



## Teaching Guide

| Teaching Guide           |                                                                                                                                                                                                                                                 |        |                          |           |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------------------------|-----------|
| Identifying Data         |                                                                                                                                                                                                                                                 |        |                          | 2018/19   |
| Subject (*)              | Internships                                                                                                                                                                                                                                     |        | Code                     | 632844215 |
| Study programme          | Mestrado Universitario en Enxeñaría da Auga (plan 2012)                                                                                                                                                                                         |        |                          |           |
| Descriptors              |                                                                                                                                                                                                                                                 |        |                          |           |
| Cycle                    | Period                                                                                                                                                                                                                                          | Year   | Type                     | Credits   |
| Official Master's Degree | 1st four-month period                                                                                                                                                                                                                           | First  | Obligatory               | 15        |
| Language                 | English                                                                                                                                                                                                                                         |        |                          |           |
| Teaching method          | Face-to-face                                                                                                                                                                                                                                    |        |                          |           |
| Prerequisites            |                                                                                                                                                                                                                                                 |        |                          |           |
| Department               | Enxeñaría CivilMatemáticas                                                                                                                                                                                                                      |        |                          |           |
| Coordinador              | Vázquez González, Ana María                                                                                                                                                                                                                     | E-mail | ana.maria.vazquez@udc.es |           |
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| Web                      | http://caminos.udc.es/info/asignaturas/201/masterindex.html                                                                                                                                                                                     |        |                          |           |
| General description      | Students will choose, between different institutions, national or international, where they will study the university practicum<br>The time period to course this subject will be bewtween 10 weeks and 6 months. The journey will be full time |        |                          |           |

## Study programme competences

| Code | Study programme competences                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A1   | Knowledge, understanding and capacity to apply legislation related with water engineering during professional development. Capacity to analyse the working mechanism of the economy and public and private management of water                                                                                                                                                                                                                                                                                      |
| A2   | Capacity to resolve basic physical problems of water engineering and theoretic and practical Knowledge of the chemistry, physics, mechanics and technologic properties of the water                                                                                                                                                                                                                                                                                                                                 |
| A3   | Capacity to apply the mechanics of the fluids and the fundamental flow equations in calculate for conductions at pressure and in free layer                                                                                                                                                                                                                                                                                                                                                                         |
| A4   | Capacity to apply the hydrology knowledge and the principles of flow mechanics in the method of calculations about hydrology as well as surface and underground. Capacity to make the evaluation of the hydraulic resources and apply the principal tools to do the hydrologic planning and the regulation and lamination of the inputs Capacity to analyse the river hydraulics and to apply the knowledge acquired in the restauration of the river direction and other works about rivers and their surroundings |
| A5   | Knowledge of the basic concepts about ecology applied to water engineering. Capacity to act in the respectful way and enriching way about the environment contribution to the sustainable development. Capacity to analyse the ecological quality of water. Knowledge of the basic principles of the ecology and basic understanding of the working continental water systems                                                                                                                                       |
| A7   | Knowledge of the fundamentals about the evaluation of water resources and the principal tools for the hydrological planning, starting from theoretical justification and practical applications that lead to the specific problem resolution and the use of updated methodologic (programs and models) for the evaluation of the exploitation, uses, defence, and the management the combined planning of surface and underground water. Knowledge of national and hydrological plans                               |
| A8   | Capacity to calculate and manage of extreme avenues                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| A9   | Knowledge of geographical information systems (SIG) applied to the management of water resources. Knowledge of the basic working of the system for the analysis of the geographical data, making use of SIG tools and support management and the analysis of data regarding water resources. Knowledge of the geospatial data and his characteristics and the processes for its acquisition, storage treatment analysis, modelling and presentation                                                                 |
| A10  | Understanding of the fundaments of dynamic fluid computation (CFD). Capacity to elaborate codes that can resolve non-understandable flow on the surface as well as in the porous media                                                                                                                                                                                                                                                                                                                              |
| A11  | Knowledge of numerical models applied to hydraulic engineering. Capacity to use and analyse the results of the hydraulic models. Capacity to design, develop and analyse numerical schemes used in a hydraulic models                                                                                                                                                                                                                                                                                               |
| A12  | Capacity to use commercial numerical models for flux in free layer, flow pressure, drainage, hydrologic calculations for avenues, sediment transport in rivers and costal zones, transport of contaminants and wave propagation                                                                                                                                                                                                                                                                                     |
| A13  | Knowledge of the experimental technics applied to the water engineering. Capacity to design experiments. Capacity to develop reduced models in the laboratory. Capacity to use different types of experimental instrumentation, including flowmeter, depth probes, three-dimensional speedometer, limnimeter, windlass..                                                                                                                                                                                            |



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|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A14 | Knowledge and understanding for design and construction of scale-models of hydraulic structures. Understanding of different technics that exist in the measurement of physical conditions (pressure, temperature, speed?) in the field of hydraulic knowledge of computing systems and electronic control and the acquisition of hydraulic data (monitoring and control of the river basin, hydraulic circuit, etc) |
| A15 | General vision and balanced of the basic aspects and application of underground hydrologic from the needs of civil engineering. Capacity to Project or interpret the different hydraulic trials of hydrodynamic characterization, interpret hydrogeological maps and know the constructive aspects of the water uptake                                                                                              |
| A16 | Knowledge of the chemical basis of water which totally condition its behaviour in nature and its uses. Understanding and knowledge of the different water regulations for quality at local, national and European level                                                                                                                                                                                             |
| 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                                                                                                                                                                              |
| A18 | Capacity to realize an integral use and efficient use of water resource. Knowledge of the working of the basin organisms and general analysis of water engineering projects in the area of cooperation and development and humanitarian aid.                                                                                                                                                                        |
| A19 | Knowledge of advanced water treatment with different conclusions: depuration, re-use, purification, elimination of nutrients and regeneration treatments                                                                                                                                                                                                                                                            |
| A20 | Use and management of measuring equipment in the field and in the laboratory. Knowledge of the methodology of control process and the determination of design parameters for water treatment processes                                                                                                                                                                                                              |
| A21 | Knowledge of water quality control models. Capacity to analyse and propose solutions to problems in water quality control                                                                                                                                                                                                                                                                                           |
| A22 | Capacity to plan, to Project, to measure and to direct the constructions and exploitation of water conducts, reservoirs, hydroelectric installations, river regulations systems, water channels, river works, and other hydrologic and hydraulics Works                                                                                                                                                             |
| A23 | Fundamental knowledge of energy consumption and its environmental implications inside a development sustainable                                                                                                                                                                                                                                                                                                     |
| 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                                                  |
| A25 | Knowledge and understanding of water in different situations: the working of ecosystems, environmental factors with the purpose of to make an inventory of medium, applying the methodology to value the impact and its use in studies and evaluations of the environmental impact.                                                                                                                                 |
| 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 comunicate 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 |         |
|                   |  | AC1                         | BC1 CC1 |
|                   |  | AC2                         | BC2 CC2 |
|                   |  | AC3                         | BC3 CC3 |
|                   |  | AC4                         | BC4 CC4 |
|                   |  | AC5                         | BC5 CC5 |
|                   |  | AC7                         | BC6 CC6 |
|                   |  | AC8                         | BC7 CC7 |
|                   |  | AC9                         | BC8 CC8 |
|                   |  | AC10                        | BC9 CC9 |
|                   |  | AC11                        |         |
|                   |  | AC12                        |         |
|                   |  | AC13                        |         |
|                   |  | AC14                        |         |
|                   |  | AC15                        |         |
|                   |  | AC16                        |         |
|                   |  | AC17                        |         |
|                   |  | AC18                        |         |
|                   |  | AC19                        |         |
|                   |  | AC20                        |         |
|                   |  | AC21                        |         |
|                   |  | AC22                        |         |
|                   |  | AC23                        |         |
|                   |  | AC24                        |         |
|                   |  | AC25                        |         |

| Contents                                                                        |              |
|---------------------------------------------------------------------------------|--------------|
| Topic                                                                           | Sub-topic    |
| Internships in companies and research institutions in Spain, Germany and abroad | No subtopics |



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|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| <p>The practice in the company will impose a development of the professional exercise in the different areas related with water engineering, in one of the companies where there is a collaboration agreement signed by the participating universities. The company training can be developed in companies and institutions joined with the universities of A Coruña and Magdeburgo or another universities wich have collaboration agreement.</p> <p>The assignment of the destinations will take into account the students priority and in the case of the conflict it will follow the academic criteria strictly.</p> <p>A tutor will be designed in the receiving university so that he can supervise the training at the end of wich he will create a report about the work carried out, having to value the character of the work.</p> <p>The duration of the practice will be between 2 and 6 months wich can be extended by agreement between both parts.</p> <p>In the same way, the development of this work will also be admitted in the instalations of the participating universities, collaborating in investigation projects in the different areas implicated.</p> <p>This will constitute the training period. The contractual relationship will be paid preferably in any case.</p> | There are no subtopics |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|

| Planning                                                                                                                        |                                                                                                                                                                       |                      |                               |             |
|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------------------|-------------|
| Methodologies / tests                                                                                                           | Competencies                                                                                                                                                          | Ordinary class hours | Student?s personal work hours | Total hours |
| Supervised projects                                                                                                             | A1 A2 A3 A4 A5 A7<br>A8 A9 A10 A11 A12<br>A13 A14 A15 A16<br>A17 A18 A19 A20<br>A21 A22 A23 A24<br>A25 B1 B2 B3 B4 B5<br>B6 B7 B8 B9 C1 C2<br>C3 C4 C5 C6 C7 C8<br>C9 | 0                    | 355                           | 355         |
| Personalized attention                                                                                                          |                                                                                                                                                                       | 20                   | 0                             | 20          |
| (*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students. |                                                                                                                                                                       |                      |                               |             |

| Methodologies       |                                                                                                                 |
|---------------------|-----------------------------------------------------------------------------------------------------------------|
| Methodologies       | Description                                                                                                     |
| Supervised projects | The students should spend a minimum of two months and a maximum of 6 months at the company/research institution |

| Personalized attention |                                                                                                                                          |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Methodologies          | Description                                                                                                                              |
| Supervised projects    | Each student will have a training tutor associated in the university with the company where he will develop the third term of the master |



| Assessment          |                                                                                                                                                                       |                                |               |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|---------------|
| Methodologies       | Competencies                                                                                                                                                          | Description                    | Qualification |
| Supervised projects | A1 A2 A3 A4 A5 A7<br>A8 A9 A10 A11 A12<br>A13 A14 A15 A16<br>A17 A18 A19 A20<br>A21 A22 A23 A24<br>A25 B1 B2 B3 B4 B5<br>B6 B7 B8 B9 C1 C2<br>C3 C4 C5 C6 C7 C8<br>C9 | In terms of the developed work | 100           |

| Assessment comments |
|---------------------|
|                     |

| Sources of information |                                                                                                                                                           |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Basic                  | - ().<br>o listado de empresas que colaboran co máster para A realización das prácticas fin de máster, serán proporcionadas ós alumnos ó comenzo do curso |
| Complementary          |                                                                                                                                                           |

| Recommendations                                          |
|----------------------------------------------------------|
| Subjects that it is recommended to have taken before     |
|                                                          |
| Subjects that are recommended to be taken simultaneously |
|                                                          |
| 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.