

Course title: Wetland conservation and management		
Course code: WSW 168	No. of credits: 3	L-T-P: 2-0-1
Pre-requisite course code and title (if any): Will be of advantage to students who have studied Ecology/Biodiversity and Conservation		

Course Description:

Wetlands play an important role in ecosystem functioning. Their management, governance and conservation however remain neglected not because of awareness but due to lack of capacity and complexities involved in their assessment of management needs. Wetlands categorized as Protected Areas in India are mostly governed by the Wildlife Protection Act of 1972. Biodiversity studies on aquatic eco systems are mostly restricted to a few charismatic fish species, aquatic plants, water birds which is an impediment to. This course on Wetland Management and Conservation shall focus on the needs and approaches to Wetland management and their conservation in India.

Course objectives

1. To understand the ecology of the wetlands and their contribution to human well-being.
2. To develop hands on ability to undertake biodiversity monitoring of wetlands.
3. To develop an ability to understand issues related to best practices in Wetland Management and conservation
4. To be able to prepare a management plan for wetland conservation.

Course content

Modules	Topic	L	T	P
Module 1:	Basic Concepts on Wetland Ecology			
	Definition and classification of Wetlands: Wetlands as Ecosystems and part of River Basin. Distribution and typology. Wetland Habitat and Ecology. Physico-chemical parameters Hydrology and Soils. Unusual and Extreme habitats	2		
	Biodiversity in Wetland Systems : Aquatic Organisms : Microbes, Phyto and zooplanktons , Plants and Invertebrates and Vertebrates.	2		
	Wetland Functions and Values; Ecosystem services . Nutrient cycling in aquatic systems. Productivity, trophic states and eutrophication . Freshwater ecosystems	2		
	Tutorial : <i>Case study on Ecosystem services by Wetlands.</i>			
	Practical : Basics on Taxonomy and Enumeration of Phyto and Zooplanktons. Estimation of Chlorophyll.		2	2
Module 2:	Issue of Wetlands Conservation and Management			
	Threat analysis and management Planning : Natural and Human impacts; major threats to wetlands;. Setting management objectives and priorities.	2		
	Key aspects of Wetland management planning; Preparing a Management Plan. Collating baseline information using assessment tools, approaches to assessment of aquatic bio-diversity. Management for migratory water fowl, fisheries, amphibians, reptiles and mammals. Management of aquatic weeds. Monitoring of Wetlands. Managing hydrology; Control of Siltation and Pollution. Involvement of local communities in conservation of Wetlands.	4		
	Environmental Flows: The River ecosystems and their natural flow regimes. Concept and History of environmental flows, Methodologies for			

	the assessment of Environmental Flows. Impact of flow alteration on biota. Environmental flow assessment in India. <i>Case studies on Environmental Flows : Experiences of South Asia</i>	2		
			2	
Module 3:	Wetland Conservation in India and the World Wetlands in India: Wetlands of Ramsar significance in India; Wetland policy . National Wetland Rules 2010. Wetland related Institutional arrangements: Functioning of Lake Development Authorities. Trans-boundary waters Major Wetlands of the World: Ramsar Convention; Wetland conservation <i>vis a vis</i> other Conventions (CBD, CMS, CITES, UNFCCC). Conservation issues of major wetlands of the World. <i>A case study on Environmental Impact Assessment related to a Wetland in India</i> <i>Preparation for the assignment on a Wetland Conservation</i>	2		
		2		
			2	
			2	
Module 4:	Field study on revival and restoration of Wetlands Wetlands Restoration. Field visit to a Wetland in India (Chilka /Keoladeo Birds Sanctuary, Bharatpur Rajasthan / Any other Ramsar Site): to study restoration and revival efforts. In field lectures . Presentations on the assignment. Submission of the report.	3		26
		21	8	28
Evaluation criteria				
Minor tests 1: 10%				
Minor test II : 10%				
Assignment report : 30%				
Presentation based on assignment: 20%				
Major Test: 30%				
Learning outcomes				
Students undertaking this course will develop an understanding of values and functioning of Wetland Ecosystems and different aspects of Wetland management planning that will aid governance. Will be useful to students aspiring higher studies and career paths that involves assessment of aquatic biodiversity and governance of Wetland management				
Pedagogical approach				
The course will be an amalgamation of theory on aquatic biology interspersed with a deeper understanding of management needs of fresh water aquatic systems. Students will delve through case studies in India, undertake monitoring of biological and physico -chemical parameters of wetlands, undertake root cause analysis to the threats				

wetland are subjected to and learn preparation of management plans as per the national and global best practices guidelines guide-lines. The course will apprise the students of the national and global policy environment *vis a vis* wetland management conservation and priorities.

Materials

Dodds. Walter K. (2002). *Freshwater Ecology. Concepts and Environmental Applications*. Elsevier Science. Academic Press. California.

Gopal B. (1995). *Handbook of Wetland Management* ., World Wide Fund for Nature India. New Delhi
(Revised Edition being planned by author)

Gopal B. (2013). *Environmental Flows. An introduction for water resource managers*. National Institute of Ecology. New Delhi

Wetzel, Robert G and (2010). *Limnological analysis*. Springer Science. New York. USA

Wetzel Robert G. .2001. *Lake and river ecosystems*. Elseiver. Academic Press. USA.

An integrated Wetland assessment toolkit. IUCN.

Ramsar Convention Handbooks

Handbooks on Wetland Management by Convention on Biological Diversity.

Standard methods for examination of water and waste water. (1998) .20th edition. American Public Health association (AHPA), American Water Works Association.

Case studies

Environmental Impact assessment (EIA) : Studies nf the Teesta River basins.(Eg.)

Websites: www.ramsar.org, www.cbd.int,

Suggested Readings

Fraser, L.H. and P.A. Keddy (Eds). *The World's largest wetlands: Ecology and Conservation*. Cambridge University Press, UK

Kar, Devashish. (2013). *Wetlands and lakes of the world*. Springer. New Delhi.

Krishnamurthy, J. , Sharachchandra Lele and R. Jayakumar. (2006). *Hydrology and watershed services in the Western Ghats of India*. Tata McGraw – Hill Publishing Company Limited. New Delhi.

Journals

Biological Conservation

Diversity and Distributions Journal of Wetland Ecology Journal of Applied Ecology Lakes and Reservoirs: research and management Landscape Ecology Wetland Ecology and Management
Additional information (if any) Guest lectures will be organized on specialized topics as mentioned in course content.
Student responsibilities Attendance, feedback, participation in field based research shall be mandatory.

Course reviewers

1. Prof Brij Gopal, School of Environmental Sciences, Jawahar Lal Nehru University, New Delhi.
2. Dr. Joachim Schmerbeck.. Associate Professor, TERI University, New Delhi
3. Dr. Parikshit Gautam, ex Director, Wetland Conservation Division , WWF – India
4. Trans-boundary Water initiative, International Union for Conservation of Nature-(IUCN) India.