DEPARTAMENTO DE ANÁLISIS MATEMÁTICO Y MATEMÁTICA APLICADA

Facultad de Ciencias MATEMÁTICAS

Instituto de Matemática Interdisciplinar

SEMINARIO DE ANÁLISIS MATEMÁTICO Y MATEMÁTICA APLICADA

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Modeling and analysis of random and stochastic disturbances in chemostat devices

A chemostat is a laboratory device used to investigate the growth of populations of species that consume a certain nutrient. It has many applications in real life, such as wastewater treatment, antibiotic production, renewable energy development or fermentation processes. For many years, researchers have used the classical chemostat model, which is a system of nonlinear ODEs, to obtain detailed information about the biological process that occurs in the chemostat. Nevertheless, biologists claim that real devices are subject to randomness and then new mathematical models, more realistic, must be developed.

In this talk the chemostat device will be introduced and the classical chemostat model will be derived. In addition, two different approaches to introduce randomness/stochasticity in the chemostat model will be shown. On the one hand, the common way in the literature, based on the standard Wiener process, that produces important drawbacks from the biological point of view. Secondly, a new promising manner, based on a bounded noise, that has been proved to be very realistic from the mathematical and the biological points of view. In both cases, the resulting random/stochastic systems will be carefully analyzed, accompanied with biological interpretations and numerical simulations that illustrate the theoretical results.

Organized by: Departamento de Análisis Matemático y Matemática Aplicada, Grupo de investigación CADEDIF and Instituto de Matemática Interdisciplinar (IMI)

Date: Thursday, march 21, 2024,13:00h
Place: Seminario Alberto Dou (Room 209)
Facultad de CC. Matemáticas, UCM