GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Civil (Water Resource Engineering)

Subject Code: ME02033091

Subject Name: Water Resource System Planning

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

Prerequisite:	Engineering Hydrology, Water Resources Engineering
Rationale:	The subject provides a comprehensive understanding of water resources planning, combining technical, economic, and social aspects. It focuses on practical applications, economic analysis, environmental and social considerations, and decision-making tools. The goal is to equip students with the skills to address water scarcity, quality degradation, and climate change challenges.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Comprehend the basic concepts, principles, and processes involved in water resources planning.	R
02	Assess water availability, demand patterns, and data requirements for project formulation.	A
03	Evaluate the technical, economic, financial, environmental, and social feasibility of water resources projects.	E
04	Conduct economic and financial analyses, including benefit-cost analysis, risk assessment, and financial planning.	N
05	Assess the environmental and social impacts of water resources projects and develop mitigation measures.	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 to Water Resource Planning:** Concept, Importance and Objectives of Water Resources Planning, Water Resources Planning Process, Role of Stakeholders, Challenges and Constraints, Water Resources Assessment, Water Demand Patterns (Domestic, Agricultural, Industrial, Environmental), Data Requirements for Project Formulation Project Formulation and Feasibility Analysis: Fixing Objectives, Identification of Alternatives, Technical Feasibility Analysis, Economic Feasibility Analysis, Financial Feasibility Analysis, Environmental and Social Feasibility Analysis Modern System Theories and Artificial Intelligence Methods	**15**	**35%**
2.	**Planning of River Valley Development and Multipurpose Projects:** Concept of River Valley Development, Components of River Valley Projects, Planning and Design Considerations, Case Studies of Major River Valley Projects and River Interlinking Projects, Environmental and Social Impact Assessment of River Valley Projects Concept of Multipurpose Projects, Planning and Design Considerations, Optimization Techniques, Reservoir Operation Rules, Simulation Techniques	**12**	**25%**
3.	**Economic Analysis of Water Resources Projects:** Economic Evaluation Techniques, Benefit-Cost Analysis, Risk and Uncertainty Analysis, Financial Analysis, Financing Options, Debt Service Analysis, Revenue Requirements, Case Discount Flow Methods, Dynamics of Project Analysis, Economic Planning by Project Purpose, Methods of Allocation, Cost to Various Purposes of Project, Reservoir Capacity, Reservoir Working Tables, Reservoir Operation for Optimum Benefits	**12**	**25%**
4.	**Water Law and Policy:** Water Laws and Regulations, Interstate and International Water Disputes, Water Rights and Allocation, Water Pricing and Tariff Structures	**02**	**5%**

5.	**Environmental and Social Impact Assessment:** Environmental Impact Assessment Process, Social Impact Assessment, Mitigation Measures, Public Participation and Stakeholder Engagement	**04**	**10%**
	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**	**30**	**15**	**15**	**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. Water Resources Systems Planning and Management by Loucks, D.P. et. al.
2. Water Resources Systems Analysis by H.A. Thomas Jr.
3. Water Resources Planning by Asit K. Biswas
4. Economics of water resources planning – L. Douglas James
5. Principles of Water Resources Planning – S. Goodman
6. Management of water projects - OECD
7. Water Resources Planning and Management – Helweg O. G
8. Water resources planning - Mahapatra

(b) Open source software and website:

1. HEC-HMS (Hydrologic Modeling System)
2. QGIS
3. Google Earth Engine

Suggested Course Practical/Assignment List:

1. Hydrological Data Analysis
2. Water Demand Assessment
3. Water Quality Assessment
4. Reservoir Operation Simulation
5. Economic Analysis of Water Resources Projects
6. Soft Computing Tools Applications
7. Public Participation and Stakeholder Engagement

8. Water Law and Policy Analysis

List of Laboratory/Learning Resources Required:

Suggested Project List:

1. Sustainable Water Management in Urban Areas: A Case Study of [City Name]
2. Impact of Climate Change on Water Resources in [Region Name]
3. Economic Evaluation of Water Conservation Technologies in Agriculture
4. Optimization of Reservoir Operation for Multiple Objectives
5. Public Participation in Water Resources Planning: A Case Study

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