UNIVERSITÀ DEGLI STUDI DI TORINO

ID

VP11_DIP_FIS

Visiting Professor Program
Academic year 2020/2021

DEPARTMENT OF PHYSICS

TEACHING COMMITMENT: 24 hours

COURSE TITLE

Physics of the Atmosphere (Module A)

TEACHING PERIOD

1st term

SCIENTIFIC AREA

Experimental physics

LANGUAGE USED TO TEACH

English

COURSE SUMMARY

Introduction. Eulerian and Lagrangian representation. Formation of the earth and its evolution. Atmospheric regions. Forces acting on the static atmosphere. Hydrostatic equilibrium. Equation of state for dry air. Equation of state for the actual air. Conventional temperatures: the virtual temperature. Gravitational potential energy. The geopotential. Barometric general formulations and scaling heights of the atmosphere. Various simplifications of atmosphere: homogeneous, isotherm, politropic. General barometric formula. Representations in pressure coordinates. Scale heights. Isentropic coordinates. Hygrometric variables. Thermodynamic transformations. Cyclical transformations. Isentropic processes. First principle of thermodynamics for the atmosphere. Reversible adiabatic transformations for saturated air. Potential temperature. Stability of the non-saturated atmosphere. First law of thermodynamics for adiabatic saturated processes in the atmosphere. Clapeyron equation. Infinitesimal adiabatic transformations for saturated air. Pseudo-adiabatic processes. Atmospheric stability for saturated and not saturated adiabatic processes. Conventional temperatures. The atmospheric stability with the model of the layer. Convective instability and stability. The main real forces in the moving atmosphere. The apparent forces in the

atmosphere. Uniform rotation relative motion. Reference systems non-inertial. Local coordinates. Vector equation of motion on the rotating Earth.

LEARNING OBJECTIVES

The course is aimed to give the physical-mathematical bases which regulate the behavior of the terrestrial atmosphere, pointing out on the phenomena connected to the stability (also by the point of view of the pollution), on the thermodynamic transformations, on the hygrometric variables and on the dynamics, pointing out on the different contribution of the forces involved in the dynamics of the atmosphere. A special section introduces the dimensional analysis and the similarity theory.

TUTORSHIP ACTIVITIES (IF APPLICABLE)

LAB ACTIVITIES (IF APPLICABLE)

OTHER ACTIVITIES (IF APPLICABLE)

Seminars and conferences.

VISITING PROFESSOR PROFILE DESCRIPTION

Pluriannual expertise in: teaching physics of the atmosphere, and/or meteorology, and/or hydrometeorology at university (undergraduate or graduate students); carrying out research in the fields of atmspheric physics, meteorology, or climatology; expertise in managing research projects on the above mentioned topics.

CONTACT PERSON AT THE DEPARTMENT

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