

M,W - MWAH 249 - 3:00-3:50 pm

F – MWAH 249 – 3:00-4:50 pm

*Instructor:* Sergei Katsev                      *Phone:* 726-6057  
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*Office hours:* MW 4-5pm and whenever.    *Course web page:*  
<http://www.d.umn.edu/~skatsev/Phys5053.htm>

**Texts:**

- Bevington P.R. and Robinson D.K. Data Reduction and Error Analysis for the Physical Sciences (on reserve in library).
- Swan A.R.H. and Sandilands M. Introduction to Geological Data Analysis.
- Davis J.C. Statistics and Data Analysis in Geology.
- Taylor J.R. An Introduction to Error Analysis.
- Electronic Statistics Textbook: <http://www.statsoft.com/textbook/stathome.html>

**Course content:**

Methods for statistical description and analysis of data in natural sciences. Time series analysis, hypothesis testing, measures of uncertainty. Stochastic vs. deterministic (chaotic) components of dynamical models. Examples will cover a range of data analysis subjects in nonlinear dynamics, astrophysics, particle dynamics, physical oceanography, limnology, meteorology, climate science, geochemistry, and geology.

**Skill requirements:** Calculus. Experience with scientific software packages such as Matlab, Mathematica, Origin, or advanced functions in Excel. Basic programming skills.

**Grading:** Course grades will be based on these contributions and associated weights.

- Homework assignments - 30%
- Tests and short quizzes - 30%
- Project presentation and paper - 30%
- Class participation – 10%

Grades for most things will be assigned on a letter-grade basis and averaged in the end.

“A” means you have exceeded the expectations for the task with extra investigation or excellent and thorough work.

“B” means you’ve met the basic expectations of the exercise. The basic concepts have been understood well and the technical aspects of the exercise have been carried out to completion with no major mistakes.

“C” or worse means something was significantly wrong, incomplete, or inadequate.

*Note:* Because there is often an element of discovery left in the labs and exercises (and because this is a graduate course), the written statements of the assignments will not always indicate all the details that are necessary for their completion.

**Class participation:** Part of the course will involve discussion of the real-world data and reading scientific articles. Your active participation in the discussions and suggestions of topics and datasets is strongly encouraged. This is your contribution towards making the course relevant and interesting. Discussion of homework problems with classmates is permitted and encouraged; however, all work turned in must be your own, i.e. you should be able to present and explain it.

**Project:** By the end of October, you will be required to write a one to two page proposal for the project that will occupy your efforts for the final four weeks of this course. The project is intended to be a real scientific exploration and should naturally involve analysis of some real-world (or, in rare cases, computer-generated) data. You will present the results in class and will write a report on your investigations.

**Homework and lab reports:** Homework and lab reports should demonstrate the knowledge of the relevant physical and mathematical concepts and the mastery of the analysis techniques. The reports should be self-sufficient: it should be clear what was done, why, and how. Writing should be concise; explanations should be as simple as possible, but not simpler. Visualize with diagrams and plots whenever possible. When dealing with algebraic calculations, work the problems symbolically as far as possible, plugging in numbers in the end. Needless to say, show units for all dimensional variables, including those in the data plots.

***Students with disabilities:** It is the policy and practice of the University of Minnesota Duluth to create inclusive learning environments for all students, including students with disabilities. If there are aspects of this course that result in barriers to your inclusion or your ability to meet course requirements – such as time limited exams, inaccessible web content, or the use of non-captioned videos – please notify the instructor as soon as possible. You are also encouraged to contact the Office of Disability Resources to discuss and arrange reasonable accommodations. Please call 218-726-6130 or visit the DR website at [www.d.umn.edu/access](http://www.d.umn.edu/access) for more information.*