



## Teaching Guide

| Teaching Guide           |                                                                                                                                                                                                                                                                                                    |        |                        |           |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------------------------|-----------|
| Identifying Data         |                                                                                                                                                                                                                                                                                                    |        |                        | 2017/18   |
| Subject (*)              | Audit and Energy Services                                                                                                                                                                                                                                                                          |        | Code                   | 770523010 |
| Study programme          | Mestrado Universitario en Eficiencia e Aproveitamento Enerxético                                                                                                                                                                                                                                   |        |                        |           |
| Descriptors              |                                                                                                                                                                                                                                                                                                    |        |                        |           |
| Cycle                    | Period                                                                                                                                                                                                                                                                                             | Year   | Type                   | Credits   |
| Official Master's Degree | 2nd four-month period                                                                                                                                                                                                                                                                              | First  | Optativa               | 3         |
| Language                 | SpanishGalicianEnglish                                                                                                                                                                                                                                                                             |        |                        |           |
| Teaching method          | Face-to-face                                                                                                                                                                                                                                                                                       |        |                        |           |
| Prerequisites            |                                                                                                                                                                                                                                                                                                    |        |                        |           |
| Department               | Enxeñaría Industrial                                                                                                                                                                                                                                                                               |        |                        |           |
| Coordinador              | Masdias y Bonome, Antonio                                                                                                                                                                                                                                                                          | E-mail | antonio.masdias@udc.es |           |
| Lecturers                | Masdias y Bonome, Antonio                                                                                                                                                                                                                                                                          | E-mail | antonio.masdias@udc.es |           |
| Web                      | pcmasdias.cdf.udc.es                                                                                                                                                                                                                                                                               |        |                        |           |
| General description      | The knowledge aim with this course are aligned with the requirements to pursue the professional activity energy auditor according to Royal Decree 56/2016 by which transposes Directive 2012/27 / EU energy efficiency, in terms energy audits, energy service providers and promoting efficiency. |        |                        |           |

## Study programme competences

| Code | Study programme competences                                                                                                                                                                                                              |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A1   | Análise e aplicación de metodoloxías e normativa para unha xestión eficiente da enerxía.                                                                                                                                                 |
| A2   | Análisis e implantación de medidas de ahorro y eficiencia energética en los sectores industrial, terciario y residencial.                                                                                                                |
| A3   | Capacidad para la elaboración de Auditorías Energéticas.                                                                                                                                                                                 |
| A4   | Análisis de consumos energéticos y de su costes asociados.                                                                                                                                                                               |
| B1   | Que los estudiantes sepan aplicar los conocimientos adquiridos y su capacidad de resolución de problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con su área de estudio. |
| B4   | Que los estudiantes posean las habilidades de aprendizaje que les permitan continuar estudiando de un modo que habrá de ser en gran medida autodirigido o autónomo.                                                                      |
| B5   | Que los estudiantes sepan comunicar sus conclusiones y los conocimientos y razones últimas que las sustentan a públicos especializados y no especializados de un modo claro y sin ambigüedades.                                          |
| B6   | Buscar y seleccionar alternativas considerando las mejores soluciones posibles.                                                                                                                                                          |
| B8   | Incorporar el vocabulario propio para expresarse con precisión en una comunicación efectiva, tanto escrita como oral.                                                                                                                    |
| B9   | Extraer, interpretar y procesar información, procedente de diferentes fuentes, para su empleo en el estudio y análisis.                                                                                                                  |
| B15  | Conocer la legislación vigente y reglamentación aplicable al sector de las energías renovables y de la eficiencia energética.                                                                                                            |
| B16  | Valorar la aplicación de tecnologías emergentes en el ámbito de la energía y el medio ambiente.                                                                                                                                          |
| B17  | Desarrollar la capacidad para asesorar y orientar sobre la mejor forma o cauce para optimizar los recursos energéticos en relación con las energías renovables.                                                                          |
| B18  | Plantear y resolver problemas, interpretar un conjunto de datos y analizar los resultados obtenidos; en el ámbito de la eficiencia energética y la sostenibilidad.                                                                       |
| C1   | Adquirir la terminología y nomenclatura científico-técnica para exponer argumentos y fundamentar conclusiones.                                                                                                                           |
| C2   | Fomentar la sensibilidad hacia temas medioambientales.                                                                                                                                                                                   |
| C4   | Desarrollar el pensamiento crítico                                                                                                                                                                                                       |
| C5   | Adquirir la capacidad para elaborar un trabajo multidisciplinar                                                                                                                                                                          |

## Learning outcomes

| Learning outcomes | Study programme competences |
|-------------------|-----------------------------|
|-------------------|-----------------------------|



|                                                                                                                                                                       |            |                                  |            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------------------------|------------|
| Knowledge of regulations and legislation necessary to elaborate energy audits.                                                                                        | AJ3        | BC4<br>BC6<br>BC8<br>BC9<br>BC15 | CC1        |
| Get real knowledge of energy consumption and associated costs.                                                                                                        | AJ1<br>AJ4 | BC1<br>BC17                      |            |
| Identify and characterize the factors that affect energy consumption on the premises.                                                                                 | AJ4        | BC1<br>BC9                       |            |
| Detect and evaluate different savings opportunities by hiring Energy Services and its impact on energy costs and maintenance and other benefits and associated costs. | AJ4        | BC16<br>BC18                     | CC5        |
| Knowing, design, manage and maintain the different services that can provide Energy Services Provider.                                                                | AJ2        | BC5                              | CC2        |
| Quantification and verification of savings from Energy Service Companies (ESCOs).                                                                                     | AJ4        | BC9                              | CC4        |
| Apply methodologies and programs for efficient energy management through the implementation of Management Systems Energy.                                             | AJ1<br>AJ4 | BC1<br>BC6                       | CC4<br>CC5 |

| Contents                                 |                                                                                                                                            |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Topic                                    | Sub-topic                                                                                                                                  |
| Legislative framework and rules involved | Legislative framework structure.<br>European directives. 2012/27 / EU<br>National legislation. Royal Decree 56/2016.<br>Applied standards. |
| Energy audits.                           | General requirements.<br>Structure of an audit.<br>Design, equipment and methodologies.<br>Audits in Buildings, Processes and Transport.   |
| Energy Management Systems                | Evolution and current range.<br>SGE systems.<br>Development and Implementation.                                                            |
| Energy Service Providers                 | Classification and categories.<br>Certifications Energy Service Providers.                                                                 |

| Planning                       |                                  |                      |                               |             |
|--------------------------------|----------------------------------|----------------------|-------------------------------|-------------|
| Methodologies / tests          | Competencies                     | Ordinary class hours | Student?s personal work hours | Total hours |
| ICT practicals                 | A1 A2 A3 B4 B6 B8<br>B9 B18 C5   | 9                    | 10                            | 19          |
| Objective test                 | A4 B1 B5 B16                     | 3                    | 0                             | 3           |
| Case study                     | B15 B16 C1 C4 C5                 | 3                    | 20                            | 23          |
| Guest lecture / keynote speech | A3 B1 B8 B15 B16<br>B17 C1 C2 C4 | 9                    | 20                            | 29          |
| Personalized attention         |                                  | 1                    | 0                             | 1           |



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

| Methodologies                  |                                                                                                     |
|--------------------------------|-----------------------------------------------------------------------------------------------------|
| Methodologies                  | Description                                                                                         |
| ICT practicals                 | It includes the development of practices that are both laboratory and with the assistance of T.I.C. |
| Objective test                 | A review will take place at the end of the course.                                                  |
| Case study                     | It includes the study, analysis of solutions and implementing them.                                 |
| Guest lecture / keynote speech | Lecture and exhibition by support T.I.C.                                                            |

| Personalized attention |                                                                                                                                                        |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Methodologies          | Description                                                                                                                                            |
| ICT practicals         | In both case studies and practical care and personalized follow-up that may be not only in the face part but also by using ICT or e-mail will be held. |
| Case study             |                                                                                                                                                        |

| Assessment     |                                |                                                                                                                                                                                   |               |
|----------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Methodologies  | Competencies                   | Description                                                                                                                                                                       | Qualification |
| ICT practicals | A1 A2 A3 B4 B6 B8<br>B9 B18 C5 | The student must develop a mandatory practices, in addition to work or cases raised.<br>The laboratory practices will be compulsory for passing the subject.                      | 10            |
| Objective test | A4 B1 B5 B16                   | It includes the preparation of the final exam of the subject.                                                                                                                     | 50            |
| Case study     | B15 B16 C1 C4 C5               | Several case studies both group and individual analyzes to be tutored and supervised by the teacher, evaluating the work, effort and results achieved during the course proposed. | 40            |

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

| Sources of information |                                                                                                                                                                                                                                                                               |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Basic                  | <ul style="list-style-type: none"> <li>- AENOR (2016). Especificación AE0055 sobre eficiencia energética. Madrid</li> <li>- AENOR (2011). Sistemas de Gestión de la Energía ISO 50001:2011.</li> <li>- AENOR (2014). Auditorías Energéticas Parte 1 a 4 UNE 16247.</li> </ul> |
| 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.