GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Civil (Water Resource Engineering)

Subject Code: ME02033031

Subject Name: Climate Change Impact On Water Resources

w. e. f. Academic Year:	2024-25
Semester:	2
Category of the Course:	Professional Elective Course

Prerequisite:	Basic understanding of hydrology, Introduction to climate change.
Rationale:	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.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Understand the physics and causes behind the climate change	U
02	Simulate climatic models and downscaling	N
03	Apply the models for prediction of climate change uncertainties	A
04	Prepare a compilation on global and national initiatives to fight the climate change impacts	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	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	Introduction: Climate Variability, Sustainable Development Goals (SDGs), Definition of Terms	4	9
2.	Causes of Climate Change: Greenhouse Effect, Evidence of Climate Change, Trend analysis of hydro-meteorological data, Paleoclimate–learning from the past	5	11
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	13
4.	Methodology to Study Climate Change Impacts on Water Resources: GHG Emission Scenarios and their Purpose, Representative Concentration Pathways	5	11
5.	Downscaling Climate Data: Dynamical Downscaling, Statistical Downscaling, Transfer Function-Based Methods, Weather Generators, Weather Typing	5	11
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	18
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	18
8.	Global and National Initiatives to Combat the Impacts of Climate Change	4	9
	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	10	20	20	20	20

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. Dessler, A.E., Introduction to Modern Climate Change, Cambridge University Press
2. Farmer, G. Thomas and John Cook. Climate Change Science: A Modern Synthesis. Springer
3. IPCC, SRES, N. Nakićenović, R. Swart (Eds.). Special Report on Emissions Scenarios: A Special Report of Working Group III of the Intergovernmental Panel on Climate Change. Cambridge: Cambridge University Press.
4. Jain, Sharad K., and V P Singh, Engineering Hydrology: An Introduction to Processes, Analysis, and Modeling, McGraw Hill Education.
5. Nagesh Kumar, D. and K. SrinivasaRaju. Impact of Climate Change on Water Resources: With Modeling Techniques and Case Studies. Springer
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. Climatic Change. 109:5, 2011. doi:10.1007/s10584-011-0148-z.

(b) Open source software and website:

1. NPTEL

Suggested Activities for Students: Site visit

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