Course title: Hydrology			
Course code: NRE 162	**No. of credits:** 3	**L-T-P:** 29-13-0	**Learning hours:** 42
Pre-requisite course code and title (if any):			
Department: Energy and Environment			
Course coordinator:	**Course instructor:** Prof. Prateek Sharma		
Contact details: prateeks@terisas.ac.in			
Course type: Elective	**Course offered in:** Semester 2		

Course Description

This course will introduce the concepts of hydrology. It would also provide an understanding of the basic methods and techniques to analyze the different factors governing the hydrological cycle. It would provide the students with an overview of monitoring and evaluation of hydrologic elements. A field-trip or a large-scale laboratory experiment will provide an exposure to the monitoring of hydro-meteorological parameters in practice. It would prepare the students to take up water resource management later on, leading to sustainable development.

Course objectives

1. Analyse precipitation data in detail, presentation of rainfall data and calculation of missing precipitation data
2. Assess precipitation losses like evaporation, transpiration and infiltration
3. Measure discharge and calculate runoff using empirical formulae

Course content

Module	Topic	L	T	P
1.	Definition, need, history, world water inventory, the Indian scenario, the hydrologic cycle, the monsoon system	2	0	0
2.	Precipitation: process, forms, types, measurement, assessment of precipitation in ungauged basins	2	0	0
3.	Analysis of Precipitation data: required number of rain gauges, data consistency check and data gap fill up, presentation of rainfall data–mass curve and hyetograph, precipitation variability, calculation of required number of rain gauges, estimation of mean precipitation over an area, depth area relationship, intensity-duration-frequency relationship, probable maximum precipitation	4	2	0
4.	Losses from precipitation: Evaporation-process, measurement and estimation; Evapotranspiration- process, measurement and estimation of potential maximum evapotranspiration; Interception, Depression storage, Infiltration-process, measurement and estimation, Horton's equation and phi index method	3	2	0
5.	Measurement of Discharge, requirements of a good gauge-discharge site, direct and indirect estimation methods, measurement of stage	3	2	
6.	Runoff: components, water yield, flow duration curve, flow mass curve, hydrograph, factors affecting flood hydrograph, Unit Hydrograph-definition, assumptions, limitation, derivation of UH from storm hydrograph, derivation of UH of longer duration from UH of shorter duration, derivation of UH of shorter duration from UH of longer duration, derivation of storm hydrograph from UH	5	3	0
7.	Fixation of reservoir capacity using mass curve method and sequent peak algorithm, estimation of sedimentation using area increment method and empirical area reduction method	2	1	0
8.	Estimation of flood peak-Rational method, empirical formulae, Unit Hydrograph techniques, flood frequency studies; Flood Routing concept and techniques, hydrologic routing, hydrologic reservoir routing using	5	2	0

	Modified Puls method, hydrologic channel routing using Muskingum method, introduction to hydraulic routing			
9.	Introduction to ground water hydrology, concept of aquifers, flow of water to a well in confined and unconfined aquifers	3	1	0
	Total	**29**	**13**	

Evaluation criteria

- Tests 1 & 2: 20% each
- Assignments/Quizzes: 20 %
- Test 3: 40%

Learning outcomes

- Ability to estimate flood peaks, fix capacity reservoir of reservoirs
- Ability to quantify rainfall data, estimate return period of extreme rainfall events
- Prepare to take up advanced courses in water resources in future semesters

Pedagogical approach

Materials

Required text

1. Chow V.T. (1988) *Applied Hydrology,* Tata McGraw Hill Publishing Co.
2. Patra K.C. (2011) *Hydrology and Water Resources Engineering,* Narosa Publishing House.
3. Subramanya K. (2004) *Engineering Hydrology,* Tata McGraw-Hill, New Delhi.

Suggested readings

1. Black P.E. (1996) *Watershed Hydrology,* Lewis Publishers.
2. Chow V.T. (1988) *Applied Hydrology,* Tata McGraw Hill Publishing Co.
3. Jain S.K., Agarwal P.K. and Singh V.P. (2007) *Hydrology and Water Resources of India,* Springer, TheNetherlands.
4. Patra K.C. (2001) *Hydrology and Water Resources Engineering,* Narosa Publishing House.
5. Shaw E.M (2004) *Hydrology in Practice,* 3rd Ed, Routledge.
6. Singh G., Venkataraman C., Sastry G. and Joshi B.P. (1990) *Manual of Soil and Water Conservation Practices,* Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
7. Singh V.P. (1989) *Hydrologic Systems, Vol–I and II,* Prentice Hall, New Jersey.
8. Singh V.P. (1993) *Elementary Hydrology,* Prentice Hall, Englewood, New Jersey.
9. Subramanya K. (2004) *Engineering Hydrology,* Tata McGraw-Hill, New Delhi.
10. Suresh R. (2005) *Watershed Hydrology,* Standard Publishers Distributors, New Delhi.
11. Viessman W., Lewis and Gary L. (2002) *Introduction to Hydrology,* Prentice Hall.
12. Ward A.D. and Elliot W.J. (eds.) (1995) *Environmental Hydrology***,** Lewis Publishers.
13. Ward R.C. and Robinson M. (1990) *Principles of Hydrology,* McGraw Hill.

Journals

1. Hydrology Journal of IAH
2. Journal of Hydrology
3. Journal of Spatial Hydrology

Advanced Reading Material

Additional information (if any)

Student responsibilities

The students are expected to submit assignments in time and come prepared with readings when provided

Course reviewers: