

Department of Atmospheric Sciences

COURSE ANNOUNCEMENT – SEMESTER I – 2002–03

ATMOS 406: Dynamical Weather Prediction

(Same as CSE 467)

Call Number: 00940

Instructor: Professor M. Ramamurthy, 111 Atmos. Sci. Bldg., 333-8650

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Room and Time: 109 Atmos. Sci. Bldg., 9:00–10:15 a.m. Tu Th

Credit: 1 unit

Prerequisites: ATMOS 302

This course introduces the principles of numerical modeling and prediction of atmospheric motions. Several computational techniques will be reviewed, along with procedures for incorporating different physical processes. We will examine different methods of model initialization and review current operational and research NWP models. In addition, students will gain hands-on experience with some of these models.

Course Outline:

1. **Introduction:** Map projections, vertical coordinates, and modern observing systems.
2. **Numerical methods:** Finite difference methods, grid staggering, stability analysis, economical schemes, elliptic and parabolic equations, and spectral methods.
3. **Filtered and primitive equation models:** The barotropic model, shallow water model, and PE model.
4. **Data Assimilation:** Objective analysis methods, geostrophic adjustment, initialization of primitive equation models, and 4-dimensional data assimilation techniques.
5. **Parameterization of physical processes:** Large-scale condensation, parameterization of sub-grid scale processes such as convection, surface and planetary boundary layer processes, microphysical parameterization, and radiation.
6. **Model sensitivities and performance:** Predictability, model sensitivities, ensemble forecasting, and adaptive observations.

Text: *Numerical Prediction and Dynamic Meteorology.* G. J. Haltiner and R. T. Williams, 2nd Ed., John Wiley & Sons, Inc., New York, 1980, (Recommended).

Numerical Methods for Wave Equations in Geophysical Fluid Dynamics. Dale R. Durran, Springer Verlag, 1999, (Highly recommended).