

MATRIX of existing Master course (University of A Coruna)

Name of compulsory chair	Year	Semester	Number of ECTS	Number of elective chairs	List of available elective chairs	Short description	Relation between the contents and RETHINK's theme
MSc. in Environmental Sciences, Technologies and Management							
– Legislation, regulation and environmental management	1 st	1 st	6			<p>This chair includes three blocks. The first one focuses on different aspects of environmental legislation, environmental protection laws and sustainability of natural resources. Public and private organisms specialized in environmental protection, liability of environmental damage, and available economic and legal instruments to enforce environmental protection and the prevention of pollution are studied.</p> <p>The second block discusses methodologies for environmental assessment. These include the selection, compilation, analysis and assessment of environmental variables and identification of environmental units. Finally, technical instruments for assessment and prevention of risks, impacts and damages caused to the environment, and instruments for pollution control, are studied.</p> <p>The third block is focused on environmental assessment studies: Environmental actions, factors, indicators, and matrices that lead to the identification of impacts and to propose protection measures, and control and surveillance plans. This block also includes the self-regulation and environmental management in industry and environmental audits.</p>	
– Analytical strategies applied to environmental studies	1 st	1 st	6			<p>This chair's main objective is to contribute to develop an "analytical criterion" so the student will learn to solve problems of different nature independently, selecting the analytical method that is more appropriate for each study case. The advances and current trends in sample preparation and instrumental determination will be studied, including specific methodologies to measure pollutants in different media (air, water, soil, sediments). A relevant part of this chair includes student's work in the laboratory learning different analytical methods.</p>	
– Statistical methods applied to environmental data	1 st	1 st	3			<p>This chair focuses on the study of statistical methods that are useful for working with environmental data. Environmental studies usually involve big amounts of data, whose appropriate analysis is crucial to extract the relevant information contained in them. These methods include simple and multiple regressions and multivariate statistics, like principal components, discriminant and cluster analysis.</p>	
– Ecology and environmental	1 st	1 st	3			<p>This chair introduces the student to ecological studies. Basic theories of</p>	

biomonitoring						ecology, evolution, and population dynamics will be discussed. Moreover, the structure of communities, and matter and energy fluxes, will be analyzed. Practical work will include the study of competition and predation strategies, spatial dynamics, and metapopulations. Examples of biomonitorization, discussing the example of antifouling paints, will be studied. The final part of this chair is focused on palaeoecology studies.	
– Water quality	1 st	1 st	6			This chair focuses on natural and wastewater studies, including the characterization of waters, the definition of physico-chemical and biological pollution indicators, and wastewater treatment. Different processes used in wastewater treatment plants are studied: Physico-chemical treatments (settling, coagulation-flocculation, sedimentation, flotation, adsorption, ion-exchange, redox-processes) and biological treatments (aerobic and anaerobic digestion, nutrient removal). The chair includes visits to water treatment plants, and laboratory work to determine microbiological parameters in water, to remove heavy metal from wastewater, and to identify both organic and inorganic compounds in water samples.	
– Soil quality	1 st	1 st	3			The aim of this chair is to study the concept of soil quality. The main soil characteristics involved in soil quality will be introduced, as well as soil functioning and self-restoring capacity. Soil quality, and the main quality indicators and risks for soil quality are defined, including the different types of soil degradation: physical degradation (soil erosion, compaction), and soil pollution (nutrients, heavy metals, organic compounds). Treatment and restoration of polluted soil (mechanical, chemical and biological), with special emphasis in phytoremediation, are studied.	
– Air quality			3			This chair focuses on air quality, including analytical methods to measure parameters in air, the most common air pollutants, pollutant dispersion processes, and technologies to clean polluted atmospheres. Studied methodologies include sampling and analysis methods of main air pollutants and types of surveillance networks used for air pollution control. Pollutants diffusion in the atmosphere will be analyzed, including Gaussian dispersion and soil concentrations. Special emphasis is made in the main human activities causing air pollution and the distribution of pollutants in industrial smoke plumes. Among the technologies of air-pollutant removal, particle removal and gas/vapour technologies will be analyzed, including its design. Practical cases will include the interpretation of air analysis results.	
Total	1	1st	30	0	0		
– Energy resources	1 st	2 nd	3			The topics covered by this chair include: Energy: production, transformation, transport and storage; fossil fuel power plants (gas, coal, oil); renewable energy resources (hydroelectric power plants, wind farms, photovoltaic and high-temperature solar power plants); current technologies for renewable energy production; nuclear power;	

						and future developments in power resources (hydrogen and fuel cells, batteries, new perspectives in fossil fuels, ultracapacitors, and satellites for solar power production).	
– Waste management	1 st	2 nd	3			This chair includes all aspects of wastes resulting from human activities. The definition and types of wastes, their environmental impact and current regulations that focus on waste management are introduced. Strategies for waste minimization, pollution prevention and good industrial practices are defined, and practical examples are discussed. Urban waste collection and different alternatives for waste treatment are analyzed, including recycling, organic waste composting, thermal treatments to produce energy, and anaerobic digestion to produce methane. The final part of the chair is focused on treatment of industrial wastes and design and regulations involving waste dump sites.	
– Masters Degree Project	1 st	2 nd	18			A final research project that the student needs to develop and present in front of a panel	
–	1 st	2 nd	3		Quality management	The aim of this chair is to provide a general view of Environmental and Quality Management in private companies. This includes the definition of quality, the effect of quality management systems in the society, and the different models of management (ISO 9000, ISO 17025, ISO 14000, EFQM), and common problems related to quality management in a private company (work organizing, participation and motivation of employees). Finally, the integration of environmental, security and protection systems (Oshas 18000) is discussed.	
–	1 st	2 nd	3		Environmental economy	The main goal of this chair is to introduce the students to the fundamental principles of environmental economy and natural resources, including environmental policy. The concepts of economic sustainability, the limits of economic growth, and indicators of sustainability are studied. Also, the relationships between economy and environment, including economic aspects of pollution, are analyzed. The chair's final part approaches the main objectives and instruments of environmental economic-policies, environmental taxes, and the application of environmental policies in the private sector.	
–	1 st	2 nd	3		Advanced instrumentation	This chair covers advanced and novel aspects of instrumental techniques currently used in environmental studies. These include mass spectrometry, atomic absorption spectrometry, induced coupled plasma, gas chromatography, high pressure liquid chromatography, and thin electrophoresis. The hands-on part of the chair will include the determination of organic pollutants using GC-MS, the determination of heavy metals in solid samples using AAS with electrothermal atomization, and the measurement of trace elements using ICP-MS.	
–	1 st	2 nd	3		Environmental monitoring	The aim of this chair is to introduce automation systems in environmental monitoring. Covered topics include the description of automation systems for analytical operations and the introduction to	

						systems for environmental information management. Discontinuous and continuous automatic analyzers, types of sensors, process analyzers and types (photometric, electrochemical and chromatographic) and their comparison with laboratory methods are discussed. The final part of the chair covers sampling methods and specific aspects of water monitoring (on-line and off-line analyzers) and air monitoring (air quality control networks).	
Total	1	2nd	30	2 chairs (6 ECTS)	4 (3 ECTS/chair)		
Total for Master course:	1 year	2 semesters	60	2 chairs (6 ECTS)	4 (3 ECTS/chair)		

All the chairs in this Master's program are linked to the RETHINK's theme of Environmental Science

MATRIX of existing PhD programs (University of A Coruna)

The current PhD programs whose scope is related to that of RETHINK are:

Environmental Science and Technology

Agriculture and Forestry Research

Environmental and Fundamental Chemistry

The only requirement to enrol in these PhD programs is to have a previous MSc title, and they do not require attending any courses during the duration of the program. Just in those cases when the admission committee decides that the student's previous formation should be complemented, the student must

attend courses up to a maximum of 15 ECTS. Those courses are chosen from those existing in the different programs at the University of A Coruna (BSc or MSc).