UAB
Universitat Autònoma de Barcelona

Call for applications for funded predoctoral fellowships 2025

PID2024-156240OB-C22 Project grant

The project PID2024-156240OB-C22 (funded by the State Research Agency) of the Department of Physics at the Universitat Autònoma de Barcelona (UAB) calls for **applications for a PhD student** in the project "*Instrumentation and Methods for Polarimetric data Acquisition and processing Combined with Artificial InTelligence for BIOmedical and botanical applications (IMPACT-BIO)*" supervised by Dr. Angel Lizana and la Dr. Irene Estévez.

The application is framed in the **call for grants for funded predoctoral fellowships 2025 (PREP 2024).**

<u>IMPORTANT:</u> The deadline for submission **is 19 November 2025.**

Applications must be submitted **through the [following link](#)**, accessing as an external user or UAB community and looking for the name of the call: "*CONVOCATÒRIA D'AJUTS PER A CONTRACTES PREDOCTORALS PER A LA FORMACIÓ DE DOCTORS 2025 (PREP 2024)*".

Job description

The selected person will join the research team of the project PID2024-156240OB-C22. The PhD student will work closely with the rest of the team. The main duties will include:

- The realization of physical models to study the interest of structured light and OAM in the visualization of biological tissues.
- The implementation of optical systems and control software, for the performance of experimental measurements.
- Analysis of results and participation in scientific discussions with team members.
- The preparation, presentation and publication of research results in journals of impact in the field.
- Participation in conferences, seminars and workshops.
- The PhD student will have the opportunity to participate in university teaching and/or science outreach activities together with other students in the group.
- The opportunity to conduct a funded research visit at a specialized international institution within the thesis field.

Requirements

<u>Main requirements:</u>

1. Bachelor's degree in Physics, Engineering Physics, Telecommunications Engineering, or a related discipline.
2. To be in possession of a master's degree. It will be valued if the master's degree is specialized in Photonics or a related master's degree with knowledge in optics.

<u>Other merits:</u>

3. Programming skills (Python, MATLAB, or LabVIEW).
4. Motivated to develop and perform experimental work in an optical instrumentation laboratory

environment. Interest in polarization and its applications.

5. Ability to work autonomously and in a team.
6. Knowledge of English will be an asset, as the candidate will be expected to publish in international journals and participate in conferences.

What do we offer?

1. A 4-year PhD contract with the possibility of a funded short-term research stay at an international research group.
2. The opportunity to be part of a research group with international recognition and extensive experience in the field.
3. A supportive and collaborative research environment with dedicated guidance for doctoral thesis development.
4. The possibility of participating in international conferences and publishing results in scientific journals with impact.

PID2024-156240OB-C22 project

This thesis focuses on the study of polarization, structured light, and orbital angular momentum (OAM) to enhance the imaging of biological structures. In recent years, it has been possible to generate structured light by controlling its amplitude, phase, and polarization. The objective of this thesis is to investigate how these structures interact with matter and how this can help to visualize tissues that are not visible with standard imaging techniques. Furthermore, additional degrees of freedom will be explored, such as the degree of polarization and the degree of coherence. To achieve this, mathematical models based on the Jones and/or Stokes-Mueller formalisms and the corresponding experimental measurements to validate them will be developed.

A fundamental aspect of the project is the combination of structured light with polarimetry. The goal is to use the polarization states present in vector beams, such as Poincaré or Bessel beams, to be able to measure samples in-depth or enhance specific parts. These proposals require the incorporation of a structured light module to complement or replace the polarization state generation and analysis modules in conventional imaging polarimeters. To generate and control the different light and OAM structures, it will be necessary to calibrate and optimize a spatial light modulator. This light modulation can be achieved through the use of devices based on liquid crystals, or other elements such as Q-plates, which will allow for the control of phase structures. It will be necessary to study the relationship between the generated structures and the changes in the sample images. The best configurations for the visualization of structures will be implemented in image enhancement techniques and will be compared with standard polarimetric methods or other optical imaging techniques.

Additionally, the project will preliminarily explore the potential of the terahertz (THz) region for applications in biophotonics. It will be analyzed how this non-ionizing spectral range can expand non-invasive imaging techniques, developing and characterizing specific polarimetric components for the sub-THz band. The goal is to study its interaction with biological samples (such as cancerous tissues) and evaluate its interest in the characterization of advanced materials.

More information and requests

If you have any interest or questions, please contact:
Angel Lizana, angel.lizana@uab.es
Irene Estévez, irene.estevez@uab.es
https://webs.uab.cat/optics/

Additional information

Interested candidates may only submit one application, for a single research project (Art. 4.1.2).

Mandatory documentation to be submitted with the application:

- In the case of studies completed abroad, the statement of equivalence for the average grade of the bachelor's and master's degrees, using the form from the Ministry of Education and Vocational Training.
- Curriculum Vitae (CV) according to the CVA (AEI) model, which lists the merits of the candidate.

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