Course Name	Code\No.	Number of Credits			
		Theo.	Lab.	Train.	Credit
Hydrological Spatial Statistics	HWR 451	2	2	-	3
Pre-Requests	HWR 314				

Course Objectives:

The purpose of this course is to teach students how to deal with spatial data in hydrology, how to draw maps for a given hydrological phenomenon, and the ability to analyze and extract information form the maps on the computer.

Course Contents:

1. Spatial data: Types of data, how to present it graphically, uni-variate statistics.
2. Spatial relationships: Covariance, auto-covariance, autocorrelation, correlation length, variogram, and semi-variogram.
3. Modeling of the variogram: types of models, fitting a model to the experimental variogram using least square method.
4. Introduction to computer softwares in this field: how to input data, how to calculate basic statistics, etc.
5. Analysis of the variogram form the program: directional dependency (anisotropy), filtering the data, range calculation, choice of the convenient model.
6. Drawing maps: the methods available in the program. The Kriging method: theory and application. The advantage of Kriging.
7. Cross-validation.
8. Presentation of the results in 2 and 3D.

Course outcomes:

It is expected that the student will get the following knowledge and experience:

- How to present the spatial data in hydrology.
- Derivation of spatial statistical relationships between the data.
- Modeling variogrom by the method of least squires.
- Application of some software like "Surfer".
- Drawing maps of variables by Kriging method.
- Displaying results in 2D and 3D graphs.

Evaluation Method:

Student can be evaluated upon monthly exams, final exam and class homework, class discussions as well as lab experiments and lab reports.

References:

- Kitanidis, P. (1997). Introduction to geo-statistics: application to hydrogeology, Cambridge University press.
- Ripley, B.D. (1981). Spatial statistics, J. Wiley & Sons.
- Rubin, Y. (2003). Applied stochastic hydrogeology, Oxford University Oxford Press.