

Department of Atmospheric Sciences

COURSE ANNOUNCEMENT – SEMESTER II – 2005-2006

ATMOS 511: Atmospheric Radiation

Call number: 43704

Instructor: Professor M. Schlesinger, 208 Atmos. Sci. Bldg., 333-2192,

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Room and Time 109 Atmos. Sci. Bldg.; 2 p.m. M W F

Credit: 4 hours or 1 unit

Prerequisites: ATMOS 401

This course will present the physical processes by which radiant energy is emitted, absorbed, scattered and transmitted through planetary atmospheres. Applications will include the calculation of radiative transfer and heating rates for weather-prediction and general-circulation models.

Course Content:

Fundamentals of Radiation

Spectrum of radiation; concepts, definitions, units; the laws of Beer, Kirchhoff, Planck, Wien and Stefan-Boltzmann; the Schwarzschild equation; applications to energy-balance problems.

Absorption and Emission

The Schrödinger wave equation and quantum mechanics; atomic energy levels, molecular energy levels; structure of absorption bands; principal absorption bands in the earth's atmosphere.

Infrared Radiation Transfer in the Atmosphere

Infrared radiative transfer equation and its solution by band models; parameterization in the UIUC atmospheric general circulation model.

Solar Radiation

The Sun, its spectrum and irradiance; distribution at the top of the atmosphere; ultraviolet, visible and infrared absorption in the ionosphere, thermosphere, mesosphere, stratosphere and troposphere.

Scattering in the Atmosphere

Rayleigh scattering; Mie scattering; multiple scattering equation and its solution; parameterization in the UIUC atmospheric general circulation model

Text: None