

**ACADEMIC AFFAIRS OFFICE  
INDIAN INSTITUTE OF TECHNOLOGY ROORKEE**

No. Acd./ 4211 /IAPC-86

Dated: August 05, 2020

**Head, Department of Civil Engineering**

The IAPC in its 86<sup>th</sup> meeting held on 09.06.2020 vide **Item No. 86.2.12** considered the proposal to introduce a new PEC **CEN-638: Climate Change and Its Impact on Water Resources** from session 2020-21 onwards.

The IAPC accepted the proposal with minor modifications. Duly modified syllabus is attached as **Appendix-A**.



**Assistant Registrar (Curriculum)**

**Encl:** as above

**Copy to (through e mail):-**

1. All faculty
2. All Heads of Departments/ Centres
3. Dean, Academic Affairs
4. Associate Dean of Academic Affairs (Curriculum)
5. Channel I/ Academic webpage of iitr.ac.in

## INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

**NAME OF DEPARTMENT:** Civil Engineering

**1. Subject Code:** CEN-638      **Course Title:** Climate Change and its Impact on Water Resources

**2. Contact Hours:**      **L:** 3                      **T:** 1                      **P:** 0

**3. Examination Duration (Hrs.):**      **Theory:** 3              **Practical:** 0

**4. Relative Weightage:** **CWS:** 20-35      **PRS:** 0      **MTE:** 20-30      **ETE:** 40-50      **PRE:** 0

**5. Credits:** 4                      **6. Semester:** Spring                      **7. Subject Area:** PEC

**8. Pre-requisite:** Basic understanding of hydrology

**9. Objective:** To provide background about climate change, how to determine its impact on water resources, adaptation and mitigation. Various initiatives to combat the impacts of climate change will also be covered.

### 10. Details of the Course

S. No.	Contents	Contact Hours
1.	Introduction: Climate Variability, Sustainable Development Goals (SDGs), Definition of Terms	4
2.	Causes of Climate Change: Greenhouse Effect, Evidence of Climate Change, Trend analysis of hydro-meteorological data, Paleoclimate–learning from the past	5
3.	Simulation of Behaviour of the Climate System: Physics and Earth's Climate, Global Carbon Cycle, Global Climate Models and Climate Feedbacks, Coupled Model Systems, Climate Archives and Climate Data	6
4.	Methodology to Study Climate Change Impacts on Water Resources: GHG Emission Scenarios and their Purpose, Representative Concentration Pathways	4
5.	Downscaling Climate Data: Dynamical Downscaling, Statistical Downscaling, Transfer Function-Based Methods, Weather Generators, Weather Typing	5
6.	Impacts of Climate Change on Water Resources: Hydrologic Modeling to Determine Impacts, Impacts on Hydrologic Extremes, Impact of Climate Change on Environment, Societal Impacts of Climate Change, Uncertainties in Climate Predictions	8
7.	Climate Change: Adaptation and Mitigation, Adaptation and Mitigation Strategies, Economics of Climate Change, Adaptation Needs in Water Sector, Land-Use Change and Management, Afforestation and Reforestation, Climate Change Denial	8
8.	Global and National Initiatives to Combat the Impacts of Climate Change	2
<b>Total</b>		<b>42</b>

## 11. Suggested Books

S. No.	Name of Books/Author/Publisher	Year of Publication/ Reprint
1.	Dessler, A.E., Introduction to Modern Climate Change, Cambridge University Press	2012
2.	Farmer, G. Thomas and John Cook. Climate Change Science: A Modern Synthesis. Springer	2013
3.	IPCC, SRES, N. Nakićenović, R. Swart (Eds.). <i>Special Report on Emissions Scenarios: A Special Report of Working Group III of the Intergovernmental Panel on Climate Change</i> . Cambridge: Cambridge University Press.	2000
4.	Jain, Sharad K., and V P Singh, Engineering Hydrology: An Introduction to Processes, Analysis, and Modeling, McGraw Hill Education.	2019
5.	Nagesh Kumar, D. and K. SrinivasaRaju. Impact of Climate Change on Water Resources: With Modeling Techniques and Case Studies. Springer	2017
6.	vanVuuren, D. P., J. Edmonds, M. Kainuma, K. Riahi, A. Thomson, K. Hibbard, G. C. Hurtt, et al. The representative concentration pathways: An overview. <i>Climatic Change</i> . 109:5, 2011. doi:10.1007/s10584-011-0148-z.	2011