PEOPLE'S DEMOCRATIC REPUBLIC OF ALGERIA

MINISTRY OF HIGHER EDUCATION AND SCIENTIFIC RESEARCH
UNIVERSITY OF YAHIA FARES OF MÉDÉA
PhD PROGRAM PROPOSAL
ACADEMIC YEAR 2025/2026

Specialization: Energy Engineering and Fluid Mechanics

1. General Objective of the Doctoral Project

This doctoral project aims to investigate the thermal and fluid dynamic behavior of working fluids in modern energy systems, with a focus on numerical modeling and theoretical analysis for applications such as:

- Renewable energy systems (solar, thermal, wind, etc.)
- Energy conversion systems (heat exchangers, thermal engines, turbines...)
- Fluid flow in complex or multiphase environments
- Fluid–heat–material interactions at micro- and nano-scales

Numerical tools will be employed, including Computational Fluid Dynamics (CFD), Finite Element Methods (FEM), and simulations of turbulence and heat transfer.

The goal is to train highly qualified researchers capable of:

- Accurately modeling complex energy systems
- Developing innovative solutions for energy efficiency
- Analyzing fluid behavior under various operating conditions

2. Training Focus Areas

- Advanced Fluid Mechanics
- Applied Thermodynamics
- Numerical Simulation Techniques (CFD, FEM...)
- Heat and Mass Transfer
- Renewable Energy Technologies

3. Doctoral Research Training

Doctoral candidates will benefit from close scientific supervision through research projects, technical workshops, specialized seminars, and guidance for scientific publishing and thesis preparation.

4. Core Courses

- Non-Newtonian Fluid Mechanics
- Non-Equilibrium Thermodynamics
- Numerical Modeling of Energy Systems
- Heat Transfer in Composite Media
- Introduction to Multiphase Systems

5. Advanced Topics

- Microflows and Miniature Channel Dynamics
- Turbulence Modeling and Control
- Cooling of Electronic Devices
- Thermodynamics of Solar Systems
- Fluid–Structure Interaction

6. Complementary Training

Scientific English:

- Writing reports and research papers
- Scientific presentations and communication
- Technical vocabulary in energy and fluid mechanics

Research Methodology:

- Thesis writing techniques
- Publication tools and reference management
- Research ethics and academic integrity

7. Knowledge Enhancement Program

Area	Year 1	Year 2	Year 3
Scientific English	Basic skills	Technical writing and presentations	Publishing and oral preparation
Research Methodology	Introduction to research methods	Scientific writing and referencing	Ethics and thesis defense prep
Applied Computing	Simulation tools	Programming (Python, CFD software)	Workflow automation and scripting