Main course information	
Academic subject	Contamination of natural systems
Degree course	Master's degree in Science of nature and environment
Degree class	LM/60 LM/75
ECTS credits (CFU)	6
Compulsory attendance	
Teaching language	italian
Accademic Year	2019/2020

Professor/Lecturer	
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Tutorial time/day	Wednesday

Course details	Pass-fail exam/Exam with mark out of 30	SSD code	Type of class
	Exam with mark out of 30	CHIM02	Lecture and laboratory experiments

Teaching schedule	Year	Semester
	I	II

Lesson type	CFU/ECTS	Lessons (hours)	CFU/ECTS lab	Lab hours	CFU/ECTS tutorial/workshop	Tutorial/workshop hours	CFU/ECTS field trip	Field trip Hours
	5	40	I	15	0	0	0	0

Time management	Total hours	Teaching hours	Self-study hours
	150	55	95

Academic Calendar	First lesson	Final lesson
	October	January

Syllabus	
Course entry requirements	Fundamental knowledge of Chemistry, Physical chemistry and Organic Chemistry. Entry open question text to test the level of the students.
Expected learning outcomes (according to Dublin Descriptors) (it is recommended that they are congruent with the learning outcomes contained in A4a, A4b, A4c tables of the SUA-CdS)	
Knowledge and understanding	Basic knowledge of physical chemistry (thermodynamic laws, kinetic chemistry) and inorganic and organic chemistry as fundamental background to understan the processes envolved in the contamination of the air, water and soil compartments.
Applying knowledge and understanding	Ability to apply the acquired knowledge to the contamination of air, water and soil as consequence of the antropic activities. , to interpret them correctly and to know how to use the principles that govern them. The skills acquired will be verified by conducting classroom exercises, and during the written / oral examination.
Making informed judgements and choices	Students must demonstrate to have acquired aptitude for scientific reasoning and developed critical skills in the analysis of chemical phenomena and in the resolution of problems and exercises. The achievement of this objective will be verified by carrying out exercises in the classroom and during the written / oral examination.
Communicating knowledge and understanding	Acquisition of the correct terminology in the scientific and chemical field, acquisition of exhibition skills characterized by clarity and language properties. Students must be able to correctly expose definitions, fundamental concepts, theories concerning the contents

	of the course itself and to discuss clearly the problems presented to him. Students will be stimulated to actively partecipate during the lecture.
Capacities to continue learning	Acquisition of the ability to investigate issues and topics related to the teaching discipline in an autonomous way through the consultation of texts, databases and scientific works available in the library or on the web and to identify the connections with other disciplines of the course of study. The acquisition of this ability will be verified by discussing the topics of the exam.

Syllabus	
Course content	Nature of Physical chemistry, Units, The ideal and real gas, kinetic theory of the gas, definition of temperature and pressure, temperature and pressure in the atmosphere, , first and second thermodynamic law, the state functions, heat capacity and thermochemistry. ATMOSPHERIC CHEMISTRY AND AIR POLLUTION Stratospheric Chemistry: the Ozone Layer; The Ozone Holes; The Chemistry of Ground-Level Air pollution (the photochemistry smog) ENERGY AND CLIMATE CHANGE The Greenhouse Effect; Energy Use, Fossil Fuels, CO_2 Emissions, and Global Climate Change WATER CHEMISTRY AND WATER POLLUTION The Chemistry of Natural Waters; The Pollution and Purification of Water; Toxic Heavy Metals TOXIC ORGANIC COMPOUNDS Pesticides; Dioxins, Furans and PCBs; Other toxic Organic Compound ENVIRONMENT AND THE SOLID STATE Wastes, Soils, and Sediments; Laboratory exercises: (I) photocatalytic degradation of dye polluted water , (II) determination of water harness
Course books/Bibliography	Chimica dell'ambiente, C. Baird e M: Cann Chimica fisica Vol I – R. Chang
Notes	Integration with other books available in library and lectures notes
Teaching methods	Power point Lectures, numerical exercises, lab experiences.
Assessment methods (indicate at least the type written, oral, other)	Oral Examination and power point presentation
Evaluation criteria (Explain for each expected learning outcome what a student has to know, or is able to do, and how many levels of achievement there are	The evaluation criteria include an oral test that will be preceded by an oral examination 1) the acquired level of knowledge of the course contents and the use of correct terminology to describe the phenomena (insufficient, superficial, good, complete, excellent); 2) the ability to apply theoretical concepts and laws, and to interpret chemical phenomena (insufficient, discrete, good, excellent); 3) the capacity for critical analysis and judgment autonomy (fair, good, excellent); 4) clarity of exposition and ownership of language (confused and insecure; clear and correct; excellent and safe); 5) the ability to study in depth individual contents of the course and interdisciplinary links (discreet, good, excellent). Other factors, such as the active participation of students in lectures and laboratory exercises, the work done individually by the student in the form of presentations and laboratory exercises carried out will also be evaluated in a positive sense.
Further information	