

# Bachelor in Agricultural Engineering

## Course information

Year 2021-22

GENERAL SPECIFICATIONS			
<b>English name</b>			
Horticulture			
<b>Spanish name</b>			
Horticultura			
<b>Code</b>		<b>Type</b>	
606110211		Compulsory	
<b>Time distribution</b>			
	<b>Total</b>	<b>In class</b>	<b>Out class</b>
Working hours	150	60	90
<b>ECTS: 6</b>			
<b>Standard group</b>	<b>Small groups</b>		
	<b>Classroom</b>	<b>Lab and Field work</b>	<b>Field trip</b>
<b>3.28</b>		2.22	0.5
<b>Departments</b>		<b>Knowledge areas</b>	
Agroforestry Sciences		Plant Production	
<b>Year</b>		<b>Semester</b>	
3 <sup>th</sup>		1 <sup>st</sup>	

TEACHING STAFF			
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SPECIFIC INFORMATION OF THE COURSE
<b>1. Contents description</b>
1.1. In English:
<p>The course introduces the science and technology of Horticulture: Growing plants for foods and beverages, and ornamental, landscape or recreational purposes.</p> <p><b>Horticulture</b> is divided into four branches in English speaking countries:</p> <ul style="list-style-type: none"> <li><b>Olericulture:</b> the science of production and utilisation of vegetable crops.</li> <li><b>Floriculture:</b> the science of production and utilisation of ornamental plants.</li> <li><b>Pomology:</b> the science of production and utilisation of fruit crops</li> <li><b>Landscape horticulture:</b> beautification and protection of the environment.</li> </ul> <p>However, in Spanish speaking countries, Horticulture means Olericulture, that is, vegetable crops production, and consequently, the course will focus just on this topic.</p> <p>The course is structured to provide students with a survey of Horticulture. The process will include understanding fundamental concepts integral to all aspects of production and management such as climate, soil, culture, pest management, harvesting, marketing, sales and distribution. Additionally, we will strive to identify emerging issues in horticulture and encourage robust discussion.</p>

## 1.2. In Spanish

El curso presenta la ciencia y la tecnología de la Horticultura: Cultivo de plantas para alimentos, bebidas, y para fines ornamentales, paisajísticos o recreativos.

La **Horticultura** se divide en cuatro ramas en los países de habla inglesa:

**Olericultura:** la ciencia de la producción y utilización de los cultivos hortícolas.

**Floricultura:** la ciencia de la producción y utilización de plantas ornamentales.

**Pomología:** la ciencia de la producción y utilización de los cultivos frutales

**Horticultura paisajística:** embellecimiento y protección del medio ambiente.

Sin embargo, en los países de habla hispana, la Horticultura sólo significa Olericultura, es decir, producción de cultivos hortícolas, por lo que el curso se centra única y exclusivamente en esa área.

El curso está estructurado para proporcionar a los estudiantes una visión general de la Horticultura. Esto es, dotar a los alumnos de conocimientos de Horticultura General mediante la adquisición de los conocimientos aplicados sobre los sistemas de cultivos hortícolas, modificación del clima y del suelo, técnicas de cultivo, riego, fertilización, defensa fitosanitaria, recolección y post-recolección de productos hortícolas y técnicas de conservación. Así como, capacitar a los alumnos de las habilidades necesarias para aplicar los conocimientos adquiridos a situaciones reales y concretas.

## 2. Background

### 2.1. Situation within the Degree:

This subject is taught in the 3<sup>rd</sup> year of the Bachelor in Agricultural Engineering. The primary objective of this course is to provide the students with adequate knowledge of the theory and practice of growing vegetable crops such as tomatoes, peppers, eggplants, cucumbers, melons, watermelons, and so on as well as other minor ones.

### 2.2. Recommendations:

There are no specific prerequisites, but it is highly recommended that students have a background in Agronomy and other related subjects.

## 3. Objectives (as result of teaching):

The participants will develop core skills for their professional career in this vital field at the same time will complete their training in this branch of Horticulture. In particular, the course gives a practical insight into the proper agricultural practices of growing vegetable crops, including thorough knowledge of botanical concepts such as morphology, anatomy, taxonomy, physiology, genetics, and propagation as they apply to grow vegetable crops.

The process will include understanding fundamental concepts integral to all aspects of production and management such as climate, soil, culture, pest and diseases management, harvesting, marketing, sales, and distribution. Additionally, we will strive to identify emerging issues in growing vegetable crops and find out a solution.

By the end of the course, students should be able to:

- Successfully grow any vegetable crops.
- Provide general and specific production recommendations.
- Know the best agricultural techniques.
- Know Soil and Nutrient Management.
- Know Irrigation Management.
- Know Pest and Diseases Management.
- Know Greenhouses Management.
- Know Soil-less culture Management.

<b>4. Skills to be acquired</b>
<b>4.1. Specific Skills:</b>
<p>C01: Ability to know, understand and use the principles of identification and characterization of plant species.</p> <p>C09: Ability to know, understand and use decision-making principles using resources in multidisciplinary groups</p> <p>C10: Ability to know, understand and use the principles of technology transfer, and ability to understand, communicate, and adopt developments in the agricultural industry.</p> <p>H01: Qualification in fruits and vegetables production technology. Vegetable, fruit and ornamental flowers production and propagation. Quality control. Plant genetics and breeding.</p> <p>E02: Qualification in plant production technology. Production, protection and management systems and techniques. Pest and diseases management. Animal genetics and breeding. Farming cultivations engineering. Agro-energy.</p>
<b>4.2. General Skills:</b>
<p>CT1: Master English language, the different styles and specific languages necessary for the development and communication of knowledge both the scientific and academic field.</p> <p>G01: Ability to solve problems.</p> <p>G02: Ability to make decisions.</p> <p>G04: Ability to apply knowledge in practice.</p> <p>G05: Ability to work in a team.</p> <p>G07: Ability to analysis and synthesises.</p> <p>G12: Ability to independent and deep learning.</p> <p>G17: Ability to critical reasoning.</p>

<b>5. Training Activities and Teaching Methods</b>		
<b>5.1. Training Activities:</b>		
<p>1.- Theoretical and problem-solving classes In order to achieve the objectives, the course combines different teaching methods: lectures, practical exercises in class or on the computer, group work assignments, student presentations, and class discussions.</p> <p>2.- Lab and Field work Labs and field work will be hands-on work sessions and will consist of growing different kinds of vegetable crops at the University field.</p> <p>3.- Activities Academically Directed (AAD): Seminars, conferences, work development, debates, collective tutorials, evaluation activities and self-evaluation.</p> <p>4.- Field trip There will be one field trip (½ or 1 day) in the province of Huelva or surroundings in which will visit agricultural enterprises.</p>		
<b>5.2. Teaching Methods:</b>		
Methodology	Activity	Description
Face-to-face classes	Theoretical and problem-solving classes	Lectures, in which the participation of students in the classroom (discussions) is encouraged: Foundations and theoretical approaches.
Practical sessions	Lab and Field work	Field work sessions in small groups, in which students will grow vegetable crops under supervision. During the course and at the end of the course, they have to write a report on this.

Writing assignments	Activities Academically Directed (AAD): Individual or group work	Students have to carry out an assignment on vegetable crops and present it in class for discussion. At the end of the course, they have to write a paper on this and give a short presentation.
Guest Lectures	Activities Academically Directed (AAD): Seminars, conferences	A few guest lectures will be given by agricultural engineers working in agricultural enterprises on a chosen subject by the staff.
Off-Campus	Field trip	A field trip in the province of Huelva or surroundings that will provide the opportunity to be in contact with agricultural enterprises. At the end of the field trip, they have to write a paper on this.

All the necessary material to follow the theoretical and practical classes will be available on the online (distance) learning platform Moodle (<https://moodle.uhu.es/>). The page will contain information about the contents of the subject, the work plan, the schedule of lectures and practices, as well as interesting links about the subject.

### 5.3. Development and Justification:

#### **Theoretical and problem-solving classes**

For lectures, resources to be used are the blackboard or whiteboard (traditional and electronic version), presentations with the help of a computer and supplementary material provided by the lecturer (photocopies, electronic files, etc.).

(Competencies G01, G02, G04, G07, G12, G17, CT1, C01, C09, C10, E02, H01)

#### **Lab and Field work**

Compulsory attendance for students. In the lab and field work, the content addressed in the lectures will be applied, solving problems will be emphasised, limitations and advantages of techniques, as well as a critical analysis of the results obtained. These practical sessions will be highly interactive. As our lab sessions will be hands-on work dress appropriately for the weather and location.

(Competencies G01, G02, G04, G07, G12, G17, CT1, C01, C09, C10, E02, H01)

#### **AAD (Seminars, conferences, writing assignments, etc.) and Field Trip**

There will be one required field trip. As for the field trip, be prepared to take notes on paper notebooks in order to prepare reports. The students are encouraged to take photos during the field trips (if the producers allow) and incorporate into your report (with captions under the pictures). Clothing may be soiled, therefore, dress appropriately. Bus service will be provided for transportation. Reports are due one week (7 days) after the field trip.

(Competencies G04, G05, G07, G17, CT1, C01, C09, H01)

#### **Student's individual/autonomous work**

The student's individual/autonomous work implies that the student is responsible for the organization of his/her work and the acquisition of the different skills and the use of the most appropriate resources.

(G01, G02, G04, G05, G07, G12, G17, CT1, C01, C09, C10, E02, H01)

## 6. Detailed Contents:

### THEORETICAL PROGRAM

#### General Horticulture

Unit 1.- Introduction. Fundamentals of Horticulture.

Unit 2.- Modification of the climate: Temperature, Humidity, Light, and CO<sub>2</sub>.

Unit 3.- Modification of the soil (includes soilless culture).

Unit 4.- Crop management, harvest, and postharvest handling.

#### Specific Horticulture

Many different vegetable classifications systems have been developed, but the value of any system depends on its usefulness. The following section introduces a classification system that is useful in the study of vegetable crops.

Classification of vegetables according to the part consumed:

Unit 5.- Root vegetables: Enlarged taproot, such as potato, carrot, table beet, turnip and radish. Enlarged lateral root, such as sweet potato and cassava.

Unit 6.- Bulb vegetables: important for their flavour and colour in foods such as onion, shallots, leeks, and garlic.

Unit 7.- Stem vegetables: plants grown primarily for their edible shoot, mainly the young, succulent stem, used here only for those vegetables composed primarily of above-ground stems such as asparagus.

Unit 8.- Leafy vegetables: the leaves and succulent young shoots are picked for consumption.

Examples are lettuce, kale, cabbage, broccoli, Brussels sprout, cauliflower, endive, spinach, bitter leaf, and watercress.

Unit 9.- Fruit vegetables: this comprises of young, immature unripe fruits or mature ripe fruits of plants grown as vegetables. Examples are tomato, cucumber, okra, pumpkin, eggplant, melon, watermelon, courgette or zucchini, sweet pepper and chilli pepper, and strawberry, raspberry, blackberry, and blueberry.

Unit 10.- Pod and Seed vegetables: this group is important for the seed produced. Examples are legumes such as beans, peas, and broad beans.

Each vegetable crop includes the following sections:

- Introduction.
- Economic importance.
- Botanical description.
- Physiology.
- Climatic and Soil requirements.
- Soil preparation and disinfestation.
- Irrigation and Fertilization.
- Pruning, Trellising, Pollination, etc.
- Weeds management.
- Harvest and Post-harvest.
- Pest and diseases management.
- Physiological disorders.

### PRACTICAL PROGRAM

1.- High tunnels and/or greenhouses.

Students will grow vegetable crops under supervision throughout the fall and winter season, in particular tomatoes, peppers, eggplants, strawberries, raspberries and blackberries at "La Rábida Campus" in Palos de La Frontera (11 km far away from "El Carmen Campus" in Huelva). They must write a weekly report taking into consideration the growth and development of the vegetable crops that can be found on Growth stages of mono-and dicotyledonous plants, BBCH Monograph. A major component of this course is working outdoors at the University field, so students are expected to wear appropriate clothing, including work gloves, closed toe shoes or boots and outerwear/raingear as needed. Students

not adhering to this policy will not be allowed to participate in these activities.

## 2.- Field trip.

There will be a required field trip in the province of Huelva or surroundings in which will visit top agricultural enterprises. The students must write a report. Reports are due one week (7 days) after the field trip. Reports should include 1) name of the farm, 2) location, 3) owner or presenter of information, 4) information on production, 5) information on marketing technique, 6) what you liked and/or disliked about the operation, and 7) what you learned from the visit. Please incorporate pictures (with legends) into the report. Report should be 500-600 words.

## 7. Bibliography

### 7.1. Basic Bibliography

*Producing Vegetable Crops*, by John M. Swiader and George Whitaker Ware.

*Vegetable Production and Practices*, by Gregory E. Welbaum.

*Greenhouse Technology and Management*, 2nd Edition. Nicolás Castilla.

*Knott's Handbook for Vegetable Growers*, by Donald N. Maynard and George J. Hochmuth.

### 7.2. Additional Bibliography:

On demand.

## 8. Systems and Assessment Criteria

### 8.1. System for Assessment:

- Exams on theoretical lessons and problem-solving.
- Exams on lab and field work or practical program.
- Defence of papers and written reports
- Individual Student Follow-Up

### 8.2. Assessment Criteria and Marks:

According to Policy of Evaluation for undergraduate Degrees at Universidad de Huelva (Reglamento de Evaluación para las Titulaciones de Grado y Máster Oficial de la Universidad de Huelva):

([http://www.uhu.es/sec.general/Normativa/Textos\\_Pagina\\_Normativa/Normativa\\_2019/Rgto\\_evaluacion\\_grado\\_mofs\\_ccgg\\_19\\_03\\_13.pdf](http://www.uhu.es/sec.general/Normativa/Textos_Pagina_Normativa/Normativa_2019/Rgto_evaluacion_grado_mofs_ccgg_19_03_13.pdf)), the student can choose between Continuous Assessment and Final Examination. In order to opt for the final examination, the student, in the first two weeks, will communicate it by email to the professor. This will imply the express waiver of continuous assessment.

The purposes and objectives of assessment are not only to assess the specific knowledge the student has acquired but also to assess their ability to synthesise and express themselves (the language they use, etc.).

The course assessment will be determined by the scores obtained by the students in the assignments, lab and field work and exams for Continuous Assessment or Final Examination as follow:

a) Theory and problem-solving written assessments (Continuous Assessment or Final Examination).

The theory exam worth 60 % (A) and the problem-solving exam represent 20 % (B) of the final mark. To pass the subject, it is necessary to obtain at least 5 out of 10 in these exams. It evaluates the competencies G01, G02, G04, G07, G12, G17, CT1, C01, C09, C10, E02, and H01.

b) Participation on Lab and field work (Continuous Assessment).

The grade is: "pass" or "fail" and worth 10 % (C) of the final mark. It evaluates the competencies G01, G02, G04, G07, G12, G17, CT1, C01, C09, C10, E02, and H01. To pass the subject, it is necessary to obtain a "pass" without exception.

c) Activities Academically Directed (Continuous Assessment).

The mark for this task represents 10% of the final mark (D). The mark is from 0 to 10 and to pass the subject; it is necessary to obtain at least 5 points. The evaluation of this task takes into account the quality of the written work and oral exposition. It evaluates the competencies G04, G05, G07, G17, C01, C09, CT1, C10, E02 and H01.

d) Practical written assessment (Final Examination).

The mark for this task represents 20% of the final mark (E). It evaluates the competencies G01, G02, G04, G07, G12, G17, CT1, C01, C09, C10, E02 and H01. To pass the subject, it is necessary to obtain at least 5 out of 10 in this exam.

Final mark

a) The final mark for the subject will be obtained thus for Continuous Assessment as follow:

Final mark =  $0.60 * A + 0.20 * B + 0.10 * C + 0.10 * D$ , where A is the mark for the theory written exam, B is the mark for the problem-solving written exam, C is the mark for the lab and field work exam and D is the mark for AAD. To pass the subject, students must obtain at least 5 points in the final mark, with at least 5 points in the grades for A, B, C, and D.

b) The final mark for the subject will be obtained thus for Final Examination as follow:

Final mark =  $0.60 * A + 0.20 * B + 0.20 * E$ , where A is the mark for the theory written exam, B is the mark for the problem-solving written exam and E is the mark for the practical exam. To pass the subject, students must obtain at least 5 points in the final mark, with at least 5 points in the grades for A, B, and E.

The rating system used in the subject agrees with the one provided in article 5 of Royal Decree 1125/2003, of September 5, by which the European credit system and the grading system is set for official university degrees, and it is valid in all Spain: Results obtained by the student in each subject of the curriculum/syllabus will be graded according to the following numerical scale from 0 to 10, with one decimal, to which may be added the corresponding qualitative rating:

- 0.0 to 4.9: D. Fail (Suspenso)
- 5.0 to 6.9: Grade C (Aprobado)
- 7.0 to 8.9: Grade B (Notable)
- 9.0-10: Grade A (Sobresaliente)

The mention "honors" will be awarded to students who have obtained a score equal to or greater than 9.0. Their number may not exceed 5% of the students registered in a subject in the same academic year unless the number of students registered is less than 20. In that case, a single "honors" may be awarded.

**DISABILITY-RELATED CONCERNS:** Students with either an ongoing or short-term disability are encouraged to contact Student Disability Services for a confidential discussion of their need for academic accommodations. In that case, make-up exams shall be subject to the Policy of Evaluation for Undergraduate Degrees at Universidad de Huelva (Reglamento de Evaluación para las Titulaciones de Grado y Máster Oficial de la Universidad de Huelva):

([http://www.uhu.es/sec.general/Normativa/Textos\\_Pagina\\_Normativa/Normativa\\_2019/Rgto\\_evaluacion\\_grado\\_mofs\\_ccgg\\_19\\_03\\_13.pdf](http://www.uhu.es/sec.general/Normativa/Textos_Pagina_Normativa/Normativa_2019/Rgto_evaluacion_grado_mofs_ccgg_19_03_13.pdf))