

EART 266 Geologic Signal Processing and Inverse Theory -Spring 2011

Instructor: Susan Schwartz, sschwartz@pmc.ucsc.edu, E&MS A133

Meeting Times: T, Th 12:00-1:45 E&MS D250

Text: Material is drawn from several books, some that are listed on the attached sheet and should be used to supplement class notes as needed.

Course Work: Consists of ~5 homework assignments, take home final and class project

Course Goals: To establish the foundations of time series analysis and inverse theory as applicable to modern digital data in the Earth Sciences with an emphasis on seismology.

Schedule

T	3/29	Introduction
Th	3/31	Fourier Analysis I
T	4/5	Fourier Analysis II
Th	4/7	Discrete-Time Fourier Theory I
T	4/12	Discrete-Time Fourier Theory II
Th	4/14	Sampling Theorem
T	4/19	Digital Filters I
Th	4/21	Digital Filters II
T	4/26	Power Spectrum I
Th	4/28	Power Spectrum II
T	5/3	Inverse Theory I - solution to over-determined problems
Th	5/5	Inverse Theory II- solution to under-determined problems
T	5/10	Eigenvalue Problems
Th	5/12	The Generalized Inverse
T	5/17	Deconvolution I
Th	5/19	Deconvolution II
T	5/24	Research Applications I
Th	5/26	Research Applications II

T 5/31 Project Presentations

Th 6/2 Project Presentations

Helpful Texts:

Signal Processing:

Bracewell, R. (1986), *The Fourier Transform and its Applications*, McGraw-Hill, New York.

James, J. F. (1995), *A Student's Guide to Fourier Transforms: With Applications in Physics and Engineering*, Cambridge University Press), N.Y

Jenkins, G. M., and D. G. Watts (1968), *Spectral Analysis and its Applications*, 525 pp., Holden-Day, San Francisco.

Oppenheim, A. V., and R. W. Schaffer (1989), *Discrete-time Signal Processing*, Prentice Hall, Englewood Cliffs, N.J.

Percival, D. B., and A. T. Walden (1993), *Spectral Analysis for Physical Applications: Multitaper and Conventional Univariate Techniques*, Cambridge University Press, Cambridge.

Robinson, E. A., and S. Treitel (1980), *Geophysical Signal Analysis*, Prentice Hall, Englewood Cliffs, N.J.

Scherbaum, F. (2001), *Of Poles and Zeros: Fundamentals of Digital Seismology*, Kluwer Academic Publishers, Boston.

*Stearns, S.D. (2003), *Digital Signal Processing with Examples in MATLAB*, CRC Press. (used in this class during the last offering)

Inverse Theory:

Aster, R.C, B. Borchner, and C.H. Thurber, (2005), *Parameter Estimation and Inverse Problems*, Elsevier Academic Press.

Menke, W., (1989), *Geophysical Data Analysis: Revised Edition*, volume 45 of *International Geophysics Series*. Academic Press, San Diego.