ES4420

Professor:
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Office hours: TBA   .

Lectures: Two sessions, one hour each.
Computer Lab: One lab, three hours.

Course Goals: An introduction to potential theory and methods of interpreting geophysical data through the construction of forward models, optimization of misfit surfaces, and inversion. Students will learn to assess an individual data set and determine one or more appropriate ways to invert for the underlying geophysical sources.   The students will be familiar with various types and constructions of forward models and the appropriate optimization methods. In addition, the students should be fluent in the estimation and quantification of standard error sources.

Prerequisites: Calculus 2302A/B and 2303A/B.

Required Text: *Parameter Estimation and Inverse Problems,* Aster, Borchers, & Thurber.

Additional Sources:
Geophysical Data Analysis: Discrete Inverse Theory, Revised Edition, William Menke. Academic Press, 1989.
Numerical Recipes in C, Press et al.

Computing: Most of the assignments will require MATLAB and C or Fortran to complete.

Grading, ES4420:
Homework assignments - 8 assignments, each worth 5%, for a total of 40%
Midterm Exam - 30%. Covers the important mathematical basics – matrix algebra, probability, linear regression, discretization.
Final project – 30%, due on the final day of classes.

Late Policy: Homework assignments are due on the date specified on the assignment. 10% will be deducted for every day late. If you have exceptional circumstances, please contact Dr. Tiampo prior to the due date.

Electronic Devices: Computers, cell phones, music players and cameras will not be used during class time.

Syllabus (subject to revision):

Lecture No.	Subject
1	Introduction – Ch. 1 & Appendix A
2	Introduction to Geophysical Sources
3	Geophysical Sources, continued
4	Data and Error – HW Assig. 2
5	Data and Error – Ch. 2
6	Least Squares Theory – HW Assig. 3
7	Least Squares Theory – Ch. 3
8	Least Squares and L1
9	Discretizing Integral Equations – HW Assig. 4
10	Discretizing Integral Equations – Ch. 4
11	Ill-Posed Problems - HW. Assig. 5
12	Ill-Posed Problems
13	Rank Deficient Problems – Ch. 5; HW Assig. 6
14	Rank Deficient Problems – Hand out projects
15	Regularization – Ch. 9
16	Regularization - HW Assig. 7
17	Regularization
18	Nonlinear Regression – Ch. 10
19	Nonlinear Regression – HW Assig. 8
20	Nonlinear Regression
21	Nonlinear Inversions – Ch. 6
22	Nonlinear Inversions
23	Nonlinear Inversions – Final Project Due

Academic Honesty Statements:

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:
http://www.uwo.ca/univsec/handbook/appeals/scholastic_discipline_grad.pdf.

All required papers may be subject to submission for textual similarity review to the commercial plagiarism-detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the

licensing agreement, currently between The University of Western Ontario and Turnitin.com (http://www.turnitin.com).

Computer-marked multiple-choice tests and/or exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

Medical Issues:

For UWO Policy on Accommodation for Medical Illness and a downloadable SMC see:
http://www.uwo.ca/univsec/handbook/appeals/accommodation_medical.pdf
Students seeking academic accommodation on medical grounds for any missed tests, exams, participation components and/or assignments worth 10% or more of their final grade must apply to the Academic Counselling office of their home Faculty and provide documentation. Academic accommodation cannot be granted by the instructor or department.
For components or assignments worth less than 10%, individual arrangement will be made between the student and instructor.