



Teaching Guide				
Identifying Data				2018/19
<b>Subject (*)</b>	Water supply and drainage systems	<b>Code</b>	632844202	
<b>Study programme</b>	Mestrado Universitario en Enxeñaría da Auga (plan 2012)			
Descriptors				
<b>Cycle</b>	<b>Period</b>	<b>Year</b>	<b>Type</b>	<b>Credits</b>
Official Master's Degree	1st four-month period	First	Obligatory	6
<b>Language</b>	English			
<b>Teaching method</b>	Face-to-face			
<b>Prerequisites</b>				
<b>Department</b>	Dereito PúblicoEconomíaEnxeñaría CivilMatemáticas			
<b>Coordinador</b>	Naves García-Rendueles, Acacia	<b>E-mail</b>	anaves@udc.es	
<b>Lecturers</b>	Martinez Lopez, Alberto Naves García-Rendueles, Acacia Rodríguez-Vellando Fernández-Carvajal, Pablo Sanz Larruga, Francisco Javier	<b>E-mail</b>	alberte.martinez@udc.es acacia.naves@udc.es pablo.rodriguez-vellando@udc.es javier.sanz.larruga@udc.es	
<b>Web</b>	caminos.udc.es/info/asignaturas/201/masterindex.html			
<b>General description</b>	Historical introduction to water supply and sewer systems. Water catchment and drinking water treatments. Water supply networks: general concepts, description and design. Sewer systems: general concepts , description and design. Sustainable drainage systems (SUDS). Waste water treatments prior to discharge to the aquatic media. Legal framework.			

Study programme competences / results	
Code	Study programme competences / results
A17	A global vision of water supply by the distinct elements which form it, at the same time having the necessary knowledge for its basis dimensioning and technological aspects related to its management and constructive implementation
A24	Capacity to design and manage the water supply and treatment in a population area, including design and Project for solutions regarding water treatment, drainage, and advanced management of residual waters in the city. Knowledge regarding advanced processes for the water treatment, elimination of nutrients, and management strategy in times of rainwater
B1	To resolve problems effectively
B2	To apply critical thinking, logic and creativity
B3	To work individually with initiative
B4	To communicate effectively in work surroundings
B5	Continuous recycling of knowledge in a general perspective in a global situation of water engineering
B6	Understanding of the need to analyse history to understand the present
B7	Facility to integrate in multidiscipline teams
B8	Capacity to organize and plan
B9	Capacity for analysis, synthesis and structure of information and ideas
C1	To understand the importance of the enterprising culture and to know the means at the reach of the enterprising people
C2	To value knowledge critically, technology and available information to resolve problems that they will face
C3	To assume as a professional and citizen the importance of learning throughout life
C4	To value the importance of the investigation, innovation and technology development in the social ?economic advance and cultural in society
C5	To posses and understand knowledge that gives a base or oportunity to be original in the development and for applications of ideas, often in the context of investigation
C6	The students must be able to apply the acquired knowledge and their capacity to resolve problems in new surrandings or not well known within wider contexts (or multidiscipline) related with the study area
C7	The students must be able to integrate knowledge and to affront the complexity to formulate judgements from information that, been incomplete or limited, include reflexions about social responsibilities and ethics related to the application of the knowledge and judgments



C8	The students must be able to communicate their conclusions, knowledge and the last reasons that support them, to spezialated publics and not spezialated in a clear and unambiguous way.
C9	The student must possess the learning ability with permits them to continues to study in a manner wich will be in a great measure self directed and individual

Learning outcomes			
Learning outcomes	Study programme competences / results		
Overview of water supply and sanitation systems through their components	AC17	BC1 BC2 BC3 BC4 BC5 BC6 BC7 BC8 BC9	CC1 CC2 CC3 CC4 CC5 CC6 CC7 CC8 CC9
Ability to design solutions and basic dimensioning water catchment, drinking water treatment , water supply networks, sewer systems, wastewater treatment and systems of urban water.	AC17 AC24	BC1 BC2 BC3 BC4 BC5 BC7 BC8 BC9	CC1 CC2 CC3 CC4 CC5 CC6 CC7 CC8 CC9
Ability to design solutions and basic dimensioning water catchment, water treatment, water supply, sewer systems, waste water treatment and SUDS	AC17 AC24	BC1 BC2 BC3 BC4 BC5 BC6 BC7 BC8 BC9	CC1 CC2 CC3 CC4 CC5 CC6 CC7 CC8 CC9

Contents	
Topic	Sub-topic
1. Introduction to water supply and sanitation systems.	1.1. Historical introduction to supply and sewer systems 1.2. Characteristics of nowadays water services 1.3. Overview of water catchment systems and water supply 1.4. Overview of sewer systems and wastewater treatments 1.5. Overview of the surface runoff management
2. Water catchment systems and drinking water treatments.	2.1. Catchment of surface water: rivers, lakes, reservoirs ... 2.2. Spring catchments 2.3. Groundwater catchment 2.4. Drinking water purification treatment



3. Water supply networks	3.1. General concepts 3.2. Description 3.3. Design
4. Sewer systems	4.1. General concepts 4.2. Description 4.3. Design
5. Non conventional sustainable urban drainage systems	5.1. Runoff management 5.2. Structures of runoff detention and treatment
6. Legal Framework	6.1. European legal framework

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A17 A24 B1 B2 B5 B6 B7 B9 C1 C2 C3 C4 C5 C6 C7 C8 C9	30	5	35
Collaborative learning	A24 B1 B2 B3 B4 B7 B8 B9 C1 C2 C3 C4 C5 C6 C7 C8 C9	15	5	20
Document analysis	A24 A17 B2 B3 B4 B9 C1 C2 C3 C6 C7 C8	2	10	12
Oral presentation	A17 A24 B2 B4 B8 B9 C7 C8 C9	2	5	7
Problem solving	A17 A24 B1 B2 B3 B4 B7 B8 B9 C1 C2 C3 C4 C5 C6 C7 C8 C9	6	2	8
ICT practicals	A17 A24 B1 B2 B3 B4 B8 B9 C2 C3 C4 C5 C6 C7 C8 C9	8	8	16
Field trip	A17 B2 B5 B6 B7 B8 B9 C1 C2 C3 C4 C5 C6 C7 C8 C9	8	4	12
Objective test	A24 A17 B2 B3 B6 B8 B9 C5 C7 C9	6	4	10
Student portfolio	A17 A24 B2 B3 B4 B7 B8 B9 C1 C2 C4 C5 C6 C7 C8 C9	0	15	15
Personalized attention		15	0	15

(\*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies	
Methodologies	Description
Guest lecture / keynote speech	Lectures where the main theoretical contents of the subject are regarded. Practical examples and real cases are shown also.
Collaborative learning	Go in depth in supply and sewer systems elements and design methodologies. Working will be divided between groups and shared at the end.
Document analysis	Individual review of documentation as introduction to concepts or as review and deepening methodology. The understanding and asimilation of the mean ideas should be shown in a collaborative learning activity or in an objective test.



Oral presentation	Preparation of a poster or a set of slides and oral presentation at class. Not only the contents are evaluated but the prepared material and the performance.
Problem solving	Solution of problems proposed by the teachers to strengthen theoretical concepts.
ICT practicals	Design and dimension of components of supply and sewer systems by using technical software.
Field trip	Visit to drinking water and/or wastewater treatment in A Coruña Visit to works on a water supply or sewerage system
Objective test	Multiple choices or true/false tests answered individually or in groups.
Student portfolio	Document which consists on the compilation of activities performed during all the subject which should be presented at the end of the semester.

### Personalized attention

Methodologies	Description
ICT practicals	Answering of questions arising from the theoretical contents exposed in class, problem resolution and other activity.
Guest lecture / keynote speech	Monitoring of collaborative tasks.
Collaborative learning	
Problem solving	
Oral presentation	

### Assessment

Methodologies	Competencies / Results	Description	Qualification
ICT practicals	A17 A24 B1 B2 B3 B4 B8 B9 C2 C3 C4 C5 C6 C7 C8 C9	Resolution of proposed simulations using technical software.	15
Objective test	A24 A17 B2 B3 B6 B8 B9 C5 C7 C9	Multiple choice or true/false tests	20
Collaborative learning	A24 B1 B2 B3 B4 B7 B8 B9 C1 C2 C3 C4 C5 C6 C7 C8 C9	Development of the proposed tasks and conclusions exposition.	25
Student portfolio	A17 A24 B2 B3 B4 B7 B8 B9 C1 C2 C4 C5 C6 C7 C8 C9	Document which consists on the compilation of activities performed during all the semester	25
Oral presentation	A17 A24 B2 B4 B8 B9 C7 C8 C9	Short oral presentation of a subject at class using support material (poster or slides).	15

### Assessment comments

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### Sources of information

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<b>Basic</b>	<p>Advanced water distribution modeling and management. Haestad Methods, Thomas M. Walski...[et al.]  <a href="http://kmelot.biblioteca.udc.es/search~S8*gag?/dAgua+++Depuraci{226}on./dagua+depuracion/-3%2C-1%2C0%2CB/frameset&amp;FF=dagua+distribucion&amp;6%2C%2C30">http://kmelot.biblioteca.udc.es/search~S8*gag?/dAgua+++Depuraci{226}on./dagua+depuracion/-3%2C-1%2C0%2CB/frameset&amp;FF=dagua+distribucion&amp;6%2C%2C30</a> Analysis of water distribution networks. P.R. Bhave, R. Gupta.</p> <p><a href="http://kmelot.biblioteca.udc.es/search~S8*gag?/dAgua+++Depuraci{226}on./dagua+depuracion/-3%2C-1%2C0%2CB/frameset&amp;FF=dagua+distribucion&amp;8%2C%2C30">http://kmelot.biblioteca.udc.es/search~S8*gag?/dAgua+++Depuraci{226}on./dagua+depuracion/-3%2C-1%2C0%2CB/frameset&amp;FF=dagua+distribucion&amp;8%2C%2C30</a> Design of water supply pipe networks. Prabhata K. Swamee, Ashok K. Sharma.</p> <p><a href="http://kmelot.biblioteca.udc.es/search~S8*gag?/dAgua+++Depuraci{226}on./dagua+depuracion/-3%2C-1%2C0%2CB/frameset&amp;FF=dagua+distribucion&amp;10%2C%2C30">http://kmelot.biblioteca.udc.es/search~S8*gag?/dAgua+++Depuraci{226}on./dagua+depuracion/-3%2C-1%2C0%2CB/frameset&amp;FF=dagua+distribucion&amp;10%2C%2C30</a> Urban Drainage. 3rd Ed. Butler y Davies (2011). Taylor Francis.</p> <p><a href="http://kmelot.biblioteca.udc.es/search~S8*gag?/turban+drainage/turban+drainage/1%2C3%2C4%2CB/frameset&amp;FF=turban+drainage&amp;2%2C%2C2/indexsort=-">http://kmelot.biblioteca.udc.es/search~S8*gag?/turban+drainage/turban+drainage/1%2C3%2C4%2CB/frameset&amp;FF=turban+drainage&amp;2%2C%2C2/indexsort=-</a> Wastewater hydraulics theory and practice. Hager (2010). Springer.</p> <p><a href="http://kmelot.biblioteca.udc.es/search~S8*gag?/twastewater+/twastewater/1%2C25%2C27%2CB/frameset&amp;FF=twastewater+hydraulics+theory+and+practice&amp;1%2C%2C2/indexsort=-">http://kmelot.biblioteca.udc.es/search~S8*gag?/twastewater+/twastewater/1%2C25%2C27%2CB/frameset&amp;FF=twastewater+hydraulics+theory+and+practice&amp;1%2C%2C2/indexsort=-</a> EPANET:  <a href="https://www.epa.gov/water-research/epanetSWMM">https://www.epa.gov/water-research/epanetSWMM</a>:  <a href="https://www.epa.gov/water-research/storm-water-management-model-swmmITOGH">https://www.epa.gov/water-research/storm-water-management-model-swmmITOGH</a> Instruções Técnicas para Obras Hidráulicas en Galicia.  <a href="http://augasdegalicia.xunta.gal/seccion-tema/c/Obras_AHG_saneamento_depuracion?content=/Portal-Web/Contidos_Augas_Galicia/Seccions/itohg/seccion.html&amp;std=itohg.html">http://augasdegalicia.xunta.gal/seccion-tema/c/Obras_AHG_saneamento_depuracion?content=/Portal-Web/Contidos_Augas_Galicia/Seccions/itohg/seccion.html&amp;std=itohg.html</a></p>
<b>Complementary</b>	

### Recommendations

Subjects that it is recommended to have taken before

Subjects that are recommended to be taken simultaneously

Physico-chemistry and quality of water/632844203

Subjects that continue the syllabus

Other comments

(\*)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.