# Syllabus: SIO 221C, Data Analysis Laboratory

Sarah Gille
*Class Meetings:* Tuesday and Thursday, 12:30-1:50, OAR 150 Conference Room
*SIO Office:* Nierenberg Hall 348
*Telephone:* 822-4425 *e-mail:* sgille@ucsd.edu
*Course website:* http://www-pord.ucsd.edu/∼sgille/sio221c
*Grading:* S/U

*Course Objectives:* Students refine data analysis skills by carrying out projects that employ specific techniques and by discussing data analysis problems with the group.

*Course requirements:* Complete 3 projects from list below. In order to keep everybody on the same page, the first project should involve spectral analysis, the second can be objective mapping or EOFs, and the third will be free choice (and may be arranged with instructor to be tailored to research). Each project is scheduled to take 3 weeks. Report on progress at each class meeting and discuss problems and possible solutions with the group. Written reports are submitted at the end of each project. In addition, to get started, you will read the draft chapter on data analysis from the revised edition of *Descriptive Physical Oceanography* and provide a written review. (You may work together on the review.)

Written reports should include text and figures, with sufficient detail to allow you and your classmates to reconstruct the work that you have done. Although you may wish to put together slides to present to the class, the presentation alone does not constitute a report. As in any scholarly writing, you must acknowledge your sources using proper scientific citations. (You may find useful resources on the web, that could prove difficult to cite formally, but please provide as much information as possible.) Your report should clearly indicate the specific sources of facts and opinions that you draw from other sources. You should also follow the strictest guidelines for quotation: if you draw more than three consecutive words verbatim from a source, place them in quotation marks and identify the source.

*Schedule:*

— Organization: September 25

— Project 1 (spectral methods): September 30, October 7, October 9, October 14, October 16, October 21 (Data analysis chapter review due October 7; written project reports due October 21)

— Project 2 (EOFs or objective mapping): October 23, October 28, October 30, November 4, November 6, November 13, (written reports due November 13)

— Project 3: November 18, November 20, November 25, December 2, December 4, December 9, (written reports due December 9).

No class meeting October 2 (travel), November 11 (Veterans' Day), November 27 (Thanksgiving Day).

*Projects*

- Time series and spectra
  - — Complex Demodulation

  - — Salinity Spiking
  - — Filtering and Assessing Resolution
  - — Wind-Driven Currents
  - — Wind-Driven Geostrophic Currents
  - — Wavelets
- Empirical Orthogonal Functions
  - — Empirical Orthogonal Functions
  - — EOFs with Missing Data
- Objective Mapping
  - — Objective Mapping
  - — Objective Mapping (with Anisotropic Decorrelation Functions)
  - — Geostrophic Velocity
- Other
  - — Box Inverse
  - — Probability Density Functions

**Texts on reserve for SIO 221C: Data Analysis Laboratory**

Bendat, J. S. and A. G. Piersol, 2000: *Random Data: Analysis and Measurement Procedures*. John Wiley & Sons, 3rd edition, 566 pp.

Bevington, P. R. and D. K. Robinson, 2003: *Data Reduction and Error Analysis for the Physical Sciences*. McGraw Hill, 320 pp.

Daley, R., 1991: *Atmospheric Data Analysis*. Cambridge University Press, 457 pp.

Emery, W. J. and R. E. Thomson, 2001: *Data Analysis Methods in Physical Oceanography*, 2nd edition. Elsevier, 638 pp.

Lawson, C. L. and R. J. Hanson, 1974: *Solving Least Squares Problems*. Prentice-Hall, 340 pp. (reprinted 1997)

Menke, W., 1989: *Geophysical Data Analysis: Discrete Inverse Theory*. Academic Press, 289 pp.

Noble, B., and J. W. Daniel, 1988: *Applied Linear Algebra*, 3rd edition. Prentice-Hall, 521 pp.

Parks, T. W. and C. S. Burrus, 1987: *Digital Filter Design*, Wiley, 342 pp.

Preisendorfer, R. W., 1988: *Principal Component Analysis in Meteorology and Oceanography*, Elsevier, 425 pp.

Press, W. H., B. P. Flannery, S. A. Teukolsky and W. T. Vetterline, 1986: *Numerical Recipes*. Cambridge University Press, 818 pp.

Strang, G., 1988: *Linear Algebra and Its Applications*. Academic Press, 3rd edition, 414 pp.

Strang, G., 1986: *Introduction to Applied Mathematics*. Wellesley-Cambridge Press, 758 pp.

Taylor, J. R., 1997: *An Introduction to Error Analysis*. University Science Books, 2nd edition, 270 pp.

von Storch, H. and F. W. Zwiers, 1999: *Statistical Analysis in Climate Research*, Cambridge University Press, 484 pp.

Wunsch, C., 1996: *The Ocean Circulation Inverse Problem*. Cambridge University Press, 442 pp.