Course Code	Course Title	L	T	P	C
BCLE214L	Global Warming	3	0	0	3
Pre-requisite	NIL	Syllabus version 1.0			

Course Objectives

The objectives of this course is to :

1. Learn atmospheric dynamics and transport of heat.
2. Evaluate climate changes using models and predict global warming.
3. Acquire the concept of mitigation measures for global warming.

Course Outcomes

Upon completion of this course, the student will be able to :

1. Understand the principles of atmospheric dynamics and demonstrate the intimidations of global warming at global and regional level.
2. Understand the need for mitigation and vulnerability assessment of regional and global warming.
3. Critically evaluate the scientific insights of the IPCC, global policies on global warming and mitigation.
4. Develop climatic models to predict global warming.
5. Relate knowledge of science and engineering for mitigation of global warming.

Module:1	Introduction	5 hours

Introduction to global warming–Significance of ozone in environment–Depletion of ozone layer-Greenhouse gases-Vienna convention and Montreal protocol-Role of hydrological cycle with greenhouse gases-Carbon cycle.

Module:2	Characteristics of atmosphere and its effects	8 hours

Physical and chemical characteristics of atmosphere-Biogeochemistry-Atmospheric stability-Temperature profile of the atmosphere–Temperature inversion effects–Isobaric heating and cooling–Adiabatic lapse rates-Radiation, convection and advections-Sun & solar radiation–Energy balance–Terrestrial radiation and the atmosphere.

Module:3	Elements of global warming	7 hours

Total carbon dioxide emissions by energy sector–industrial, commercial, transportation, residential–Impacts–air quality, hydrology, green space–Causes of global and regional climate change–Changes in patterns of temperature, precipitation and sea level rise–Greenhouse effect.

Module:4	Impacts of global warming	7 hours

Roots of global warming-Temperature alteration in the atmosphere-Melting of ice Pole-sea level rise-Impacts on Ecosystem–Water Resources-Methods and Scenarios–Uncertainties in the impacts of global warming–Risk of irreversible changes –Vulnerability assessment.

Module:5	Forecasting global warming with climate change models	6 hours

Developing climate models–Climate system model–Climate simulation and drift–Evaluation of climate model simulation–Regional (RCM)–Global (GCM)–Global average response to warming–Climate change observed to date.

Module:6	Global Policies and regulations towards global warming	5 hours

National and national legislative frameworks–UNFCCC–IPCC–Kyoto protocol–Kyoto mechanisms, clean development mechanisms, IPCC details and actions–Carbon credits-International and Regional cooperation.

Module:7	Mitigation measures of global warming	5 hours

Carbon sequestration and Carbon capture and storage (CCS)-Clean development mechanism (CDM)–Carbon trading-Future clean technology–Renewable and alternative energy, Green building, eco-friendly plastic.		
Module:8	**Contemporary issues**	**2 hours**
Total Lecture Hours		**45 hours**

Text Book(s)

1. Robin Moilveen, Fundamentals of weather and climate, 2010, Second Edition, Oxford University Press, UK.
2. Neelin David J, Climate Change and Climate Modelling, 2011, First Edition, Cambridge University Press, UK.

Reference Books

1. Thomas Stocker, Introduction to Climate Modelling, Advances in Geophysical and Environmental Mechanics and Mathematics. 2011, Springer, UK.
2. Robert T. Watson, Marufu C. Zinyowera, Impacts, Richard H. Moss, Adaptation and mitigation of climate change-Scientific Technical Analyses, 1996, Cambridge University Press, Cambridge, USA.
3. J.M. Wallace, P.V. Hobbs, Atmospheric Science, 2006, Second Edition, Elsevier / Academic Press, USA.

Mode of Evaluation: CAT, Assignment, Quiz, FAT.

Recommended by Board of Studies	24.02.2022		
Approved by Academic Council	No. 66	**Date**	16-06-2022