

DISCIPLINE SPECIFIC ELECTIVES (DSE-EVS-6): WETLAND CONSTRUCTION AND MANAGEMENT

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
		Lecture	Tutorial	Practical/ Practice		
DSE-EVS-6: WETLAND CONSTRUCTION AND MANAGEMENT	4	2	0	2	Class XII pass	NA

Learning objectives

The Learning Objectives of this course are as follows:

- Understand physical and chemical processes for classifying, segregating, and managing solid wastes
- Characterize the different solid waste types and apply interdisciplinary knowledge for effective solid waste collection and processing of solid waste
- Compare methods of collection, transfer, storage, treatment, disposal, and use of solid waste in developed and developing nations
- Management, construction, and operations of landfill and other solid waste management facilities

Learning outcomes

After successful completion of this course, students will be able to:

- Conduct the life cycle assessment of solid waste and its impact on the urban metabolisms
- Identify and select landfill sites using GIS and other analytical techniques
- Examine and apply technical and legal solutions for sustainable management of solid waste
- Plan and design waste recycling programmes, compost and incineration facilities, and landfills
- Mine and analyze the relevant data and apply multiple criteria decision-making systems for a sustainable integrated solid waste management plan

SYLLABUS OF DSE-EVS-06

Theory (02 Credits: 30 lectures)

UNIT – I Wetlands Basics (1½ Weeks) (3 lectures)

Wetlands: definition, classification, functions and values, ecology and hydrology, ecosystem services; Importance in global environment, Wetland plant and animal communities, Wetland biogeochemistry, Threats to wetlands and wetland conservation

UNIT – II Design and Construction of Wetlands (2 Weeks) (4 lectures)

Design and planning principles, Construction techniques and materials, Wetland hydrology and water management, Vegetation selection and planting methods, Soil preparation and amendment, Erosion and sediment control, Monitoring and maintenance of constructed wetlands, Case studies in wetland design and construction

UNIT – III Restoration, Creation, and Wetland Management in Practice (3 Weeks) (6 lectures)

Restoration and creation goals and objectives, Site assessment and planning, Hydrological restoration techniques, Vegetation establishment and management, Wildlife habitat restoration and management, Monitoring and adaptive management of wetland restoration projects, Wetland restoration and creation in urban areas, Case studies in wetland restoration and creation,

Wetland management for: biodiversity conservation, water quality improvement, climate change adaptation and mitigation, and flood control and stormwater management; Challenges and opportunities for wetland management and restoration

UNIT – IV Monitoring and Assessment of Wetlands (2½ Weeks) (5 lectures)

Monitoring and assessment goals and objectives, Indicators of wetland health and function, Methods for measuring wetland hydrology, Vegetation sampling and analysis, Wildlife monitoring and assessment, Water quality monitoring, Data management and analysis, Case studies in wetland monitoring and assessment

UNIT – V Socio-Economic Benefits of and Emerging Issues in Wetland Management (3½ Weeks) (7 lectures)

Economic valuation of wetland services, Wetland-based: livelihoods, tourism, recreation and sustainable development, Wetlands and cultural heritage, Stakeholder engagement in wetland management, Social equity considerations in wetland management

Climate change impacts on wetlands, Innovative wetland management and restoration techniques, Role of wetlands in green infrastructure, and social justice, Wetland management and restoration in the developing world and the Anthropocene, and Policy and research needs for wetland management and restoration

UNIT – VI Wetland Regulations and Policy (2½ Weeks) (5 lectures)

Wetland regulatory frameworks in India and other developed countries, Wetlands (Conservation and Management Rules) 2017, Wetland impact assessment, Ramsar Convention and international wetland protection, Wetland mitigation banking, Adaptive management for wetland restoration, Legal and ethical considerations in wetland management

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. Conduct a wetland site assessment and identify wetland vegetation, soils, and hydrological features
2. Analyze a wetland construction project and learn about the methods and materials used in wetland construction
3. Monitor wetland using specific indicators including vegetation characteristics and water quality
4. Identify a suitable site and develop a wetland restoration project based on theoretical concepts
5. Analyze wetland conservation policy and its relations with other environmental and biodiversity conservation policies and regulations
6. Develop and implement a wetland education and outreach program for a local community
7. Calculate water budget of a selected wetland in your area or from any other parts of the country
8. Survey a local wetland and identify characteristic plants using field guides and manuals
9. Document wetland specific wildlife, including birds, amphibians, and reptiles,
10. Analyze wetland soil samples for key soil physico-chemical properties
11. Map wetlands in your city using GIS mapping and assess the ecosystem diversity
12. Conduct a wetland education program and evaluate its effectiveness in promoting importance of wetlands

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

- Brinson, M. M., & Rheinhardt, R. D. (2017). The practice of wetland restoration. American Society of Civil Engineers.
- Craft, C. B., Seneca, E. D., & Broome, S. W. (2018). Methods in biogeochemistry of wetlands. Soil Science Society of America.
- Lewis, J. (Ed.). (2018). Wetlands law and policy: understanding regulatory and environmental challenges. American Bar Association.
- Richardson, C. J. (Ed.). (2019). The wetland book: I: structure and function, management and methods (2nd ed.). Springer.
- Vymazal, J. (2018). Constructed wetlands for wastewater treatment: municipal, industrial and agricultural. Elsevier.

Suggestive readings

- Middleton, B. A. (2018). Wetland restoration: flood pulsing and disturbance dynamics (2nd ed.). Island Press.
- Millennium Ecosystem Assessment. (2005). Ecosystems and human well-being: wetlands and water synthesis. World Resources Institute.
- Mitsch, W. J., & Gosselink, J. G. (2015). Wetlands (5th ed.). John Wiley & Sons.
- Richardson, C. J., & King, R. S. (2019). Understanding and managing freshwater wetlands (2nd ed.). CRC Press.
- Zedler, J. B., & Kercher, S. (Eds.). (2015). Wetland restoration and construction: a technical guide (2nd ed.). CRC Press.

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