Course title: Impacts of climate change

Course code: NRC 185	**No. of credits:** 1	**L-T-P:** 18-10-0	**Learning hours:** 28

Pre-requisite course code and title (if any):

Department: Energy and Environment

Course coordinator(s): **Course instructor(s):** Dr Chubamenla Jamir

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Course type: Compulsory Core **Course offered in:** Semester 2

Course description

The course is designed to inform students about causes and impacts of climate change. It introduces the students to different types of changes in the climate system and explores observed impacts on both natural and human managed systems on various sectors and regions throughout the world. It would also explore the state of science with respect to tipping points in the Earth System and projections for the future.

Learning objectives

- To provide basic understanding of the nature of climate change
- To explore climate change impacts on different sectors and regions

Course content

Module	Topic	L	T	P
1.	**Introduction to extreme events and gradual changes of the climate; tipping elements and proxies for future climate change** (paleo-climatic evidences; astronomical factors); natural earth system activities (e.g. volcanic activity; earthquakes)	4	2	
2.	**Observed impacts of climate change on natural and managed systems** − Natural systems–ecosystems (forest, freshwater and marine aquatic systems) − Managed systems-agriculture, urban infrastructure, society	6	2	
3.	**Future climate impacts** − Future climate projections of climate parameters and sea-level rises and its impacts on natural systems (physical and biological) and society	4	2	
4.	**Sectoral and regional climate impacts–Case studies** − Case studies on infrastructure, agriculture and food system, water intensive industries, health, urban heat island.	4	4	
	Total	**18**	**10**	**0**

Evaluation criteria

Course grades will be based on the following criteria:

- Assignments: 20 %
- Test 1: 15%
- Test 2: 15%
- Test 3: 50 %

Learning outcomes

Upon completion of the course, students would be able to:

- Have a profound view about causes of climate change and the impacts of advancing climate change on different systems and regions.

Pedagogical approach

Lectures and discussion of assigned readings. Students would be required to do an assignment and presentation which will be evaluated by the course instructor.

Materials

Suggested readings

1. Pittock B (2009) Climate change: The science, impacts and solutions 2nd edition. CSIRO, Melbourne, and Earthscan, London.
2. IPCC (2007) Climate Change 2007: Working Group II: Impacts, Adaptation and Vulnerability, Working Group II, Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
3. Alley, R. B., Marotzke J., Nordhaus W.D. et al., (2003) Abrupt Climate Change. Science 299, 2005.
4. WMO, (2013) The Global Climate 2001-2010, A Decade of Climate Extremes.
5. Gosling (2013) The likelihood and potential impact of future change in the large-scale climate-earth system on ecosystem services.
6. Kelkar, U., Bhadwal, S. (2007) South Asian Regional Study on Climate Change Impacts and Adaptation: Implications for Human Development. Human Development Report 2007/2008.Fighting Climate Change: Human Solidarity in a Divided World. Human Development Report Office, Occasional Paper.
7. Kovats, S., Akhtar, R. (2008) Climate, climate change and human health in Asian cities. Environment and Urbanization 29 (1): 165-175.
8. Lenton TM and Ciscar J (2013) Integrating tipping points into climate impact assessments. Climatic Change 117:585–597
9. Fischer G, Shah M, Tubiello FN and van Velhuizen H. (2005) Socio-economic and climate change impacts on agriculture: an integrated assessment, 1990–2080. Phil. Trans. R. Soc. B 360, 2067–2083

Additional readings

1. Hulme M., (2009), Why do we disagree about Climate change? Cambridge University Press.

Case studies

Additional information (if any)

Student responsibilities

The students are expected to submit assignments in time and come prepared with readings when provided.

Course Reviewers

The course is reviewed by the following experts.

1. Prof. Eddy Moors, Head Climate Change & Adaptive Land & Water Management, Wageningen Environmental Research, Wageningen University & Research, Alterra, Netherlands.
2. Dr. Paresh Bhaskar Shirsath, Climate Change Adaptation Specialist, CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) BISA, International Maize and Wheat Improvement Center (CIMMYT), New Delhi.
3. Dr. Anjal Prakash, Programme Coordinator, Himalayan Adaptation, Water and Resilience (HI-AWARE) Research, ICIMOD.