, Eligibility and Pre-requisites of the Course**

| Course title & Code | Credits | Credit distribution of the core course | | | Eligibility criteria | Pre-requisite of the course (if any) |
|---|---|---|---|---|---|---|
| | | Lecture | Tutorial | Practical/ Practice | | |
| Ecology, Conservation and Restoration ALS BOT DSE 01 | 4 | 2 | 0 | 2 | XII pass with Science with Biology/ Biotechnology | NIL |

**Learning Objectives:**

The learning objectives of this course are as follows:

- To develop a scientific understanding of the diverse aspects of ecology.
- To familiarize students with the interactions between the organisms and their physical environment.
- To understand various attributes of populations and communities with the help of theoretical concepts and field studies.
- To make students understand various factors that lead to variations among populations of a species.
- To familiarize students about the concepts of conservation and restoration.

**Learning Outcomes:**

By studying this course, students will be able to:

- Gain knowledge about the basic concepts of ecology.
- Comprehend the characteristics of the community, ecosystem development and climax theories.
- Explicate the relationship of evolution of various species and their environment.
- Analyse the basic field studies including data collection and its interpretation.
- Explicate the Conservation and Restoration methods.

**Unit 1: Introduction to Ecology** **(3 Hours)**

Autecology and Synecology, Laws of limiting factors, Study of physical factors: Temperature and Light.

**Unit 2: Population (4 Hours)**

Unitary and Modular populations, Unique and group attributes of population: density, natality, mortality, Life tables, Fecundity table, Survivorship curves, Intraspecific population regulation: density-dependent and independent factors.

**Unit 3: Species Interactions (5 Hours)**

Types of species interactions, Interspecific competition: Lotka-Volterra model of competition, Gause's Principle, Niche concept, Predation, Predator defence mechanisms.

**Unit 4: Community (4 Hours)**

Community characteristics: species richness, dominance, diversity, abundance, guilds, ecotone and edge effect, Ecological succession with examples and types.

**Unit 5: Ecosystem (5 Hours)**

Types of Ecosystems: terrestrial and aquatic ecosystems, Vertical stratification in tropical forest, Food chain: detritus and grazing food chains, linear and Y-shaped food chains, F ood web, Energy flow through the ecosystem: Ecological pyramids and Ecological efficiencies, Biogeochemical cycles: Nitrogen cycle.

**Unit 6: Conservation (5 Hours)**

Ecology in wildlife conservation and management: In-situ conservation (Biosphere Reserves, National Parks, Wildlife Sanctuaries), Ex-situ conservation (botanical gardens, gene banks, seed and seedling banks, DNA banks), Principles of Environmental impact assessment.

**Unit 7: Restoration (4 Hours)**

Restoration ecology: Afforestation, Social forestry, Agro-forestry, Joint Forest management, Role of remote sensing in management of natural resources.

**PRACTICAL (Credit: 02)**

**(Laboratory practical- 15 classes of 4 hours each)**

12. Study of life tables and plotting of survivorship curves of different types from hypothetical/real data.
13. Determination of population density and abundance in a natural or a hypothetical community by quadrat method.
14. Quantitative analysis of herbaceous vegetation in the college campus and comparison with Raunkiaer's Frequency distribution law.
15. Study of morphological features of hydrophytes and xerophytes in the ecosystems.
16. Measurement of temperature, turbidity/penetration of light and pH of any two water samples.

17. Comparison of Dissolved oxygen content in different water samples using Winkler's titration method.
18. Comparison of organic carbon of two soil samples using Walkley and Black's rapid titration method.
19. Comparison of $CO_2$ and alkalinity in two different water samples.
20. Estimation of Total Dissolved Solids (TDS) in water samples.
21. Perform Rapid field tests to detect the presence of Carbonates, Nitrate, Sulphate, Chloride, Organic matter and Base deficiency in two soil samples.
22. A visit to a National Park/Biodiversity Park/Wildlife Sanctuary/Urban Forest.

**Essential/Recommended readings:**


4. Sharma, P.D. (2012). *Ecology and Environment*. Rastogi Publications.
5. Singh J.S., Singh S.P., and Gupta S. R. (2014) *Ecology, Environment Science and Conservation*. S. Chand and Company Limited.
6. Odum, E.P. and Barrett G. W. (2004) *Fundamentals of Ecology*. Indian Edition (5th) Brooks/Cole Publishers.


**Suggestive readings:**


4. Smith T. M. and Smith R. L. (2015). *Elements of Ecology*. 9th International Edition, Publisher: Benjamin Cummings.
5. Saha G.K. and Mazumdar S. (2020) *Wildlife Biology*, An Indian Perspective.Publisher: PHI Learning Private Limited
6. Futuyma, Douglas and Mark, Kirkpatrick (2017). *Evolutionary Biology* (3rd Edition), Oxford University Press


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