Course Description
This course focuses on the atmospheric chemistry of aerosols. It covers the chemical and physical processes that lead to the formation of aerosols and the role of aerosols in climate, marine biogeochemistry, ecosystems, and human welfare including health. Listed below is the course outline.

OVERVIEW: AEROSOLS - THE GLOBAL VIEW
- Effects of atmospheric aerosols
- Global aerosol distributions
- Large scale temporal and spatial variability
- Temporal trends
- Satellite imagery
- Relation to meteorology
- Global aerosol concentration and composition characteristics
- Major aerosol components: S, N, sea-salt, mineral aerosol, black carbon, organic species

OVERVIEW: AEROSOL PHYSICAL/ CHEMICAL PROPERTIES.
- Aerosol chemical properties: size and optical properties
- Aerosol chemical properties: size and composition; relation to physical properties
- Aerosol dynamics and processes: physical and chemical processes, aerosol formation, growth, and removal
- Aerosol-cloud interactions
- Aerosol measurement techniques: physical and chemical analysis of aerosol parameters, including size, composition as a function of size, optical properties - emphasis on temporal/spatial variability and relation to meteorological processes

DETAILED STUDIES
- Sources, process, and removal — global cycle
- Aerosol size distribution trends — processes
- Deposition to and impacts on ocean processes
- Long-term trends — ice cores

Mineral aerosols (dust)
- Dust and climate: large scale transport; long-term trends (from sediments/ice cores).
- Dust & biogeochemistry of oceans: dust sources & composition and physical properties; relation to sediments; ice cores; Impact on ocean water column processes (i.e., nutrient inputs - nitrogen species, trace elements such as Fe)

Marine aerosols
- Types: primary sea-salt aerosols and secondary marine aerosols (sulfur and iodine)
- Formation (bubble processes and chemical transformation)
• Distribution; temporal/spatial variability of concentration, size
• Role in chemical fractionation
• Role in climate change

**Black carbon:**
• Composition, sources, properties, distribution

**Organic aerosols:**
• Primary and secondary organic aerosols
• Composition, sources (terrestrial vs. ocean), physical properties
• Secondary organic aerosol formation
• Element carbon/organic carbon (EC/OC)

**Volcanic aerosols**
• Sources, size, composition, effects
• Influence in stratosphere (large eruptions)
• Influence in troposphere (small eruptions and degassing)

**Meteoritic:**
• Extra-terrestrial dust
• Stratospheric aerosols

**Radioactive aerosols:**
• Be-7, Be-10, Pb-210, Rn-222, etc
• Temporal and spatial variability
• Use as tracers for transport/removal

**Special topics**
• Biomass burning: chemical/physical/optical properties; radiative forcing
• Arctic and Antarctic aerosols: sources, chemical composition
• Hg pollution: forms, effects, global circle, Hg issue in FL
• Acid precipitation: formation, effects, spatial distribution, process synthesis
• Intercontinental transport and air quality impacts
• Global chemical transport models: transport, chemistry, emissions, deposition; aerosol operator; model evaluation

**TEXT BOOKS & REFERENCE SOURCES**
The material will be drawn from several text books. It is NOT necessary to purchase these:

In addition, extensive use of journal literature will be made.