

25UAGT303	WATERSHED HYDROLOGY	Category	L	T	P	R	Credit	Year of Introduction
		PBL	3	0	0	1	4	2025

Preamble: Objective of this course to get familiarize the students with the important aspects of watershed hydrology and to impart the knowledge about the various hydrologic phenomena and their relevance in the field of soil and water conservation.

Prerequisite: Nil

Course Outcomes: After the completion of the course, the student will be able to:

CO	Course Outcomes	Knowledge Level
CO1	Explain hydrologic cycle and its various components and their behaviour in watershed	K2 Understand
CO2	Explain the runoff characteristics of a watershed and peak runoff estimation	K2 Understand
CO3	Explain watershed characteristics through geomorphological parameters and hydrograph	K2 Understand
CO4	Evaluate the natural hazards that affect agricultural land and prioritization of watershed	K5 Evaluate

Mapping of course outcomes with program outcomes and program specific outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	2	-	-	-	-	-	-	-	3	1
CO2	3	3	2	2	-	-	-	-	-	-	-	3	2
CO3	3	3	2	2	-	2	2	-	-	-	-	3	3
CO4	2	3	3	3	2	3	3	-	-	-	-	2	3
Avg	2.75	2.75	2	2.75	2	2.5	2.5	-	-	-	-	2.75	2.25

1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Mapping of Course Outcomes with Knowledge and Attitude Profile (WK)

CO	WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
CO1	*	*	*	*	*			*	
CO2	*	*	*	*	*			*	
CO3	*	*	*	*	*		*	*	*
CO4	*	*	*	*	*	*	*	*	*

Wks Mapped with the Course

WK1	WK2	WK3	WK4	WK5	WK6	WK7	WK8	WK9
*	*	*	*	*	*	*	*	*

Total Marks	CIE Marks	ESE Marks	ESE Duration
-------------	-----------	-----------	--------------

100	60	40	2.5 hrs
------------	-----------	-----------	----------------

Mark Distribution

Continuous Internal Evaluation Pattern:

Attendance	: 5 marks
Internal Examination I	: 12.5 marks
Internal Examination II	: 12.5 marks
Project	: 30 marks

Assessment and Evaluation for Project Activity

Sl. No	Evaluation for	Allotted Marks
1	Project Planning and Proposal	5
2	Contribution in Progress Presentations and Question Answer Sessions	4
3	Involvement in the Project Work and Team Work	3
4	Execution and Implementation	10
5	Final Presentations	5
6	Project Quality, Innovation and Creativity	3
	Total	30

1. Project Planning and Proposal (5 Marks)

- Clarity and feasibility of the project plan
- Research and background understanding
- Defined objectives and methodology

2. Contribution in Progress Presentation and Question Answer Sessions (4 Marks)

- Individual contribution to the presentation
- Effectiveness in answering questions and handling feedback

3. Involvement in the Project Work and Team Work (3 Marks)

- Active participation and individual contribution
- Teamwork and collaboration

4. Execution and Implementation (10 Marks)

- Adherence to the project timeline and milestones
- Application of theoretical knowledge and problem-solving
- Final Result

5. Final Presentation (5 Marks)

- Quality and clarity of the overall presentation
- Individual contribution to the presentation
- Effectiveness in answering questions

6. Project Quality, Innovation, and Creativity (3 Marks)

- Overall quality and technical excellence of the project
- Innovation and originality in the project
- Creativity in solutions and approaches

SYLLABUS

Module 1 (14 hours)

Hydrologic cycle and components, Types and Forms of precipitation, Measurement of precipitation, Estimation of mean rainfall, Estimation of missing rainfall, determining optimum rain gauge, Graphical representation of rainfall, Frequency analysis of point rainfall, Depth-area-duration curves and intensity duration- frequency relationship, Hydrologic process.

Module 2 (12 hours)

Evaporation – definition and measurement of evaporation: Evaporimeters, Evapotranspiration- factors affecting and measurement methods, Crop coefficient and pan coefficient, Runoff- factors affecting run off; Time of concentration, Methods of Run-off computation.

Module 3 (12 hours)

Hydrograph – definition, types and components: factors affecting shape of hydrograph, Methods of base flow separation, unit hydrograph theory; Steps for developing unit hydrograph, s-curve method, Instantaneous unit hydrograph, synthetic unit hydrograph, Watershed – Definition and Geomorphology of watersheds, Integrated Water Resources Management to support clean water and sanitation

Module 4 (18 hours)

Floods –definition and flood routing, Methods to reduce impacts of flood for sustainable future. Stream gauging, Flood and drought: classification, causes, Basics of Remote Sensing and GIS, Prioritization of watershed using modern tools.

Text Books

1. Raghunath, H. M. (2022). *Hydrology: Principles, analysis and design* (4th ed.). New Age International (P) Limited.
2. Subramanya, K. (2024). *Engineering hydrology* (6th ed.). Tata McGraw-Hill.
3. Suresh, R. (2019). *Watershed hydrology* (2nd ed.). Standard Publishers and Distributors.

Reference Books

1. Chow, V. T., Maidment, D. R., & Mays, L. W. (2020). *Applied hydrology* (2nd ed.). McGraw-Hill.
2. Murthy, V. V. N. (2021). *Land and water management engineering* (7th ed.). Kalyani Publishers.
3. Garg, S. K. (2023). *Irrigation engineering and hydraulic structures* (38th ed.). Khanna Publishers.

END SEMESTER EXAMINATION - MODEL QUESTION PAPER (STC 2025 SCHEME)

Course Code	25UAGT303
Course Name	WATERSHED HYDROLOGY
Max. Marks: 60	Duration: 2.5 Hours

Part A

<i>(Answer all questions. Each question carries 3 marks)</i>				
Qn No.	Question	Marks	CO	BL
1.	Explain hydrologic cycle and list its major components.	3	CO1	L2
2.	Explain how missing rainfall data at a station is estimated.	3	CO1	L2
3.	Describe evapotranspiration and state the factors affecting it.	3	CO2	L2
4.	Explain the term time of concentration in runoff computation.	3	CO2	L2
5.	Explain a unit hydrograph and state its basic assumptions.	3	CO3	L2
6.	Explain the geomorphological parameters used to characterise a watershed.	3	CO3	L2
7.	Explain the role of remote sensing and GIS in watershed prioritisation.	3	CO4	L2
8.	Describe the measures used to reduce the impact of floods for a sustainable future.	3	CO4	L2
Part B				
<i>(Answer any one full question from each Module. Each question carries 9 marks)</i>				
Module I				
Qn No.	Question	Marks	CO	BL
9	Explain the forms and measurement of precipitation and the methods of estimating mean rainfall over a watershed.	9	CO1	L2
OR				
10	Explain depth-area-duration curves and the intensity-duration-frequency relationship of rainfall.	9	CO1	L2
Module II				
Qn No.	Question	Marks	CO	BL
11	Explain the factors affecting runoff and describe the methods of runoff computation.	9	CO2	L2
OR				
12	Explain the measurement of evaporation and evapotranspiration, including the use of crop and pan coefficients.	9	CO2	L2
Module III				
Qn No.	Question	Marks	CO	BL
13	Explain the components of a hydrograph and the factors affecting its shape, and describe base flow separation.	9	CO3	L2
OR				
14	Explain the steps for developing a unit hydrograph and describe the S-curve method.	9	CO3	L2
Module IV				
Qn No.	Question	Marks	CO	BL
15	Evaluate the natural hazards affecting agricultural land and justify a scheme for prioritisation of watersheds using modern tools.	9	CO4	L5
OR				

16	Evaluate the structural and non-structural methods of flood routing and control for a sustainable future.	9	CO4	L5
----	---	---	-----	----
