Climate change and its implications to biodiversity and environment

General introductory course

L-T-P-C: 2-0-0-2

1. **Course Objectives:**

   The following are the course objectives:

   a. Climate change and its impact on biodiversity and the environment is an introductory course on climate, climate change and its possible impact on biodiversity and the environment.
   b. Students will learn about the basic concept of climate, possible natural and anthropogenic influences on climate change, and global climate models (GCMs), interpretation of GCM outputs.
   c. Students will also get a general awareness of the impact of changing climate on our biodiversity, environment, and projected trends.
   d. At the end of the course, the students will learn the possible adaptation measures for climate change.

2. **Syllabus:**

   Unit – 1 [5 Hours]: Introduction to climate and climate change: weather and climate, important meteorological variables, global warming, possible reasons for global warming, greenhouse gases and human contributions, black carbon and global warming, sources of GHGs and black carbon

   Unit – 2 [5 Hours]: Evidence of climate change: climate since industrial revolution, climate modelling, models and future projections, representative concentration pathways, their importance.
   Hands-on training: Interpretation of global climate model output, QGIS

   Unit – 3 [3 Hours]: Projected future trends and impact: Impact of climate change: global & Indian scenario, surface temperature, precipitation, ocean pH, sea-level, Arctic sea-ice extent.
   ***Tutorials*:** Trend analysis of climate data and its interpretation

   Unit – 4 [5 Hours]: Climate change and biodiversity: biodiversity, importance of biodiversity, pressure on biodiversity from human activities, possible impact, vulnerable species and ecosystems, adaptation, and mitigation.

   Unit – 5 [3 Hours]: Climate change and agriculture: Indian agriculture, impact of climate change on agriculture and models, agricultural policies in context of climate change, initiatives of Government of India for climate change adaptation.

   Unit – 6 [3 Hours]: Climate change and water resources: global and national water budget; outline of impact of climate change on water, climate change-drought & flood, mitigation and adaptation measures.

3. **Course Outcomes:**

   i. Students will understand climate and climate change, anthropogenic influences on global warming, and climate change.

ii. Students will be familiar with global and regional climate models, representative concentration pathways, and their importance.
iii. Students can analyse the climate model projections using QGIS, future trends in climatic variables.
iv. Students can understand biodiversity, its importance, the possible impact of climate change on biodiversity, and adaptation measures.
v. Students can understand the impact of climate change on Indian agriculture and government policies to mitigate the changing climate.
vi. Students will get a general awareness about the water resources of India, the impact of climate change on water, and mitigation measures.

4. **Text Books**: (1-2 text books)
   a) Lawrence M Krauss, The physics of climate change, 2021, Published by Post Hill Press.
   b) Cynthia E. Rosenzweig, Daniel Hillel, Handbook of climate change and agroecosystems: Impacts, adaptation, and mitigation, 2010, ISBN-13 -978-1783265633
5. **Reference Books:** (2-4 text books)
   a) IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp
   b) IPCC: Climate change and biodiversity. Technical Paper V, 2002. ISBN:92-9169-104-7
   c) Jan C. Van Dam. Impacts of Climate Change and Climate Variability on Hydrological Regimes, 2003, Cambridge University Press.
   d) IPCC Report Technical Paper VI, 2008, Climate change and water.
   e) ICAR-Policy paper. Climate Change and Indian Agriculture: Impacts, Coping Strategies, Programs and Policy, 2019.