

Course Title : Hydroinformatics Using MATLAB Software

Instructor: MEGNOUNIF Abdesselam

Course Overview: The Hydroinformatics Using MATLAB Software course is designed to introduce students to the integration of hydrology, hydraulics, and information technology using MATLAB. Students will learn to apply MATLAB tools and techniques for data analysis, modeling, and simulation in the field of water resources and environmental engineering.

Learning Objectives:

- Understand the fundamentals of hydroinformatics and its applications.
- Gain proficiency in using MATLAB software for data processing and analysis.
- Learn to develop hydrological and hydraulic models using MATLAB.
- Develop skills in visualizing and interpreting hydrological and hydraulic data using MATLAB.
- Analyze precipitation data and estimate water availability.
- Investigate hydrological processes in watersheds and their impact on water resources.
- Learn about flood frequency analysis, flood routing, and floodplain management.

Course Content:

1. Introduction to Hydroinformatics:
 - a) Definition and scope of hydroinformatics.
 - b) Applications of hydroinformatics in water resources management.
2. MATLAB Basics:
 - a) Introduction to MATLAB environment and programming concepts.
 - b) MATLAB data types, arrays, functions, and plotting.
 - c) MATLAB syntax: variables, operators, loops, functions.
 - d) Writing scripts and functions to automate repetitive tasks.
3. Data Processing and Analysis:
 - a) Data import/export in MATLAB.
 - b) Data preprocessing and filtering.
4. Commands for Calculating Measures of Central Tendency (mean, median, and mode, quantiles, ...)
5. Commands for Calculating Measures of Dispersion (range, variance, and standard deviation, etc).
6. Commands for Summarizing Statistical Data
7. Data Visualization Techniques:
 - a) Graphical representations: histograms, bar charts, pie charts.
 - b) Box plots and scatter plots for data visualization.

8. Hydrological and Hydraulic Modeling:

- a) Development of hydrological models using MATLAB.
- b) Hydraulic modeling for river flow simulation and flood analysis.

Assessment: Student evaluation will be based on practical assignments, individual projects and exams.