GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering
Level: PG
Branch: Water Resources Engineering
Subject Code : ME03033031
Subject Name : Climate Change

w. e. f. Academic Year:	2024-25
Semester:	3
Category of the Course:	MOPEC

Prerequisite:	Knowledge of basic atmospheric science, hydrology and GIS.
Rationale:	The students will understand the climate system, natural greenhouse effect and the effect of trace gasses and aerosols, feedbacks in the climate system, climate change in the past, ice ages, proxy records, abrupt climate change, Instrumental record of climate, climate variability on various timescales, simple models of climate, General Circulation Models, natural and anthropogenic climate change: detection and attribution, impacts and mitigation of climate change.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Understand the basic science behind climate change	R,U
02	Analyze different interferences of climate change	U,A,N
03	Develop methods to assess the impact of climate change	U,N,E
04	Assess the impacts of climate change on different areas	R,U,N,E,C

**Revised Bloom's Taxonomy (RBT)*

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	0	3	70	30	0	0	100

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Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Atmosphere and Climate Atmospheric structure and composition, Solar radiation and global energy budget, External and internal forcing, Climate Feedbacks	9	20
2.	Global Climate -Past, Present and Future Account of past climate, Environmental indicators and instrumental records, Human Footprints on global warming, Predicting future climates, Temperature regime, Extreme climate events	12	27
3.	Climate Change Impacts Impact of climate change on agriculture, Impact of climate change on Livestock, Impact of climate change on biodiversity, Impact of climate change on water resources, Impact of climate change on livelihood, Impact of climate change on human health, Climate change vulnerability assessment, Life Cycle Assessment, Geoinformatics in Climate Change Studies, Concept of mitigation and adaptation, Climate smart agriculture, Soil carbon sequestration, Biofuels, Climate Refugees, Climate Justice, Climate Change and Gender	14	31
4.	Climate Change Impact Assessment Trend analysis, Application of GIS and Remote Sensing, Modelling, GCMs, CMIP data handling, IPCC AR, Case-studies.	10	22
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	**20**	**20**	**20**	**20**	**10**

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Climate Change and India – Vulnerability Assessment and Adaptation; Edited by P. R. Shukla, Subodh K. Sharma, N. H. Ravindranath, Amit Garg, Sumana Bhattacharya , Universities Press , 2003

2. Climate Change and Chemicals Environmental and Biological, aspects; Golam Kibria, A. K. Yousef Haroon, Dayunthi Nugegoda and Gavin Rose, Published by New India Publishing Agency, 2010
3. Global Warming – The Complete Briefing, third edition; John Honghton, Cambridge University Press, 2004,
4. Climate Change- Causes Effects and Solutions; John T. Hardy, Wiley
5. Paleoclimatology, Third Edition, Reconstructing Climate of the Quaternary; Raymond S. Bradley, Elsevier Inc.
6. IPCC (1995) Climate Change 1995: The Science of Climate Change, CambridgeUniv Press, Cambridge, UK.
7. Climate Change synthesis report (2007)
8. IPCC Climate Change 2014: Impacts, Adaptation and Vulnerability, IPCC
9. Climate Change 2013: The Physical Science Basis, IPCC
10. Andrew, Skeil, "Environmental Modeling with GIS and Remote Sensing", John Willey.
11. W Easterling, Aggarwal P, Batima P, Brander K, Erda L, Howden M, Kirilenko A, Morton J, Soussana J-F, Schmidhuber J, Tubiello F(2007) in Climate Change 2007: Impacts, Adaptation and Vulnerability, e18 ds Parry ML, Canziani OF, Palutikof JP, van der Linden PJ, Hanson CE, Cambridge Univ Press.
12. Muchow, R.C. & Bellamy, J.A.1991. Climatic risk in crop production: models and management for the semi-arid tropics and subtropics.

(b) Open source software and website:

1. https://onlinecourses.swayam2.ac.in/nou24_ge63/preview

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