

Course title: Ecosystem Dynamics and Climate Change				
Course code: NRC 121		No. of credits: 3	L-T-P: 26-10-12	Learning hours: 42
Pre-requisite course code and title (if any): Ecology				
Department: Department of Natural Resources				
Course coordinator: Dr Kamna Sachdeva		Course instructor: Prof KS Rao		
Contact details:				
Course type: Elective		Course offered in: Semester 3		
Course Description The aim of the course is to get the students familiar with the pattern of ecosystem dynamics, changes that can be expected under the impact of climate change and its consequences for human well-being. The knowledge will be transferred at the hand of examples from different ecosystems.				
Course objectives				
Course content				
SNo	Topic	L	T	P
1.	Introduction Definitions of ecosystem dynamics (ED) and its relevance regarding climate change, changes of ecosystem over different time scales (evolutionary, actual)	2		
2.	Drivers of ED Drivers of ED over evolutionary times, ED and disturbance (fire, climate, storms/cyclones, biotic impacts), human caused ED, degradation (definition and context)	2		
3.	Patterns and Elements of ED, Vegetation history and climate change in geological time Disturbance regimes and succession: Will be elaborated for different climate zones and ecosystems (primary and secondary, progressive, regressive); some examples of changes of elements of the ecosystem in different stages of succession (e.g. carbon and nutrients cycling, biodiversity, structure, functions) Examples from different mountainous regions with regard to the study tour.	6	4	
4.	ED and ecosystem services (ES) Brief recap on ecosystem functioning and ES, ES provided by different ecosystems at present, changes of ES through ED,	4		
5.	Predicted pattern of climate change For: Sea level, rainfall pattern (isohyets), hydrological systems, temperature (isotherms), disturbance regime (storms, fire, floods)	4	2	
6.	ED and climate change Expected impacts of climate change on major ecosystems and their consequences for: shifting of biomes and altitudinal belts (leading vs. trailing edge), carbon and nutrient cycling,	4	2	

	biodiversity (species, structure), vegetation and soil properties, functions like pollination, recruitment, growth, mortality			
7.	Study tour to the Himalayas Visit of project sites of IUCN, students will work on different topics in groups with practical assessments in the field	4	2	12
8.	Workshop One day workshop on the findings of the students during the study tour, each group represents the results.			
	Total	26	10	12

Evaluation criteria

- 1 Minor tests: 20%
- Presentation: 20%
- Assignment: 20 %
- Major test: 40%

Learning outcomes

Pedagogical approach

Materials

Required text

1. Halpin P.N. (1997) Global Climate Change and Natural-Area Protection: Management Responses and Research Directions, *Ecological Applications* 7(3), 828-843.
2. Harsh M.A. et al. (2009) Are Treelines Advancing? A Global Meta-analysis of Treeline Response to Climate Warming, *Ecology Letters* 12/10: 1040-1049.

Suggested readings

1. Levejoy T.E. and Hannah L.(Eds.) (2005) *Climate Change and Biodiversity*, TERI Press, New Delhi.
2. MacDonald G.M., Velichko A.A. et al. (2000) Holocene Treeline History and Climate Change Across Northern Eurasia, *Quaternary Research*, 53(3), 302-311.
3. Withmore T.C. (1998) Forest Dynamics, Kapitel 7 in, *An Introduction to Tropical Rain Forests*, Oxford University Press, S. 109-155.
4. Withmore T.C. (1998) Nutrients and their Cycles, Kapitel 8 in, *An Introduction to Tropical Rain Forests*, Oxford University Press, S. 156-178.

Other Important Readings

1. Miles L. and Kapos V. (2008) Reducing Greenhouse Gas Emissions from Deforestation and Forest Degradation: Global Land-Use Implications, *Science* 320(5882), 1454-1455.
2. Stern N. (2008) The Economics of Climate Change, *American Economic Review* 98(2), 1-37.
3. Thuiller W., Albert C. et al. (2008) Predicting Global Change Impacts on Plant Species' Distributions: Future Challenges, *Perspectives in Plant Ecology, Evolution and Systematics*, 9, 137-152.
4. Turner et al. (2001) *Landscape Ecology*, Springer, New York.

Case studies

Websites

Journals

1. Climate Dynamics
2. Journal of vegetation science

Additional information (if any)

Assignments

Assignments will be given regarding the field trip to the Himalayas at the beginning of the Semester.

Student responsibilities

Attendance, feedback, discipline, guest faculty etc