Code: - **COURSE NAME: Climatology and Agrometeorology**
Degree: 'Licenciatura' in Agriculture Engineer, Environmental Engineer and Forest and Natural Resources Engineer **Curricular Year: 2nd** **(Stream:)**
Annual Course [ ] Semester Course: 1st [X] 2nd [ ] Trimester Course: 1st [ ] 2nd [ ] 3rd [ ]
Credits: 6 ECTS **Level:** **Compulsory [X] Optional [ ]**
Language: Portuguese/English
Prerequisites:
Responsible: José Paulo de Melo e Abreu
Other Lecturer(s): Francisco G Abreu, Ana C Madeira
Web Site: www.isa.utl.pt

1. Contact hours:

Lectures **Praticals** **Lecture/Practicals: 70 h** **Laboratory** **Others** **Total: 70 h**

2. Objectives:

To provide knowledge about both the functioning of the climate system and the energy and water differentiation of large climate regions. To understand the interactions between the lower atmosphere and the surface in natural and man-modified ecosystems, including the effect of meteorological elements on vegetation development and growth.
To provide skills to analyze, evaluate and modify the agro-climate, including the perspective of its evolution according to the present tendency of climate variation.

3. Programme:

Introduction
Meteorology and climatology. The climate system. The atmosphere.
Agrometeorology.
Aspects of water and energy in the climate system
Solar, terrestrial and atmospheric radiation. Radiation balance in several ecosystems. Applications.
Atmosphere thermodynamics. Pressure, density, air temperature and humidity. Adiabatic and diabatic, isobaric and non-isobaric processes. Static equilibrium of the atmosphere.
The moving atmosphere. Convection and advection. Wind types and related forces. The planetary boundary-layer.
Mean atmospheric circulation. Latitudinal gradients of temperature and pressure. Circulation cells.
Consequences on the water cycle: rainfall and evaporation.
Geo-climates. Climate types and climate classifications. Applications.
The present tendencies of climate change.
Interaction of the lower atmosphere with the surface
Transfer of momentum, sensible heat and mass (gas and particles) between the atmosphere and surfaces. Aerodynamic of the surfaces and boundary-layers. Molecular and turbulent diffusion. Fluxes and resistances. Applications.
Heat balances in several ecosystems. Partition of energy between sensible and latent heat. Evapo-transpiration. Soil heat flux and soil temperature. The determinism of surface temperature. Cooling: dew and frost.
Climate and vegetation
Phenology, temperature and photoperiod.
Solar radiation and potential biomass production (moist ecosystems).
Water limited biomass production (dry ecosystems).
Agro-climate modifications. Changing the radiation, aerodynamic and water regimes. Implications on the heat balance.
Cases-study.
Measurement of agrometeorological elements
Examples of agro-climatic studies

4. Bibliography:

Main Bibliography

Miranda, P.M. (2001). *Meteorologia e ambiente*. Universidade Aberta, Lisboa.
Monteith, J.L. & M.H. Unsworth (2008). *Principles of environmental physics*. 3rd ed. Elsevier.
Book chapters and research papers to be defined every year.

Other Bibliography

Bridgman, H.A. & Olivier (2006). *The global climate system*. Cambridge Univ Press.
Campbell, G.S. & J.M. Norman (1998). *An introduction to environmental biophysics*. 2nd ed. Springer.

5. Assessment:

Two tests (40% + 40%) or final examination (80%)
Agro-climatic study of a mediterranean location (20%)

6. Estimated Workload: 80 Hours

7. Last Update: 23/11/2011