

CLEAN ENERGY

An overview of our energy production system, based on fossil fuels and the main contributor to the emission of greenhouse gases, a reflection on the urgency to shift to clean technologies in order to limit climate change, and a review of the role and challenges of renewable energy sources (solar, wind,...), which are becoming the core of our energy systems.

➤ **Course duration: 10 contact hours**

➤ **Dates: 3, 4 & 7 July 2023**

■ **Recommended background knowledge for students:**

- Interest in energy-related issues.
Basic notions about energy and power

Meet Our

INSTRUCTORS



David Fuertes Marrón is tenured associate professor at UPM and researcher at the Solar Energy Institute. He has been working on the growth, fabrication and characterization of PV devices of different technologies over the last twenty years. He holds a BSc in Physics (UAM, Madrid, Spain), M.Eng.Sc. (UNSW, Sydney, Australia), Dr.rer.Nat. (Freie Universität Berlin, Germany) and has been visiting scientist at INL (Portugal), HZB (Germany) and MIT (MA, USA).



Carlos del Cañizo is full professor at the UPM, specializing in photovoltaics since 1994. He is Director of the Solar Energy Institute, a pioneering R&D center belonging to the UPM founded in 1979 focusing on PV. He has lengthy experience in silicon solar cell fabrication and characterisation, and also works on the topic of silicon ultrapurification and alternative routes for PV applications.

LEARNING GOALS

■ **Analyse**

Information



Energy technologies and environmental impacts

■ **Evaluate**

Key properties



Clean energies

■ **Acquire**

Overview



Current energy system

■ **Learn**

Potential



Renewable energies, especially photovoltaics

SYLLABUS

MODULES

01

Environmental impact of energy systems, Climate change, pollution and the need of clean technologies

02

Renewable technologies for energy provision, From conventional energy sources to renewables, status of development and challenges

03

Photovoltaic solar energy (PV), Operation principles, components, applications, economics. Manufacturing of PV cells and modules

04

Industry talk and question and answer session

Meet Our

INDUSTRY SPEAKER



Eduardo Forniés received his PhD in Physics from the Universidad de Alcalá. He has worked for several photovoltaic companies and is currently quality manager at Sonnedix, an international Renewable Energy Producer (REP) with over 450 power plants worldwide.

OPTIMIZATION OF CLEAN ENERGY PRODUCTION SYSTEMS IN MICROSOFT EXCEL

Introduction to mathematical formulation and optimization techniques to find the best solution for decision-making problems using Microsoft Excel. The proposed problems are based on the operation of clean energy production systems. This hands-on course with a lot of student participation focuses on real-world clean energy production system case studies.

➤ **Course duration: 10 contact hours**

➤ **Dates: 5 to 7 July 2023**

■ **Recommended background knowledge for students:**

- Basic knowledge of linear algebra and differential calculus & intermediate-level Microsoft Excel user.

Meet Our

INSTRUCTORS



Manuel J. Chazarra Jover received the PhD degree in 2017 from Universidad Politécnica de Madrid (UPM), Spain, where he currently works as non-tenured Associate Professor. His research area of interest is the optimal operation of power systems and energy storage systems, with special interest on hydropower systems. He is author of 14 scientific papers included in the Journal Citations Report (JCR) and of 11 International Conference papers.



Juan I. Pérez Díaz received his PhD degree in 2008 from Universidad Politécnica de Madrid (UPM), Spain, where he currently works as Associate Professor. His current research interests focus on power generation scheduling, load-frequency control in power systems and grid integration of renewable energy, with special emphasis on pumped-hydro energy storage. He is author of 51 scientific papers in JCR journals, and of 49 International Conference papers.

LEARNING GOALS

■ **Learn**

Modelling



Decision-making problems

■ **Learn**

Optimize



Linear/mixed integer & linear/nonlinear programming models

■ **Get acquainted**

Commercial optimization software tools: Microsoft Excel



Real-world case studies

SYLLABUS

MODULES

01

Linear Programming

- I. Modelling
- II. Simplex Method
- III. Problem-Solving in Microsoft Excel
- IV. Case Studies

02

- I. Modelling
- II. Branch and Bound Method
- III. Problem-Solving in Microsoft Excel
- IV. Case Studies

03

Industry talk

Meet Our

INDUSTRY SPEAKER



Francisco Hernández González, received his BS in Electrical Engineering from Universidad de Castilla-La Mancha in 2012, spending one year at Mälardalen University (Sweden). He received his MS in Electric Power Industry from the Universidad de Comillas in 2013. He has been working at Iberdrola since 2014, managing the company's energy in power markets. One of his main activities is medium- and long-term Iberian hydro assets planning.