

DISCIPLINE SPECIFIC CORE COURSE – 12 (DSC-EVS-12): RESTORATION ECOLOGY

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-12: RESTORATION ECOLOGY	4	2	0	2	Class XII pass	NA

Learning objectives

The Learning Objectives of this course are as follows:

- Gain insights into principles and concepts of restoration ecology to understand various approaches and techniques used in ecological restoration
- Provide hands-on experience with ecological restoration techniques and field methods
- Promote critical thinking and problem-solving skills in the context of ecological restoration for innovation related methods
- Investigate the interdisciplinary issues and practices linked with ecological restoration

Learning outcomes

After this course, students will be able to

- Describe the ecological, economic and social factors that lead to ecosystem degradation
- Evaluate and select appropriate ecological restoration techniques for different types of ecosystems
- Design ecological restoration projects and identify appropriate methods to monitor and evaluate the restoration practices
- Undertake collaborative programmes to understand and solve ecological restoration problems
- Critically evaluate the scientific and technical aspects of ecological restoration research and practice.

SYLLABUS OF DSC-EVS-12

Theory (02 Credits: 30 lectures)

UNIT – I Fundamentals of Restoration Ecology (3½ Weeks) (7 lectures)

Definition and history of restoration ecology, Principles of restoration ecology, Restoration process: planning, implementation, and monitoring; Ecosystem services and the importance of restoration ecology; Challenges and limitations of restoration ecology; Case studies in restoration ecology; Ethics and values in restoration ecology; Restoration ecology and environmental policy

UNIT – II Ecological Foundations for Restoration Ecology: (3 Weeks) (6 lectures)

Role of ecological concepts in restoration ecology: ecological succession. Biodiversity, ecological interactions, and habitat fragmentation and ecosystems; Climate change and its impact on restoration ecology, Invasive species and their role in ecosystem degradation and restoration, Ecological thresholds, and their relevance to restoration ecology

UNIT – III Techniques and Tools for Restoration Ecology (3 Weeks) (6 lectures)

Ecological site assessment and inventory, Restoration planning and design, Techniques for soil and water conservation in restoration ecology, Seed collection, propagation, and planting techniques for restoration, Wildlife management in restoration ecology, Restoring aquatic ecosystems: techniques and challenges, Biomimicry and ecological engineering in restoration ecology. Evaluating and monitoring restoration outcomes

UNIT – IV Ecosystem Restoration (2 Weeks) (4 lectures)

Restoration of: grasslands, forests, wetlands, agricultural and urban landscapes, mining and industrial sites; Restoration of ecosystem services in aquatic ecosystems

UNIT – V Synthesis and Applications of Restoration Ecology (3½ Weeks) (7 lectures)

Integrating restoration ecology with conservation biology, Adaptive management in restoration ecology, Restoring ecosystem services and human well-being, Restoring cultural and spiritual values in ecosystems, Restoring resilience and resistance in ecosystems, Restoring ecosystem connectivity and migration corridors, Restoring biodiversity in the face of global change, and The future of restoration ecology and its role in sustainability

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.

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

1. Field visits to assess the magnitude of degradation in selected ecosystems
2. Analyse the success of ecosystem restoration case studies in Delhi and identify the underlying principles
3. Assess the current status of a degraded ecosystem and identify potential areas for restoration
4. Learn techniques for collecting and propagating native plant species for use in restoration projects

- 5-6. Design methods for reducing erosion and managing nutrient runoff in restored ecosystems
- 7-8. Examine techniques for planting and establishing native plant species in a restored ecosystem
- 9-10. Evaluate methods for assessing and managing wildlife habitat in a restored ecosystem
- 10-11. Assess efficacy of different methods for monitoring and evaluating restoration outcomes in a restored ecosystem
12. Learn techniques for managing invasive species in a restored ecosystem
- 13-14. Design and implement a restoration plan for selected degraded ecosystems (terrestrial and aquatic) to improve the quality of habitat

Teaching and learning interface for practical skills

To impart training on technical and analytical skills related to the course objectives, a wide range of learning methods will be used, including (a) laboratory practicals; (b) field-work exercises; (c) customized exercises based on available data; (d) survey analyses; and (e) developing case studies; (f) demonstration and critical analyses; and (h) experiential learning individually and collectively.

Essential/recommended readings

- Clewell, A. F., & Aronson, J. (Eds.). (2013). *Ecological restoration: Principles, values, and structure of an emerging profession* (2nd ed.). Island Press.
- Erickson, A. L., Ryan, C. M., & Jones, T. A. (Eds.). (2021). *The science of ecological restoration: Creating resilience in a changing world*. Island Press.
- Hobbs, R. J., & Suding, K. N. (2018). *New models for ecosystem dynamics and restoration*. CRC Press.
- Palmer, M. A. (2016). *Restoration: The science of restoring ecosystems and the human spirit*. Island Press.
- Temperton, V. M., Hobbs, R. J., Nuttle, T., Halle, S., & Tonev, C. (Eds.). (2020). *Novel ecosystems: Intervening in the new ecological world order*. John Wiley & Sons.
- Yaffee, S. L., & Wondolleck, J. M. (2019). *Ecosystem management in the United States: An assessment of current experience*. Routledge.

Suggestive readings

- Allison, S. D., & Murphy, S. D. (Eds.). (2019). *Ecosystem collapse and restoration*. Oxford University Press.
- Benedetti-Cecchi, L. (2021). *Marine restoration ecology*. Oxford University Press.
- Benson, M. H., & Phillips, A. (Eds.). (2016). *Ecosystem services and conservation in urbanizing Asia*. Springer.
- Higgs, E. S., Falk, D. A., Guerrini, A., Hall, M. P., & Harris, J. G. (Eds.). (2021). *The Routledge handbook of ecological and environmental restoration*. Routledge.
- Moreno-Mateos, D., & Perring, M. P. (Eds.). (2019). *Ecological restoration and environmental change: Renewing damaged ecosystems in a changing world*. Routledge.
- Palmer, M. A., Zedler, J. B., & Falk, D. A. (Eds.). (2021). *Foundations of restoration ecology* (2nd ed.). Island Press.

- Suding, K. N., & Hobbs, R. J. (Eds.). (2019). Handbook of restoration ecology (2nd ed.). Oxford University Press.

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