UNIVERSITY OF CENTRAL FLORIDA
Department of Mathematics

Spring 2007

Course:	MAS 3930H.201 "Weather Prediction"
Class Meets:	BHC 129, 6:00 a.m. - 8:50 p.m., M
Instructors:	Dr. S. Roy Choudhury / Dr. Marianna Pensky
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Office Hours	Dr. Choudhury: MW 9:00 -10:30 a.m., M 4:00-5:00 p.m., F 9:00-10:00 a.m. Dr. Pensky: TR 9:30 - 11:30 a.m., M 4:00-5:00 p.m.
Textbook:	Kalnay, E. "Atmospheric modeling, data assimilation and predictability" Cambridge University Press, Cambridge, 2003.
Supplementary Texts:	Daley, R. "Atmospheric data analysis", Cambridge University Press, 1991 Cox, J. "Storm watchers : the turbulent history of weather prediction from Franklin's kite to El Niño." Wiley, 2002.

Course Contents. In this course we shall consider various issues in weather forecasting. Weather forecasting starts with two major components: construction of the model for the atmosphere and carrying out observations. The state of the atmosphere (temperature, wind and humidity at different locations) is described by a very complex system of differential equations. They cannot be solved exactly since the set of boundary and initial conditions is not completely specified. In order to address these challenges, special statistical methods have been developed which are known as data assimilation. Data assimilation provides a way to combine the models and observations effectively for the estimation of the present state of the atmosphere.

Topics. The history of weather prediction. Early scientific developments of weather prediction. Introduction to topics in applied mathematics and statistics (differential and difference equations, matrix manipulations, probability, Bayes theorem, estimation theory, statistical modeling and simulations). Weather model systems. Discretization and numerics. Motivation for data assimilation. Methods of data assimilations. Successive correction and variational approaches to data assimilation. Statistical methods of data assimilation. Bayesian approach. Statistical filtering. Atmospheric predictability and weather forecasting.

Course Policy and Assignments: There will be three long homeworks for the course and one group project. Group projects will be graded in two ways. Students will give presentations in class (grade 1), and then the written portion of the project (project report) will be due by the time of the final exam and will play the role of such. There will be no in-class tests or an in-class final exam associated with the course. This is due to the very interdisciplinary nature of the course, as well as its purpose of exposing students to the nontrivial art of weather prediction rather than teaching them just a well-defined set of skills.

Grading : Each homework will constitute 20% of the overall grade, oral presentation of the project will be worth 20% of the grade, and the project report will account for the balance 20%.

Grade scale:
90-100 % – A
75-89 % – B
60-75 % – C
50-59 % – D
< 50 % – F

Withdrawal deadline: March 2
Holidays: January 15, March 12 -17 (Spring break)