

Course No.: SWCE-233

Course Title: Watershed Hydrology

Semester: III

Credits: 3(2+1)

Syllabus

Theory

Hydrologic cycle, precipitation and its forms, rainfall measurement and estimation of mean rainfall, frequency analysis of point rainfall. Mass curve, hyetograph, depth-area-duration curves and intensity-duration-frequency relationship. Hydrologic processes-Interception, infiltration -factors influencing, measurement. Evaporation - Estimation and measurement. Runoff - Factors affecting, measurement, stage - discharge rating curve, estimation of peak runoff rate and volume, Rational method, Cook's method and SCS curve number method. Hydrograph - Components, base flow separation, unit hydrograph theory. Stream gauging - discharge rating curves, flood peak, design flood and computation of probable flood. Flood routing – channel and reservoir routing. Drought – classification, causes and impacts, drought management strategy.

Practical

Visit to meteorological observatory and study of different instruments. Design of rain gauge network. Exercise on intensity - frequency - duration curves. Exercise on depth - area - duration and double mass curves. Analysis of rainfall data and estimation of mean rainfall by different methods. Exercise on frequency analysis of hydrologic data and estimation of missing data, test for consistency of rainfall records. Exercise on computation of infiltration indices. Computation of peak runoff and runoff volume by Cook's method and rational formula. Computation of runoff volume by SCS curve number method. Study of stream gauging instruments - current meter and stage level recorder. Exercise on geomorphic parameters of watersheds. Exercise on runoff hydrograph. Exercise on unit hydrograph. Exercise on synthetic hydrograph. Exercise on flood routing.

Teaching Schedule – Theory with weightages (%)

Lect. No.	Topic	Book No.	Article No.	Page No.	Weightage s (%)	
1	Introduction, Scope of Hydrology Hydrologic cycle	2 1	- 3.1	1-3,11-14 24-25	30	
2	Precipitation-forms, Rainfall measurement, mass curve	2 4 1	2.1 3.3,3.9	16-21/ 39-40 13-14 26-34		
3	Hyetograph, mean rainfall depth. Adequacy of raingauge, point precipitation, Mean Areal precipitation.	2 4	- 3.10,3.11,3.12	28-35, 39 46-54		
4	Intensity-Duration relationship, Intensity-Duration frequency relationship, Depth Area duration relationship, plotting positions. Frequency Analysis,	3 4	3.8 -	87-89 60-68		
5	Estimation of missing data, Test of consistency of rainfall records.	4	3.7, 3.8	36-45		
6-8	Hydrologic Losses (Interception, infiltration, Evaporation, Evapo-transpiration): Estimation & Measurement	4 2	4.1, 4.2, 4.3, 4.6, 4.9.2, 4.10, 4.12, -	82-88, 90-94, 101-109, 115-124, 135-138 62-68		
9	Geomorphology of watershed, stream number stream length, stream slope Horton law,	2		99-103		
10-11	Runoff-factors affecting runoff Measurement: Stage & velocity, rating curve	2 4	- -	108,186-194, 253-259	30	
12-13	Estimation of peak runoff rate, rational method, Cook's method, SCS method; Numericals on above	2 1 4 5	- 3.11 5.2.1, 5.2.2 2.6	109-112 36-38 151-162 29-36		
14-15	Curve Number method (estimation of runoff volume) Numericals on above	4 1 5	5.2.3 - -	162-166 39-43 44-48		
16-17	Hydrograph, Components. Base flow separation.	2 4	- 6.1,6.4	121-129 182-184, 191-193		25

18	Unit Hydrograph theory, Unit hydrograph of different duration	4	6.6	193-208	15
19-21	Examples/Numericals on above. Distribution hydrograph.	2	-	148-157	
22-23	Synthetic Unit Hydrograph(Snyder Method) Numericals on above	4	6.7	208-217	
24-25	Dimensionless Unit Hydrograph	4	6.8	217-220	
26-27	Head water flood control- methods	2 4	- 8.3	258-272 290-297	
28-29	Flood routing, graphical method of Reservoir Flood Routing	4	9.1-9.3, 9.8	310-311, 328	
30	Hydrology of dryland areas-drought & its classification	4	11.1,11.2,11.4, 11.5	395-399 401-402	
31-32	Introduction to watershed management & planning	1	28.1-28.3,28.9	556-558 565-567	

Practical Exercises

Exercise No.	Title
1	Visit to meteorological observatory to study different instruments.
2	Study of different types of raingauges
3	Analysis of raingauge charts
4	Checking of consistency of rainfall data
5	Estimation of average rainfall depth by different methods
6	Probability analysis of rainfall data by Weibull's method
7	Estimation of peak runoff rate by rational method.
8	Estimation of peak runoff rate by Cook's method.
9	Computation of runoff volume by Curve Number method.
10	Study of stream gauging instruments (Stage level recorder and current meter).
11	Study of base flow separation methods
12	Development of DRH from stage hydrograph.
13	Development of unit hydrograph.
14	Development of Dimensionless Unit Hydrograph
15	Study of different flood routing methods for reservoir flood routing
16	Study of different geomorphologic characteristics of watershed

Suggested readings

Text Books:

1. Land and Water Management Engineering by V.V.N. Murthy, Kalyani Publishers, New Delhi, 1998 (2nd Ed.).
2. Hydrology by H.M. Raghunath, Wiley Eastern Limited, 1997.
3. Applied Hydrology by K.N. Mutreja, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1995 (4th Ed.).
4. Watershed Hydrology by R.Suresh, Standard Publishers Distributors, New Delhi-6, 1997 (1st Ed.).
5. Manual of Soil and Water Conservation Practices By G. Singh, C. Venkataramanan, G. Sastry, and B.P. Joshi.
- 6.

Reference Book:

1. Engineering Hydrology by K. Subramanya.