



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Civil (Water Resource Engineering)

Subject Code: ME02033051

Subject Name: Flood Management

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

Prerequisite:	Engineering Mathematics, Hydrology and Environmental Science, Statistics and Probability Concepts, and Sustainability Concepts
Rationale:	Flood cause loss of life and property. Thousands of crores of rupees are spent every year in flood control and management. This course focuses on integrating modern technologies, sustainable practices, and policy-oriented education. It prepares students for real-world challenges, including climate change impacts and flood risk mitigation, while equipping them with practical skills in modeling, mapping, and decision-making tools. The inclusion of case studies and hands-on software applications bridges the gap between theory and practice, making the course relevant for industry and academia.

Course Outcome:

After Completion of the Course, Student will be able to:

No	Course Outcomes	RBT Level
01	Understand the causes, types, and impacts of floods on human and environmental systems.	R, U
02	Analyze hydrological data and apply flood prediction and forecasting techniques.	A, N
03	Design structural and non-structural flood mitigation measures.	A, C
04	Utilize modern tools, models, and software for flood risk mapping and management.	A, N
05	Evaluate flood management policies, including economic, environmental, and social considerations.	E, N
06	Develop integrated flood management plans with an emphasis on resilience and sustainability.	A, C

**Revised Bloom's Taxonomy (RBT)*



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Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR		C	Theory		Tutorial / Practical	
			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.	Fundamentals of Flood Management: Introduction to Flood Management: Types and causes of floods, global and Indian perspectives. Hydrological and Meteorological Factors: Rainfall, river flow, drainage patterns, and catchment characteristics.	9	20%
2.	Flood Risk Assessment and Forecasting: Flood Risk Assessment: Probable Maximum Flood (PMF), flood frequency analysis, and risk quantification. Flood Forecasting and Warning Systems: Methods, tools, and early warning systems using remote sensing and GIS.	12	26%
3.	Flood Mitigation Measures: Structural Flood Mitigation Measures: Dams, levees, reservoirs, embankments, and flood diversion channels. Non-Structural Flood Mitigation Measures: Flood zoning, insurance, relocation, community awareness, and policies.	10	20%
4.	Advanced Flood Management Techniques: Flood Modelling and Mapping: Use of models like HEC-RAS, SWAT, MIKE-11 and GIS for inundation mapping. Climate Change and Flood Management: Impacts of climate variability on flood risk and management.	9	20%



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5.	Integrated Flood Management and Case Studies: Integrated Flood Management (IFM): Multi-stakeholder approaches, sustainability, and resilience planning. Case Studies: Analysis of Indian and global flood events (e.g., Kerala floods, Surat flood, etc.).	5	10%
Total		45	100

Practical Sessions:

1. Hydrological Data Analysis
2. Flood Mapping and Simulation
3. Policy, Planning, and Fieldwork
4. Capstone Project – A comprehensive Case Study of your choice

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	15	15	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. Flood Risk Management – Edmund Penning-Rowsell and Matilda Becker
2. Flood Warning, Forecasting, and Emergency Response – Kevin Sene
3. Water Resources Systems Planning and Management – Sharad K. Jain, V.P. Singh, and L. Vijay Kumar
4. Introduction to Hydrology – Warren Viessman and Gary L. Lewis
5. Floodplain Modeling Using HEC-RAS – Gary W. Brunner
6. Applied Hydrology – Ven Te Chow, David Maidment, and Larry Mays
7. Handbook of Applied Hydrology – Vijay P. Singh
8. GIS and Remote Sensing in Flood Management – P.K. Singh and V.R. Sinha



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(b) Open source software and website:

1. NPTEL - Flood Management and Hydrology
 - <https://nptel.ac.in/>
2. Coursera - Remote Sensing for Disaster Management (University of Twente)
 - <https://www.coursera.org/>
3. OpenCourseWare - Hydrology and Water Management (MIT)
 - <https://ocw.mit.edu/>
4. Flood Modelling Tools (HEC-RAS, SWAT)
 - <https://www.hec.usace.army.mil/software/hec-ras/>
 - <https://swat.tamu.edu/>
5. International Flood Network
 - <http://www.internationalfloodnetwork.org/>
6. World Meteorological Organization - Flood Management Guidelines
 - <https://public.wmo.int/>

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