



## **PhD Thesis Project Offer**

### (valid during the calendar year 2025)

#### **Provisional Title of the Doctoral Thesis**

Time delay feedback control in reaction-diffusion and supramolecular polymerization models

#### Subject area\* / Research line

Mathematics/Natural sciences

#### Summary of the Doctoral Thesis (maximum 300 words)

A spatially extended system in which diffusive processes are coupled to (bio-)chemical reactions and/or polymerization reactions cannot only give rise to fascinating emergent patterns but also can contribute to the understanding of the building blocks of a living system and the creation of artificial cells. In this thesis, certain temporal (e.g., self-organized oscillations) or spatio-temporal patterns (e.g., travelling waves or spots) can be investigated analytically and/or numerically starting from basic and paradigmatic models like the complex Ginzburg-Landau equation, a generic model for supramolecular polymerization, or similar. Based on previous results [1,2], the aim is to control and induce a range of solutions in the equations using time delay feedback terms, relevant in real applications. Depending on the interest of the candidate, collaboration with experimentalists are possible.

[1] M. Stich, A.K. Chattopadhyay, Noise-induced standing waves in oscillatory systems with time-delay feedback, Phys. Rev. E 93 (2016), 052221.

[2] J. Leira-Iglesias, A. Tassoni, T. Adachi, M. Stich, T. Hermans, Oscillations, travelling fronts and patterns in a supramolecular system, Nature Nanotechnol. 13 (2018), 1021-1027.

# Is the development of this thesis associated with the execution of any research project? If so, provide details of the project (title, funding entity, and execution period)

No current funding, but there is the possibility of collaboration with an experimental group outside URJC. For more information, contact michael.stich@urjc.es

#### Academic Profile of the Student (maximum 200 words)

The project can be adapted to the prior knowledge of the candidate.

The typical profile includes graduates in Mathematics or related science or engineering degrees with computing skills.

#### Contact: institutional email of the Supervisor

michael.stich@urjc.es

#### Institutional Website of the Supervisor

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\*See the Subject Areas at <u>https://www.urjc.es/informacion-practica#oferta-proyectos-de-tesis</u>. Each project will be included in a single subject area.