

Professional Development Scholarship Program (PDSP)

GRID CONNECTED AND STAND-ALONE PHOTOVOLTAIC SYSTEMS

Course Objectives:

The main objective of the online course “Grid-connected and stand-alone photovoltaic systems” is to introduce the student in the use of photovoltaic energy in the generation of electrical energy for stand-alone PV systems (off-grid applications) or for grid-connected PV systems (grid tied PV installations).

Content:

The online course “Grid-connected and stand-alone photovoltaic systems” is organized as a modular course of 5 ECTS that is done completely online.

The course is organized in two main parts:

- Modules 1: Grid-connected photovoltaic systems.
- Module 2: Stand-alone photovoltaic systems

The first block of the course begins with the description of the elements common to all photovoltaic installations (photovoltaic modules, electronic converters, solar radiation and structures). Subsequently, the following contents are developed:

- Elements and topologies of photovoltaic systems for connection to the AC power network.
- Factors that affect the energy production of the installation.
- Grid-connected photovoltaic inverters.
- Design of photovoltaic systems with crystalline silicon modules and thin-film modules: selection of modules and inverters, wiring, protections, etc.
- Technical regulations on photovoltaic power systems.

The second block of the course deals with stand-alone photovoltaic installations (off-grid PV installations). The following contents are developed in this module:

- Elements and topologies of stand-alone photovoltaic systems.
- PWM and MPPT charge controllers, batteries and photovoltaic inverters for off-grid installations.

- Design of stand-alone photovoltaic systems operating with a DC bus, including the selection of photovoltaic modules, charge controller, PV field configuration, inverter, wiring, protections, etc.
- Study of the worst month of design of a photovoltaic stand-alone system using solar radiation data in the location of the installation and energy demand of consumptions.
- Photovoltaic water pumping systems.

The training material includes: Acrobat files, Excel and word; Multimedia material; proposed and solved problems and projects to develop.

Teaching Methodology:

The course has been developed following an e-learning methodology based on the experience obtained by the direction of the course in the different courses taught at the University and other centers. The training tools used in the PoliformaT platform (based on Sakai) are the following:

- Menu for downloading documents.
- Menu for seeing multimedia training material.
- Internal e-mail for communication between professors and students.
- Forum for the solutions of questions and doubts.
- Exams and self-tests, all on-line.
- Announcements for general information related to the course.

The contents of each of the modules include examples and practical cases that allow applying the theoretical concepts developed. Training material available to students includes:

- Pdf files with more than 200 original pages developed by teachers, including explanations and graphics.
- More than 10 hours of training videos recorded to university professors and professionals.
- Slides used in recorded classes (more than 500 pages in total).
- Proposed problems.
- Excel files with examples and projects.
- Notes and technical annexes.
- Slides used in the webinars with specialists in the photovoltaic sector.

- Proposed problems.
- More than 1500 files with application notes, reports, technical specifications of components, etc.