



POLITÉCNICA

INTERNATIONAL
CAMPUS OF
EXCELLENCE

COORDINATION PROCESS OF
LEARNING ACTIVITIES
PR/CL/001



E.T.S. de Ingenieros de
Telecomunicacion

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

93001035 - Energy And Society

DEGREE PROGRAMME

09AX - Master Universitario en Energia Solar Fotovoltaica

ACADEMIC YEAR & SEMESTER

2020/21 - Semester 1

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1. Description

1.1. Subject details

Name of the subject	93001035 - Energy And Society
No of credits	5 ECTS
Type	Compulsory
Academic year of the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	09AX - Master Universitario en Energia Solar Fotovoltaica
Centre	09 - Escuela Tecnica Superior de Ingenieros de Telecomunicacion
Academic year	2020-21

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Ignacio Rey-Stolle Prado (Subject coordinator)	IES-107	ignacio.reystolle@upm.es	W - 12:00 - 14:00
Alejandro Datas Medina	IES-202	a.datas@upm.es	M - 12:00 - 14:00

* The tutoring schedule is indicative and subject to possible changes. Please check tutoring times with the faculty member in charge.

3. Skills and learning outcomes *

3.1. Skills to be learned

CB06 - 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

CB07 - 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

CB08 - 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

CB09 - 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

CB10 - 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.

CE01 - Comprender, analizar y juzgar la relevancia de cualquier contribución en este campo, en relación con su entorno social, energético y científico-técnico.

CE06 - Aplicar metodologías de diseño e implementación de técnicas de aprendizaje y clasificación automáticas para una gestión inteligente del conocimiento

CG05 - Gestión de la información: buscar y gestionar recursos bibliográficos adecuados con eficiencia, aprender a continuar los estudios de manera ampliamente autónoma como base para la futura actividad de investigación e innovación

CG08 - Aplicar metodologías, procedimientos, herramientas y normas del estado del arte para la creación de nuevos componentes tecnológicos; Construir nuevas hipótesis y modelos, evaluarlos y aplicarlos a la resolución de problemas

CG09 - Comunicar juicios, y conocimientos a audiencias especializadas y no especializadas, de una manera razonada, clara y sin ambigüedades

CT03 - Uso de la lengua inglesa: comprender los contenidos de clases magistrales, conferencias y seminarios en

lengua inglesa; redactar en inglés informes y artículos científico-técnicos usando herramientas informáticas; realizar exposiciones públicas en inglés de trabajos, resultados y conclusiones de investigación, por ejemplo, en las asignaturas del Máster o en congresos de carácter mayoritariamente internacional o en estancias en centros extranjeros, todo ello con la ayuda de medios informáticos audiovisuales

3.2. Learning outcomes

RA53 - RA26 - Conocimiento de la evolución de los diferentes modelos energéticos

RA15 - RA27 - Capacidad crítica de analizar los diferentes modelos en términos de principios básicos de la física.

RA51 - RA28 - Comprender y analizar las diferentes fuentes y tipos de energía.

RA52 - RA27 - Capacidad crítica de analizar los diferentes modelos en términos de principios básicos de la física.

* The Learning Guides should reflect the Skills and Learning Outcomes in the same way as indicated in the Degree Verification Memory. For this reason, they have not been translated into English and appear in Spanish.

4. Brief description of the subject and syllabus

4.1. Brief description of the subject

The general goal of this course is to consolidate and expand the general knowledge around energy in a broad sense of students who will become experts in a particular energy field as is Photovoltaic Solar Energy. Graduate courses are necessarily specific so it is mandatory to raise your head, look around and understand the wide context. This general goal will be accomplished by means of achieving this set of specific goals:

- To think about the definition and concept of Energy
- To know the energetic evolution of humankind
- To understand the energetic situation of our contemporary world
- To analyze the role of fossil fuels in the world energy system
- To define and understand what Renewable Energies are
- To know the fundamental physics, technology, and degree of development of the main Renewable Energies
- To develop a basic knowledge of the envisaged future energy technologies currently under basic research

4.2. Syllabus

1. Basic concepts around energy
 - 1.1. Basic Concepts around Energy and Energetic Machines
 - 1.2. Energy in Human History
2. World energetic structure
 - 2.1. World Energy System
 - 2.2. World Electricity System
 - 2.3. Fossil Fuels
 - 2.4. Impacts of Energy Today. Ecology, Climate, People, and Sustainability
3. Other Renewable Energies
 - 3.1. Introduction to Renewable Energies
 - 3.2. Wind Energy
 - 3.3. Solar Thermal Energy
 - 3.4. Biomass Energy
 - 3.5. Geothermal Energy
 - 3.6. Hydropower
 - 3.7. Ocean Energy
4. Future and Emerging Energy Technologies
 - 4.1. Hydrogen Energy Technologies
 - 4.2. Clean Coal Technologies
 - 4.3. Nuclear Fusion

5. Schedule

5.1. Subject schedule*

Week	Face-to-face classroom activities	Face-to-face laboratory activities	Distant / On-line	Assessment activities
1	<p>Course presentation Duration: 02:00</p> <p>Unit I.1: Basic Concepts around Energy and Energetic Machines Duration: 04:00</p>			
2	<p>Unit I.2: Energy in Human History Duration: 04:00</p>			<p>Assignment for Unit I.1</p> <p>Continuous assessment Not Presential Duration: 03:00</p>
3	<p>Unit II.1 World Energy System Duration: 02:00</p> <p>Unit II.2 World Electricity System Duration: 02:00</p>			<p>Assignment for Unit I.2</p> <p>Continuous assessment Not Presential Duration: 03:00</p>
4	<p>Unit II.3 Fossil Fuels Duration: 04:00</p>			<p>Assignment for Unit II.1</p> <p>Continuous assessment Not Presential Duration: 04:00</p>
5	<p>Unit II.4 Impacts of Energy Today. Ecology, Climate, People, and Sustainability Duration: 04:00</p>			<p>Assignment for Unit II.2</p> <p>Continuous assessment Not Presential Duration: 04:00</p>
6	<p>Unit III.1 Introduction to Renewable Energies Duration: 02:00</p>			<p>Assignment for Unit II.3</p> <p>Continuous assessment Not Presential Duration: 04:00</p>
7	<p>Unit III.2 Wind Energy Duration: 03:00</p>			<p>Assignment for Unit II.4</p> <p>Continuous assessment Not Presential Duration: 04:00</p>
8	<p>Unit III.3 Solar Thermal Energy Duration: 03:00</p>			<p>First elective assignment for Unit III</p> <p>Continuous assessment Not Presential Duration: 04:00</p>

9	Unit III.4 Biomass Energy Duration: 02:00 Unit III.5 Geothermal Energy Duration: 02:00			Second elective assignment for Unit III Continuous assessment Not Presential Duration: 04:00
10	Unit III.6 Hydropower Duration: 03:00 Unit III.7 Ocean Energy (1 hour) Duration: 01:00			
11	Unit IV.1 Hydrogen Energy Technologies Duration: 02:00 Unit IV.2 Clean Coal Technnologies Duration: 02:00			
12	Unit IV.3 Nuclear Fusion Duration: 03:00			
13				Presentation of final papers Continuous assessment Presential Duration: 04:00
14				Assessment of participation in class Continuous assessment Not Presential Duration: 01:00
15				
16				
17				Final general exam Final examination Presential Duration: 02:00

Depending on the programme study plan, total values will be calculated according to the ECTS credit unit as 26/27 hours of student face-to-face contact and independent study time.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Continuous assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
2	Assignment for Unit I.1		No Presential	03:00	5%	5 / 10	CG05 CB09 CB06 CB08 CT03 CB07 CB10 CE01
3	Assignment for Unit I.2		No Presential	03:00	5%	5 / 10	CG05 CB09 CB06 CB08 CT03 CB07 CB10 CE01
4	Assignment for Unit II.1		No Presential	04:00	5%	5 / 10	CG05 CB09 CB06 CB08 CT03 CB07 CB10 CE01 CE06
5	Assignment for Unit II.2		No Presential	04:00	5%	5 / 10	CE06 CG05 CB09 CB06 CB08 CT03 CB07 CB10 CE01

6	Assignment for Unit II.3		No Presential	04:00	5%	5 / 10	CG05 CB09 CB06 CB08 CT03 CB07 CB10 CE01 CE06
7	Assignment for Unit II.4		No Presential	04:00	5%	5 / 10	CG05 CB09 CB06 CB08 CT03 CB07 CB10 CE01 CE06
8	First elective assignment for Unit III		No Presential	04:00	5%	5 / 10	CG05 CG08 CB06 CB08 CT03 CB07 CB10 CE01 CE06
9	Second elective assignment for Unit III		No Presential	04:00	5%	5 / 10	CG05 CB09 CB06 CB08 CT03 CB07 CB10 CE01 CE06
13	Presentation of final papers		Face-to-face	04:00	40%	5 / 10	CB09 CG08 CB06 CB08 CT03 CB07 CG09 CB10 CE01 CE06 CG05

14	Assessment of participation in class		No Presential	01:00	20%	0 / 10	
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6.1.2. Final examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Final general exam		Face-to-face	02:00	100%	5 / 10	CG05 CB09 CG08 CB06 CB08 CT03 CB07 CG09 CB10 CE01 CE06

6.1.3. Referred (re-sit) examination

No se ha definido la evaluación extraordinaria.

6.2. Assessment criteria

CONTINUOUS EVALUATION

Assignments

40% of your final score will be linked o the results of the 8 assignments of the course (exercises, problems, comments to proposed readings, ...). What will be assessed is the depth, quality, and rank between your classmates.

Final paper and presentation

40% of your final score will be associated with an individual paper with a free topic to be completed and presented in the final session of the course. What will be assessed in this exercise will be depth, quality, and rank between

your classmates of the written essay, For the presentation, we will assess the clarity, quality in replies to questions, fitting to time and format.

Class participation

20% of your final score will be linked to your attitude and participation (quality and quantity) in class

EVALUATION BY FINAL EXAM ONLY

You can pass the course by doing a final written general exam about the general knowledge discussed in the course.

7. Teaching resources

7.1. Teaching resources for the subject

Name	Type	Notes
Course Web page in Moodle	Web resource	The course web page at UPM's Moodle server contains all material needed to follow the course. This includes: 1) Presentations for all units in PDF format 2) Assignments 3) Ancillary material (readings, reports, videos, ...)

8. Other information

8.1. Other information about the subject

This course is closely related to SUSTAINABLE DEVELOPMENT GOAL 7, 'Ensure access to affordable, reliable, sustainable and modern energy for all'. Many of the specific targets of SDG 7 are explicitly covered in the syllabus. For instance, the current structure of the world energy system, the degree of penetration of renewable energies in the generation pool, energy efficiency, and the impacts of our energy model in ecology, climate, demography, and gender, are dealt with. Accordingly, there are also connections with other SDGs as, for example, SDG 11: Sustainable cities and communities; and SDG 13: Climate Action. Finally, it should be mentioned that SDGs in general, and SDG 7 in particular, are discussed in one of the topics in the course.