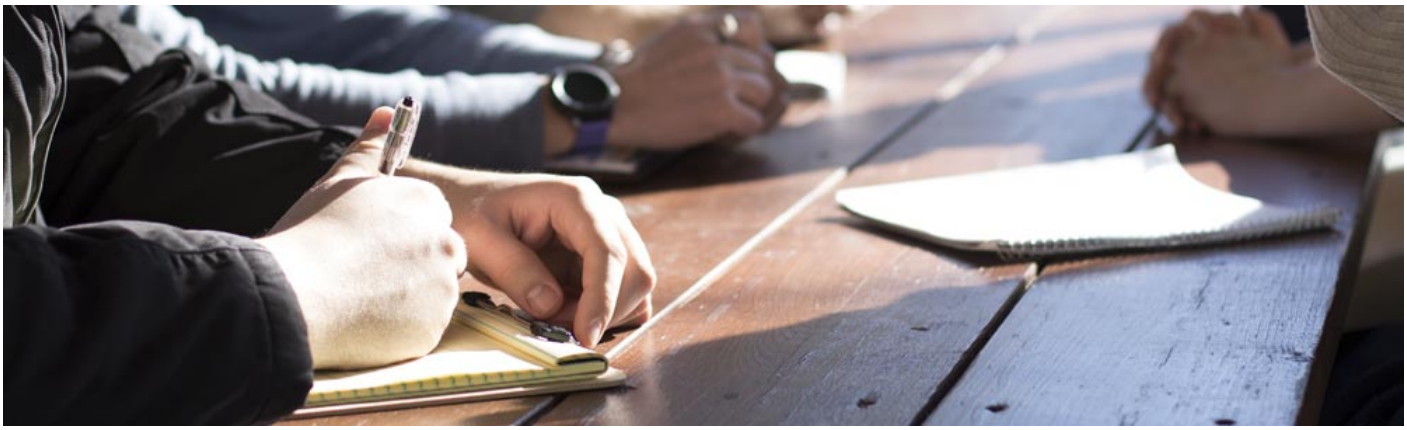

COURSE: INTRODUCTION TO PHOTOVOLTAIC POWER SYSTEMS (2020/21)

Since : 9/9/20 | **Up to :** 2/27/22 | Campus Virtual

Pre-registration: Since 7/13/20

Promoted by :
Instituto Interuniversitario de Investigación de Reconocimiento Molecular y Desarrollo Tecnológico

Lead by :
Salvador Seguí Chilet

Certification	Achievement
Course modality	ONLINE
Course	2020-2021
ECTS	6
Campus	Virtual
0 h	On-campus
60 h	Online

Course modality

Face-To-Face	Online	Live broadcast
—	✓	—
0 hours	60 hours	0 hours

Venue :
Virtual Campus
on line

Fee	Target	Deadlines	Since	Up to
300.00 €	General public	1 plazo	-	-
100.00 €	Second enrolment	1 plazo	-	-

Fees comments:
300,00 € - General enrolment
100,00 € - Second enrolment

Objectives

At the end of the course the attendees will know:
* The different topologies of photovoltaic installations.
* The different parts of grid-connected and stand-alone photovoltaic installations.
* How to design, calculate, and select each part of the photovoltaic installation.
* How to estimate the energy production of a photovoltaic installation.

Who this course is for

Intended for:
* Engineers of different specialties related to photovoltaic systems (industrial, electronics, electric, mechanical, civil, environmental, etc.), architects, physics, and professionals related with renewable energies.
* Vocational training in technical fields related to photovoltaic systems.
* Interested in learning how photovoltaic installations work

Previous knowledge

Required prior knowledge: None.
It is interesting to have some basic notions about electricity. Other necessary prior knowledge will be taught in the course.

Trainers

Mar Cañada Soriano
Profesor/a Asociado/a

Mariana Ibáñez Gil De Ramales
Expert

Paula Lamo Anuarbe
Expert

Álvaro Enrique Montero Reguera
Profesor/a Titular de Universidad

Maria Angeles Hernandez Fenollosa
Profesor/a Titular de Universidad

Gabino Jiménez Castillo
Expert

Pablo Merodio Cámara
Expert

Ana María Navarro Gozalbo
Expert

Salvador Orts Grau
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Roser Sabater I Serra
Catedrático/a de Universidad

Martín Seguí Cotano
Expert

Kyle David Ryan
Expert

Salvador Seguí Chilet
Profesor/a Titular de Universidad

Ignacio Valdeolmillos Artíguez
Expert

Teaching methodology

Teaching Methodology:
* Training material in the online platform (PoliformaT): class notes, slides, examples, videos, self-tests, exams.
* Online tutorials on asynchronous forum open for doubts and questions.
* Webinars for resolution of doubts and extending course contents.
* Training oriented to the application of the technology.

Content

Detailed program of the course:

********MODULE 1. INTRODUCTION TO PHOTOVOLTAIC SYSTEMS********

Unit 1: INTRODUCTION TO RENEWABLE ENERGIES
1.1 Renewable and non-renewable energies: energy mix and related problems.
1.2 Renewable energy types.
1.3 Problems with renewable energy resources: energy storage.
1.4 PV systems in the future energy mix.

Unit 2: PHOTOVOLTAIC CELLS AND MODULES.
2.1. Introduction.
2.2. Photovoltaic solar cells.
2.3. Photovoltaic solar modules.
2.4. Effect of temperature on photovoltaic modules
2.5. Photovoltaic field.
2.6. Tracking the Maximum Power Point.
2.7. Example of the effect of temperature on A-75 module.

Unit 3: SOLAR RADIATION AND PHOTOVOLTAIC GENERATION SYSTEMS.
3.1. Introduction.
3.2. Radiation tables.
3.3. Orientation, tilt and shading over modules.

Unit 4: SUPPORTING STRUCTURES FOR PHOTOVOLTAIC SYSTEMS.
4.1. Introduction.
4.2. Photovoltaic installations on roofs and facades.

4.3. Photovoltaic ground installations
4.4. Structural assembly for photovoltaic installations.

Unit 5: BASIC ELECTRICAL THEORY FOR PHOTOVOLTAIC INSTALLATIONS.
5.1. Introduction.
5.2. DC systems.
5.3. AC systems
5.4. Examples of PV systems.
5.5. Protections.
5.6. Wiring.

Exam: test with 25 questions.

********MODULE 2. GRID-CONNECTED PHOTOVOLTAIC SYSTEMS********

Unit 1: GRID-CONNECTED PV INVERTERS.
1.1. Introduction.
1.2. DC/DC converter.
1.3. DC/AC converter: inverters.
1.4. Electrical isolation.
1.5. Grid management.

Unit 2. GRID-CONNECTED PV POWER PLANTS.
2.1. Introduction.
2.2. Types of photovoltaic plants.
2.3. Energy production of a grid-connected photovoltaic installation.
2.4. Power losses in photovoltaic plants
2.5. Project for a grid-connected photovoltaic plant.
2.6. Photovoltaic solar farms.
2.7. Dynamic support and grid management of PV plants.

Unit 3. DESIGN OF GRID-CONNECTED PV POWER PLANTS: EXAMPLES.
3.1. 100 kW PV installation on a 50m x 20m roof.
3.2. 60 kW PV installation with a central inverter and string inverters.
3.3. 17 kW c-Si PV plant in the ETSID.
3.4. 3.3 kW a-Si PV plant in the ETSID.
3.5. 45 kW PV installation with string inverters.

Exam: Project - DESIGN OF A 12 kW PV SYSTEM

********MODULE 3. OFF-GRID PHOTOVOLTAIC SYSTEMS********

Unit 1: INTRODUCTION TO STAND-ALONE PHOTOVOLTAIC SYSTEMS
Objectives and index.

Unit 2: COMPONENTS IN STAND-ALONE PHOTOVOLTAIC SYSTEMS
2.1. Introduction.
2.2. Topologies and specifications for off-grid photovoltaic systems.
2.3. Loads.
2.4. Inverters.
2.5. Photovoltaic field.
2.6. Charge regulators.
2.7. Batteries .
2.8. Electrical installation.

Unit 3: ELECTROCHEMICAL ACCUMULATORS IN STAND-ALONE PHOTOVOLTAIC SYSTEMS.
3.1. Introduction.
3.2. Operation of an electrochemical accumulator.
3.3. Voltages in a lead-acid battery.
3.4. Battery capacity.
3.5. Battery charging: charging with constant voltage (U); charging with constant current (IA); charging with constant current and voltage (UI); charging with growing voltage (WA)
3.6. Charging batteries in photovoltaic systems.
3.7. Lithium-ion batteries.

Unit 4: DESIGN OF A STAND-ALONE PV SYSTEMS: ANALYSIS OF THE WORTH MONTH.
4.1. Introduction.
4.2. Calculation of the photovoltaic field.
4.3. Circuit currents
4.4. Battery design.
4.5. Charge regulator selection (PWM and MPPT types).
4.6 Verifying the design with the Ah approach.

Unit 5: DESIGN OF 12 V 900 W STAND-ALONE PV SYSTEMS.
5.1. Introduction.
5.2. Study on system consumptions.
5.3. Selecting the sinusoidal output inverter.
5.4. Photovoltaic field design.
5.5. Battery selection.
5.6. Selection of PWM charge regulator.
5.6.1. Verification of the photovoltaic field design with PWM charge regulator.
5.7. Selection of a MPPT charge regulator.
5.7.1 Other configurations of the photovoltaic field.
5.8 Calculation of wire cross-sections with PWM regulator.
5.8.1 DC loads wiring.
5.8.2 Wiring AC loads.
5.8.3 Wiring of photovoltaic generator, batteries and converters.
5.8.4 Installation diagram and protections.
5.9. Analysis of losses due to MPPT regulator wiring.
5.10. Comparison of losses due to wiring.

Unit 6: PV PUMPING SYSTEMS.
6.1 Components of photovoltaic pumping systems.

6.2 Applications and classification of photovoltaic pumping systems.
6.3 Types of pumps.
6.4. AC motors and DC in photovoltaic pumping systems.
6.5 Electronic converters in photovoltaic pumping system.
6.6. Sizing of photovoltaic pumping system.
6.7 Analysis of photovoltaic pumps with different hydraulic cycles.

Exam: Project - DESIGN OF 24 V 900 W STAND-ALONE PV SYSTEMS

More information and other details

Other information relevant to the student:
* Open enrollment throughout the year (self-paced course)
* Course TOTALLY online with asynchronous tutorials.
* There will be three issues of certificates: 31/January/2021, 30/September/2022 and 28/February/2022.

You can register for this activity at **www.cfp.upv.es**

Registration →

Note: Consult the general and specific conditions of this activity in the file available at www.cfp.upv.es