

**Code: 1583 Numerical Modelling of Environmental Systems****Degree:** 2<sup>nd</sup> cycle – Bioenergy Systems Engineering**Curricular Year:** 1<sup>st</sup>**Semester Course:** 1<sup>st</sup>**Credits:** 6 ECTS**Compulsory****Language:** Portuguese/English**Responsible:** Cathy Béatrice Kurz Besson (FC/UL)**Other lecturer(s):** -**Web Site:** -**1. Contact hours:****Lectures 30 Practicals/Laboratory 40 Others 14 Total 84****2. Objectives:**

The course aims to initiate students to numerical methods, data processing and physical, biological and ambient processes modeling, through data matrix manipulation and learning the use of a climbing relevant interactive application in the fields of teaching and research: Matlab.

**3. Programme:****I. Introduction to Matlab and numerical methods**

Numbers, operations and errors

Sine curves and Fourier synthesis

Linear regression adjustment on experimental data

Example: experimental determination of the Planck constant

Roots of non linear equations and bisection method

Example: thermic equilibrium of a solar panel

Solution of linear equation systems

Solution of differential equations

Linear, polynomial and spline interpolations

*Matlab project 1: Calculation of the Penman potential evapotranspiration***II. Models for bioenergetic plant cultures: Eucalyptus**

Empirical model: Globulus

Mechanistic models: 3PG, Yieldsafe

*Matlab project 2: Comparação estatística de simulações do modelo Globulus***4. Bibliography:****Main Bibliography**

A. Quarteroni and F. Saleri, Scientific Computing with MATLAB and Octave, Springer-Verlag Berlin, 2006.

Gilat, A., 2005, MATLAB: An Introduction with Applications, Wiley.

**Other Bibliography**Free Matlab application: <http://www.cygwin.com/>Teaching support in pdf <http://www.idl.ul.pt/cbbesson.htm> and <http://www.igidl.ul.pt/pmiranda.htm>**5. Assessment:**1) Matlab projects 1 and 2 (*individual or groups of 2 people*)

2) Oral discussion of Matlab projects and problem resolution

**6. Estimated Workload:**

168 Hours

**7. Last Update:**

21/7/2010