Subject	SOLAR PHOTOVOLTAIC PLANT PROJECTING
Credits	6 ECTS (4T+2P)
Character	PV-systems track
Semester	2nd
Language	English/Spanish

Competences

CG5 – Information management: to search for and manage appropriate bibliographic resources efficiently, to learn to continue studies in a largely autonomous way as a basis for future research and innovation activity.

CG9 - Communicate judgments and knowledge to specialized and non-specialized audiences in a reasoned, clear and unambiguous manner.

CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and/or application of ideas, often in a research context

CB7 - Students should be able to apply their acquired knowledge and problem-solving skills in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.

CB8 - Students are able to integrate knowledge and face the complexity of making judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities related to the application of their knowledge and judgments.

CB9 - Students should be able to communicate their conclusions and the ultimate knowledge and rationale behind them to specialized and non-specialized audiences in a clear and unambiguous manner.

CB10 - That students possess the learning skills that will enable them to continue studying in a manner that will be largely self-directed or autonomous.

CT3 - Use of the English language: understand the contents of lectures, conferences and seminars in English; write reports and scientific-technical articles in English using computer tools; make public presentations in English of research work, results and conclusions,for example, in the subjects of the Master or in congresses of a mostly international nature or in stays in foreign centers, all with thehelp of audiovisual computer media.

CT4 - Team leadership: tocarry out team work (such as those of some of the evaluation activities of the subjects), to integrate into a research group by activelyparticipating in its meetings, collaborating with own initiative in R+D+i works or projects; to interact effectively with the membersof the multidisciplinary work team.

CE1 - Understanding, analyzing and judging the relevance of any contribution in this field, in relation toits social, energetic and scientific-technical environment.

CE5 - Design, analysis, characterization, planning and installation of general purpose, stand-alone orgrid-connected photovoltaic components and systems

CE7 - Analyze, design and implementphotovoltaic systems of medium-high complexity.

CE9 - Apply the services andtools available in the market to the design of photovoltaic systems.

Outcomes

RA01 - To know how a photovoltaic systems engineering project is carried out.

RA02 - General training on applications, the practical use of photovoltaic systems and an overview of photovoltaic technology.

RA03 - Knowledge of the most commonly used simulation tools for photovoltaic cells and systems.

RA15 - Training in costing techniques

RA19 - Knowing the practical aspects of the installation

RA20 - Knowing the components of photovoltaic systems

RA21 - Apply knowledge acquired in electrical engineering of photovoltaic systems

RA29 - Knowledge of the basic principles of generation, transport and distribution of photovoltaic solar energy.

RA30 - Knowledge of safety measures in photovoltaic power plants.

RA31 - Knowledge of the particularities of the ESF in the network

RA48 - Apply the services and tools available in the market to the design of photovoltaic systems.

RA60 - Know the necessary tools for the design, analysis and evaluation of grid-connected photovoltaic installations.

RA89 - Know the specific engineering tools for the design and evaluation of photovoltaic systems.

RA90 - Ability to analyze I-V curves of photovoltaic modules and systems.

Description and syllabus

The main objective of the course is to provide students with knowledge and specific engineering tools for the design, simulation, analysis, construction, operation and maintenance of photovoltaic power plants. Throughout the course, laboratory practices are carried out so that students have a direct experience of the concepts presented.

Theory

1. Incident radiation in photovoltaic systems.
    - Data sources (ground stations, satellite images). Quality control.
    - Spatial interpolation methods.
    - Geometry of tracking systems.
    - Incident radiation estimation in tracking systems.
    - Shading. Spatial configuration of a power plant.
2. Photovoltaic generator
    - Photovoltaic modules for large power plants.
    - Degradation of photovoltaic modules.
    - Support structures and solar tracking.
    - Dirt in photovoltaic generators
3. Conversion and control equipment

- Grid-connected inverters
- Electrical configuration of the photovoltaic system.
- Transformer substations

4. Electrical safety
   - Protection of people.
   - Equipment protection.
   - Protection elements.

5. Technical conditions of connection to the network
   - Applicable regulations. Network code.
   - Variability.
   - Prediction methods.
   - Accumulation systems.

6. Energy production
   - Production estimation. Uncertainty.
   - Sources of losses.
   - Monitoring systems.
   - Statistical analysis of data. Characteristic parameters.

7. Management
   - Costs and economic analysis.
   - Documentation and reception
   - Quality assurance procedures.
   - Maintenance.

Practice

Aimed at training students for the elaboration of the technical project of a photovoltaic power plant.