

Subject	CHARACTERIZATION OF PHOTOVOLTAIC DEVICES AND MATERIALS
Credits	6 ECTS (1T+5P)
Character	PV-cells track
Semester	2nd
Language	English

Competences

CG3 - Creativity: To conceive, develop and validate new systems that can increase the quality of life of people; to carry out, in academic and professional contexts, innovations or technological advances that can advance the state of the art.

CG4 - Organization and planning: Organize, plan and manage complex and multidisciplinary projects involving several of the aspects covered in the Master.

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

CG8 - Apply methodologies, procedures, tools and state-of-the-art standards for the creation of new technological components; build new hypotheses and models, evaluate them and apply them to problem solving.

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.

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 the help of audiovisual computer media

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

CE2 - Knowledge, analysis and proposals of new concepts, methods or devices for photovoltaic conversion..

Outcomes

RA24 - Knowledge of the physical fundamentals of solar cells.

RA25 - Ability to understand the basic operation of different types of solar cells, both current and those that will emerge in the near future.

RA27 - Critical ability to analyze different models in terms of basic physics principles.

RA32 - Ability to analyze and measure i-v curves of solar cells.

RA33 - Training in the practical aspects of the characterization of solar cells.

RA36 - Knowledge of the physical effects that allow the utilization of solar energy

RA37 - Understanding the relevant physical principles that affect the operation of solar cells.

RA38 - Applied training in materials physics.

RA39 - Ability to understand the physical fundamentals of current and new generation solar cells

Description and syllabus

The course deals in depth with the most common techniques for the characterization of solar cells and photovoltaic materials.

The syllabus includes:

1. Instrumental techniques for the measurement of I-V curves
 - Use of electronic loads
 - Solar simulators and spectral mismatching.
 - ASTM references
2. Characterization of materials and devices during fabrication
 - Surface characterization of semiconductors
 - Optical characterization
 - Dopant diffusion and carrier density profiles
 - Layer growth: thickness and structural characterization
 - Carrier photogeneration and recombination in materials and devices
 - Metallization and electrical characterization of resistive contributions
 - Advanced characterization techniques