Advanced Hydrology

Code	Credit Hours
CE- 846	3-0

Course Description

The overall objective of this course is to introduce the students to the knowledge of measurement of hydrological data, verifying its accuracy and carrying out its evaluation, analysis of rainfall data, rainfall-runoff relationship, flood routing, deterministic and stochastic processes and application of hydrological techniques to practical problems.

Reference Book

1. Ven Te Chow, Applied Hydrology, Tata McGraw-Hill Education, 2010.
2. K. C. Patra, Hydrology and Water Resources Engineering, CRC Press, 2000.
3. Philip B. Bedient, Hydrology and Flood Plain Analysis, 3rd. Edition, Prentice-Hall, 2002.
4. Richard H. McCuen, Hydrologic Analysis and Design, 2nd Edition, Prentice-Hall, 1997.
5. L. Mays & Y.K. Tung, Hydro systems Engineering & Management, McGraw-Hill Book Co., N.Y., 1992.
6. Vijay P. Singh, Hydrologic Systems: Rainfall-Runoff Modeling, Prentice Hall, 1989.
7. Richard H. McCuen, A Guide to Hydrologic Analysis Using SCS Methods, Prentice Hall, 1981.
8. R. L. Brass, Hydrology: An Introduction to hydrological science, Addison-Wesley Publishing Co., N.Y., 1990.
9. E. M. Shaw, Hydrology in Practice, 3rd Edition, Chapman & Hall, London, 1994.
10. Wilfred Brutsaert, Hydrology, Cambridge University Press, 2005.
11. The Primer, Keith J. Beven, Rainfall-Runoff Modeling

Prerequisites

Nil

ASSESSMENT SYSTEM FOR THEORY

Quizzes	10%
Assignments	10%
Mid Term	30%
ESE	50%

Teaching Plan

Week No	Topics	Learning Outcomes
1	Hydrological Cycle. Global Water and Energy Budgets	Understand the relative importance of different physical processes of the hydrological and energy cycles, and their interaction
2-4	Precipitation, Evapotranspiration, Infiltration, Interception, Runoff	Calculate and understand the catchment's water balance
5	Point and Gridded Climatic Datasets, Accuracy, Evaluation and Analysis	Analyze and evaluation of the point and gridded climatic dataset
6-8	Hydrograph Analysis and Synthesis. Rainfall-Runoff Relationship, Unit Hydrograph, Estimation of Flows based on observed data and Rainfall Run off relationship S-Curve, Synthetic Unit Hydrograph, SCS Method	Estimation of flows using Hydrologic analysis and rainfall-runoff relationship
9	**Mid Term Exam**	
10	Stream Gauging. Rating Curve, Direct and Indirect Discharge Measurements, Flow duration curves	Design and implement field measurements of river flow and/or analyze data from such an exercise to determine river channel flow
11-12	Snow and Snowmelt: Energy Balance, Snowmelt Process, Snow Accumulation	Understand the importance of the energy cycle on snowmelt or snow accumulation processes
13-14	Design Flood. Frequency Analysis, Probable Maximum Flood, Flood Routing, Probable Max Precipitation (PMP) based Probable Maximum Flood (PMF)	Estimate design rainfall intensity for design purposes and flood forecasting

15-17	Statistical methods in hydrology. probability distribution of hydrologic variables, hypothesis testing and goodness of fit, flood frequency analysis, single and multiple regression analysis, classification of time series, characteristics of hydrologic time series, statistical principles, and techniques for hydrologic time series modeling	Understand the importance of statistical analysis in hydrology
18	**End Semester Exam**	