

Course Unit	New Technologies and Innovation in Agriculture		Field of study	-	
Classification	Postgraduate Degree in AgroBusiness		School	School of Technology and Management	
Academic Year	2022/2023	Year of study	1	Level	2-1
Type	Semestral	Semester	1	ECTS credits	2.0
Code	5063-749-1107-00-22				
Workload (hours)	54	Contact hours	T	-	TP
			PL	-	TC
			S	-	E
			OT	-	O

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s) João Paulo Miranda Castro, Maria Eugénia Madureira Gouveia, Valentim Pereira dos Santos Coelho

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:

1. Learn to map using Geographic Information Systems and use the various applications covered in the course with skill and autonomy.
2. Know and apply techniques for the acquisition of Geographic Information supported by field surveys and by remote sensing data.
3. Apply emerging technological solutions in the evaluation of health, physiology, vigour, rip
4. Know and understand the importance of plant protection.
5. Know biological agents and means of biotechnical control and their mechanisms of action.
6. Develop skills and competences to design the most suitable crop protection strategies.

Prerequisites

Before the course unit the learner is expected to be able to:

1. Recognise the importance of cadastre, topography, cartography and remote sensing in land management.
2. Understanding the phenomena of agricultural ecology.
3. Have a basic knowledge of statistics and computer science.
4. The student should use his/her own PC and have the ability to download data and install applications
5. Classroom with projector with recommended resolution of 1920x1080 and fast internet wireless network

Course contents

Applications of Geographic Information Systems. Spatial analysis of geographic and geophysical data; Spatial interpolation; Remote sensing applied to agriculture: satellite images; aerial photography, sensors. Direct means of plant pest control and sustainable use of pesticides. Biological and Biotechnical control in plant protection. Integrated pest management (IPM) and good phytosanitary practices.

Course contents (extended version)

1. Geographical information. Introduction to GIS. History, definitions and components
 - Coordinate systems and georeferencing
 - Features and attributes
 - Database Management Systems
 - Relational models of data structures in GIS
 - Topology
 - Toponymy
 - Acquisition, editing, manipulation and analysis of geographic information in GIS
 - Development of applications with the open access GIS programmes QGIS and SAGA-GIS.
2. Remote Sensing Systems and Digital Image Processing
 - Passive sensors (multispectral, thermal, . . .) and active sensors (RADAR, LiDAR, . . .)
3. Three-dimensional modelling of the terrain and vegetation
 - Presentation of the programs AGISOFT and PIX4D for processing data obtained by drones
4. Direct control means of plant protection and sustainable use of pesticides.
5. Biological control: Beneficial organisms against pests, diseases, and weeds.
6. Biotechnical control: Semiochemicals and IGRs (Insect Growth Regulator) in plant protection.
7. Integrated Pest Management and good Phytosanitary Practices.

Recommended reading

1. DGAV (2014). Proteção integrada das culturas: conceitos e princípios gerais. Ministério da Agricultura e do Mar, Direção Geral da Alimentação e Veterinária. Lisboa. Volume I, 73pp.
2. Domingues, T., Tomás Brandão, T., Ferreira, J.C. (2022). Machine Learning for Detection and Prediction of Crop Diseases and Pests: A Comprehensive Survey. Agriculture 2022, 12, 1350
3. Smith, M. J., Goodchild, M. F., Longley, P. A., 2018. Geospatial Analysis: A Comprehensive Guide to Principles Techniques and Software Tools. The Winchelsea Press; 6th Edition
4. Lillesand, T. M., Kiefer, R. W. 2015. Remote Sensing and Image Interpretation, 7th Edition, John Wiley and sons. New York.

Teaching and learning methods

Tutored classes (2 or 4 hours), with theoretical introduction and practical application with tutorial models.
The classroom should be equipped with a projector with a recommended resolution of 1920x1080 and a fast wireless internet network.
The student should use his/her own PC or equip the classroom with at least 1 PC per 2 students.
Some of the classes will be outside.

Assessment methods

- Individual research and forms - (Regular, Student Worker) (Final, Supplementary, Special)
- Reports and Guides - 50% (Individual Work)
- Intermediate Written Test - 50% (Forms)

Language of instruction

Portuguese, with additional English support for foreign students.

Electronic validation		
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