Universidad de Buenos Aires
Facultad de Ciencias Exactas y Naturales

1.- NOMBRE DEL CURSO: The Interdisciplinary Science of Climate Changes: Basic Elements.

2.- DOCENTES:

RESPONSABLE/S: Dr. Isidoro Orlanski, Dra. Carolina Vera

Investigadores Invitados: Dres. F. Giorgi del Abdus Salam Internacional Center for Theoretical Physics (ICTP, Italia), y los Dres. G. Philander, H. Levy, V. Ramaswamy del Geophysical Fluid Dynamic Laboratory (GFDL, EEUU)

3.- CARRERA de DOCTORADO y/o POSGRADO./EXTENSIÓN: Carreras de Doctorado y/o Postgrado en Ciencias de la Atmósfera y los Océanos, en Física, en Química Inorgánica y Analítica, en Matemática, en Ciencias de la Computación

4.- AÑO: 2007 CUATRIMESTRE/S: 1ro.

5.- PUNTAJE PROPUESTO PARA CARRERA DE DOCTORADO: 5

6.- DURACIÓN (anual, cuatrimestral, bimestral u otra): otra

7.- CARGA HORARIA SEMANAL:

Teóricas:..... 20 hs
Problemas:.....
Laboratorio:..... 15 (Computación)
Seminarios:..... 24 hs (1 vez)
Teórico – Práctico:...
Salida a Campo:.....

8.- CARGA HORARIA TOTAL: 129 hs

9.- FORMA DE EVALUACIÓN: Aprobación de Trabajos Prácticos, Examen Final.

10.- ARANCEL: 20 módulos.

11. PROGRAMA ANALÍTICO:

El curso se dictará en inglés y cubrirá temas que son básicos para el entendimiento del cambio climático.

1- Radiation and Climate Change: Introduction to the properties and composition of the atmosphere. Basic radiation quantities. Laws governing radiation transfer. Absorption and emission by gases, and formulations. Longwave radiative transfer in vertically inhomogeneous atmosphere. Solar properties of atmospheric constituents. Scattering and transmission of radiation. Solar radiative transfer in the atmosphere-surface system.

Cs. ATMOSFERA 2007
(1)

Natural and anthropogenic radiative forcing of the climate system due to greenhouse gases, aerosols and clouds; changes in land-use and solar output. Radiative and radiative-convective equilibria. Applications to the greenhouse gas and aerosol-induced climate change. Satellite observations of the global climate system. Diagnosing the climatic impacts due to greenhouse gases, aerosols and clouds using observations and models.

2- Mechanisms for Climate Variability and Change: Classical approximations for a geophysical fluids on planetary scales. The Boussinesq, hydrostatic and quasi-geostrophic approximations. Equations of motions, conservation of angular momentum and potential vorticity. Planetary waves. Baroclinc and barotropic waves, Rossby waves Forced waves and instabilities. The General Circulation of the Atmosphere. The meridional circulation, the Hadley cell and Ferrel cells, storm tracks. Quasi-stationary Response of the Atmosphere. Major responses, ENSO, PNA NAO AAO. Coupling of the global system, toy models. Ocean forcing, atmospheric response and its feedback, Simple El Nino models: the delay oscillator.

3- Models for Climate Change: Survey of development and research with simple and complex (three-dimensional) climate models. Environmental processes and their numerical representation in climate models; evaluation of model sensitivity and accuracy; coupling between atmosphere, biosphere, hydrosphere, and cryosphere; assessment of model predictions for climate change. Applications to paleoclimate and future climate scenarios

4- The Chemistry of Greenhouse Gases: Evolution of the Earth's Atmosphere and Present. Composition. Atmospheric Tool Box - Pressure, Column Density, Temperature and Thermodynamics. Solar Flux, Beer-Lambert Absorption, Rayleigh Scattering, and Photodissociation. Stratospheric Ozone: Chapman Chemistry and Basic Chemical Kinetics, Catalytic Destruction Cycles for Ozone, NOx, HOx and CLOx. Descriptive Stratospheric Transport, Photochemistry vs. Transport Stratospheric Ozone Loss, History. Antarctic Ozone Hole, Heterogeneous Chemistry. Tropospheric Chemistry, Oxidizing Power of the Tropospheric, the Hydroxyl Radical (OH), Odd-Hydrogen (HOx), Carbon Monoxide, Methane, Nitrogen Oxides (NOx) and Ozone Production, Greenhouse Gases and Aerosols: Climate Change Past, Present and Future.

5- The Oceanic Circulation and Climate: The slow, deep Thermohaline Circulation. The fast, shallow wind-driven circulation. The marriage of the wind-driven and Thermohaline Circulations. Consequences of freshening the Northern Atlantic. The Recurrent Ice Ages (Tests for Ocean and Climate Models).

12. BIBLIOGRAFÍA

An Introduction to Dynamic Meteorology James Holton 4th edition, Elsevier.
Atmosphere-Ocean Dynamics, Adrian E. Gill Academic Press.
Introduction to Atmospheric Chemistry, Daniel Jacob, Princeton University press.
The Physics of the Atmosphere, John Houghton, 2th edition, Cambridge University Press.
Atmospheric Convection, Kerry Emanuel, Oxford University Press.

Firma Profesor

Aclaración

Se adjunta el CV del Dr. I. Orlanski cuya designación como Profesor Visitante se tramita en expediente separado.