Course syllabus

Department of Civil Engineering, Indian Institute of Technology Madras

CE4011 - Introduction to Atmospheric and Climate Sciences

Credit Distribution: C:9 L:3 T:0 P:0 E:0 O:6 TH:

Course Type: Theory

Description: To introduce the fundamental concepts about atmospheric chemistry and physics and challenges associated with climate change and its potential impact on biosphere and society.

Course Content: Earth system. Components of Earth System, Hydrological cycle, Carbon Cycle, Brief history of climate and Earth System; Atmospheric Thermodynamics. Atmospheric layers, Gas laws, hydrostatic equation, laws of thermodynamics, radiative transfer; Atmospheric Chemistry. Composition of tropospheric air, important tropospheric gases and their chemistry, tropospheric and stratospheric ozone; Atmospheric aerosols. properties of atmospheric aerosols and their role in climate and human health; Atmospheric dynamics. Weather, meteorology of local and global scale, Indian monsoon and cloud physics; Earth, climate,Polar climates, temperate latitude climates, Tropical Climate, (cyclone, hurricane, and typhoons); Climate change, Fundamentals of climate change, Changing atmosphere, Human evolution and climate change; Natural and manmade greenhouse effect; Bare rock model of Earth's atmosphere; Climate change impacts Hydrological cycle, meteorological changes, implication on atmospheric chemistry and physics; Introduction to climate and Earth system models - Kyoto and Montreal protocols: Need and assessment of these protocols.

Text Books:

- Atmospheric Science, an introductory survey, Wallace and Hobs, 2nd Edition, Academic Press (an imprint of Elsevier), 2006.
- Global warming, Blackwell Publication , David Archer, 2007.

Reference Books

- Atmospheric Chemistry and Physics: From air pollution to climate change, 2nd Edition, J. Wiley publication: Seinfeld and Pandis, 2008 2.
- Atmospheric Thermodynamics: Elementary physics and chemistry. North and Erukhimova, Cambridge: 2008 3.
- Chemistry of the climate system, 2nd Edition, DG Gruyter publication: 2006 4.
- Thermodynamics, kinetics, and microphysics of clouds. Cambridge: 2008 5.
- First principles of meteorology and air pollution, Springer publication: 2009

Prerequisite: NIL

Prepared in January 2021