Gyanmanjari Innovative University

Course Syllabus
Gyanmanjari Institute of Technology
Semester-7 (B. Tech.)

Subject: Water Shed Management– BETCV17337

Type of Course: Professional Core

Prerequisite: Knowledge of Water Resources Engineering and Hydrology

Rationale: This subject focuses on the fundamental and applied aspects of hydrology, including stream gauging, flood routing, watershed management, stochastic hydrology, and rainfall–runoff modeling. It enables students to understand hydrological processes, analyze flow data, predict runoff, and apply appropriate models for effective water resources planning and watershed management.

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	
4	0	2	5	60	30	10	20	30	150

Legends: CI-Classroom 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	**Watershed Hydrology:** Hydrologic Processes; Occurrence and Variability of Rainfall in India, Surface and Subsurface Water Resources in India, Precipitation; Mass Curve, Hyetograph, DAD Curve, IDF Curve, Most Probable Flood, Standard Project Flood, Interception, Infiltration, Evaporation, Runoff, Measurement of Stream Flow, Stage–Discharge Rating Curve, Sediment Rating Curve, Hydrograph Analysis, Unit Hydrograph Theory, S-Curve, Synthetic Unit Hydrograph.	15	25
2	**Watershed Management:** Concept of Watershed, Watershed Management, Classification of Watersheds, Drain Basin Characteristics, Geomorphology of Watersheds – Linear, Aerial and Relief Aspects of Watersheds, Stream Order, Drainage Density and Stream Frequency, Exercise on Geomorphic Parameters of Watersheds. Watershed Management Policies and Decision Making, Sustainable Integrated Watershed Management, Interlinking of Rivers, Soil Erosion and Conservation, Watershed Management Practices in Arid and Semi-Arid Regions, Integrated Water Resources Management, Conjunctive Use of Water Resources, Rainwater Harvesting, Roof Catchment System, Community Participation, Private Sector Participation, Institutional Issues, Socio-Economic Aspects, Integrated Development, Water Legislation and Implementation, Case Studies.	20	25
3	**Flood and drought:** Flood Management, Flood Routing through Channels and Reservoirs, Flood Control and Reservoir Operation, Case Studies on Flood Damage, Stormwater Management, Design of Drainage System, Drought Management, Drought Assessment and Classification, Drought Analysis Techniques, Drought Mitigation Planning; Water Conservation and Recycling.	15	25
4	**Stochastic Hydrology:** Random Variables (RVs), Distribution of Random Variation, Probability, Probability Distributions, Properties of Random Variables, Parameter Estimation, Commonly Used Distributions in Hydrology, Hydrologic Data Generation, Introduction to Time Series – Stationarity, Correlation and Regression Analysis, Stochastic Process, Time Series Analysis, Frequency Analysis, Extreme Value Analysis.	05	15
5	**Watershed Modeling:** Standard Modeling Approaches and Classifications, System Concept for Watershed Modeling, Modeling of Rainfall–Runoff Process, Modeling of Subsurface Flows and Groundwater Flow, Model Calibration, Validation and Sensitivity Analysis, Applications of Geographical Information System (GIS) and	05	10

	Remote Sensing in Watershed Management, Role of Decision Support System (DSS) in Watershed Management.		

Continuous Assessment:

Sr. No.	Active Learning Activities	Marks
1	**Rainfall and Runoff Analysis** Individual student will collect 15 years rainfall data of their district and analyze variability of rainfall. They will prepare Mass Curve or Hyetograph and estimate runoff using basic method. Each student will submit a short analytical poster presentation with graphs and upload it on the GMIU web portal.	10
2	**Watershed Delineation and Geomorphic Parameters** Student in a group will select a small watershed using Google Earth and identify stream order, drainage density, and basin characteristics. Each student will prepare a brief report with map and calculated geomorphic parameters and upload it on the GMIU web portal.	10
3	**Flood & Drought Case Study** Individual student will study one recent flood & drought event in India and analyze its causes, impacts, and mitigation measures. Each student will prepare a summarized technical power point Presentation and upload it on the 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 %	20%	30%	10%	10%	20%	10%

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 watershed hydrology and hydrological processes.
CO2	Analyze hydrographs and perform watershed analysis and management.
CO3	Develop watershed models and apply GIS technology in watershed management.
CO4	Apply stochastic processes in hydrology.
CO5	Solve real-world problems using hydrological principles for effective watershed management.

List of Practical

Sr. No.	Descriptions	Unit No.	Hrs.
01	Study of rainfall data and preparation of Mass Curve, Hyetograph, and IDF Curve	01	02
02	Determination of infiltration rate and runoff estimation	01	02
03	Hydrograph analysis and development of Unit Hydrograph and S-Curve	01	04
04	Calculation of watershed geomorphic parameters.	02	04
05	Study and design of rainwater harvesting system.	02	04
06	Analysis of soil erosion and selection of suitable conservation practices	02	02
07	Flood routing through channel using given data	03	02
08	Drought analysis using historical rainfall data	03	02
09	Statistical analysis of hydrological data	04	04
10	Watershed modelling using Remote Sensing techniques	05	04
TOTAL			**30**

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 the laboratory.

Reference Books:

[1] Hydrology and Soil Conservation Engineering, Ghanshyam Das, Prentice Hall of India, New Delhi.

[2] Applied Hydrology, K. N. Mutreja, Tata McGraw-Hill Education, New Delhi.

[3] Engineering Hydrology, K. Subramanya, Tata McGraw-Hill Education, New Delhi.

[4] Engineering Hydrology, J. R. Rami Reddy, Laxmi Publications, New Delhi.

[5] Applied Hydrology, Ven Te Chow, David R. Maidment and Larry W. Mays, McGraw-Hill Education, New