

| General information | |
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| Academic subject | Contamination of natural systems |
| Degree course | <i>Master's degree in Science, nature and environment</i> |
| Academic Year | 2021-2022 |
| European Credit Transfer and Accumulation System (ECTS) | 6 |
| Language | <i>italian</i> |
| Academic calendar (starting and ending date) | |
| Attendance | |

| Professor/ Lecturer | |
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| Name and Surname | Elisabetta Fanizza |
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| Telephone | |
| Department and address | <i>Dipartimento di Chimica, Via Orbaona 4</i> |
| Virtual headquarters | |
| Tutoring (time and day) | Wednesday hours 11:00- 12:00 a.m |

| Syllabus | |
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| Learning Objectives | The teaching course aims at providing the fundamental tools belonging to the physical chemistry for the comprehension of the environmental issue (climate change, renewable energetic source), promote a critical analysis crucial for an environmental scientist training |
| Course prerequisites | <i>Fundamental knowledge of Chemistry, Physical chemistry and Organic Chemistry. Entry open question text to test the level of the students</i> |
| Contents | <i>Nature of Physical chemistry, Units, Ideal and real gas, kinetic theory of the gas, definition of temperature and pressure, temperature and pressure in the atmosphere. Henry's law. Acid-base, redox and solubility equilibria. First and second thermodynamic law, the state functions, heat capacity and thermochemistry. Kinetic law. WATER CHEMISTRY AND WATER POLLUTION The Chemistry of Natural Waters; The Pollution and Purification of Water; Toxic Heavy Metals, Nanoplastic. TOXIC ORGANIC COMPOUNDS Pesticides; Dioxins, Furans and PCBs; Other toxic Organic Compound ENVIRONMENT AND THE SOLID STATE Wastes, Soils, and Sediments; 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, CO₂ Emissions, and Global Climate Change, renewable sources</i> |
| Books and bibliography | <i>Chimica dell'ambiente, C. Baird e M: Cann Chimica fisica Vol I – R. Chang</i> |
| Additional materials | |

| Work schedule | | | |
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| Total | Lectures | Hands on (Laboratory, working groups, seminars, field trips) | Out-of-class study hours/ Self-study hours |
| Hours | | | |
| 150 | 40 | 15 | 95 |

| ECTS | | | |
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| 6 | 5 | 1 | |
| Teaching strategy | | | |
| | | <i>Power point Lectures, numerical exercises, open-access multimedia sources</i> | |
| Expected learning outcomes | | | |
| Knowledge and understanding on: | | Basic knowledge of physical chemistry (thermodynamic laws, kinetic chemistry) and inorganic and organic chemistry as fundamental background to understand the processes involved in the contamination of the air, water, and soil compartments | |
| Applying knowledge and understanding on: | | Ability to apply the acquired knowledge to the contamination of air, water and soil as consequence of the anthropic 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 oral examination | |
| Soft skills | | <ul style="list-style-type: none"> • <i>Making informed judgments and choices</i> 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 • <i>Communicating knowledge and understanding</i> 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 participate during the lecture • <i>Capacities to continue learning</i> 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 | |
| Assessment and feedback | | | |
| Methods of assessment | | | |
| Evaluation criteria | | <ul style="list-style-type: none"> ○ <i>Knowledge and understanding</i> <ul style="list-style-type: none"> ○ Awareness of the acquired knowledge as referred to environmental chemistry and physical chemistry ○ <i>Applying knowledge and understanding</i> <ul style="list-style-type: none"> ○ The learnt knowledge must be addressed to the comprehension of the environmental issues, taking advantage of knowledge belonging to other teaching course of the environmental and natural science Master Degree ○ <i>Autonomy of judgment</i> <ul style="list-style-type: none"> ○ Ability to autonomously interpret the environmental issues ○ <i>Communicating knowledge and understanding</i> <ul style="list-style-type: none"> ○ Ability to analytically describe the environmental issues by describing the process, reaction with an appropriate scientific language ○ <i>Capacities to continue learning</i> <ul style="list-style-type: none"> ○ Ability to direct the acquired knowledge to the real interpretation of environmental problems | |
| Criteria for assessment and attribution of the final mark | | <i>The evaluation criteria include an oral test that will be preceded by an oral examination</i> | |



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| | <p>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);</p> <p>2) the ability to apply theoretical concepts and laws, and to interpret chemical phenomena (insufficient, discrete, good, excellent);</p> <p>3) the capacity for critical analysis and judgment autonomy (fair, good, excellent);</p> <p>4) clarity of exposition and ownership of language (confused and insecure; clear and correct; excellent and safe);</p> <p>5) the ability to study individually the contents of the course and interdisciplinary links (discreet, good, excellent).</p> <p>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 will also be evaluated in a positive sense.</p> |
| Additional information | |
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