

## ATM515 **Aerosol Physics**, Spring 2006

Instructor: Dr. Fangqun Yu; CESTM-L208, (518) 437-8767; yfq@asrc.cestm.albany.edu

**Time & Room:** MW 02:45PM - 04:05PM ES0325 (→ CESTM L312)

**Office Hour:** The door is always open or by appointment

**Prerequisite:** Physics; Differential equations

### Course Description:

This course will introduce the aerosol fundamentals, the physical processes controlling the properties of aerosols in the atmosphere, and the climatic, chemical, and health effects of atmospheric aerosols. Some recent research advancement in the fields relevant to aerosol physics will be covered as well.

### Text Book/References:

**Atmos. Chem. and Phy.** - Seinfeld & Pandis  
Selected chapters from other books  
Recently published journal papers

### Grading Criteria

Home work: 40 % (~ 5 assignments)  
Mid-term exam: 25 % (earlier April)  
Term project and oral presentation: (20+15%)

### Introduction, Characterization of Aerosols

- Overview (1)
- Size distributions and statistics; Moment representation; Shape, fractal description (2)

### Environmental Effects of Atmospheric Aerosols

- Climate effect: Tropospheric aerosols; Aerosol direct and indirect radiative forcing; Aerosol-cloud-climate interaction (1-2)
- Chemical effect: Stratospheric aerosols; Heterogeneous reaction, PSCs and ozone hole (1)
- Health effect: Urban aerosols; Ultrafine particles; Medical study; EPA PM standard (1-2)

### Aerosol Physics

- Dynamics of single aerosol particles (Stokes' law, Brownian motion, deposition, effect of external forces) (3)
- Thermodynamic of aerosols (Basic principles, equilibrium, Kelvin/solution/charge effects) (2)
- Nucleation – from molecular clusters to nanoparticles (Theories, laboratory studies, and field measurements) (3)
- Condensation/evaporation (Diffusion, mass transport, kinetic/transition/continuum regimes) (1)
- Dynamics of aerosol populations (Coagulation) (2)
- Aerosol modeling (Dynamic equ, numerical schemes, box model, 3-D model, case study) (3)

### Other Relevant Topics

- Organic aerosols (Components, sources, properties) (1)
- Nanoparticle technology and emerging applications (1)
- Aerosol sampling and measurement techniques (Mass, number, size, composition) (1)