UNIVERSIDAD DE ALMERÍA

COURSE GUIDE
SUBJECT

1. DETAILS OF THE COURSE		
1.1. Name: Statistic Applied to Horticulture		
1.2 Code: 70784253	**1.3 Plan: Máster oficial en horticultura mediterránea bajo invernadero**	**1.4.Level: graduate**
1.5 Course: 2nd	**1.6. Type: Optative**	**1.7. Semester: 2**
1.9. ECTS: 3	**1.9.1.Theoretical: 0.8**	**1.9.2.Practical: 2.2**
1.10. Descriptors: Statistical inference, Design of Experiments and Regression.		

2. LECTURER		
2.1. Name: María Morales Giraldo		
2.2. Department: Mathematics		
2.3. Field of Knowledge: Statistics and Operations Research		
2.4. Office: 2.46 CITE III		
2.6. Mentoring: Time and place will be set at the beginning of the term		
2.6.1. 1st Semester:	**2.6.2. 2nd Semester:**	
2.7. Phone: 950 015 813	**2.8. E-Mail: maria.morales@ual.es**	**2.9. Virtual platform B-Learn: Yes**
2.10. Personal Webpage:		

3. DATA OF THE DEPARTMENT			
3.1. Name: Mathematics			
3.2. Fields of Knowledge of the Department: Statistics and Operations Research, Applied Mathematics, Real Analysis, Algebra, Geometry and Topology.			
3.3. Director: Carmelo Rodríguez Torreblanca			
3.3.1. Office: 2.49 CITE III	**3.3.2.Phone: 950 01 4549**	**3.3.3.E-Mail: crt@ual.es**	
3. 4. Head of Administration: Jesus Chaparro Torres			
3.4.1. Office: 0.11 CITE III	**3.4.2. Phone: 950 01 5480**	**3.4.3 Fax: 950 01 5167**	**3.4.4.E-Mail: chaparro@ual.es**

4. CONTEXT

4.1. Main objective of the course:

This subject strengthens the approach of statistics as a tool for obtaining and analyzing data from the Horticulture field through the treatment and modelling of databases using statistical inference techniques. In this way, the procedures included in this subject provide us with methods to infer properties of a population from a small part of it, called sample. Also, by designing an experiment one gets more precise data and more complete information on a studied phenomenon with a minimal number of experiments and the lowest possible material cost. Therefore, It is organized in two modules: 1. Data analysis and Statistical inference and 2. Design of experiments and regression models. Each module contains a theoretical introduction, study guide, real world applications of the studied techniques and one self-assessment. This subject also offers the student the opportunity of learning and experiencing with the statistical software Statgraphics, which will be used to perform the statistical studies with databases.

4.2 Previous knowledge:

Some basic knowledge of Mathematics and Computing are needed.

4.3. Prior conditions:

None

5. COMPETENCIES AND OBJECTIVES

5.1 COMPETENCIES OF THE COURSE		*5.2 OBJECTIVES OF THE COURSE*
5.1.1. GENERAL COMPETENCIES: Capacity to solve problems Ability in ICT Understand and own knowledge Application of knowledge		***5.2.1. GENERAL OBJECTIVES OF THE COURSE*** Knowledge about how to classify, represent and resume statistical data. Knowing, applying and assessing the usefulness of estimation methods and hypothesis tests (parametric and non-parametric) Understanding and management of experimental design techniques in order to improve the experimentation. Knowing, assessing the models that allow us to study the dependency relationships between variables. Knowing and operating with ease the computer program for statistical analysis Statgraphics.
5.1.2. Specific objectives	*Specific conceptual competencies (theoretical knowledge)* : *CET 1. Design experiments and carry out a statistical analysis of experimental data.*	
	Specific procedural competencies (practical knowledge): *CET 2. Knowing and applying the scientific communication methods.*	

6.CONTENTS

6.1. THEORETICAL CONTENTS:

Module I: Data Analysis and Statistical Inference

Unit 1: Data Analysis

1. Statistical variables
2. Describing data sets
3. Summarizing data sets

Unit 2: Statistical Inference

1. Parametric point estimation
2. Confidence intervals estimation
3. Parametric hypothesis tests
4. Non-parametric hypothesis tests

Module II: Design of experiments and Regression models

Unit 3: Experiments with a single factor.

1. Introduction to design of experiments
2. Analysis of variance
3. Randomized design
4. Randomized blocks design

Unit 4: Designs with two or more factors

1. Factorial design with two blocking factors
2. General factorial experiments
3. Fractional factorial experiments
4. Nested models

Unit 5: Regression models

1. Simple regression model
2. Parameter estimates and inferences over the model
3. Checking previous assumptions
4. Multiple linear regression model

6.2. PRACTICAL CONTENTS:

All practical lessons will deal with the Statgraphics computer program. In each of the practical lessons the contents of the theoretical lessons will be used and the student will learn to apply them using Statgraphics.

The student will be required to solve problems autonomously using the Statgraphics computer program, and this will be the core of their evaluation.
There are 5 practical lessons scheduled for each theoretical unit.

7. SCHEDULE

7.1 Schedule for the different units

Unit	Theory hours	Practical hours
Unit 1: Data Analysis	1	2
Unit 2: Statistical Inference	1	2
Unit 3: Experiments with a single factor	2	5
Unit 4: Designs with two or more factors	1	4
Unit 5: Regression models	1	3.5
Total	**6**	**16.5**

8. METHODOLOGY

8.1 Methodology for the treatment of the theoretical contents :

Before the date of the lecture, the students should download and print the slides of the corresponding unit, available via B-learn. Also, there will be some documents that the students must read **before** the unit starts, and complementary material provided by the professor.

The professor will explain the concepts of the unit, using the given slides, and some other documents available to the student.

Students will be motivated to actively participate in classroom.

As autonomous work, students should study the contents, look up the bibliography and attend to mentoring if necessary. At the end of each unit, the student must submit a self-assessment questionnaire to check the assimilation of the contents of the unit.

8.2 Methodology for the treatment of practical content:

Practical contents are closely related to theoretical contents, so the student must have covered the corresponding theoretical content before attending to the practical lessons.

At the beginning of the class the teacher will summarize the necessary theoretical contents to follow the lecture and will explain briefly how the exercises in Statgraphics have to be done.

The exercises proposed in each lesson have to be solved individually.

The professor will respond questions and solve problems when doing the proposed exercises, and, in some of the units, the solutions of the exercises will be requested (using b-lean), and they will become part of the evaluation.

As autonomous work, students should operate the Statgraphics program, available in the free-access computer room in campus, and complete all the exercises proposed in the practical lessons, in order to acquire advanced skills using the program.

8.3 Workload of the student (calculated by number of hours)

WORKING HOURS OF THE STUDENT

8.3.1. IN-CLASS HOURS (with professor)

TEACHING ACTIVITY		**NO. HOURS**
CLASS of theory (THEORY GROUP ACCORDING TO OD)		6
CLASS OF PRACTICAL TRAINING (PRACTICE GROUPS ACCORDING TO OD)	Laboratory	
	Problems	
	Informatics	16.5
	Field	
	Other	
SUBTOTAL IN-CLASS HOURS		22.5
HOURS FOR TESTS AND EXAMS		3

8.3.2 . AUTONOMOUS WORKING HOURS (not in-class, estimated)

HOURS OF PREPARATION FOR ACTIVITIES AND WORK (theory)	9
HOURS OF PREPARATION FOR ACTIVITIES AND WORK (practice)	28.5
HOURS OF STUDY FOR TESTS AND EXAMS	15
OTHER	
SUBTOTAL AUTONOMOUS WORKING HOURS	*52.5*

TOTAL WORKING HOURS	***STUDENT***
	75

9. BIBLIOGRAPHY OF THE COURSE

9.1 Recommended Reading:

Design and analysis of experiments (Montgomery, D.)
Introduction to design and analysis of experiments (Cobb, G.)
Design and Analysis of experiments (Hinkelmann, K. Kempthorne, O.)
Fundamental concepts in the design of experiments (Hicks, C.R., Turner, K.V.)
Design and Analysis of experiments (Dean a. Voss, D.)

9.2 Web addresses:

10 EVALUATION SYSTEM

10.1 Aspects and/or criteria:

The evaluation of the subject will be mostly based on the performance in the practical works using Statgraphics. Students are expected not only to obtain the numerical result of a problem, but also to interpret its meaning and consequences. They should know how to apply the procedures explained in theory, when to apply them, how these procedures work and why, interpret the results and study the previous conditions before applying them.

Students should also be able to extract the important information provided by the statistical procedures

learned in theory and write simple reports expressing the solution to the proposed exercises.

Clarity in the acquired concepts will be of special importance in the evaluation, as well as the correct use of the mathematical terminology and notation, the reasoning skills and deep understanding of statistical procedures.

10.2 Modalities and instruments:
Written final exam
Handing in activities through b-learn.

10.3 Marking system:
The total mark of the subject is 10 points, divided in this way:

1. **Seven points, as** maximum, can be obtained through a practical final exam covering the contents of the subject. The exam will take place in a computer room.

2. **Three points, as** maximum, can be obtained through individual assignments to be handed in using the b-learn platform. In order to obtain the three points, it is an essential requirement to deliver the required exercises before the established deadline.