Instructor: Prof. Marat Khairoutdinov  
Office hours: by email appt; Endeavour 121  
Email: marat.khairoutdinov@stonybrook.edu  
Class website: TBA

**Learning Objectives**

- Apply the laws of physics to a variety of atmospheric phenomena and processes  
- Explain cloud and precipitation processes with emphasis on the microphysics, atmospheric electricity, solar and terrestrial radiation, photochemical processes, and boundary layer heat and mass transfer

**Textbooks**
The class does not strictly follow any textbook; therefore, it is important not to skip classes and take notes. The following books are helpful, but optional:

- "Atmospheric Science" by J. Wallace and P. Hobbs, Academic Press, 2nd edition; some of you probably still have it from other classes.

- "A Short Course in Cloud Physics" by R.R. Rogers and M.K. Yau, 3rd edition – recommended if you want to become an atmospheric scientist.


- All class-presentation slides and notes on various subjects will be posted on the class website (the link is above).

**Grading**
25% Homework; 70% Exams (total of three); 5% class participation; no final exam.  
Unexcused absence - minus 3%; late by more than 15 min - minus 2%  
Grade conversion: A: >90, B+: 86-90, B: 76-85, C+: 70-75, C: 65-70; Failed if <65  
The final score can be adjusted upward depending on overall performance and activity at the class.

**Policies**
Homework is handed out biweekly or so, and is usually due in one week. After the due date, homework can be turned in for 50% credit. Homework can be discussed with other students; however, each student is expected to write the solutions
independently. If you copy the solution/answer from the web, make sure to at least change the wording. Intentional use of phones during the lecture is prohibited. No one is allowed to simply leave the classroom, for bathroom or any other reasons, without my explicit permission.

Outline (approximate as I may adjust some topics as we go):

Introduction
Structure of the atmosphere; hydrostatics; static stability; buoyancy; dry adiabatic lapse rate.

Cloud Physics
Clausius - Clapeyron equation. Moist variables.; Saturation over water and ice; Moist adiabatic lapse rate; Cloud formation; Types of clouds; conditional instability; Convection; Saturation over curved surface; Homogeneous Condensation of Water Vapor; Heterogeneous nucleation; Cloud Condensation Nuclei; Diffusional growth of droplets; Growth of population of droplets; Microphysics of Warm Clouds; Formation of Precipitation in Warm Clouds; Microphysics of Cold Cloud; Formation of Precipitation in Cold Clouds; Weather Modification and Cloud Seeding; Thunderstorm Electrification;

Turbulence and Atmospheric Boundary Layer
Dimensional analysis; Statistical Description of Turbulence; Clouds and Entrainment; Surface Energy Balance and Fluxes; Soil; Vertical Structure of PBL; Evolution of PBL over Land; Surface Effects on PBL; Marine Boundary Layers; Effects of Vegetation;

Atmospheric Radiation
Spectrum of radiation; Blackbody Radiation; Scattering and Absorption; Reflection and Refraction; Cloud Radar; Radiances and Fluxes; Radiative Transfer; Earth Radiation Budget; Greenhouse effect; Radiation and Climate; Climate Change; PaleoClimates

Americans with Disabilities Act . If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disability Support Services, ECC (Educational Communications Center) Building, room 128, (631) 632-6748. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential. Students requiring emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. For procedures and information, go to the following web site. http://www.ehs.sunysb.edu/fire/disabilities/asp

Academic Integrity Statement
Each student must pursue his or her academic goals honestly and be personally
accountable for all submitted work. Representing another person’s work as your
own is always wrong. Any suspected instance of academic dishonesty will be
reported to the Academic Judiciary. For more comprehensive information on
academic integrity, including categories of academic dishonesty, please refer to the
academic judiciary website at http://www.stonybrook.edu/uaa/academicjudiciary/
Adopted by the Undergraduate Council September 12, 2006

Critical Incident Management:
Stony Brook University expects students to respect the rights, privileges and
property of other people. Faculty are required to report to the Office of Judicial
Affairs any disruptive behavior that interrupts their ability to teach, compromises
the safety of the learning environment, or inhibits students’ ability to learn.