Semester	: IV		
Course No.	: SWCE-243	Credit Hrs.	: 3(2+1)
Course Title	: Watershed Hydrology		

SYLLABUS

Objectives : To make the students acquainted with the different hydrological processes, their methods of analysis, so as to enable them to apply these for watershed development, water harvesting, minor irrigation, drought and flood control, etc.

THEORY

Hydrologic cycle, components; Precipitation and its forms, rainfall measurement and estimation of mean rainfall, estimation of missing rainfall, optimum number of rain gauges; Frequency analysis of point rainfall; Mass curve, hyetograph, depth-area-duration curves and intensity-duration- frequency relationship; Hydrologic processes- interception, infiltration -factors influencing, measurement and indices; 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; Geomorphology of watersheds - linear, aerial and relief aspects of watersheds-stream order, drainage density and stream frequency; Hydrograph-components, base flow separation, unit hydrograph theory, s-curve, synthetic hydrograph, applications and limitations; Flood routing - channel and reservoir routing; Hydrology of dry land areas, Troll's climatic classification; Drought- classification, causes and impacts, drought management strategy.

PRACTICAL

Visit to meteorological observatory and study of different instruments; Study of optimal rain gauge network; Study of intensity - frequency - duration curves, Study of depth - area - duration curve; Analysis of rainfall data and estimation of mean rainfall by different methods; Analysis of frequency of hydrologic data and estimation of missing data, test for consistency of rainfall records; 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; Study and determination of geomorphic parameters of watersheds; Study of runoff hydrograph and separation of base flow and surface flow; Study of unit hydrograph; Study of synthetic hydrograph; Study of flood routing; Study of various discharge measuring devices.

THEORY [SWCE-243]

Lecture No.	Topics	Sub-topics/Key points	Weightage (%)
1 - 7	Hydrologic Cycle and Rainfall	Hydrologic cycle components, Precipitation and its forms, Rainfall measurement, Estimation of mean rainfall, Estimation of missing rainfall Optimum number of rain gauges, Frequency analysis of point rainfall	20
8 - 13	Rainfall Analysis and Hydrologic Processes	Mass curve, Hyetograph, Depth- Area- Duration curves Intensity - Duration - Frequency Relationship, Hydrologic processes - Interception, Infiltration- Factors influencing, Infiltration measurement and indices, Evaporation- Estimation and measurement	20
14 - 20	Surface Runoff and Geomorphology	Runoff- Factors affecting, Runoff measurement, Stage- Discharge rating curve, Estimation of peak runoff rate and volume, Rational method, Cook's method, SCS curve number method, Geomorphology of watersheds - Linear, aerial and relief aspects of watersheds- Stream order, Drainage density and Stream frequency	20
21 - 26	Hydrograph	Hydrograph- Components, Hydrograph- Base flow separation, Unit hydrograph theory, S-curve, Synthetic hydrograph, Unit Hydrograph- applications and limitations	20
27 - 30	Flood Routing	Flood routing- Channel routing, Flood routing- Reservoir routing, Hydrology of dryland areas, Troll's climatic classification	20
31 - 32	Drought	Drought- Classification, Causes and Impacts, Drought management strategy	
		Total =	100

PRACTICAL [SWCE-243]

Exercise No.	Exercise Title
1	Visit to Meteorological Observatory and study of different instruments.
2	Study of optimal rain gauge network.
3	Study of intensity - frequency - duration curves and Study of depth - area - duration curve.
4	Analysis of rainfall data and estimation of mean rainfall by different methods.
5	Analysis of frequency of hydrologic data, Estimation of missing data and Test for consistency of rainfall records.
6	Computation of infiltration indices.
7	Computation of peak runoff and runoff volume by Cook's method.
8	Computation of peak runoff rate by rational formula.
9	Computation of runoff volume by SCS curve number method.
10	Study of stream gauging instruments - Current meter and Stage level recorder.
11	Study and determination of geomorphic parameters of watersheds.
12	Study of runoff hydrograph and separation of base flow and surface flow.
13	Study of unit hydrograph.
14	Study of synthetic hydrograph.
15	Study of flood routing.
16	Study of various discharge measuring devices.

Suggested Readings [SWCE-243]:

1. Chow V.T. Maidment D.R. and Mays L.W. 2010. Applied Hydrology. McGraw Hill, New York.
2. Jaya Rami Reddy P. 2011. A Text Book of Hydrology. University Science Press, New Delhi.
3. Linsley R.K, Kohler M.A. and Paulhus J.L.H. 1984. Hydrology for Engineers. McGraw-Hill Publishing Co., Japan.
4. Panigrahi Band Panigrahi K. 2016. Engineering Hydrology. New India Publishing Agency, New Delhi.
5. Mutreja K.N. 1990. Applied Hydrology. Tata McGraw-Hill Publishing Co., New Delhi.
6. Raghunath H.M.2006. Hydrology: Principles Analysis and Design. 2nd Edition, New Age International (P) Limited Publishers, New Delhi.
7. Subramanya K. 2008. Engineering Hydrology. 3rd Edition, Tata McGraw-Hill, New Delhi.
8. Suresh R. 2005. Watershed Hydrology. Standard Publishers and Distributors, Delhi.
9. Varshney R.S. 1986. Engineering Hydrology. Nem Chand and Brothers, Roorkee, U.P.
10. Garg S.K. 1998. Hydrology and Water Resources Engineering. Khanna Publishers, Delhi.
11. Das G. 2000. Hydrology and Soil Conservation Engineering. PHI, New Delhi.

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