Course Syllabus
Gyanmanjari Institute of Technology
Semester-4 (Diploma)

Subject: Water Resources Engineering-DETCV14210

Type of course: Major core

Prerequisite: NA

Rationale: Hydraulics

The quantitative study of the hydrologic cycle, known as water resources engineering, focuses on the distribution and circulation of water among the earth's atmosphere, land, and oceans. Civil engineers play a critical role in the optimal planning, design, and operation of water resource systems. Due to industrial development, population growth, and changing lifestyles, the demand for water is increasing rapidly. Engineers face the challenge of managing water from uneven rainfall patterns across seasons, requiring river-connected structures for storage to divert excess water to deficient regions. Groundwater is also a significant water source that relies heavily on past rainfall, with the groundwater table declining due to overuse and annual rainfall deficiency

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks		Practical Marks		CA	
CI	T	P	C	ESE	MSE	V	P	ALA	
3	0	2	4	60	30	10	20	30	150

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Content:

Sr. No	Course Content	Hrs.	% Weightage
1	**Introduction of water resources engineering** Introduction to W.R.E., Objectives of Water Resource development, State wise water resources of India, Utilization of Water resources, India's climate and water supply conditions, Introduction to Hydrology, Hydrological Cycle, Applications in Engineering. Types of Precipitations, Measurement rain gauges, Estimation of missing data Mean precipitation over an area, Data analysis. Run off cycle, Factors affecting of runoff, Runoff estimation, Rainfallrunoff correlation, DrainageBasinCharacteristics Imperial methods for Estimation of evaporation, Methods to reduce Evaporation, Evapotranspiration: Methods for Estimation of Evapotranspiration	08	25
2	**Hydrograph & its Application** Definition and purpose of a hydrograph. Types of hydrographs: direct runoff hydrographs, unit hydrographs. Components of a hydrograph: peak flow, time to peak, falling limb, base flow. The rainfall-runoff process. Hydrograph formation from rainfall data. Mathematical models for hydrograph generation (e.g., S-curve, TR-55, NRCS method). Hydrograph routing techniques: Muskingum method, dynamic programming. Flood forecasting techniques using hydrographs. Analyzing historical flood data to predict future events. Use of hydrographs in floodplain mapping and flood risk assessment.	10	20
3	**Floods Frequency analysis** Flood, flood forecasting, Flood control in IndiaWatershed Management: Concept of "watershed". Classification of water sheds, Characteristics of watershed, size, shape, Soil & Water conservation, Necessity of Soil erosion, Causes, Effects, Remedial measures against erosion, Watershed management & people's participation., Role of cooperative society in watershed management, Water harvesting, Runoff collection, Onsite detention basin, Seepage control, Method evaporation control Water harvesting: Necessity of rain water harvesting, Importance of Rain water harvesting, Roof-top rain water harvesting method and its design	8	10
4	**Ground water Hydrology** Ground water Hydrology: Sources of ground water, Importance of ground water and Comparison of ground water source with other sources of water on dependability Terms related to groundwater engineering, Darcy's law, Well Hydraulics, well concept, location and importance, Necessity of recharging, Types of artificial	9	20

	recharge, Sea Water Intrusion phenomenon, Relationship between Salt water/Fresh water interface, Disadvantages and Remedial Measures to counteract salt water intrusion.		
5	**Water Resources Planning And software used in water Resources Engineering** Principles and objectives of Water resources planning, Steps in water resources planning., Requirement of Water Resources schemes, Levels in planning, Computer Application in the designs of water resources., Fundamentals of Geographical Information system and Geospatial data, List out uses of GIS in water resource Engineering and give its brief., Use in the Management of Geospatial data, Flood and Drought Risk Assessment.	10	25

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Model Making** Faculty will assign to a group of students a model/prototype of rain water harvesting structure. And student group will make the model and upload it on GMIU Web Portal.	10
2	**Case Study Analysis of Water Resource Projects** According to faculty guidance, the students will create at least one real-world case study of successful and failed water resource projects, such as flood management, dam construction, or irrigation systems, and submit a brief report of it on GMIU Web portal.	10
3	**Presentation based on Local Water Issues** Faculty will assign students a group project to address a local water issue, such as scarcity or groundwater depletion. They will research, analyze, and propose practical engineering solutions, fostering skills in research and problem-solving. Students will prepare a presentation on it and upload it on GMIU Web Portal.	10
	Total	30

Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks **(Revised Bloom's Taxonomy)**						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage %	30%	30%	20%	20%	-	-

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course, the students should be able to:	
CO1	Understand the basic principles of hydrology and hydraulics relevant to water resources.
CO2	Analyze hydrographs for flood prediction and water management
CO3	Identify the basics of flood frequency analysis and its importance in water resources management.
CO4	Study the occurrence and movement of groundwater.
CO5	Develop the ability to integrate software solutions into water management strategies.

List of Practical

Sr No.	Description	Unit No.	Hrs.
1	Produce a Thiessen polygon for a given area utilizing rain gauge station points.	1	4
2	Calculate the average precipitation for the given region using the arithmetic mean as well as isohyetal method.	1	4
3	Measurement of rainfall Non recording Type Rain gauge	1	4
4	Calculate runoff for a given basin using an empirical formula	2	4
5	Determine the optimum number of rain gauges for the specific catchment area	2	2
6	Determine the reservoir's live and dead storage capacity using the information that is given.	2	4
7	Flood estimation using unit hydrographs.	3	4
8	Prepare a presentation outlining the technical details of any emerging approach in water resource engineering.	5	2
9	Mini project	-	2

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory.

The internal evaluation will be done on the basis of Active Learning Assignment.

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

[1] Engineering Hydrology K. Subramanya, Tata Mc Graw Hill Pub. Co. New Delhi.Fluid
[2] Hydrology and Water Resources Engineering, R.K. Sharma and T.K. Sharma, Dhanpat Rai Publications, New Delhi.
[3] Hydrology: Design, Principles and Analysis, H.M. Raghunath, New Age International Publishers.
[4] Applied Hydrology, Ven Te Chow, D.R.Maidment L.W Mays, McGraw Hill International Edition, New York
[5] Water Resources Engineering, R.K. Linsley, J.B. Franzini, D.L. Freyberg And G. Tchobanoglous, McGraw Hill Singapore