Course Type	Course Code	Name of Course	L	T	P	Credit
DP	NCEC546	Computational Laboratory in Hydrology	0	0	3	1.5

Course Objective
The course aims to educate students in computational skills for analyzing, modeling, and interpreting hydrological data for research and practical applications.
Learning Outcomes
Upon successful completion of this course, the students should be able to: • Write and debug scripts for analyzing and visualizing hydrological datasets. • Utilize computational techniques to develop hydrographs, model infiltration, and simulate basic rainfall-runoff processes. • Learn statistical techniques to analyze hydrological extremes and perform probabilistic assessments on hydrological datasets.

Unit No.	Topics to be Covered	Contact Hours	Learning Outcome
1.	**Introduction to Programming Interface for Handling Hydrological Datasets:** MATLAB, R and Python. Basic Operators, Vector, Arrays, Library Functions, Functions, Control Statements.	6	Understand basic programming concepts, write and debug scripts.
2.	**Download, Reading, Handling and Visualization of Multi-dimensional Hydrological Data**: Basic Statistical Computations. 1D, 2D and 3D Data Visualization. Downloading and Extracting Data from NetCDF files.	6	Learn to manage, visualize download, read, and analyze hydrological data.
3.	**Infiltration Theory & Hydrographs**: Development of Unit Hydrograph and Flood Hydrograph from Storm Data of Catchment. Computation of Infiltration using Horton's and Philip's Method	6	Learn computational methods to model infiltration & develop hydrographs.
4.	**Advanced Hydrological Statistics**: Exploratory Data analysis, Correlation, Auto Correlation and Partial-Auto Correlation.	6	Understand patterns and relationships in hydrological datasets.

Unit No.	Topics to be Covered	Contact Hours	Learning Outcome
5.	**Probability in Hydrology**: Flood Frequency Analysis, Distributions Fitting, Parameter Estimation of Probability Distributions.	6	Learn to perform probabilistic analysis on hydrological datasets.
6.	**Hydrological Extremes**: Identification of Hydrological Extremes (Precipitation and Temperature).	6	Able to analyze hydrological extremes events using statistical methods.
7.	**Introduction to Numerical Modeling:** Initialization and basic set-up of Hydrological Models (SWAT, HEC-HMS etc.).	6	Learn to simulate simple rainfall-runoff models
	Total Contact Hours	**42**	

Text Books:

1. Maity, R. (2018). Statistical methods in hydrology and hydroclimatology (Vol. 585). Springer.
2. Subramanya, K. (2023), Engineering Hydrology, Tata McGraw Hill.

Reference Books:

1. Balaji, R. (2020). Basics of MATLAB Programming. Notion Press.
2. Agresti, A., & Kateri, M. (2021). Foundations of statistics for data scientists: with R and Python. Chapman and Hall/CRC.