LITHUANIAN
ENERGY
INSTITUTE

ADMISSION TO PHD STUDIES FOR THE YEAR 2024

DOCTORAL RESEARCH TOPIC:

Numerical study of turbulent phenomena and interactions in reacting and non-reacting flows

RESEARCH FIELD:

Energetics and Power Engineering (T 006)

BRIEF DESCRIPTION OF RESEARCH TOPIC:

The research themes within the proposal focus on the numerical exploration of turbulent flows, covering topics from fundamental flow behaviour to combustion phenomena.

Turbulence, as a persistent challenge, remains an unresolved problem of great relevance in science and engineering. In fluid dynamics, researchers are investigating complex interactions within turbulent flows, aiming to understand resulting flow configurations and describe coherent structure dynamics, even in basic geometries such as triple channels. Moreover, turbulence can play a crucial role in combustion processes, where its impact on flame propagation and acceleration is a subject of intense exploration. The pursuit of cleaner and more efficient combustion underscores the significance of comprehending turbulent combustion, influencing innovations in energy production and safety. In engineering, turbulence poses challenges in areas ranging from heat transfer to fluid-structure interactions.

The overall goal of the proposed themes is to provide fundamental insights into turbulent flow dynamics in technologically relevant settings, whether for enhancing combustion efficiency, ensuring nuclear safety or optimizing heat transfer processes.

Two main research themes are offered under this proposal:

- Numerical research of premixed flame-turbulence interaction. It would involve simulation (including validation against experiments) and investigation of combustion-turbulence interaction in technologically relevant contexts, leading to new physical and phenomenological knowledge. Main foreseen possibilities include severe accident conditions in nuclear power plants and synthetic gas mixtures for engine applications.
- Numerical research of flow regime and Reynolds number variation effects on turbulent flow configuration and resulting coherent structure dynamics. It would entail simulation (including validation against experiments) and systematic investigation of turbulent flow evolution in a universalized, practically relevant geometry currently lacking phenomenological clarity (main foreseen possibility is a triple parallel channel), resulting in phenomenological knowledge with common traits to fundamental flow scenarios and relevance for practical application, e.g., in reactor systems.

SCIENTIFIC SUPERVISOR:

Dr. Mantas Povilaitis
Laboratory of Nuclear Installation Safety

Lithuanian Energy Institute
Breslaujos 3, 44403 Kaunas
Lithuania

Mantas.Povilaitis@lei.lt

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