



Department of Environmental Sciences
School of Earth and Environmental Sciences
हिमाचल प्रदेश केंद्रीय विश्वविद्यालय
Central University of Himachal Pradesh
(Established under Central Universities Act 2009)
Shahpur, Distt. Kangra, Himachal Pradesh- 176206



Course Name: Basics of Climate Change

Course Code: ENV 443

Level: 4

Credits: 2

Credits Equivalent: 2 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual/ group work; obligatory/ optional work placement; literature survey/ library work; data collection/ field work; writing of papers/ projects/dissertation/thesis; seminars, etc.)

Course Outcomes:

On completion of the course, the students will be able:

1. To know about the structure and various components constituting the Earth's Climate System.
2. To distinguish between climate variability and climate change.
3. To understand Natural and Human Drivers of Climate Change.
4. To understand the roles of atmospheric aerosols and gases in the present process of Climate Change.
5. To know about the observations of climate change in the various spheres of the Earth's Environment.

Learning Outcomes: The deliverables Learning Outcomes of this paper with students are following:

- ✓ Student will be able to understand the Earth's Climate System.
- ✓ Will distinguish between natural climate variability and anthropogenic climate change.
- ✓ Familiarize the concept of Green House Effect, Radiative Forcing and Climate Sensitivity.
- ✓ Will be able to map the concept, meaning and theories of carbon sequestration and carbon capture.
- ✓ Explore the different phases of climate variability in the past and observation of present era of Global Climate Change.

Attendance Requirements:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.



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Evaluation Criteria:

1. Mid Term Examination:20%
2. End Term Examination:60%
3. Continuous Internal Assessment: 20%. i.e. 20 marks out of 100

Unit I: The Climate System: an overview

[5 Hrs]

- Weather Vs Climate
- Components of the Climate System
- The Driving Forces of Climate
- Climate Parameters and Data-sets available to study Climate Change,
- Observed Natural Vs Anthropogenic Climate Change

Unit II: Natural and Human Drivers of Climate Change

[5 Hrs]

- The Sun and the Earth Geometry,
- Milankovitch Cycles, Solar Constant,
- The Effect Temperature of the Earth,
- Green House Effect,
- The concept of Radiative Forcing and Climate Sensitivity

Unit III: Radiative effects of Aerosol and Gases

[5 Hrs]

- Greenhouse gases
- Halocarbon radiative forcing
- Radiative forcing due to stratospheric ozone changes
- Tropospheric Aerosols: Direct forcing due to Sulphate aerosols and Soot aerosols,
- Indirect forcing due to effect of aerosols on cloud properties,

Unit IV: Observations of Changes in Climate

[5 Hrs]

- Atmospheric Changes: Instrumental Record,
- Changes in the Ocean: Instrumental Record,
- Changes in the Cryosphere: Instrumental Record,
- A Palaeoclimatic Perspective,



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- Extreme Weather Events

Essential Readings

- Intergovernmental Panel on Climate Change (1995), Climate Change 1995: The Science of Climate Change, Edited by J.T. Houghton, L.G. MeiraFilho, B.A. Callander, N. Harris, A. Kattenberg and K. Maskell, Cambridge University Press, ISBN: 0 521 56436 0
- Intergovernmental Panel On Climate Change (2007), Specifications of Climate Change 2007 - The Physical Science Basis, Cambridge University Press, ISBN: 9780521705967
- John H. Seinfeld, Spyros N. Pandis: Atmospheric Chemistry and Physics, John Wiley & Sons, Inc., ISBN: 978-0-471-72018-8