ES 112/266: Practical Geophysics

Fall 2015

Meeting Times: T, Th 10-11:45 PM D226

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Course Goals: To build practical skills for analyzing real geophysical data. Matlab programming, Fourier analysis and data structures will be emphasized.

Required Software: MATLAB

You can purchase a student copy of matlab for $99. To purchase and download the student version of Matlab, go to the Mathworks store:
https://www.mathworks.com/store/default.do?s_tid=gn_store
Under "Products," click on the link for Student Software and follow the prompts. If you run in to trouble with your download, there is an FAQ page at: http://www.mathworks.com/academia/student_version/faq/#buyordownload

The student version has enough functionality for everything we are doing in this class and is useable after the class is over.

Please install matlab and be ready to use it in Tuesday's class.

Primary textbook (available via Amazon or bookstore): Stearns, S.D. *Digital Signal Processing with Examples in Matlab* CRC Press, 2nd edition, 2011.

Supplementary Reading: Press, W. et al., *Numerical Recipes: The Art of Scientific Computing*, Third Edition, Cambridge Univ. Press, 2007.

Prereqs: ES 110C (intro to geophysics) or equivalent

This course will have regularly assigned exercises, a midterm and a final, take-home exam. Exercises will often be started in class and due the following week (Usually Thursdays). IT IS VERY IMPORTANT THAT YOU BRING A LAPTOP WITH A STAND-ALONE MATLAB LICENSE INSTALLED TO EVERY CLASS TO DO THE PRACTICAL EXERCISES.

ES 266 is a graduate/capstone version of 112. It will be distinguished by more sophisticated assignments and collection of your own seismic data for analysis.

Grades:
50% Take-home assignments (Letter graded)
20% Midterm
30% Final

Collaboration Policy

You may choose to work together on problem sets. I **strongly encourage** you spend time discussing your course work with other students. You should always begin a problem set on your own and then meet up with your classmates to discuss your progress and stumbling blocks. Do not start a group study session with a blank problem set.

What you turn in must be your own work. In an intense collaboration, it is often hard to tell whose work belongs to whom. A good way to determine whether or not what you are submitting is your own is to ask yourself if you can reproduce the work without help. If I asked you to come to my computer and do the problem without any notes, would you be able to do it? This is the test we will apply if we are worried about a collaboration, so please be prepared to demonstrate your knowledge.

Preliminary Class Schedule
Sept. 24 Introduction – Matlab progams and functions; math review

Sept. 29/Oct. 1 Importing data and Least-squares fitting
Examples: Earthquake catalogs

Oct 6/8 Time series: discretization and frequency
Examples: Gravity and tides

Oct. 13/15 Fourier Transforms
Examples: More gravity and tides

Oct. 20/22 Power spectra/Matlab structures
Examples: Fault roughness

Oct. 27 Instrument responses
Oct. 29 Midterm

Nov. 3/5 Filters and Convolution
Examples: Global seismic data

Nov. 10 Cross-correlation
Nov. 12 – Seismometer deployment
Examples: Local seismograms

Nov. 17/19 Cross-correlation and significance
Examples: Induced Seismicity

Nov. 24. Linear models
Examples: Induced seismicity (again)

Dec. 1/3 Review
Dec. 7 Final Exam