Syllabus for ATMS 373 – Applied Numerical Modeling – Fall 2007

Date	Topic	Reading/Homework*
T 21 Aug 2007	Introduction/ Overview	
R 23 Aug	Overview & History	Chapter 1 & Appendix A
T 28 Aug	Overview	
R 30 Aug	Continuous Equations	Kalnay 2.1-2.5
T 4 Sep	"	
R 6 Sep	"	
T 11 Sep	Discretization of the Continuous Equations	Kalnay 3.1-3.3.5, 2.6, Activity #1 due
R 13 Sep	"	
T 18 Sep	"	
R 20 Sep	"	Activity#2 due
T 25 Sep	"	
R 27 Sep	"	Activity#3 due
T 2 Oct	"	
R 4 Oct	Lecture/Review	Activity#4 due
R 11 Oct	Exam I	Kalnay Ch 1, 2.1-2.6, 3.1-3.3.5, Activity#1-#4, lecture notes through 4 Oct
T 16 Oct	Boundary Conditions	Kalnay 3.4, 3.5
R 18 Oct	"	Activity#5 due
T 23 Oct	Model Physics	Kalnay Ch. 4
R 25 Oct	"	Activity#6 due, *Final Project Plan Approval*
T 30 Oct	"	
R 1 Nov	Data Assimilation	Activity#7 due, Kalnay Ch. 5
T 6 Nov	"	
R 8 Nov	"	
T 13 Nov	"	Activity#8 due
R 15 Nov	Predictability and Ensemble Forecasting	Kalnay Ch. 6, Activity#9 due
T 20 Nov	"	
T 27 Nov	"	
R 29 Nov	Final Project Presentations	Final Project due
Finals Week	Exam II	Kalnay 3.4, 3.5, Ch. 4 – 6, Activity #5-#9, lecture notes from 16 Oct – 27 Nov

*assignment completed before class meets on this date

Description

"LONG TERM (THURSDAY NIGHT THROUGH MONDAY)...
LOW CONFIDENCE CONTINUES THOUGH THE EXTENDED PERIOD WITH MEDIUM RANGE MODELS STILL ALL OVER THE PLACE REGARDING UPPER LOW MOVING OUT OF THE PLAINS AND TOWARD THE N GULF STATES LATE IN THE WEEK. THE LATEST GFS IS STILL SHOWING THE UPPER LOW REMAINING CLOSED OFF AND NEARLY STATIONARY OVER THE N GULF THROUGH THE WEEKEND. HAVE STUCK TO PREVIOUS PACKAGE WITH THE EXCEPTION OF ADDING A SOLID CHANCE POP TO SAT."

As weather forecasters, we rely heavily on numerical weather models to aid in making our short- and long-term forecasts (see above quote). Unfortunately, we believe their predictions all too readily because we don't understand when they work and when they don't. This course is intended to give the student a basic introduction to numerical weather prediction and should assist the student in evaluating model-derived forecasts with a critical eye.

Outline

- Introduction
  - Overview of course
  - History of NWP [Kalnay Ch. 1]
- Continuous Equations
  - Kalnay 2.1-2.5
- Discretization of the Continuous Equations
  - Kalnay 3.1-3.3.5, 2.6
  - Krish. & Boun. Ch. 2
- Boundary Conditions
  - Kalnay 3.4, 3.5
  - Krish. & Boun. p. 70-92
- Model Physics
  - Kalnay Ch. 4
  - Krish. & Boun. Ch. 6-9
- Data Assimilation
  - Kalnay Ch. 5
  - Krish. & Boun. Ch. 5
- Predictability and Ensemble Forecasting
  - Kalnay Ch. 6
- WRF Model Fundamentals {time permitting}
  - Initialization
  - Simulation
  - Post-processing

Grading

Activities	20%
Daily Model Brief	10%
Exam I	20%
Exam II	20%
Final Project	30%
Total	**100%**

92% < total score ≤ 100%	A
90% < total score ≤ 92%	A-
88% < total score ≤ 90%	B+
82% < total score ≤ 88%	B
80% < total score ≤ 82%	B-
78% < total score ≤ 80%	C+
72% < total score ≤ 78%	C
70% < total score ≤ 72%	C-
68% < total score ≤ 70%	D+
60% < total score ≤ 68%	D
total score ≤ 60%	F

Activities

Activities (both in-class and at-home) will be assigned throughout the semester and are intended to aid in improving your understanding of the course material contained in the lecture and reading assignments. Activities will be defined as *individual* or *group* assignments. When an assignment is designated for a *group*, each individual within the group will receive an identical grade.

Daily Model Brief

Each student will be responsible for giving discussions on the weather of the day and how atmospheric models are being used by operational centers and weather offices (HPC, SPC, NWS) to make their weather forecasts. Each discussion should include a brief background description of the current weather for CONUS and focus primarily on how the operational forecasters are using the models [e.g. Is there a clear-cut "model-of-choice"? If so, do we know why the forecasters made it the MOC? Is there a discussion about model continuity in their discussion? If so, how do the forecasters use the notion of model continuity in their forecast?] Do the forecasters list any inadequacies of the models? If so, what are they?

Exams I and II

The mid-term exams (I and II) will be primarily testing new material introduced since the previous exam or since the start of the semester. Exam II will be taken during Final Exams week and will test the material given during the second half of the semester.

Final Project

Each student will be part of a research team responsible for completing an in-depth activity related to boundary conditions, numerics, data assimilation, model physics, modeling, or ensemble forecasting. The final project idea must meet the approval of the instructor by 25 October 2007. A presentation and write-up will be required as part of the final project. Details of the presentation and write-up will be given after 25 October. The final project is due on 29 November 2007.

Assignment/Quiz/Exam Policy

Assignments are to be handed in before the start of lecture on the date they are due. Assignments handed in after the start of lecture are considered late until 5:00 pm on the date they are due and will be have an automatic 10% deduction from their final score. Assignments handed in after 5:00 pm on the date they are due will receive no credit.

Quizzes and Exams are written tests and will be taken on the date they are scheduled, unless circumstances (e.g. medical or loss in the family) warrant. Make-up quizzes and exams for special circumstances will consist of an individual oral graded question and answer session at a mutually agreed upon time outside of the usual class meeting time.

Instructor

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Textbook

"Atmospheric Modeling, Data Assimilation and Predictability" by Eugenia Kalnay

Reference

"An Introduction to Numerical Weather Prediction Techniques" by T.N. Krishnamurti and L. Bounoua

"Numerical Prediction and Dynamic Meteorology" by G.J. Haltiner and R.T. Williams

Disabilities

Contact Prof. Miller early in the course if you have a disability that requires special accommodations.

Academic Integrity

Cheating or plagiarism results in a failed assignment, quiz, or exam on the first infraction. A second infraction results in course failure and a report to the UNCA administration. See http://www.unca.edu/catalog/academicregs.html under "Student Responsibilities" for a refresher on the UNCA policy.