Teaching Guide				
Identifying Data				2020/21
Subject (*)	Prevention, management and environmental audits		Code	610475404
Study programme	Mestrado Universitario en Biotecnoloxía Avanzada			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	2nd four-month period	First	Optional	3
Language	SpanishGalicianEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	Departamento profesorado másterEnxeñaría CivilMatemáticasQuímica			
Coordinador	Soto Castiñeira, Manuel	E-mail	m.soto@udc.es	
Lecturers	Soto Castiñeira, Manuel	E-mail	m.soto@udc.es	
Web	masterbiotecnologiaavanzada.com/			
General description	Esta materia forma parte do módulo de especialización en Biotecnoloxía ambiental, común tanto ao itinerario profesional como ao académico-investigador. Trata aspectos básicos da xestión ambiental tanto de tipo xeral como aplicados á actividade empresarial e industrial. Os distintos temas serán impartidos por un equipo interdisciplinar, cuxos membros pertencen a diversas institucións universitarias e empresas: - Avaliación de Impacto Ambiental: Vicente Jimenez e Mª del Carmen Veiga (veiga@udc.es) - Xestión e auditorías ambientais: Pablo Comendador Gil (pablocg@cysconsulting.com) (C&S Consulting Services). - Análise do ciclo de vida (LCA) e pegada ecolóxica (PE): Ángeles Domínguez (admguez@uvigo.es) - Xestión de Residuos (minimización, reducción, reutilización e reciclaxe): Manuel Soto (m.soto@udc.gal) - Xestión Integral da Agua: Emilio Rosales Villanueva, de UVigo, (emiliorv@uvigo.es)			
Contingency plan	1. Modifications to the contents 2. Methodologies *Teaching methodologies that are maintained *Teaching methodologies that are modified 3. Mechanisms for personalized attention to students 4. Modifications in the evaluation *Evaluation observations: 5. Modifications to the bibliography or webgraphy			

Study programme competences	
Code	Study programme competences
A27	Coñecer a problemática da contaminación ambiental e saber facer avaliacións do impacto ambiental.
A30	Coñecer e saber utilizar as medidas de prevención e xestión da contaminación ambiental enfocada ao control da mesma e á minimización dos seus efectos.
A31	Saber levar a cabo auditorías sobre contaminación ambiental.
B1	Capacidade de análise e síntese (localización de problemas e identificación das causas e a súa tipoloxía).
B2	Capacidade de organización e planificación de todos os recursos (humanos, materiais, información e infraestruturas).
B3	Capacidade de xestión da información (con apoio de tecnoloxías da información e as comunicacións).
B4	Capacidade de planificación e elaboración de estudos técnicos en biotecnoloxía microbiana, vexetal e animal.
B5	Capacidade de identificar problemas, buscar solucións e aplicalas nun contexto biotecnolóxico profesional ou de investigación.

B6	Capacidade de comunicación oral e escrita dos plans e decisións tomadas.
B7	Capacidade para formular xuízos sobre a problemática ética e social, actual e futura, que propón a Biotecnoloxía.
B8	Capacidade de comunicación eficazmente coa comunidade científica, profesional e académica, así como con outros sectores e medios de comunicación.
B9	Capacidade de Traballo en equipo multidepartamental dentro da empresa.
B10	Capacidade de Traballo nun contexto de sostibilidade, caracterizado por: sensibilidade polo medio ambiente e polos diferentes organismos que o integran así como concienciación polo desenvolvemento sostible.
B11	Racionamento crítico e respecto profundo pola ética e a integridade intelectual.
B12	Adaptación a novas situacións legais, ou novidades tecnolóxicas así como a excepcionalidades asociadas a situacións de urxencia.
B13	Aprendizaxe autónoma.
B14	Liderazgo e capacidade de coordinación.
B15	Sensibilización cara á calidade, o respecto medioambiental e o consumo responsable de recursos e a recuperación de residuos.

Learning outcomes			
Learning outcomes	Study programme competences		
Evaluate the environmental problems in contaminated environments and apply prevention and management tools to ensure the conservation of the environment. Getting knowledge of the 3R alternative and how to contribute to the circular economy.	AC30	BC1 BC2 BC4 BC6 BC8 BC9 BC10 BC11 BC12 BC13 BC14 BC15	
Know how to carry out audits on environmental pollution.	AC31	BC3	
Know how to conduct environmental impact studies.	AC27	BC3 BC5 BC7 BC9 BC10 BC12 BC15	
Know how to carry out life cycle analyzes of products and activities	AC27	BC1 BC3	
Know how to manage the use of water with efficiency and sustainability criteria	AC27	BC1 BC12	

Contents	
Topic	Sub-topic
1. Environmental Impact Assessment	1.1. Basic rule for environmental evaluation 1. 2 Basic Procedures for environmental evaluation 1. 3 Scope of the documents and environmental studies. Objective and procedures. 1.4. Practical cases
2. Environmental audits and management	2. Environmental management systems. Rule ISO 14000. EMAS Regulation.

3. Analysis of the life cycle (LCA) and Ecological footprint (EF)	3.1. Sustainability. Methodologies of environmental evaluation. Life Cycle Analysis (LCA) and Ecological Footprint (EF). Introduction. Definitions. Applicability. Methodologies of calculation. 3.2. ISO 14040 Methodology for LCA. Definition of objectives and range of the study. Compilation and analysis of inventory. Impact evaluation. Interpretation. Methods of impact evaluation. CML Method (midpoint method). The Ecoindicador 99 (endpoint method). The Carbon Footprint (CF). 3.3. Methodology of Ecological Footprint. 3.4. Example of application. Software for LCA.
4. Waste Management	4.1. Inventories and ranking of waste. Characterization. Planning. 4.2. Introduction to clean technologies. Plan of minimization. Minimization oriented audit. Examples. 4.3. Waste reuse and recycling. Separated collected and classification for recycling.
5. Integrated water management	5.1. The traditional urban cycle of water use. Concepts of water management. 5.2. Water Frame Directive. New principles and his application. Water management planning. 5.3. Urban uses and resource sustainability strategies: grey waters, wastewater reuse, rain water uses. 5.4. Strategies ?Low Water sensitive urban design? and ?Low impact development?. 5.5. Strategies for the control of discharges. Directive 91/271 for urban wastewater. Municipal rules. Galician water taxes.

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Introductory activities	B3 B6	1	0	1
Guest lecture / keynote speech	A30 B2 B3 B4 B5 B6 B7 B11 B15	14	28	42
Seminar	A27 A30 B1 B5 B11 B12	3	5	8
Objective test	A27 A30 A31 B1 B3 B5 B6 B7 B9 B10 B12 B13 B14 B15	1	0	1
Field trip	A27 A30 B5 B7 B12	2	2	4
Supervised projects	A27 A30 A31 B1 B3 B5 B6 B7 B8 B9 B10 B12 B13 B14 B15	1	16	17
Personalized attention		2	0	2
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Introductory activities	Presentation of the program and guide of the subject. Questions posed by the teacher and debate about the interests, points of view and starting points of the students.
Guest lecture / keynote speech	The teacher will expose orally and through the audiovisual media the basic contents of the subject. He will ask questions and other observations to direct the attention of the student on the key aspects. He will provide the student with the schemes, charts, tables, texts and other materials that he deems appropriate.
Seminar	Formulation of theoretical or practical problems and documentation for analysis, study-debate and conclusions in the group. Therefore, the seminars are conceived as practical work in which to deal with real or theoretical problems.

Objective test	It consists of a test type, with a single or multiple answer, which will deal with the contents worked on in the analysis of documentary sources, seminars and lectures.
Field trip	The most important aspects of the installation or place to visit will be analyzed, and the key elements of it will be discussed in groups and individually, as well as the doubts and points of interest that it caused to the students.
Supervised projects	Works related to one of the sections of the program themes will be performed. The steps to follow are: selection of the subject at the proposal of the teacher or the student, preliminary identification of the documentation and the methodology, elaboration of a general script, periodic sessions with the teacher or by email to follow up and prepare the report or memory, delivery of the final report, revision and, as the case may be, correction by the student.

Personalized attention	
Methodologies	**Description**
Seminar Supervised projects	There will be personalized attention, by email or in contact tutorials (individual or small group), on any aspect of the subject and the work of the student. For students with recognition of part-time dedication and academic assistance waiver, the teacher will adopt the measures that he deems appropriate in order not to undermine his or her qualification.

Assessment			
Methodologies	**Competencies**	**Description**	**Qualification**
Guest lecture / keynote speech	A30 B2 B3 B4 B5 B6 B7 B11 B15	Continuous assessment of the active participation of the student.	10
Seminar	A27 A30 B1 B5 B11 B12	Continuous assessment of the active participation of the student.	15
Objective test	A27 A30 A31 B1 B3 B5 B6 B7 B9 B10 B12 B13 B14 B15	Quantification of the percentage of correct answers.	40
Supervised projects	A27 A30 A31 B1 B3 B5 B6 B7 B8 B9 B10 B12 B13 B14 B15	Interactive process of realization, work in groups and quality of memory.	30
Field trip	A27 A30 B5 B7 B12	Continuous assessment of the active participation of the student.	5

Assessment comments
A maximum period of 15 calendar days is established for the delivery of student's work reports, except explicit agreement with the teacher in specific cases. The qualification of Not Presented is reserved for those students who have participated in less than 40% of the programmed activities and / or do not participated to the objective test.

Sources of information

Basic	- H. Jacobsen and M. Kristoffersen (2002). Case studies on waste minimization practices in Europe. EEA Report nº 2 - (2005). Effectiviness of packaging waste management systems in selected countries: an EEA pilot study . EEA Report nº 3 - Guineé, J.B. (2001). Life cycle assessment. An operational guide to the ISO standards. Final report, Part 2. . Centre of Environmental Science (CML), Leiden University, Holanda. - Institut Cerdá (1995). Manual de Minimización de Residuos y Emisiones Industriales: Tomo 1: Plan de Minimización; Tomo 2: Auditorías orientadas a la minimización; Tomo 3: Buenas Prácticas.. Publicaciones del Institut Cerdá. - ISO (International Organization for Standardization) (2009). Normas ISO, Serie 14040. . www.iso.org - X.E. Castells (2000). RECICLAJE DE RESÍDUOS INDUSTRIALES. Diaz de Santos, Madrid - Baumann, H.; Tillman, A.M. (2004). The hitchhiker's guide to LCA : an orientation in life cycle assessment methodology and application. . Sweden : Studentlitteratur, cop. - Metcalf and Eddy. (). Wastewater Engineering: Treatment and reuse?. . International Edition. McGraw Hill. - Parlamento e Consello da UE (2000). ?Directiva 2000/60/CE del Parlamento Europeo y del Consejo, de 23 de octubre de 2000, por la que se establece un marco comunitario de actuación en el ámbito de la política de aguas?. - (Julio 2009). ?Evaluating options for water sensitive urban design ? A National guide? . Join Steering Committee for water Sensitive Cities (JSCWSC) - (). ?WSUD -?Water Sensitive Urban Design. Engineering procedures?. CSIRO Publishing. - Sánchez e cols. (2014). DE RESIDUO A RECURSO. EL CAMINO HACIA LA SOSTENIBILIDAD. Residuos Urbanos. . Mundi-Prensa: Madrid. - OMA UDC (2020). Exposición: O lixo na UDC - Modelo Nostián. https://udc.es/sociedade/medio_ambiente/compostaxe/expo-residuos/
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Environmental contamination/610475401 Environmental management and water technology/610475402 Environmental management and floor and air technology/610475403
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Master Thesis/610475006 External Practicals/610475007
Other comments
Given that part of the recommended bibliography for this subject is in English, it is advisable to have knowledge of this language, at least, at the level of comprehension of written texts.

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.