



## Teaching Guide

Identifying Data					2019/20
Subject (*)	Cogeneration and Biomass Systems			Code	770523003
Study programme	Mestrado Universitario en Eficiencia e Aproveitamento Enerxético				
Descriptors					
Cycle	Period	Year	Type	Credits	
Official Master's Degree	1st four-month period	First	Obligatory	6	
Language	Spanish				
Teaching method	Face-to-face				
Prerequisites					
Department	Enxeñaría Industrial				
Coordinador	Casteleiro Roca, José Luis	E-mail	jose.luis.casteleiro@udc.es		
Lecturers	Casteleiro Roca, José Luis	E-mail	jose.luis.casteleiro@udc.es		
Web					
General description	This subject aims to give students theoretical knowledge of various types and operations systems Cogeneration and Biomass used in Power Generation.				

## Study programme competences

Code	Study programme competences
A7	Capacidad para el diseño y análisis de sistemas de cogeneración.
A8	Capacidad para el diseño y análisis de sistemas de biomasa.
A9	Tener conocimiento de los fundamentos, potencial, tecnología, aplicaciones y normativa de fuentes de energía renovables.
A10	Capacidad para analizar e incluir energías renovables en diferentes instalaciones.
A12	Capacidad para la toma de decisiones en un entorno tecnológico donde los materiales se utilicen en aplicaciones de eficiencia
A13	Capacidad para analizar, aplicar y optimizar los sistemas de aprovechamiento energético.
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.
B11	Adquirir nuevos conocimientos y capacidades relacionados con el ámbito profesional del máster.
B14	Aplicar conocimientos de ciencias y tecnologías avanzadas a la práctica profesional o investigadora de la eficiencia
C3	Aplicar una metodología que fomente el aprendizaje y el trabajo autónomo.
C5	Adquirir la capacidad para elaborar un trabajo multidisciplinar
C6	Dominar la expresión y la comprensión de un idioma extranjero.

## Learning outcomes

Learning outcomes	Study programme competences		
Knowing the environmental issues relating to electric power generation	AJ9 AJ13	BC1 BC11	CC5
Analyze and know how to design cogeneration systems	AJ7 AJ12	BC11 BC14	CC3
Analyze and know how to design biomass generation systems	AJ8 AJ10	BC4 BC11	CC6

## Contents

Topic	Sub-topic
Topic 1: Environmental considerations	1.1. Environmental problems  1.2. Solutions to environmental problems. Renewable energy



Topic 2: Use of waste heat. Cogeneration	<p>2.1. General aspects of cogeneration</p> <p>2.2. Technology applied to cogeneration and trigeneration</p> <p>2.3. Cogeneration and trigeneration power stations</p>
Topic 3: Biomass	<p>3.1. Energy sources</p> <p>3.2. Municipal Solid Waste</p> <p>3.3. Process of using biomass</p> <p>3.4. Domestic applications</p>

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student's personal work hours	Total hours
Guest lecture / keynote speech	A7 A8 B11 B4 C5 C6	18	25	43
Laboratory practice	A12 A13 B1 B14 C3 C5	22	25	47
Workshop	A7 A8 B14	5	50	55
Mixed objective/subjective test	A7 A8 A9 A10 B1 B11	3	0	3
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
Guest lecture / keynote speech	<p>Keynote speech complemented with the use of audiovisual media and the introduction of some questions to students, in order to transmit knowledge and facilitate learning.</p> <p>The order of the topics covered will not have to be the one described in the teaching guide. In addition, there will be topics that can be seen together on the development of others, and the division between them may not be strict.</p>
Laboratory practice	Performing laboratory practice as far as possible; or, failing that, solving exercises and specific problems in the classroom, from the knowledge explained.
Workshop	Realization of an individual work of a specific subject of the subject and sharing in a group to share knowledge. Later the works will be joined in a common one that will be presented in class by groups.
Mixed objective/subjective test	It consists in carrying out an objective test of approximately 3 hours, in which the acquired knowledge will be evaluated.

Personalized attention	
Methodologies	Description
Laboratory practice	The student has the relevant meetings of personalized tutorials, to resolve the concerns arising from the matter.

Assessment			
Methodologies	Competencies	Description	Qualification
Laboratory practice	A12 A13 B1 B14 C3 C5	Some tasks established in the subject, within the framework of this methodology	5



Mixed objective/subjective test	A7 A8 A9 A10 B1 B11	Exam type objective test	60
Workshop	A7 A8 B14	Accomplishment of an individual and group work, as well as its exhibition in class	35

### Assessment comments

As part of the "Laboratory practice" may include aspects such as attendance, personal work, attitude, etc., to help to pass the subject.

The "Mixed test" will be divided into a multiple choice and some questions.

It is necessary to exceed 15% of the score in the "Mixed test" to pass, as well as to approve the works proposed in "Workshop".

### Sources of information

<b>Basic</b>	<ul style="list-style-type: none"> <li>- Sala Lizarraga, José María (1994). Cogeneración: aspectos termodinámicos, tecnológicos y económicos. Bilbao: Universidad del País Vasco, Servicio Editorial</li> <li>- García Garrido, Santiago (2012). Centrales termoeléctricas de biomasa. Fuenlabrada: Renovetec</li> </ul>
<b>Complementary</b>	<ul style="list-style-type: none"> <li>- Boyce, Meherwan P. (2010). Handbook for cogeneration and combined cycle power plants. New York: ASME</li> <li>- Villares Martín, Mario (2003). Cogeneración. Madrid: Fundación Confemetal</li> </ul>

### Recommendations

Subjects that it is recommended to have taken before

Subjects that are recommended to be taken simultaneously

Subjects that continue the syllabus

Thermal Instalations/770523018

### Other comments

To help achieve an immediate sustainable environment and meet the objective of action number 5: "Healthy and sustainable environmental and social teaching and research" of the "Green Campus Ferrol Action Plan":

1. The delivery of the documentary works that are made in this matter:
  - 1.1. They will be requested in virtual format and / or computer support
  - 1.2. They will be made through Moodle, in digital format without the need to print them

(\*)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.