Instructor: Dr. Xuguang Wang (xuguang.wang@ou.edu)

When and where: Tuesday and Thursday 10:00-11:15am, NWC 5720

Office hours: Tuesday and Thursday 11:15-12:15am, NWC 5341

Prerequisites: MATH 3113 (ODE), 4163 (PDE), and 3333 (linear algebra); ENGR 3723 (numerical methods) or equivalent or permission of instructor. Programming experience is useful. Not limited to Meteorology students.

Reference texts:

- Course notes.
- Selected journal articles.

Grading policy:

- In-class exams (40%): Mid-term exam (15%), Final exam (25%)
- 4 Homework assignments (40%), due in class two weeks after assigned
- In-class presentation/short paper (20%)

Objectives:

The course is designed to introduce students to the world of ensemble Kalman filter data assimilation technique (EnKF), an advanced data assimilation method that has become popular in Meteorology, hydrology, Ecology, etc. The students will learn the most popular EnKF techniques through lectures and hands-on project assignments, and learn the EnKF applications in different fields through in-class presentations and discussions. The students will not only learn various EnKF techniques and their applications, but also develop their skills in scientific thinking and synthesis, written and oral communication throughout the course.

Tentative topics:

- Basic concepts of data assimilation
- Mathematical preparation: matrix algebra
- Least square and Bayesian contexts
- Brief review of statistical interpolation, 3DVAR and 4DVAR
- Classic Kalman filter and Extended Kalman filter
- Basic concepts of Ensemble Kalman filter
- Ensemble Kalman filter with perturbed observations
- Ensemble square root filter
- Local Ensemble Transform Kalman filter
- Common problems and treatments in ensemble Kalman filters
- Ensemble smoother and other special topics
- Guest lectures
- Applications of ensemble Kalman filters: Student power point presentations of papers on EnKF applications

Notes:

1. Homework assignments require programming.
2. In-class presentation includes reviewing the paper (critically), present the paper, lead discussion, and write a summary.

The University of Oklahoma is committed to providing reasonable accommodation for all students with disabilities. Students with disabilities who require accommodations in this course are requested to speak with the professor as early in the semester as possible. Students with disabilities must be registered with the Office of Disability Services prior to receiving accommodations in this course. The Office of Disability Services is located in Goddard Health Center, Suite 166, phone 405/325-3852 or fax only 405/325-4173.

All students are expected to be familiar with and abide by the OU Academic Misconduct Code. Information on this code and other student policies is located at http://www.ou.edu/studentcode.