

**COURSE CODE:** CE-356  
**COURSE NAME:** Engineering Hydrology  
**CREDIT HOURS:** Theory = 3 Practical = 1 Total = 4  
**CONTACT HOURS:** Theory = 48 Practical = 16 Total = 54  
**PREREQUISITE:** None  
**MODE OF TEACHING:** Three hours of lecture per week  
Two hours of Lab work per week

**COURSE DESCRIPTION:**

This course focuses on basics of surface and groundwater hydrology, occurrence and measurement of precipitation, evapotranspiration, infiltration, stream flow, hydrology of extreme events and hydrological aspects of water quality.

**RELEVANT PROGRAM LEARNING OUTCOMES (PLOs):**

The course is designed so that students will achieve the PLOs:

- |                                    |                                     |                                   |                          |
|------------------------------------|-------------------------------------|-----------------------------------|--------------------------|
| 1 Engineering Knowledge:           | <input checked="" type="checkbox"/> | 7 Environment and Sustainability: | <input type="checkbox"/> |
| 2 Problem Analysis:                | <input type="checkbox"/>            | 8 Ethics:                         | <input type="checkbox"/> |
| 3 Design/Development of Solutions: | <input checked="" type="checkbox"/> | 9 Individual and Teamwork:        | <input type="checkbox"/> |
| 4 Investigation:                   | <input checked="" type="checkbox"/> | 10 Communication:                 | <input type="checkbox"/> |
| 5 Modern Tool Usage:               | <input type="checkbox"/>            | 11 Project Management:            | <input type="checkbox"/> |
| 6 The Engineer and Society:        | <input type="checkbox"/>            | 12 Lifelong Learning:             | <input type="checkbox"/> |

**COURSE LEARNING OUTCOMES:**

Upon successful completion of the course, the student will demonstrate competency by being able to:

Sr. No.	CLO	Domain	Taxonomy Level	PLO
1	<b>Explain</b> components of hydrological cycle in relation to environmental engineering	Cognitive	2	1
2	<b>Apply</b> models for precipitation, evapotranspiration, infiltration, surface, and ground water flow	Cognitive	3	3

3	<b>Analyse</b> and generate unit hydrograph for a watershed and flood routing.	Cognitive	4	3
4	<b>Practice</b> response of processes involved in Precipitation, infiltration, surface, and ground water flow in lab conditions.	Psychomotor	3	4
5	<b>Maintain</b> ethical conduct in lab and adhere to lab safety procedures while contributing effectively towards individual and/ or group goals.	Affective	5	9

### TOPICS COVERED:

Week	Topic Covered	Reading Assignment/ Homework	CLO #
1	Introduction to Hydrology Introduction, Origins and evaluation of Scientific Hydrology, Major Aspects of Hydrology, Hydrology for Environmental Engineers	Chapter 1	1
2-3	Introduction to Hydrology Residence Time, The Hydrologic Cycle, Hydrologic Systems, Physical Laws of Application in Hydrology, Concept of Watershed, Water Budget Equation	Chapter 1 Quiz 1 Assignment 1	1
4-5	Precipitation Forms, Occurrence, Types, Measurement of Precipitation, Rain Gauge Network, Estimation of Missing Precipitation Data, Consistency of Precipitation Data, Temporal and Spatial Variation of Precipitation, IDF Curves, PMP	Chapter 2 Assignment 2 Quiz 2	2
6-7	Evapotranspiration introductions, factors affecting, models involved, modelling of ET	Chapter 3 Assignment 3 Quiz 3	2
8	Infiltration introduction, soil properties, Darcy's Law, Horton and Holton's model of Infiltration, Holtan's Model, Actual infiltration rate with losses, $\Phi$ Index Approach, Double Ring Method	Chapter 4 Quiz 4	2
9	<b>Mid Semester Exam</b>		

10	Groundwater hydrology introduction, aquifers, Permeability, Hydraulic Conductivity, Transmissivity, Storage Coefficient, Exploitation of Groundwater, flow in well under different conditions	Chapter 5 Assignment 4	2
11- 12	Streamflow, Mechanisms of Runoff Generation, Classification of streams, Stream Flow Measurement, Hydrographs, Unit hydrograph, stream flow forecasting	Chapter 6 Quiz 5	2, 3
13- 14	Hydrology of extreme events, Flood wave Propagation, Flood Routing	Chapter 7 Assignment 5 Quiz 6	2,3
17	Hydrology aspect of water quality, Measures of water quality	Chapter 8	1,2
18	<b>End Semester Exam</b>		

#### LIST OF PRACTICALS:

Not Applicable

Sr. No.	Practical	CLO #
1	Investigating rainfall-runoff relation of a Long Duration Rainstorm on Dry Catchment.	4
2	Investigating rainfall-runoff relation of a Short Duration Rainstorm on Dry Catchment.	4
3	Investigating rainfall-runoff relation of a Long Duration Rainstorm on Wet Catchment.	4
4	Investigating rainfall-runoff relation of a Short Duration Rainstorm on Wet Catchment.	4
5	Investigation of Infiltration rate of soil in field with ring infiltrometer.	4
7-8	Investigation of Flow of ground water in unconfined aquifer.	4
9	Investigating rainfall-runoff relation of a Long Duration Rainstorm on Impermeable Catchment.	4
10	Investigating rainfall-runoff relation of a Short Duration Rainstorm on Impermeable Catchment.	4

11	Investigating rainfall-runoff relation of a Long Duration Rainstorm on Catchment with Slope.	4
13-14	Investigating rainfall-runoff relation of a Short Duration Rainstorm on Catchment with Slope.	4
15-16	Investigating rainfall-runoff relation of multiple simulated moving storms.	4

### TEXT AND MATERIAL:

#### Textbook (s)

Hydrology for Engineers, Geologists and Environmental Professionals (2010 Edition) by Sergio E. Serrano

#### References Material:

Applied Hydrology by V.T. Chow, D.R. Maidment and L.W. Mays, McGraw-Hill, (Latest Edition).

Engineering Hydrology by A.R. Ghuman, Nastaleeq Publishers, Rawalpindi.

### ASSESSMENT SYSTEM:

<b>Theoretical/Instruction</b>	<b>75%</b>
Assignments	10%
Quizzes	15%
Mid Semester Exam	30%
End Semester Exam	45%
<b>Practical Work</b>	<b>25%</b>
Lab Attendance	00%
Lab Report	40%
Lab Quiz	30%
Lab Rubrics	30%