

Code: 1370 Engineering and Agricultural Technology

Degree: 2nd cycle – Agriculture

Stream: Agriculture and Animal Production; Agricultural Engineering; Horticulture

Curricular Year: 2nd

Semester Course: 1st

Credits: 6 ECTS

Compulsory (Agriculture and Animal Production;
Agricultural Engineering)

Language: Portuguese/English

Optional (Horticulture)

Responsible: Olívio Godinho Patrício

Other lecturer(s): Pedro Manuel Leão Rodrigues de Sousa and Luís Manuel Bignolas Mira da Silva

Web Site: <http://www.isa.utl.pt/home/node/3786>

1. Contact hours:

Lectures 28 Lecture/Practicals 42 Others 14 Total 84

2. Objectives:

- Provide knowledge on the working principles, characteristics and performance of agricultural machinery and equipment,
- Provide the students with basic knowledge regarding the automation of systems for agriculture and irrigation which allows them to master and use the different component parts of an automatic system;
- Enable students with the necessary skills to supervise the functioning and maintenance of such equipment,
- Enable students to use conventional and renewable energies in a rational way.

3. Programme:

Module 1 – Energy efficiency and renewable energy

Introduction; Energy sources, energy conversion; Thermal solar energy; Photovoltaic solar energy; Passive solar energy; Wind energy; Hybrid systems; Low-enthalpy geothermal energy; Mini-hydro plants; Biomass energy; Biofuels; Development of techniques, strategies and behaviour with a view to increasing energy efficiency and reducing energy intensity.

Module 2 – Mechanics and Agricultural Mechanisms

The agricultural tractor, main component parts of the tractor; Internal combustion engine; Hydraulic system in tractors and agricultural machinery; Mechanical transmission, traction amplifiers and “power-shift” gearboxes; Traction theory; Interpretation and analysis of testing reports for agricultural tractors; Use and performance of tractors, mechanical limits; Safety and accident prevention elements on the agricultural tractor

Module 3 – Automation of agricultural and irrigation systems

General concepts on agricultural systems mechanization and automation; Control systems. Timers and controllers. Protection and alarm; Irrigation systems automation; Automation levels. Low, medium and high capacity controllers; Valves flow meters, manometers and transducers; Pumping stations automation; Automation of the associated operations on under pressure irrigation systems; Filtering. Fertigation.

Module 4 - Precision Agriculture

Precision Agriculture (PA): general concepts; Theory, technology and use of GPS (Global Positioning System); Soil sampling in PA; Productivity and quality mapping; Geographical Information Systems and spatial variability analysis; Variable rate technology; Application of PA to irrigation systems; Decision Support Systems in PA

4. Bibliography:

Main Bibliography

- Coelho, J.C.; Mira da Silva, L.; Tristany, M.; Neto, M.; Pinto, P.A. *Agricultura de Precisão*. Prefácio, Lisboa, 2004.
- J. Love. *Process automation handbook. A guide to theory and practice*. Springer, 2007.
- Ortiz-Canavate, J., *Tractores: Técnica y Seguridad*, Ed. Mundi-Prensa, 2005.
- Patrício, O., *Elementos de apoio à disciplina de Engenharia e Tecnologias Agrícolas*, Serviço de Reprografia do ISA, 2010.

Other Bibliography

- Lerat, P., *Les machines agricoles: conduite et entretien*, Ed. Tec&Doc, Paris, 1999.
- Macmillan, R. H., *The Mechanics of Tractor- Implement Performance*, University of Melbourne, 2002

5. Assessment:

- The final classification for modules 1 and 2 is obtained through an average mark calculated on the basis of 60% for the written test and 40% for the practical;
- The final classification for module 3 is obtained through a written test;
- The final classification for module 4 is obtained through the practical;
- The final classification for the subject is the arithmetical average of classifications obtained in the four modules;
- The students obtain a positive final classification if they have 10 marks or more and a minimum of 10 marks in the 4 modules.

6. Estimated Workload:

168

 Hours

7. Last Update:

19/7/2010
