



## Climate Change, Impacts and Adaptation in Himalaya

### Semester -III: July - December 2020

Coordinator	Prof. Prakash C. Tiwari
Credits	100 Marks [4 Credits]*
Lecturers	Decided in Departmental Meeting
Level	M.A./M.Sc.
Host institution	Department of Geography, Faculty of Arts, Kumaun University, Nainital
Course duration	One Semester [July - December]

### Summary

*This one full semester course provides the Master level students of Geography basic understanding of climate change and its fundamental concepts; and knowledge about the trends of Climate Change in Himalaya. Besides, it will also introduce students to climate change induced natural disasters, climate change vulnerability assessment; and methods, techniques and approaches of climate change adaptation in Himalaya. The course includes individual assignments.*

### Target Student Audiences

Semester - III Students of M.A./M.Sc.

### Prerequisites

Required Courses (or equivalents):

- Environmental Management
- Ecology
- Introduction to Computer Science or Information Technologies,
- Environmental Management

### Aims and Objectives

This course has been designed with a view to help students in developing a comprehensive understanding and knowledge of the impacts of climate change in Himalaya and the need of evolving and implementing effective adaptation strategies. The main objectives of the course are: (i) to help students in understanding the increasing impacts of climate change on natural and socio-economic systems in Himalaya; (ii) to provide students with the state-of-art recent knowledge about the climate change induced natural disasters in Himalaya; and (iii) to appraise students about the need of developing effective climate change adaptation strategies and mainstreaming climate change adaptation in development planning.

### General Learning Outcomes:

By the end of the course, successful students will:

- Understand the fundamental concept and science of climate change,
- Learn the trends and impacts of climate change in Himalaya,



- Gain adequate knowledge of the climate change induced natural disasters,
- Understand climate change vulnerability assessment techniques, tools and methods,

**\* Note: Kumaun University has Mark System at all Levels**

- Develop comprehensive understanding of climate change adaptation approaches and strategies for the Himalayan mountains
- Understand the concept of science-policy interfaces in climate change adaptation,
- Understand the role of local institutions in climate change adaptation

## Overview of Sessions and Teaching Methods

The course will make most of interactive and self-reflective methods of teaching and learning including mainly lectures and presentations. It will start with an overview of climate change science and global climate change trends. Subsequent sessions will combine interactive lecturing on different course components divided up into 5 Units, and individual assignments. The third part of the course is built around supervised preparation of short interdisciplinary dissertation by students.

## Course Workload

The table below summarizes course workload distribution:

Activities	Learning outcomes	Assessment	Estimated workload (hours)
<b>In-class activities</b>			
Lectures and Presentations	<b>Unit I - Elements of Climate:</b> Nature and Scope and Relationship with other Sciences; Understanding Climate Change; Concept of Climate Change; Global Trends of Climate Change; Assessment of Climate Change over mountains	End Semester Written Examination	08
Lectures and Presentations	<b>Unit II - Trends of Climate Change in Himalaya:</b> Himalaya as Climate Change Hot Spot; Trends of Climate Change in Himalaya: Rainfall, Temperature and Extreme Weather Events	End Semester Written Examination	08
Lectures and Presentations	<b>Unit III - Climate Change Induced Natural Disasters:</b> Understanding Linkages between Climate Change and Natural Disasters; Droughts and High Intensity Rainfall and their impacts on natural environment, society and economy	End Semester Written Examination	08
Lectures and Presentations	<b>Unit IV - Climate Change Vulnerability and Risk:</b> Concept of Vulnerability and Risk; Assessment of Climate Change Vulnerability and Risk; Upstream downstream linkage of Climate Change	End Semester Written Examination	08



Lectures and Presentations	<b>Unit V - Climate Change Adaptation in Himalaya:</b> Concept of Climate Change Adaptation; Types of Climate Adaptation; Role of Local Institutions in climate Change Adaptation; Mainstreaming Climate Change Adaptation and Disaster Risk Reduction into Development Planning; Community Based Climate Change Adaptation	End Semester Written Examination	08
<b>Independent work</b>			
- Individual Assignments	Ability to interpret data, and to use the concepts, tools, and methods for communicating information	Individual Presentations	20
<b>Total</b>			<b>60</b>

## Grading

The students' performance will be based on the following:

- Written performance at the end Semester Written Examination 75%
- 25% based on the evaluation of 2 individual Assignments and attendance in classroom lectures

## Course Schedule: Semester- III: July - December 2020

### Course Assignments

The Structure of Course Assignments will be as follows:

- The Course Teacher will set 5 detailed answer Questions one each from 5 Units.
- Each of the students will have answer 2 questions of his/her choice before the commencement of the Semester End Examinations.

### Literature

- P. Wester, A. Mishra, A. Mukherji, A. B. Shrestha (eds), The Hindu Kush Himalaya Assessment: Mountains, Climate Change, Sustainability and People, Springer Nature Switzerland AG, Cham, pp., 2019
- World Bank, South Asia's Hotspots Impacts of Temperature and Precipitation Changes on Living Standards, Report Preview Spring 2018, World Bank Group, Washington D.C. 2018
- S. Irudaya Rajan, R. B. Bhagat eds, Climate Change, Vulnerability and Migration, Routledge, India, 2018
- M.S.S. Rawat et al. (eds), Environment, Resources and Development of the Indian Himalaya, Transmedia Publication, Srinagar, Garhwal, Uttarakhand, India, 2018
- Tor H. Aase, Climate Change and the Future of Himalayan Farming, Oxford University Press, 2017
- Velma Grover et al.(eds), Global Change and Mountains: Consequences, Responses and Opportunities, Science Publishers, CRS Press, Taylor and Francis, USA, 2015
- E. Grohmann et al. (eds), Environmental Deterioration and Human Health: Natural and Anthropogenic Determinants, Springer, Dordrecht, 2014
- Ning, Wu; Rawat, G.S.; Joshi, S.; Ismail, M.; Sharma, E. (Eds) High-altitude rangelands and their interfaces in the Hindu Kush Himalayas. Kathmandu: ICIMOD, 2013
- Jean Palutikof et al. (eds.) Climate Adaptation Futures, Wiley Publishing Company, U.K., 2013
- C. Margottini et al. (eds), Landslide Science and Practice, Vol. 4, Springer-Verlag, Berlin, Heidelberg, Germany, 2013





- Velma Grover (ed) Impact of Climate Change on Water and Health, CRC Press, Taylor and Francis Group, 2013
- G. Rasul and M. Karki (eds) Policy Priorities for Sustainable Mountain Development, Kathmandu: International Center for Integrated Mountain Development, 2008
- Huddleston, B., Ataman, E. and d'Ostlanl, L. F., Towards a GIS-based analysis of mountain environments and populations, FAO, Rome, 2003
- ICIMOD, Mountains of the world: ecosystem Services in a Time of global and climate change: seizing opportunities meeting challenges Framework paper prepared for the Mountain Initiative of the Government of Nepal by ICIMOD and the Government of Nepal, Ministry of Environment [<https://lib.icimod.org/search?page=1&size=20&q=climate%20change>]
- IPCC, Climate change: Impacts, adaptation, and vulnerability, Part A: Global and sectoral aspects, Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Summary for policymakers, Cambridge University Press, Cambridge, United Kingdom and New York, USA, 2014 [www.ipcc.ch > pdf > assessment-report > ar5\\_wgII\\_spm\\_en](http://www.ipcc.ch/pdf/assessment-report/ar5/wgII/wgII_spm_en)
- Tse-ring, K., Sharma, E., Chettri, N., Shrestha, A. (eds), Climate change vulnerability of mountain ecosystems in the eastern Himalayas. Climate change impact on vulnerability in the eastern Himalayas-synthesis report. Kathmandu: ICIMOD, 2010 [<https://lib.icimod.org/search?page=1&size=20&q=climate%20change>]
- M. Beniston, Environmental change in mountains and uplands. London, 2000.
- Food and Agricultural Organization, Food Security in Mountains – High time for action. Brochure of the International Mountain Day 2008. <http://www.mountaineering.ie/documentbank/uploads/IMD08%20brochure.pdf>
- Food and Agricultural Organization, International Year of the Mountains. Food and Agriculture Organisation of the United Nations, Rome, 2002.
- Food and Agricultural Organization, Land-water linkages in rural watersheds. Land and Water Bulletin 9. Food and Agriculture Organisation of the United Nations, Rome, 2002
- Martin J. Haigh, Headwater control: integrating land and livelihoods, paper presented at the International conference on Sustainable Development of Headwater Resources. United Nation's International University, Nairobi, Kenya, September, 2002.
- ICIMOD, Mountains of the World –Ecosystem Services in a Time of Global and Climate Change: Seizing Opportunities – Meeting Challenges. Framework paper prepared for the Mountain Initiative of the Government of Nepal by ICIMOD and the Government of Nepal, Ministry of Environment, 2010 <https://lib.icimod.org/search?page=1&size=20&q=climate%20change>
- ICIMOD, The Changing Himalayas: Impact of Climate Change on Water Resources and Livelihoods in the Greater Himalayas. ICIMOD, Kathmandu, Nepal, 2009
- IPCC, Climate change 2007: The scientific basis. Working Group I contribution to the Intergovernmental Panel on Climate Change Fourth Assessment Report. Cambridge: Cambridge University Press, 2007 [www.ipcc.ch > pdf > assessment-report > ar4\\_wgI\\_spm\\_en](http://www.ipcc.ch/pdf/assessment-report/ar4/wgI/wgI_spm_en)
- IPCC, Climate Change: Impacts, adaptation and vulnerability. Working Group II contribution to the Intergovernmental Panel on Climate Change Fourth Assessment Report. Cambridge: Cambridge University Press, 2007 [www.ipcc.ch > pdf > assessment-report > ar4\\_wgII\\_spm\\_en](http://www.ipcc.ch/pdf/assessment-report/ar4/wgII/wgII_spm_en)
- Messerli, B. and Ives, J. D. (eds), Mountains of the world – A global priority. A contribution to Chapter 13 of Agenda 21. New York: Parthenon, 2007

