AS 209 January 3:0

Mathematical Methods in Climate Science

Instructor

V. Venugopal
Email: venu@iisc.ac.in

Teaching Assistant

Email:

Department: Centre for Atmospheric and Oceanic Sciences

Course Time: MWF: 2:30-3:30

Lecture venue: CAOS Seminar Hall

Detailed Course Page:

Announcements

Brief description of the course

The course can be taken by students from any engineering streams. The course covers the fundamentals of probability and statistics and time-frequency methods (mainly Fourier transforms) and how they can be used in atmospheric and oceanic sciences. The methods discussed in class can be applied to a variety of fields (earth sciences, civil engineering). In the past, students from Ecology and Biochemistry have registered for the course.

Prerequisites

Familiarity with calculus

Syllabus

â€¢ PROBABILITY AND STATISTICS

â€“ Discrete and Continuous Random Variables

â€“ Derived Distributions

â€“ Distributions of Sample Statistics

â€“ Confidence Intervals

â€“ Hypothesis Testing

â€“ Goodness-of-Fit Tests

â€¢ TIME-FREQUENCY/TIME-SERIES ANALYSIS

â€“ Fourier Transforms

â€“ Principal Component Analysis (if time permits)

Course outcomes

The desirable outcome is that students learn when and how to apply different apporaches in probability and statistics, and time-frequency analysis, to atmosphere-ocean datasets (both observed and model simulations). At the end of the course, they also should be able to grasp more advanced techniques available for observational analysis.

Grading policy

20% Assignments

15% each for Two Mid Term Exams

50% for Final

Assignments

Resources

â€¢ Papoulis, A., and U. Pillai, Probability, Random variables and Stochastic Processes, McGraw Hill, Fourth edition, 2002. (See also http://www.mhhe.com/engcs/electrical/papoulis/)
â€¢ Ross, S., Introduction to Probability and Statistics for Engineers and Scientists, Elsevier, Fourth edition, 2009 (or Third edition, 2005).
â€¢ Benjamin, J. R., and C. A. Cornell, Probability, Statistics and Decision for Civil Engineers, McGraw-Hill, First Edition, 1970.
â€¢ Wilks, D., Statistical Methods in the Atmospheric Sciences, Academic Press, Second Edition, 2006.
â€¢ Brigham, O. E., The Fast Fourier Transform, Prentice Hall, First Edition, 1974.
â€¢ Press, W. H., S. A. Teukolsky, W. T. Vetterling, and B. P. Flannery, Numerical Recipes in C/Fortran: The Art of Scientific Computing, Cambridge University Press, Third Edition, 2007.