Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NCED515	Hydrological Measurements and Stochastic Analysis	3	0	0	3

Course Objective
The course aims to explain basic principles and methods of hydrologic measurements, process datasets using various statistical analysis approaches, and extract valuable insights from the data.
Learning Outcomes
Students who complete this course will be able to: • describe different categories of data on water resources and the methods used for data collecting, validation, and processing. • determine the frequency distributions usually applied to water resources and outline methodologies for parameter estimation. • estimate the frequency, duration, and intensity of extreme hydrological events.

Unit no.	Topics to be covered	Contact Hours	Learning outcome
1	**Measurement and Processing of Hydrologic Datasets:** Methods of Collection of Hydrologic Data, Design of Hydrometeorological Data Networks, Measurement Errors, Precipitation, Stream flow, Evapotranspiration, Temperature, Ground-Water, and Other Datasets, Emerging Technologies for Spatial Data Acquisition.	12L	Learn the methods for collecting, verifying, and processing hydrologic data and their networks for measuring data over an area.
2	**Stochastic Techniques for Data Analysis**: Probability, Commonly Used Distributions in Hydrology, Parameter Estimation: Method of Maximum Likelihood, Probability Weighted Moments, Generation of Normal Random Numbers, Correlation, Covariance.	9L	Understand the frequency distributions that are employed in water resources.
3	**Stochastic Analysis of Hydrologic Time-Series**: Stationarity, Ergodicity, Stochastic Models, and Markov Processes. Spectral Analysis, Frequency Domain Analysis, Autocorrelation.	9L	Learn to model the deterministic and stochastic nature of hydrologic time-series
4	**Statistical Determination of Floods & Droughts**: Floods, Annual Maxima, Annual Minimum, Partial Duration Series Models. Distribution of Extreme Values, Frequency Method of Flood Estimation, Peak Over Threshold Method. Drought Concept, Types, Determination of Drought Characteristics, Standardized Drought Indices.	12L	Learn to identify floods and perform flood frequency analysis. Estimate the characteristics of drought using standardized indices.
	Total Contact Hours	**42L**	

Text book:

1. Kottegoda, N.T. 'Stochastic Water Resources Technology', Macmillan, London 1980.

2. Jain, S.K., and Singh, V.P. (2003). Water Resources Systems Planning and Management. Elsevier, Amsterdam

Reference Books:

1. WMO (2008). Guide to Hydrological Practices. WMO No. 168. World Meteorological Organization, Geneva.
2. Haan, C. T., Statistical Methods in Hydrology, Wiley, 2002.