GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Diploma in Agricultural Engineering		
Semester	II	Version	1.0.0.0
Effective from Academic Year	2025-26	Effective for the batch admitted in	JULY 2025
Course code	1AE2101	Course Name	Hydrology

I.TEACHING-LEARNING AND ASSESSMENT SCHEME

Course Type	Course Code	Learning Scheme						Assessment Scheme											
		Actual Contact Hrs./Week			SLH	NLH	Credits	Theory				Practical				Based on SL		Total Marks
		CL	TL	LL				FA-TH	SA-TH	TOTAL		FA-PR	SA-PR	TOTAL		SLA		
								MAX	MAX	MAX	MIN	MAX	MAX	MAX	MIN	MAX	MIN	
DSC	Hydrology	2	0	2	2	6	3	40	60	100	40	30	20	50	20	20	8	170

Abbreviation:	**CL-** Classroom Learning	**TL -** Tutorial Learning	**LL -** Laboratory Learning
	SLH - Self Learning Hours	**NLH -** Notional Learning Hours	**SLA -** Self Learning Assessment
	FA - Formative Assessment (Term work +Mid Sem Exam +Attendance)		**SA -** Summative Assessment

II. PRE-REQUISITES

Basic knowledge of Physics and Mathematics
Fundamentals of Fluid Mechanics and Soil Science.
Awareness of Water Resources and Environmental Science concepts.
Ability to analyze data and use simple statistical methods.
Familiarity with basic computer applications (Excel, graphing tools).

III. INDUSTRY / EMPLOYER EXPECTED OUTCOMES

They can apply hydrologic principles to design and manage water resources systems, analyze hydrological processes, and evaluate groundwater flow. They'll develop effective solutions for sustainable water management, preparing them for roles like water resources engineers, hydrologists, or environmental specialists.

IV. COURSE LEARNING OUTCOMES

At the end of the course, students will be able to achieve the following course learning outcomes:

- **CO1:** Understand and describe the components of the hydrological cycle.
- **CO2:** Analyze precipitation data and evaluate its impact on hydrological processes.
- **CO3:** Calculate evaporation and transpiration rates and their effects on water balance.
- **CO4:** Model surface runoff and understand its implications for flood management.
- **CO5:** Evaluate groundwater flow and its importance in water resources management.
- **CO6:** Apply hydrologic principles in the design and management of water resources systems.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:

Name of Unit	Theory Learning outcomes (TLO's) aligned to CO's	Learning Content mapped with Theory Learning outcomes (TLO's) & CO's	Marks	Hours
Unit 1: Definition and Scope of Hydrology	**TLO 1.1:** Explain the definition and scope of hydrology. **TLO 1.2:** Describe the importance of hydrology in water resources management. **TLO 1.3:** Identify the components of the hydrological cycle (precipitation, evaporation, transpiration, infiltration,	**1.1** Explain the definition and scope of hydrology. **1.2** Describe the importance of hydrology in water resources management. **1.3** Identify the components of the hydrological cycle: precipitation, evaporation, transpiration, infiltration, runoff, and groundwater flow. **1.4** Discuss global water distribution.	**10**	**5**

	runoff, groundwater flow). **TLO 1.4:** Discuss global water distribution.			
Unit 2: Precipitation	**TLO 2.1:** Explain types and forms of precipitation. **TLO 2.2:** Apply methods for measurement of precipitation. **TLO 2.3:** Analyze precipitation data and perform frequency analysis. **TLO 2.4:** Estimate design storms.	**2.1** Explain types and forms of precipitation. **2.2** Apply methods for measurement of precipitation. **2.3** Analyze precipitation data and perform frequency analysis of rainfall. **2.4** Estimate design storms	**10**	**5**
Unit 3: Evaporation and Transpiration	**TLO 3.1:** Define evaporation and transpiration and their importance. **TLO 3.2:** Explain factors affecting evaporation and transpiration. **TLO 3.3:** Describe measurement techniques and estimation methods. **TLO 3.4:** Discuss evapotranspiration and its role in water balance.	**3.1** Define evaporation and transpiration and their importance. **3.2** Explain factors affecting evaporation and transpiration. **3.3** Describe measurement techniques and estimation methods (empirical and analytical). **3.4** Discuss evapotranspiration and its role in water balance.	**10**	**5**
Unit 4: Runoff and Flood Management	**TLO 4.1:** Explain runoff processes and factors affecting runoff. **TLO 4.2:** Develop runoff hydrographs and rainfall-runoff relationships. **TLO 4.3:** Estimate peak discharge. **TLO 4.4:** Apply methods of flood routing and flood management.	**4.1** Explain runoff processes and factors affecting runoff. **4.2** Develop runoff hydrographs and rainfall-runoff relationships. **4.3** Estimate peak discharge. **4.4** Apply methods of flood routing and flood management.	**10**	**5**
Unit 5: Groundwater Hydrology	**TLO 5.1:** Explain aquifers and their types. **TLO 5.2:** Apply Darcy's law and groundwater flow equations. **TLO 5.3:** Explain well hydraulics and pumping tests. **TLO 5.4:** Evaluate groundwater management and sustainability.	**5.1** Explain aquifers and their types. **5.2** Apply Darcy's law and groundwater flow equations. **5.3** Explain well hydraulics and pumping tests. **5.4** Evaluate groundwater management and sustainability.	**10**	**5**
Unit 6: Hydrologic Models and Applications	**TLO 6.1:** Describe hydrologic models and their applications. **TLO 6.2:** Explain watershed management. **TLO 6.3:** Apply hydrologic principles in stormwater management system design. **TLO 6.4:** Use rainwater harvesting and hydrologic design criteria for water resources projects.	**6.1** Describe hydrologic models and their applications. **6.2** Explain watershed management. **6.3** Apply hydrologic principles in stormwater management system design. **6.4** Use rainwater harvesting and hydrologic design criteria for water resources projects.	**10**	**5**

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL

Sr. No.	Practical/Laboratory Learning Outcome (LLO)	Practical Titles	Relevant COs
1	**LLO 1:** Demonstrate knowledge of instruments used in meteorological observatory stations and their functions	To study various instruments at meteorological observatory station	CO1
2	**LLO 2.1:** Understand the working principle and application of non-recording rain gauges	To study the non-recording rainfall gauge	CO2
3	**LLO 3.1:** Operate and interpret data from self-recording rainfall gauges	To study the self-recording rainfall gauge	CO2
4	**LLO 4.1:** Analyze rainfall data for intensity, duration, and frequency distribution	Analysis of rainfall data i.e., intensity, duration, frequency analysis	CO2
5	**LLO 5.1:** Estimate mean areal rainfall using different methods	Estimate the mean areal depth of rainfall	CO2
6	**LLO 6.1:** Measure and estimate surface runoff from rainfall events	Measurement and estimation of runoff	CO4

VII. SUGGESTED MICRO PROJECT / ASSIGNMENTS / ACTIVITIES FOR SELF LEARNING / SKILL DEVELOPMENT (SELF LEARNING)

- Report on global and regional water distribution.
- Analyze 10 years rainfall data for mean and return period.
- Design rain gauge network for a watershed.
- Estimate evapotranspiration using different methods.
- Develop simple water balance model for campus/field.
- Construct runoff hydrograph from rainfall–runoff data.
- Design stormwater drainage system for campus/catchment.
- Case study on flood management in Indian river basin.
- Groundwater survey and aquifer classification in village.
- Conduct mini pumping test for aquifer properties.
- Comparative chart of rainwater harvesting structures.
- Prepare mini watershed management plan.
- Simulate rainfall–runoff using hydrologic software.
- Poster/infographic of hydrological cycle.
- Review on climate change impact on hydrological cycle.

Mini projects

- Rainfall Data Analysis – Collect 10–15 years rainfall data of your district, compute mean rainfall, return period, and frequency analysis.
- Runoff Estimation – Calculate runoff for a small watershed using Rational method and SCS Curve Number method.
- Evapotranspiration Study – Estimate crop water requirement using Blaney-Criddle and Penman-Monteith methods, compare results.

- Groundwater Assessment – Conduct a survey of wells in a village to classify aquifers and analyze groundwater availability.
- Rainwater Harvesting Design – Prepare design of rooftop rainwater harvesting and recharge structure for your campus/building.
- Flood Case Study – Analyze a recent flood event in India, prepare report on causes, impacts, and mitigation measures.

VIII. LIST OF INSTRUMENTS / EQUIPMENT / TRAINER BOARD	
1	Non-recording Rain Gauge
2	Self-recording Rain Gauge (Automatic / Tipping bucket)
3	Class A Pan Evaporimeter
4	Lysimeter
5	Sunshine Recorder
6	Anemometer
7	Hygrometer / Psychrometer
8	Thermometers (Dry bulb, Wet bulb, Max–Min)
9	Current Meter / Flow Meter
10	Weirs (V-notch, Rectangular, Trapezoidal)
11	Parshall Flume
12	Water Level Recorder
13	Piezometer Tubes
14	Runoff Measuring Tank / Setup
15	Darcy's Law Apparatus (Trainer board)
16	Constant Head Permeameter
17	Falling Head Permeameter
18	Pumping Test Apparatus (Well and Submersible Pump)
19	Groundwater Flow Model / Aquifer Model (Trainer board)
20	Rainfall–Runoff Simulator (Trainer board)

IX. LIST OF REFERENCE BOOKS

Sr.No.	Title	Author	Publication
1	Land and Water Management Engineering (IV edition).	Murthy, V. V. N.	Kalyani Publishers, New Delhi.
2	Hydrology: Principles, Analysis, and Design (Revised II Edition).	Raghunath, H. M. (2006).	New Age International, Pvt. Ltd., Publishers, New Delhi
3	Engineering Hydrology (III Edition)	Subramaniya, K. (2008).	Tata McGraw-Hill Publishing Co., New Delhi.

X.LINK OF LEARNING WEB RESOURCE

1	https://onlinecourses.nptel.ac.in/noc23_ce44/preview
2	https://onlinecourses.nptel.ac.in/noc24_ag05/preview
3	https://onlinecourses.nptel.ac.in/noc22_ce37/preview
4	https://www.nptelprep.in/courses/126105334/materials
5	https://wecivilengineers.files.wordpress.com/2017/10/applied-hydrology-ven-te-chow.pdf
6	https://karstwaters.org/2023/02/new-open-access-hydrogeology-textbook-available-by-kwi-board-member-neven-kresic/
7	https://gw-project.org/multilingual-online-version-of-groundwater-by-freeze-and-cherry-with-free-access-to-all/
8	https://www.learner.org/series/the-habitable-planet-a-systems-approach-to-environmental-science/water-resources/online-textbook/

XI. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE							
Unit	**Unit Title**	**Aligned COs**	**Learning Hours**	**R-Level**	**U-Level**	**A-Level**	**Total Marks**
1	Definition and Scope of Hydrology	CO1	5	3	3	4	10
2	Precipitation	CO2	5	3	4	3	10
3	Evaporation and Transpiration	CO3	5	3	2	5	10
4	Runoff and Flood Management	CO4	5	2	5	3	10
5	Groundwater Hydrology	CO5	5	2	4	4	10
6	Hydrologic Models and Applications	CO6	5	2	4	4	10
Grand Total			30	17	25	18	60

XII. COs AND POs AND PSOs MAPPING										
Course outcome (Cos)	**Programme Outcomes (POs)**							**Programme Specific Outcomes (PSOs)**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	0	0	2	0	1	3	2	3
CO2	3	3	2	2	2	0	2	3	2	3
CO3	3	3	2	2	2	0	2	3	2	3
CO4	3	3	3	3	2	2	2	3	3	3
CO5	3	3	2	2	2	1	2	3	3	3
CO6	3	3	3	3	3	2	2	3	3	3
Legends: - *3- High* *2-Moderate/Medium* *1-Slight/Low* *0-None*										