Università degli Studi della Basilicata
Scuola di Ingegneria

COURSE: Environmental and Atmospheric Physics				
TEACHER: Paolo Di Girolamo				
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Language: Italian				
ECTS: 9	n. of hours: 81	Academic year: 2014-2015	Campus: Potenza	Semester: II

TOPICS

Atmospheric composition and its variability with height, thermal structure of the atmosphere, air pollution, dry and wet atmospheric thermodynamics, atmospheric stability, atmospheric spectroscopy, radiation-matter interaction, absorption and emission in the atmosphere, Reileigh and Mie scattering, atmospheric photochemistry, radiative transfer, cloud physics, atmospheric dynamics, atmospheric waves and turbulence, remote sensing techniques, radiometers, radar, sodar, Rass, GPS and lidar, the oceans, the cryosphere.

TEACHING METHODS (please tick one or more options)

☒ Theoretical lessons
☐ Tutorials in classroom
☐ Tutorials in laboratory
☐ Project works
☐ Technical visits
Other activities (please specify) _____

TEXTBOOKS

Murry L. Salby, Fundamentals of Atmospheric Physics, Vol. 61, Academic Press, 1996.
John M. Wallace, Peter V. Hobbs, Atmospheric Science: An Introductory Survey, Academic Press 1977.

ON-LINE EDUCATIONAL MATERIAL

web address: none

LEARNING OUTCOMES

Knowledge of the fundamentals of environmental and atmospheric physics.

REQUIREMENTS

It is desired that students attending this course have previously attended and gone through the final examinations of the courses of Mathematical Analysis I and II, Geometry, Physics I and II, Matematical Physics.

EVALUATION METHODS (please tick one or more options)

☐ Intermediate verifications
☐ Written examination
☐ Discussion of a project work
☐ Practical test
☒ Oral examination
Other methods (please specify) _____

DETAILED CONTENT

The disciplines of atmospheric physics, introductory elements on the terrestrial atmosphere, atmospheric composition and its variability with height, vertical profiles of pressure and density, molecular diffusion and turbulent motion, mean characteristics of the terrestrial atmosphere, charged particles ain the atmosphere, ionosphere, magnetosphere, origin of the atmosphere, thermal structure of the atmosphere, climatological variability of atmospheric temperature, units to quantify atmospheric concentration, water vapour, carbon dioxide and ozone, aerosol, minor atmospheric constituents and air pollution, atmospheric thermodynamics, ipsometric equations, scale height, first thermodynamic law, specific heat, latent heat, potential temperature, adiabatic lapse rate, water vapour in the atmosphere, mixing ratio, saturation vapour pressure, saturation mixing ratio, relative humidity, dew point and freezing point, Lifting condensation level, saturation adiabatic lapse rate, pseudo-adiabatic process, equivalent potential temperature, irreversible condensation processes, atmospheric stability, Clausius-Clapeyron equation. Atmospheric spectroscopy, radiation-matter interaction, absorption, emission and scattering in the atmosphere, selection rules, electronic, vibrational and rotational levels of molecules, Reileigh and Mie

scattering, atmospheric photochemistry, radiative transfer, radiometric quantities, radiant flux, radiance and irradiance, black-body radiation, Stefan-Boltzmann law. Kirchhoff's law. Selective absorbers and emitters. Beer's law. The vertical profile of absorption. Schwarzchield's equation. Radiative transfer equations in the presence of clouds. Cloud physics. Atmospheric aerosols. Origin of atmospheric aerosols: sources and sinks, size distributions, Nucleation, Kelvin's formula, homogeneous and heterogeneous nucleation, cloud condensation nuclei, warm cloud microphysics: condensation, collision and coalescence, cold cloud microphysics: aggregation and riming, Atmospheric dynamics, Motion equation and its form in a rotating system, Lagrangian and Eulerian derivative, Coriolis's acceleration, Scale analysis, The geostrophic approximation, The hydrostatic approximation, Cyclostrophic motion, Rossby's number, Thermal wind equation, Continuity equation, Barotropic and baroclinic atmosphere, atmospheric waves and turbulence, Primitive equations, Acoustic waves, Gravity waves, Lee waves, Rossby waves, Vorticity equation, Remote sensing techniques, radiometers, radar, sodar, Rass, GPS and lidar, the oceans, The oceans, composition and vertical structure, sea water density dependence on temperature, salinity and pressure, the mixed layer, the pycnocline, the thermocline, the ocean circulation, wind-driven component, thermohaline component, gyres, the Gulf Stream, the marine biosphere, the euphotic zone, the role of phytoplankton. The cryosphere, the continental ice sheets, the alpine or mountain glaciers, the sea ice and the ice floes, the Permafrost.

SEMINARS BY EXTERNAL EXPERTS YES ☐ NO ☐ ☒

FURTHER INFORMATION