



## Teaching Guide

Identifying Data					2022/23
Subject (*)	Wind Systems	Code	770523009		
Study programme	Mestrado Universitario en Eficiencia e Aproveitamento Enerxético				
Descriptors					
Cycle	Period	Year	Type	Credits	
Official Master's Degree	2nd four-month period	First	Obligatory	6	
Language	Spanish				
Teaching method	Face-to-face				
Prerequisites					
Department	Enxeñaría Industrial				
Coordinador		E-mail			
Lecturers		E-mail			
Web	moodle.udc.es/				
General description	Wind farm , isolated installations or connected to the electricity network, serving law: With this course the student the knowledge necessary for the drafting , assembly and maintenance of a wind project use will be provided				

## Study programme competences

Code	Study programme competences
A1	Análise e aplicación de metodoloxías e normativa para unha xestión eficiente da enerxía.
A4	Análisis de consumos energéticos y de su costes asociados.
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.
A11	Capacidad para aplicar métodos de análisis de datos para la creación de sistemas energéticos eficientes.
A13	Capacidad para analizar, aplicar y optimizar los sistemas de aprovechamiento energético.
A14	Capacidad para el diseño y análisis de sistemas eólicos.
A15	Capacidad para desarrollar un proyecto en el ámbito del máster.
A16	Capacidad para buscar, analizar, identificar y aplicar nuevas fuentes de energía eléctrica o nuevas técnicas de gestión de la electricidad bajo criterios como eficiencia, sostenibilidad o cooperación, así como el empleo de éstas sobre nuevas aplicaciones.
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.
B2	Que los estudiantes sean capaces de integrar conocimientos y enfrentarse a la complejidad de formular juicios a partir de una información que, siendo incompleta o limitada, incluya reflexiones sobre las responsabilidades sociales y éticas vinculadas a la aplicación de sus conocimientos y juicios.
B3	Poseer y comprender conocimientos que aporten una base u oportunidad de ser originales en el desarrollo y/o aplicación de ideas, a menudo en un contexto de investigación.
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.
B11	Adquirir nuevos conocimientos y capacidades relacionados con el ámbito profesional del máster.
B13	Aplicar los conocimientos teóricos a la práctica
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.
C3	Aplicar una metodología que fomente el aprendizaje y el trabajo autónomo.
C4	Desarrollar el pensamiento crítico
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		
Know the elements and devices of a wind power generation system and its features and operating principles	AJ9	BC4	CC3
Knowing the different techniques and technological processes for converting wind energy into electrical energy	AJ9 AJ10 AJ15	BC2 BC8	CC3 CC6
Knowing the fundamentals that govern the behavior of wind from a physical point of view , and to familiarize students with the process of conversion of wind energy	AJ13 AJ14	BC1 BC9 BC11 BC16	CC2 CC5
Allow access to the knowledge of the influence on the environment have different processes and systems used , as well as mechanisms to limit such influence	AJ9 AJ11 AJ14 AJ15	BC4 BC6 BC13	CC1 CC5
To train students in techniques for the study and development of wind energy projects that can be used in the professional field	AJ1 AJ4	BC6 BC15	CC2
To provide students with the knowledge and skills necessary to perform specific tasks in the field of wind energy within the scope of the sector's	AJ10 AJ11 AJ13 AJ14 AJ16	BC3 BC18	CC5
Learning to determine the response of a wind system, especially from the point of view of energy generation and to determine the factors that influence this response and its impact on conversion into electricity.	AJ9 AJ10 AJ13 AJ14 AJ15	BC5 BC17	CC1 CC3 CC4

Contents	
Topic	Sub-topic
Development of wind technology	Old windmills Modern developments in wind turbines State of current technology Trends of future wind developments



physical and aerodynamic Fundamentals of Wind Energy Conversion	<p>Meteorological Concepts</p> <p>Characterization of wind resources</p> <p>Treatment of wind data</p> <p>Estimation of electricity production</p> <p>Assessment models wind potential</p> <p>wind resources on land and at sea in Spain .</p> <p>Bezt limit . Theory momentum</p>
Structure, components and characteristics of wind turbines	<p>Blades: Theory profiles .</p> <p>parametric study of performances</p> <p>Loads on the turbine rotor .</p> <p>Selection of materials on towers and blades</p> <p>dynamic and fatigue analysis towers and blades</p> <p>Uninterrupted speed and variable speed .</p>
Methods for calculating the energy generated	<p>Monitoring of wind turbines</p> <p>electrical systems and control</p> <p>Connection to the electricity distribution network</p> <p>economic aspects</p> <p>environmental aspects</p> <p>Types of machines and companies operating in the wind energy market .</p>
Methodology for the design of wind farms, impact analysis	<p>Monitoring of wind turbines</p> <p>electrical systems and control</p> <p>Connection to the electricity distribution network</p> <p>economic aspects</p> <p>environmental aspects</p> <p>Types of machines and companies operating in the wind energy market</p>
Evaluation systems: technological, economic and legal aspects .	<p>Sags and quality of energy generated :</p> <p>Detection and investigation of wind sites .</p> <p>Estimation of electricity produced at wind farm</p> <p>Assessment models potential wind park</p> <p>isolated grid systems .</p> <p>socioeconomic aspects</p> <p>environmental and legal aspects</p> <p>Wind generation billing</p>
Installation and maintenance of the wind farm	<p>Operations and commissioning of power plants eólica. Metodología mounting and electrical and mechanical maintenance of wind turbines .</p> <p>Installation and maintenance of power grids , generators, transformer and transformer substation.</p> <p>Installation and maintenance of instrumentation equipment .</p> <p>Control systems and regulation of wind farms.</p>

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Events academic / information	A9 A16 B4 B6 B9 B16	2	4	6



Case study	A1 A4 A13 B2 B13 C3	2	4	6
Objective test	A10 A11 A14 A15 B3 B1 B11 B15 C1 C5	10	10	20
Field trip	A16 B2 B5 C5	10	10	20
Guest lecture / keynote speech	A1 A9 A14 B8 C1 C4 C6	30	30	60
Supervised projects	A10 A11 B17 B18 C2	10	20	30
Document analysis	A4 A10 A13 A16 B16 C3	4	0	4
Personalized attention		4	0	4

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

Methodologies	
Methodologies	Description
Events academic / information	Study of the major advances in wind energy in the world, technological and scientific innovations .
Case study	Study of the problems encountered in the installation and assembly of different wind farms. problems of legislation and networking .
Objective test	Examination explained and discussed in class
Field trip	Visits to wind farms and manufacturing facilities of wind components
Guest lecture / keynote speech	Description - explanation of wind systems , components maintenance and commissioning
Supervised projects	Description - explanation of wind systems , components maintenance and commissioning
Document analysis	Magazine articles and Internet sector

Personalized attention	
Methodologies	Description
Document analysis Guest lecture / keynote speech Supervised projects Objective test Field trip Case study Events academic / information	The teacher will be provided in their hours of class and tutorials to solve any problem submit students , both in person, by telephone or via e-mail or moodle .

Assessment			
Methodologies	Competencies / Results	Description	Qualification
Document analysis	A4 A10 A13 A16 B16 C3	The presentation will consider the comments and analyzes of documentary sources consulted	5
Guest lecture / keynote speech	A1 A9 A14 B8 C1 C4 C6	Regular attendance of students to classes are taken into account.	5
Supervised projects	A10 A11 B17 B18 C2	Presentation in a timely manner of work marked	10
Objective test	A10 A11 A14 A15 B3 B1 B11 B15 C1 C5	Written test problem solving, theory and issues on the agenda of the contents	50
Field trip	A16 B2 B5 C5	Assistance to field trips .	20



Case study	A1 A4 A13 B2 B13 C3	the presentation of the study of the cases raised will be taken into account.	5
Events academic / information	A9 A16 B4 B6 B9 B16	proper presentation of news and work marked in a timely manner will be taken into account.	5

#### Assessment comments

#### Sources of information

Basic

Complementary

#### Recommendations

##### Subjects that it is recommended to have taken before

Renewable Systems/770523005

##### 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.