(BL257/2025-IST-ID)

Research Studentships (Master or Integrated Master students)

Applications are open for one Research Studentship, within the framework of project SPECTRUM - Solar PolygEneration Collector for combined heaT, poweR, hydrogen fUel and wastewater treatMent/Associação do Instituto Superior Técnico para a Investigação e Desenvolvimento, reference Horizon Europe nº 101172891, financed by the European Commission funds through Horizon Europe programme – the Framework Programme for Research and Innovation Actions (2021-2027), of the call HORIZON-CL5-2024-D3-01 — Next generation of renewable energy technologies, under the following conditions:

Scientific Area: Plasmas, Lasers and Nuclear Fusion

Admission Requirements: *To be enrolled at an integrated master or a master.*

Workplan: Thermal and Optical Design of a High-Temperature Hybrid Solar Collector (SPECTRUM-HT)

The research work will be developed within the scope of Work Package 2 (WP2) of the Horizon Europe Project with Grant nº 101172891, entitled "SPECTRUM - Solar PolygEnera-tion Collector for combined heaT, poweR, hydrogen fUel and wastewater treatMent".

This workplan aims to develop integrated optical and thermal simulation models for the high-temperature hybrid solar collector (SPECTRUM-HT), contributing specifically to the tasks done by the IST-ID team. The work will focus on creating a robust design tool that synergistically combines ray-tracing optical analysis with a 1D steady-state thermal model to predict and optimize the system's overall performance. The specific objectives are the following:

1. To develop and integrate an optical model of the SPECTRUM-HT collector using specialized ray-tracing software, accounting for the performance of its physical components (e.g., spectral splitters, photocatalytic reactor optical properties).

2. To create a 1D steady-state thermal model for the collector, utilizing a standard approach that decouples detailed transverse loss/gain calculations from the longitudinal tempera-ture evolution analysis.

3. To synergistically integrate the optical and thermal models to simulate the overall performance of the SPECTRUM-HT collector under varying operating conditions.

The work will begin with the development of a detailed optical model using state-of-the-art ray-tracing software. This model will simulate the path of sunlight through the collector's components, including the spectral splitting system and the photocatalytic reactor, to accurately determine the spatial distribution of solar irradiance. Subsequently, a 1D steady-state thermal model will be developed. This model will characterize thermal gains and losses in the transverse direction and calculate the temperature profile of the heat transfer fluid along the collector's length. The final and crucial step will be the integration of both models into a cohesive simulation tool. This integrated tool will be used to perform parametric studies and optimize the SPECTRUM-HT collector design, ensuring high efficiency in heat, power, and hydrogen generation. The results will directly feed into the collaborative tasks of WP2, sup-porting the final prototype design specifications.

The candidate must demonstrate skills and knowledge of programming, the use of ray tracing for designing optical systems, and heat transfer processes in thermal systems.

Legislation and Regulations: Statute of Scientific Research Fellow, approved by Law nr. 40/2004, of August 18, as worded by Decree-Law nr. 123/2019, of August 28; IST-ID Regulation of Scientific Research Fellowships, available on https://ist-id.pt/recursos/documentos/recursos-humanos/bolseiros/#1690453819726-6707f7f2-ce04

Workplace: The work will be developed at the Department of Physics of the Instituto Superior Técnico (DF-IST), Avenida Rovisco Pais 1, 1049-001 Lisboa, and in the Unidade de Energias Renováveis e Eficiência Energética of LNEG, Estrada do Paço do Lumiar 22, 1649-038 Lisboa, under the scientific supervision of Professor Luís Filipe Moreira Mendes (DF-IST) and Engenheiro João Cardoso (LNEG).

Duration: The research fellowship will have the duration of 6 months. It's expected to begin in November 2025. The contract of the research fellowship is not renewable.

Monthly maintenance allowance: the amount of the monthly maintenance allowance is €1040,98, being the payment method an option of the Fellow by Wire Transfer/Check.

Selection methods: The selection methods will be the following: *Curriculum Vitae* evaluation and individual interview (to be carried out in person), with the respective grades of 0 to 20 points attributed to each method and with the weight of 50% (*Curriculum Vitae* evaluation) and 50% (individual interview).

Composition of the selection Jury: Professor Luís Filipe Moreira Mendes; Professor Carla Isabel Costa Pinheiro; Professor João Alberto dos Santos Mendanha Dias.

Announcement/ notification of the results: The final evaluation results will be communicated to all applicants by email.

Deadlines and procedures of complaint and appeal. A complaint may be lodged from the final decision, or an appeal to the Executive Board of IST-ID, within 15 working days counted from the respective notification.

Application deadline and formalization: The call is open from November 10 until November 14, 2025.

It is mandatory to formalize applications with the submission of the following documents: i) B1 Form – Fellowship application (https://ist-id.pt/recursos-humanos/bolseiros/#documentos-relacionados); ii) *Curriculum Vitae*; iii) academic degree certificate, where applicable; iv) proof of enrollment at an academic degree course (Master, Integrated Master); v) motivation letter;

Applications must be submitted to the email*:* filipe.mendes@tecnico.ulisboa.pt