DEMOCRATIC AND POPULAR REPUBLIC OF ALGERIA
MINISTRY OF HIGHER EDUCATION AND SCIENTIFIC RESEARCH
ET DE LA RECHERCHE SCIENTIFIQUE

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THIRD-CYCLE TRAINING OFFER FOR THE DOCTORAL DEGREE FOR THE 2025/2026 ACADEMIC YEAR

Doctoral Training Project by Field

Institution	Domain	Field (s)
University of Médéa	**Sciences and Technologies**	**Renewable Energies**

Supporting Structures for the Doctoral Training Project

☒ **Laboratory Code :** C0561900

☐ **Other (Research Center or Unit):**

Type of Doctoral School

	Type
☐	**National Doctoral School**
☒	**International Doctoral School**

Objectives of the Doctoral Project

✓ Objectives of this doctoral training:

The goal is to make candidates effective in research. The training focuses on industrially oriented research aimed at developing new knowledge, processes, and techniques.

The connection of the research topic with industrial concerns is essential. The institution, through its doctoral school, organizes meetings and training sessions to facilitate the future industrial integration of doctoral candidates.

The doctoral training also includes collective training and professional activities designed to:

- Strengthen the scientific culture of doctoral candidates,
- Prepare them for professional careers in both public and private sectors,
- Promote their international exposure.

In the context of renewable energies, the objectives are as follows:

- Train doctoral candidates in all aspects related to renewable energies, electrical energy, and thermal energy,
- Train them to optimize energy technically and economically,
- Improve energy and environmental management,
- Acquire theoretical knowledge and experimental skills to develop autonomy and critical thinking for all stages of research. These skills are essential for successfully completing a doctoral thesis.

✓ Connection with strategic and priority axes:

For the three-year period 2025–2028, the following strategic axes have been defined for the field of Renewable Energies:

- Bibliographic research and state of the art,
- Modeling and simulation of dedicated systems,
- Experimental validation or practical implementation in collaboration with partner companies.

Available Resources

✓ Human Resources Mobilized:

The human resources mobilized for the doctoral projects will primarily include:

- Permanent teachers participating in the third-cycle doctoral program in Renewable Energies and successful doctoral candidates from the University of Médéa,
- Teachers from other partner higher education institutions and their doctoral candidates, under agreement with our institution,
- Researchers from affiliated research centers,
- Individuals or entities (project-bearing companies).

✓ Material Resources Deployed:

Material resources are selected based on detailed specifications, ensuring impartiality and prioritizing performance to guarantee project quality. Our Renewable Energies and Materials laboratory includes research equipment such as:

- **Photovoltaic solar energy:** PV panels, MPPT controllers, DC-DC and DC-AC converters, DC and AC loads, storage batteries, etc.
- **Thermal solar energy:** Thermal sensors, thermocouples,
- **Wind energy:** Wind emulator, wind turbines, DC and AC machines (DFIG, PMSG, etc.).

The program

✓ Core Courses

The doctoral program in **Renewable Energies** focuses on the following general topics:

• Simulation Tools:

Learning Objectives: Through this course, the doctoral student will be able to familiarize himself with the software and calculation tools used in the design, sizing, and operation of photovoltaic and wind energy systems.

Recommended Prior Knowledge: Bachelor's degree courses: Basic mathematical tools and electricity.

Subject Content:

This course covers the various calculation codes applied in the solar and wind energy sectors and their associated knowledge models.

Chapter 1: General information about electrical installation sizing.

Chapter 2: Sizing photovoltaic installations: Using Archelios to size photovoltaic installations.

Chapter 3: Sizing wind turbine installations: Using RetSceen to size wind turbine installations.

Chapter 4: Sizing solar-wind hybrid installations: Using Homer to size solar-wind hybrid installations.

Chapter 5: Simulating a photovoltaic and wind energy system using MPPT in Matlab.

Software Websites:
- http://www.archelios-pv.fr/
- http://www.retscreen.net/fr/home.php
- http://www.homerproject.eu/
- https://www.pvsyst.com/fr/

https://www.mathworks.com/

✓ Advanced Topics

The PhD program in **Renewable Energies** allows students to improve their skills in the following advanced subjects:

First: Photovoltaic Energy Conversion Systems:

Teaching Objectives:

This course aims to introduce the principles of converting solar energy to light energy, its applications, and the method of generating electricity using solar photovoltaic cells.

Recommended Prior Knowledge:

Basic concepts in: electrical circuits, semiconductor physics.

Subject Content:

Chapter 1: Photovoltaic Energy Conversion

Chapter 2: Photovoltaic Systems

Chapter 3: Stationary Converters Used

Chapter 4: Storage Systems

Chapter 5: Charge Controllers

Chapter 6: Sizing Photovoltaic Systems

Chapter 7: Applications

Second: Advanced Fluid Mechanics:

Teaching Objectives:

This subject aims to develop the basic knowledge of the doctoral student. The energy specialization is closely related to the phenomena of viscous and turbulent flows observed in energy systems, and understanding and analyzing them is crucial.

The doctoral student's immersion in the physical and mathematical laws and models of these often complex flows is essential for the specialization in order to acquire the consistent teaching necessary for research.

Recommended Prior Knowledge:

- Fundamentals of Fluid Mechanics
- Mathematics
- Numerical Methods

Subject Content:

Chapter 1: Fluid Dynamics and Transport Equations

Chapter 2: Ideal Fluid and Its Applications

Chapter 3: Real Fluid Dynamics

Chapter 4: Boundary Layers

Chapter 5: Turbulent Flows

Chapter 6: Flow Calculations in Pipes