Master degree 2, Mathematics & Applications
MASC
(Modeling & Analysis of Complex Systems)

PDE Modeling in Life Science

Lesson Objectives

Partial Differential Equations have been widely used for modeling in Physics and Biology. The aim of this course is to provide some techniques which have been successfully applied for analysis of PDE's in biological context.

Program:

- Some PDE models in Biology

- Background in Parabolic and Hyperbolic systems, linear and nonlinear.

- Applications : generation of Dynamical Systems and Attractors for some nonlinear problems in biological context. Extension to Complex Systems of PDE's.

- Qualitative theoretical and numerical analysis: stability of stationary solutions, bifurcations, periodic solutions, traveling-waves, pattern formation ...

Requirement: Functional analysis, PDE and ODE courses of Master-1 degree

Bibliography & Further Reading

1. A. Lunardi: Analytic Semi-groups and Optimal Regularity in Parabolic Problems, Birkhäuser, Basel, 1995.
2. A. Pazy: Semigroups of Linear Operators and Applications to Partial Differential Equations, Springer-Verlag, Berlin, Heidelberg, Tokyo, 1983.
3. R. Temam: Infinite Dimensional Dynamical Systems in Mechanics and Physics, Springer-Verlag New-York, 1997.
4. D. Henry: Geometric Theory of Semi-linear Parabolic Equations, Springer, 2009.
5. G.B. Ermetrout and D.H. Terman: Mathematical Foundations of Neuroscience Springer-Verlag New-York, 2010.
6. J.D. Murray: Mathematical Biology, Springer-Verlag New-York, 2002.