Course: Environmental and Atmospheric Physics

Academic Year: 2019-2020

Type of Educational Activity: (Basic, Characterizing, Affine, Free choice, Other) Affine

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Language: Italian

ECTS: (Lessons + Tutorials/Practice) 9

n. of hours: (Lessons + Tutorials/Practice) 81

Campus: Potenza

School of Engineering

Program: CdLM-IAT

Semester: II

Educational Goals and Expected Learning Outcomes

This course is the only one within this Program dedicated to Environmental and Atmospheric Physics and examines the basic elements of these disciplines. The main objective of the course is to provide the students with the basic information to face the study of physical and dynamical meteorology and climatology.

The primary stock of knowledge provided by the course includes the fundamentals of environmental and atmospheric physics. More specifically, faced topics include:

- 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, Rayleigh 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 primary skills acquired by the students during the course will be represented by the capability to analyze environmental and atmospheric physics problems and determine possible solutions for them.

The knowledge gained in this course will help in consolidating the student’s understanding of the principles of Environment and Territory Engineering, specifically in the field of air pollution and prevention of hydrological and hydraulic risks, with the primary objective of gaining a specialized engineering training for the purposes of environmental protection and pollution control.

Pre-requisites

It is highly 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, Mathematical Physics.

Syllabus

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 in 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, isometric 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

TEACHING METHODS
Theoretical lessons.

EVALUATION METHODS
Intermediate oral verifications, Oral examination.

TEXTBOOKS AND ON-LINE EDUCATIONAL MATERIAL
Copy of slides for a portion of the program.

INTERACTION WITH STUDENTS
During the introductory lecture, after describing the educational goals of the course, the program and the evaluation methods, the Professor provides the students with part of the didactic material (copy of slides for part of the program). During this introductory lecture, the Professor also files the list of students attending the course, including first and last name, matriculation number, email address and mobile phone number for each student. The Professor provides the students with his email address and mobile phone number to be used by the students both to directly request information and clarifications and to define the date for a possible meeting.

Receiving hours: Wednesday from 15:00 to 16:00 and Thursday from 15:00 to 16:00 in the Professor office, i.e. room 33 ter, fifth floor, Engineering School Building. Besides the receiving hours, the Professor is continuously available to the students through emails and mobile phone.

EXAMINATION SESSIONS (EXPECTED)¹
11 December 2019
05 February 2020
11 March 2020
Further dates to be defined with the students

SEMINARS BY EXTERNAL EXPERTS YES □ NO x

FURTHER INFORMATION

¹ Subject to possible changes: check the web site of the Teacher or the Department/School for updates.