COURSE CONTENT

Date	:	09 Mar, 2016
Academic Year	:	2016/2017
Study Year (if applicable)	:	3 and 4
Course Code & Title	:	ES4902 Geophysical Data Analysis
Academic Unit	:	3 AUs
Pre-requisite	:	ES2001 Computational Earth Systems Science
		AND
		MH1800 Calculus for the Sciences I or MH1802 Calculus for the Sciences/ MH1100 Calculus I/ CY1201 Calculus of One Variable / CY1601 Mathematics I
		AND
		MH1801 Calculus for the Sciences II or MH1802 Calculus for the Sciences / MH1101 Calculus II/ CY1202 Calculus of Several Variables / CY1602 Mathematics II
Co-requisite	:	NA
Mutually exclusive with	:	NA

Course Description :
This course provide training for a useful toolkit skills to analyze geospatial and time series data.

ES4902 Geophysical Data Analysis
[Lectures: 13 hours; Tutorials: 26 hours; Pre-requisites: ES2001 AND MH1800/MH1100/CY1201/CY1601 AND MH1801/MH1101/CY1202/CY1602; Academic Unit: 3.0]

Learning Objective
The main goal of this course is to provide students with a useful toolkit of skills that can be used to analyze your geospatial and time series data.

Content

We will cover ways to plot your spatial data using GMT, time-series analysis, probability, statistics, regression, and error analysis.

Week	Course Outline	Lecture	Tutorial
1	Introduction and Generic Mapping Tools	1hr lecture	2hr tutorial
2	GMT continued	1hr lecture	2hr tutorial
3	MATLAB or Python skills	1hr lecture	2hr tutorial
4	MATLAB or Python skills, continued	1hr lecture	2hr tutorial
5	Probability and statistics	1hr lecture	2hr tutorial
6	Probability and statistics, continued	1hr lecture	2hr tutorial
7	Error analysis and outlier detection	1hr lecture	2hr tutorial
8	Least squares and regression	1hr lecture	2hr tutorial
9	Time series analysis	1hr lecture	2hr tutorial
10	Time series analysis, continued	1hr lecture	2hr tutorial
11	Time series analysis, continued	1hr lecture	2hr tutorial
12	Class project	1hr lecture	2hr tutorial
13	Class project	1hr lecture	2hr tutorial

Learning Outcome

The students should understand basic mathematical and statistical concepts underlying data analysis in the Earth Sciences, and be able to critically evaluate the statistical significance of your and others' results.

Student Assessment

Students will be assessed by:

Class project and presentation (45%)

Each student will choose one of the following as class projects, including plot spatial and time series data using GMT, time-series analysis, probability, statistics, regression, and error analysis, or any relevant project a student think is helpful for his research and be approved by the lecturer. At the end of the class, the student is required to make a 15-20min presentation for the class project.

Labs and assignments (45%) (Assignments in hard copy)

All the students will do their labs and assignments on GMT, matlab, Fourier analysis and statistics, regression and error analysis.

Class participation and discussion (10%)

Students will be assessed on their active participation and oral contribution in class.

There will be no final exam. Memorizing facts is not as important for this material as understanding the general concepts and knowing where to look things up if you need them.

Resources /References

- Environmental Data Analysis with MATLAB, by Menke and Menke, 1st Edition, 2011, Elsevier, ISBN-13: 978-0123918864

- Data Reduction and Error Analysis for the Physical Sciences, by Bevington and Robinson, McGraw-Hill Education; 3rd edition, ISBN-13**:** 978-0072472271

- MATLAB Recipes for Earth Sciences, by Trauth, Springer; 2015 edition, ISBN 978-3-662-46243-0

- An Introduction to Error Analysis: The Study of Uncertainties in Physical Measurements, by Taylor, University Science Books, 2nd edition, ISBN 978-0-935702-75-0

- Geostatistics Explained, by McKillup and Dyar, 1st Edition, 2010, Cambridge University Press, ISBN-13: 978-0521746564

- Statistics of Earth Science data, by Borradaile, Springer; 2003 edition, ISBN-13: 978-3540436034

- The Fourier Transform and Its Applications 2nd Revised Edition by Ronald Bracewell ISBN 13: [9780070070158](9780070070158)

- GMT Technical Reference and Cookbook (free to download at http://gmt.soest.hawaii.edu/)

- The big library of MATLAB and Python books we have in the computer lab