

Course guide

230335 - ESF - Photovoltaic Solar Energy

Last modified: 02/06/2023

Unit in charge: Barcelona School of Telecommunications Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering.

Degree: BACHELOR'S DEGREE IN TELECOMMUNICATIONS TECHNOLOGIES AND SERVICES ENGINEERING (Syllabus 2015). (Optional subject).
BACHELOR'S DEGREE IN ELECTRONIC ENGINEERING AND TELECOMMUNICATION (Syllabus 2018). (Optional subject).

Academic year: 2023 **ECTS Credits:** 2.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: Ortega Villascclaras, Pablo Rafael

Others: Biel Sole, Domingo

PRIOR SKILLS

Basic knowledge of electrical/Electronic circuit theory

TEACHING METHODOLOGY

Theory lectures

LEARNING OBJECTIVES OF THE SUBJECT

Show photovoltaic solar energy fundamentals and an introduction to the sizing of typical photovoltaic systems

STUDY LOAD

Type	Hours	Percentage
Hours large group	20,0	40.00
Self study	30,0	60.00

Total learning time: 50 h



CONTENTS

1. Photovoltaic solar energy fundamentals

Description:

- 1.1 Renewable and non-renewable energies. Energy and power units
- 1.2 Irradiance and irradiation. Solar radiation components: direct, diffuse and albedo components
- 1.3 Spectral irradiance. AM0 and AM1.5G solar spectra
- 1.4 Status and prospects of the photovoltaic solar energy
- 1.5 Apparent movement of the sun and sun-path charts
- 1.6 Irradiation on solar collectors. Fixed-tilt vs. tracking systems

Full-or-part-time: 12h

Theory classes: 6h

Self study : 6h

2. The solar cell

Description:

- 2.1 Working principles
- 2.2 The photocurrent and related parameters
- 2.3 Electrical parameters of the solar cell
- 2.4 Temperature and irradiance dependence. Concentration systems

Full-or-part-time: 12h

Theory classes: 6h

Self study : 6h

3. Photovoltaic modules and arrays

Description:

- 3.1 Introduction
- 3.2 Voltage, current and power scaling in photovoltaic modules and arrays
- 3.3 Temperature and irradiance dependence

Full-or-part-time: 6h

Theory classes: 2h

Self study : 4h

4. Introduction to photovoltaic system sizing

Description:

- 4.1 Grid and Off-grid photovoltaic systems
- 4.2 Application exercise

Full-or-part-time: 14h

Theory classes: 6h

Self study : 8h

GRADING SYSTEM

Final Exam and/or homework/mini-projects along the course



BIBLIOGRAPHY

Basic:

- Klaus Jäger, Olindo Isabella, Arno H.M. Smets, René A.C.M.M. van Swaaij, Miro Zeman. Solar Energy Fundamentals, Technology, and Systems [on line]. Delft: Delft University of Technology, 2014 [Consultation: 12/06/2023]. Available on: http://web.kpi.kharkov.ua/ief/wp-content/uploads/sites/39/2020/05/solar_energy_1.pdf.