

SCPY 633 - Geophysical Inverse Problems

Second Semester 2011, 3 Credits

Monday and Friday, 10:30 AM – 12:00 PM, Rm P620

Thursday, 1:30 PM – 3:00 PM, Rm 620

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Course Home Page: <http://geophysics.sc.mahidol.ac.th/chaiwoot/teaching/gip>

Text: Computational Methods for Inverse Problems, C. Vogel, SIAM, 2002

Geophysical Inverse Theory, R. L. Parker, 1994

Parameter Estimation and Inverse Problems, R. Aster, B. Borchers, and C. H. Thurber, 2005

Matlab codes can be downloaded from author's websites:

<http://www.math.montana.edu/~vogel>

<http://www2.imm.dtu.dk/~pch/Regutools>

Grading: Homework 60%, Project Proposal 10%, Final Project 30%

Course Outline: The course provides an introduction to methods of solution of ill-posed inverse and imaging problems, such as parameter estimation, signal processing, solution of integral equations, statistical inverse problems, ill-posed optimization problems, and identification of coefficients of partial differential equations. Applications are numerous, we will discuss formulations and examples of inverse problems in medical and geophysical imaging, non-destructive testing and image processing, optical imaging and inverse scattering, seismic imaging, frequency- and time-domain problems. The studied topics and techniques are deconvolution methods, ill-posedness, various regularization techniques, choice of regularization parameters, adjoint method, iterative methods for linear and nonlinear problems, statistical estimation, and variational methods. The course is addressed to senior undergraduate and graduate students in mathematics, science, and engineering. The lectures will be supported by numerous examples and most likely MATLAB based exercises.