Code: 1764 **Dynamical Systems**
Degree: 2nd cycle – Mathematics Applied to Biological Sciences
Curricular Year: 1st/2nd **Semester Course: 2nd/1st**
Credits: 6 ECTS **Optional**
Language: Portuguese/English
Responsible: Pedro Cristiano Santos Martins da Silva
Other lecturer(s): Maria Isabel Varejão de Oliveira Faria
Web Site: http://www.isa.utl.pt/home/node/3896

1. Contact hours:
Lecture/Practicals 70 **Others** 14 **Total** 84

2. Objectives:

This course seeks to further the students basic training in Mathematics,
endowing them with a set of important tools for studying and modelling natural phenomena. The students should acquire knowledge from a theoretical and a practical point of view. (Applications using mathematical software)

3. Programme:

Homogeneous and non-homogeneous Linear Differential Equations
Systems of linear differential equations with constant coefficients. Exponential of a matrix. Stability and phase portrait of a system.
Dynamic systems: qualitative theory, fundamental theorems.
Introduction to bifurcation theory.
Difference equations and discrete dynamic systems. Stability and chaos.
Modelling in Ecology and Biology.

4. Bibliography:

Main Bibliography

Braun, M. (1992), Differential equations and their applications. Springer.
Hirsch, M., and Smale (1974), S. Differential Equations, Dynamical Systems, and Linear Algebra. Academic Press.
Hale, J., and Koçak (1991), H. Dynamics and Bifurcations. Springer-Verlag.
Perko, L (2001). Differential Equations and Dynamical Systems, Springer.
S. Wiggins (1990), Introduction to Applied Nonlinear Dynamical Systems and Chaos. Springer-Verlag.

5. Assessment:

Exam and projects to be developed by the students

6. Estimated Workload: 168 Hours

7. Last Update: 15/7/2010