



## Course Syllabus: Data Analysis in Geosciences - ErSE 253

<b>Division</b>	Physical Science and Engineering Division
<b>Course Number</b>	ErSE 253
<b>Course Title</b>	Data Analysis in Geosciences
<b>Academic Semester</b>	Fall
<b>Academic Year</b>	2018/2019
<b>Semester Start Date</b>	08/26/2018
<b>Semester End Date</b>	12/11/2018
<b>Class Schedule</b> (Days & Time)	10:30 AM - 12:00 PM   Mon Thu

Instructor(s)				
Name	Email	Phone	Office Location	Office Hours
Ibrahim Hoteit	ibrahim.Hoteit@kaust.edu.sa	+966128080344		Tuesdays 16:00-18:00
Sigurjon Jonsson	sigurjon.jonsson@kaust.edu.sa	+966128080291	3136, 1, Al-Khwarizmi (bldg. 1)	Tuesdays 16:00-18:00

Teaching Assistant(s)	
Name	Email
TPD	TBD

Course Information	
<b>Comprehensive Course Description</b>	Processing of multidimensional data, spatial statistics including variogram, covariance analysis and modeling, multipoint estimation, spatial interpolation including statistical methods (kriging), time series analysis, uncertainty assessment, cross validation, multivariate analysis including principal component analysis and canonical analysis.
<b>Course Description from Program Guide</b>	Time Series (filtering, correlation, deconvolution, spectral analysis, regression), processing of multidimensional data, spatial statistics including variogram, covariance analysis and modeling, multipoint estimation, spatial interpolation including statistical methods (kriging) and dynamical methods (Kalman filter), uncertainty assessment, cross validation, multivariate analysis including principal component analysis and canonical analysis.
<b>Goals and Objectives</b>	Understand and apply spatial and temporal data analysis techniques to geophysical problems. Analyze space-time geophysical datasets. Space-time data fillings and predictions. Think critically about issues associated with the analysis of spatial and temporal data.
<b>Required Knowledge</b>	Undergraduate statistics, analysis and linear algebra Coding and Matlab programming
<b>Reference Texts</b>	Edward H. Isaaks and R. Mohan Srivastava, An introduction to applied geostatistics, Oxford University Press, New York, USA, (1989).

<b>Method of evaluation</b>	10.00% - Attendance and Participation 30.00% - Midterm exam 40.00% - Homework /Assignments 20.00% - Course Project(s)
<b>Nature of the assignments</b>	Written assignments Group project
<b>Course Policies</b>	Attend classes, participate in discussions, and read assigned material. No late homeworks.
<b>Additional Information</b>	

### Tentative Course Schedule

*(Time, topic/emphasis & resources)*

Week	Lectures	Topic
1	Mon 08/27/2018	Introduction to data analysis in geosciences and applied geostatistics
1	Thu 08/30/2018	Univariate and bivariate data description
2	Mon 09/03/2018	Spatial data description
2	Thu 09/06/2018	Exhaustive and sample data sets
3	Mon 09/10/2018	Sample data sets
3	Thu 09/13/2018	Spatial continuity
4	Mon 09/17/2018	Estimation
4	Thu 09/20/2018	Global and point estimation
5	Mon 09/24/2018	Kriging
5	Thu 09/27/2018	More kriging
6	Mon 10/01/2018	Cross validation
6	Thu 10/04/2018	Modeling sample variograms
7	Mon 10/08/2018	Co-kriging
7	Thu 10/11/2018	Estimating a distribution
8	Mon 10/15/2018	Change of support
8	Thu 10/18/2018	Assessing uncertainty
9	Mon 10/22/2018	Midterm exam
9	Thu 10/25/2018	Search strategies
10	Mon 10/29/2018	Principal component analysis
10	Thu 11/01/2018	More principal component analysis
11	Mon 11/05/2018	More principal component analysis
11	Thu 11/08/2018	Time series analysis
12	Mon 11/12/2018	Fourier and z-transforms
12	Thu 11/15/2018	Spectral analysis
13	Mon 11/19/2018	Aliasing
13	Thu 11/22/2018	Spectral leakage
14	Mon 11/26/2018	Time series processing
14	Thu 11/29/2018	Filtering
15	Mon 12/03/2018	Final project presentations
15	Thu 12/06/2018	Final project presentations
16	Mon 12/10/2018	No final exam in this course

**Note**

The instructor reserves the right to make changes to this syllabus as necessary.