

Syllabus and Evaluation Scheme

School of Engineering
Department of Civil Engineering
Course Code: CE443
Course Name: Surface Water Hydrology (3 0 0: 3Cr, 3Hr)

1.ABSTRACT

The course focuses on the occurrence, circulation and distribution of water and various method of measurements and estimation of surface runoff.

2. OBJECTIVE

The Course will introduce the overall concept of surface water hydrology which will help the student to understand how the measurements and estimation of surface water is done. This course will help in comprehending the various hydrograph parameters and thereby applying the various methods of flood estimation.

The objectives can be summarized as:

1. Understand the hydrologic cycle and its components
2. Understand the runoff estimation methods and their measurement techniques
3. Understand the hydrograph generation and the parameters
4. Estimate the flood magnitude

3. PREREQUISITES OF THE COURSE: None

4. COURSE SYLLABUS

Introduction: Hydrologic Cycle, Water Budget Equation, Residence Time, Hydrologic data sources, History of Hydrology, Hydrology in ancient India

Precipitation and Abstraction: Forms of precipitation, Measurement of precipitation, Monsoon in India, Estimation of missing precipitation data, Consistency test, Depth area duration relationships, Frequency of point rainfall, Evaporation, Transpiration, Infiltration, Infiltration Indices

Streamflow measurement: Stage measurement, Velocity measurement, Bed load measurement and suspended load measurement, Indirect methods, Stage-Discharge relationship

Runoff: Runoff, interflow, groundwater flow, Runoff characteristics, SCS-CN Method, Estimating reservoir capacity

Hydrograph: Flood hydrograph, Factors affecting hydrograph, Components of hydrograph, Base flow separation, Unit hydrograph, Method of superimposition, S-curve, Synthetic unit hydrograph, Instantaneous unit hydrograph

Flood Analysis: Rational method, Empirical Formulas, Flood Frequency Analysis, Regional Flood Frequency Analysis, Risk and Reliability

Flood Routing: Reservoir routing, Channel routing, Conceptual model

5. GRADING POLICY

The assessment is based on the revised guidelines on continuous evaluation with relative grading. The break-up of the scheme is as follows,

Sl.	Mode of assessment	Type	Marks	Duration	Syllabus
1	Test 1	Written	25	45 minutes	<i>From beginning</i>
2	Mid Semester Exam	Written	40	120 minutes	<i>From beginning</i>
3	Test 2	Written type (including objective type), assignment, Quiz, Seminar, Field visit etc	25	45 minutes	<i>From Mid Semester Exam till Test 2</i>
4	End Semester Exam	Written	60	180 minutes	<i>From Mid Semester Exam onwards; and the course instructor may include some units of the syllabus covered under Test-1 and Mid Semester Exam</i>
Grand total			150 marks		

6. BOOKS

Text Books:

1. Chow, V. T., Maidment, D. R., Mays, L. W., Applied Hydrology, McGraw Hill, 1988.
2. Haan, C. T., Statistical Methods in Hydrology, Iowa State University Press, 1977.
3. Subramanya, K., Engineering Hydrology, Fifth Edition, McGraw-Hill, 2020.

Reference Books:

1. Mays, L. W., Water Resources Engineering, John Willey and Sons, US, 2001.
2. Viessman, W., and Lewis, G.L., Introduction to Hydrology, Fifth Edition, PHI Learning Private Limited, New Delhi, 2003.
3. Wilfried Brutsaert., Hydrology: An Introduction by, Cambridge University Press, 2012.

7. PEDAGOGY

Teaching-learning methods to be used

- Lecture and Discussion
- Presentations
- Quiz

8. EXPECTED OUTCOME

On successful completion of the course students will be able to

1. Apply the knowledge of science to analyse the hydrologic cycle and the various forms of precipitation and abstractions.
2. Identify and analyse precipitation and the runoff characteristics.
3. Design, develop and analyse the components of hydrographs using various methods.
4. Apply the knowledge of mathematics and engineering to estimate the magnitude of flood.

9. PROGRAM OUTCOME

- PO1 Apply knowledge of science, mathematics and engineering principles to analyse and solve problems of civil engineering.
- PO2 Identify, formulate, review literature and analyse the complex civil engineering problems using the principles of mathematics, natural science and engineering sciences.
- PO3 Design and develop the components or a complete civil engineering system within realistic constraints such as public health and safety, cultural, societal and environmental considerations.
- PO4 Design and conduct experiments with research-based knowledge; and thereby analyse and interpret the results from the observations to provide valid conclusions.
- PO5 Select and apply the latest state-of-the-art tools and techniques in civil engineering to model and predict the complex activities and understand its limitations.
- PO6 Apply the information from contextual knowledge to assess societal, health, safety, legal and cultural issues and responsibilities relevant to civil engineering problems.
- PO7 Demonstrate the knowledge of, and need for sustainable development in providing the solutions to the civil engineering problems in environment and societal context.
- PO8 Apply ethical principles and commit to professional ethics and responsibilities and norms of the civil engineering practice.
- PO9 Work individually as well as in teams, both as a member and as a leader, across diverse teams with multidisciplinary settings.
- PO10 Develop appropriate skills of written, oral and visual communications to disseminate their works.
- PO11 Demonstrate knowledge and understanding of the engineering and management principles and apply these to his own work, as a member and leader in a team, to manage projects in multidisciplinary environments.
- PO12 Recognize the need for and have the preparation and ability to engage in life-long learning and continuing professional development.

10. Programme Specific Outcomes (PSOs)

The Graduates will be able to demonstrate the acquisition of:

PSO-01: Graduate will understand and apply knowledge of the discipline of Civil Engineering in current and emerging areas.

PSO-02: Graduates will be able to undertake professional assignments including self-employment initiatives by acquiring practical, professional, and procedural knowledge.

PSO-03: Graduates will be able to demonstrate theoretical and practical skills in areas of Civil Engineering including multidisciplinary aspects.

11. CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2					1						3	2	1
CO2	2	3			1								3	2	1
CO3	2	1	3										2	3	1
CO4	3		1									2	2	3	1

12. COURSE OUTLINE AND TENTATIVE SCHEDULE

Module No.	Module Name	Topics	Nos. of classes
I	Introduction	<ol style="list-style-type: none"> 1. Hydrologic Cycle 2. Water Budget Equation 3. Residence Time 4. Hydrologic data sources 5. History of Hydrology 6. Hydrology in ancient India 	3
II	Precipitation and Abstractions	<ol style="list-style-type: none"> 1. Forms of precipitation 2. Measurement of precipitation 3. Monsoon in India 4. Estimation of missing precipitation data 5. Consistency test 6. Depth area duration relationships 7. Frequency of point rainfall 8. Evaporation 9. Transpiration 10. Infiltration 11. Infiltration Indices 	4
III	Streamflow Measurement	<ol style="list-style-type: none"> 1. Stage measurement 2. Velocity measurement 3. Bed load measurement and suspended load measurement 4. Indirect methods 5. Stage-Discharge relationship 	4
IV	Runoff	<ol style="list-style-type: none"> 1. Runoff, interflow, groundwater flow 2. Runoff characteristics 3. SCS-CN Method 4. Estimating reservoir capacity 	6
V	Hydrograph	<ol style="list-style-type: none"> 1. Flood hydrograph 2. Factors affecting hydrograph 3. Components of hydrograph 	7

		<ol style="list-style-type: none"> 4. Base flow separation 5. Unit hydrograph 6. Method of superimposition 7. S-curve 8. Synthetic unit hydrograph 9. Instantaneous unit hydrograph 	
VI	Flood Analysis	<ol style="list-style-type: none"> 1. Rational method 2. Empirical Formulas 3. Flood Frequency Analysis 4. Regional Flood Frequency Analysis 5. Risk and Reliability 	7
VII	Flood Routing	<ol style="list-style-type: none"> 1. Reservoir routing 2. Channel routing 3. Conceptual model 	5