

Academic Year: ( 2023 / 2024 )

Review date: 08-06-2023

Department assigned to the subject: Electrical Engineering Department

Coordinating teacher: CHINCHILLA SANCHEZ, MONICA

Type: Compulsory ECTS Credits : 6.0

Year : 1 Semester : 1

**REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)**

Electric Circuits and Fundamentals of Electric Machines

**OBJECTIVES**

- Acquire adequate knowledge of photovoltaic solar energy technology.
- Follow the technological evolution of photovoltaic solar energy and have prospective knowledge of this evolution.
- Evaluate the solar resource in a certain location and know how to determine the environmental impact of a photovoltaic solar installation.
- Know how to project, calculate and dimension photovoltaic solar energy installations (connected to the grid and autonomous), selecting the most appropriate components for each application, within those commercially available, and using or designing specific software for each application.
- Have knowledge of the regulations that directly affect the use of photovoltaic solar energy.
- Acquire the ability to develop a specific photovoltaic solar energy project in practice: from the use of device selection, use of regulations, catalogs and commercial technical documentation, to its implementation in the field, using computer programs.

**DESCRIPTION OF CONTENTS: PROGRAMME**

- 1.- Photovoltaic energy. Basic statements and present technology.
- 2.- Solar resource. Introduction.
  - 2.1. Definitions
  - 2.2. Solar radiation
  - 2.3. Solar path. Measurements and instrumentation.
  - 2.4. Irradiation models.
- 3.- Solar cell.
  - 3.1. Actual technology
  - 3.2. Types and characteristics
  - 3.3. Equivalent cell model
- 4.- Photovoltaic modules.
  - 4.1. Types and characteristics.
  - 4.2. Power curve. Radiation and temperature. Maximum power tracking.
  - 4.3. Test.
5. Inverters
  - 5.1. Types and function
  - 5.2. Efficiency
  - 5.3. Selection. Regulation
6. PV generators
  - 6.1 Module association
  - 6.2. Maximum Power Point Tracking
- 7.- Protections
- 8.- Solar power tracking.
- 9.- Stand-alone photovoltaic energy systems.

9.1. Components. Batteries. Charge regulators. AC/DC Inverters (PWM, Maximum point power tracking).

9.2. Problems. Sizing.

10.- Urban PV Systems.

11.- Net metering

12.- Grid connected photovoltaic energy systems

12.1-Types.

12.2.Power devices in Grid connected photovoltaic energy systems.

12.3. Sizing. Retscreen and PVSyst simulation software.

12.4. Grid integration

12.5. Operation and Maintenance.

13.- Regulation.

14.- Technical project. Grid connected photovoltaic energy system: example. PVSyst. PVDesign

15.- Microgrids. Introduction. Sw Homer Pro.

#### LEARNING ACTIVITIES AND METHODOLOGY

-Teacher and industrial experts lessons, doubts resolution classes -in reduced groups-, students presentations, individual mentorship and student work to acquire theoretical concepts.  
Simulation lessons also be provided.

#### ASSESSMENT SYSTEM

A continuous assessment based on the completion of several tasks, students participation and tests that value both skills and general knowledge; 100% continuous assessment (three individual works)

<b>% end-of-term-examination:</b>	0
<b>% of continuous assessment (assignments, laboratory, practicals...):</b>	100

#### BASIC BIBLIOGRAPHY

- Deutsche Gesellschaft Für Sonnenenergie Planning and Installing Photovoltaic Systems, EarthScan, 2008
- Jose M. Fernandez Salgado Guia Completa de la Energía Solar Fotovoltaica, AMV Ediciones, 2007

#### ADDITIONAL BIBLIOGRAPHY

- Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas Fundamentos,dimensionado y aplicaciones de la Energía solar fotovoltaica, Editorial del Ciemat, 2005
- Luis Castañer Muñoz Energía Solar Fotovoltaica, Ediciones UPC, 1994

#### BASIC ELECTRONIC RESOURCES

- ANPIER Asociacion nacional de productores de energía fotovoltaica . Informes Asociacion nacional de productores de energía fotovoltaica: <https://anpier.org/>
- APPA - Asociación de Empresas de Energías Renovables . Informes de la Asociación de Empresas de Energías Renovables: <http://www.appa.es>
- UNEF . Union Española Fotovoltaica: <https://unef.es/>
- United Nations . Sustainable Development Goals (SDGs): <http://https://www.un.org/sustainabledevelopment/>