

**COURSE GUIDE: 2016-17**

<b>COURSE DETAILS</b>			
Name :	Agronomical bases of protected crops		
Code :	70782209	Plan :	Máster en Horticultura Mediterránea bajo Invernadero
Academic year :	2016/17	Level :	Official Master
Course :	1º	Type :	Optative
Semester :			
<b>TIME DISTRIBUTION IN ACCORDANCE WITH REGULATION</b>			
ECTS :	3	In-class hours:	22.5
		Not in-class hours:	52.5
		Total time (in hours):	75
<b>USE OF VIRTUAL PLATFORM:</b>	Yes		

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<b>ACTIVITIES ORGANIZATION</b>	
<i>Planned activities for learning and workload distribution per activity (in hours)</i>	
I. STUDENT'S ACTIVITIES (In-class / Online)	• Teaching group 13,5
	• Work group / small group 9,0
	<i>Total In-class/Online time :</i> 22,5
II. STUDENT'S AUTONOMOUS ACTIVITIES (not in-class)	• 52,5
	<i>Total not in-class time :</i> 52,5
<b>TOTAL WORKING HOURS</b>	<b>75,0</b>

<b>ELEMENTS OF INTEREST FOR COURSE LEARNING</b>
<b>Justification of contents</b>
Protected (mostly greenhouses) crops are usually high-value crops grown intensively with the main aim of obtaining high production of high quality products. For optimal production, these crops systems usually require specific cultivars and crop management techniques and, therefore, they need specific agronomical knowledge and know-how about their growth, development and production, and about how these parameters are affected by the main environmental factors (greenhouse microclimate). In regions with warm climates, such as the Mediterranean basin, low-cost greenhouses predominate. These greenhouses are covered with plastic film, have no active climate control systems, and most contain soil-grown crops. In Mediterranean areas the main greenhouse microclimate variables influencing crop behaviour are usually below or above the optimum range (low air temperature, high air humidity, low PAR radiation CO <sub>2</sub> air content from November to February; and high air temperature, low air humidity, low PAR radiation CO <sub>2</sub> air content from April to September), which frequently reduces crop productivity and fruit quality.
<b>Other courses related</b>
Gestión del microclima. Respuesta de los cultivos
<b>Minimum knowledge required to deal with the course</b>
- Basic knowlegde on agronomy (mostly crop production) - Basic computer skills - Good English language level (reading)

<b>COMPETENCIES</b>
<b>General competencies</b>
<i>General objectives of the University of Almería</i>
Ability to use information and communication technologies
<i>Other general objectives</i>
To get and understand knowledge
<b>Specific competencies developed</b>

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To know the agronomical basis of protected crops

**LEARNING OBJECTIVES/OUTCOMES**

Students should be able to get specific knowledge about growth, development and production of protected crops, and about how these crops respond to the environment (greenhouse microclimate) in order to optimize crop management techniques.

**CONTENTS**

**Module I. Growth, development and production of protected crops**

**Content**

**1. Basic concepts of growth and development of protected crops:**

- Crop growth pattern and characterization. Growth parameters. Protected crops *versus* extensive crops.
- Crop development: characterization and types
- Crop phenology
- Determinate and indeterminate crops
- Factors influencing growth and development rate.

**2. Basis of crop production in protected crops**

- Crop yield and yield components
- Plant density
- Crop models
- Crop photosynthesis and respiration
- Intercepted radiation. Radiation use efficiency (RUE)
- Assimilate partitioning
- Factors influencing crop production
- Demonstration and simulation of crop growth, development and production

**Learning system and methodology**

<i>System</i>	<i>Learning procedures and activities</i>	<i>Observations</i>	<i>Hours In-class/ Online</i>
Teaching group	Seminars and evaluation		4,5
Work group	Practical cases: demonstration and simulation of crop growth, development and production; practical exercises, etc.		3,0

**Description of autonomous workload**

- Study selected documentation
- Identify and solve doubts about classes and selected documentation

**Module II. Bases of root system of protected crops**

**Content**

**1. Root distribution and functioning**

**2. Root characterization. Factors influencing growth, development and distribution of roots of protected crops**

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<b>Learning system and methodology</b>			
<i>System</i>	<i>Learning procedures and activities</i>	<i>Observations</i>	<i>Hours In-class/ Online</i>
Teaching group	Seminars and evaluation		3,5
Work group	Laboratory practices; debates; exercise reports; practical problems, etc.		4,0
<b>Description of autonomous workload</b>			
<ul style="list-style-type: none"> <li>- To find and understand specific documentation</li> <li>- Analysis of laboratory data</li> <li>- Writing a report</li> </ul>			
<b>Module</b>	<b>Module III. How protected crops respond to microclimate?</b>		
<b>Content</b>	<ol style="list-style-type: none"> <li><b>1. Temperature and crop responses</b></li> <li><b>2. Radiation and crop responses</b></li> <li><b>3. The influence of CO<sub>2</sub> concentration and other microclimate variables in protected crops</b></li> </ol>		
<b>Learning system and methodology</b>			
<i>System</i>	<i>Learning procedures and activities</i>	<i>Observations</i>	<i>Hours In-class/ Online</i>
Teaching group	Seminars and evaluation		5,5
Work group	A practical case study; practical and theoretical exercises.		2,0
<b>Description of autonomous workload</b>			
<ul style="list-style-type: none"> <li>- To study the selected documentation (presentations, articles, etc.)</li> <li>- A case study: elaboration and analysis de microclimate, growth and production data of a greenhouse tomato crop subjected to varying temperature and radiation conditions.</li> <li>- Online evaluation.</li> </ul>			

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<b>EVALUATION SYSTEM</b>			
<b>Assessment criteria</b>			
<ul style="list-style-type: none"> <li>- Student assistance and participation into in-class/online activities (15 % of total score)</li> <li>- Evaluation of case studies, reports, exercises and other programmed activities (35% of total score)</li> <li>- Final test (50% of total score)</li> </ul>			
<b>Marking system</b>			
	<i>Activity</i>	<i>(Number of hours)</i>	<i>Percentage</i>
I. STUDENT 'S ACTIVITIES (In-class/Online)	<ul style="list-style-type: none"> <li>• Teaching group [seminars and evaluation]</li> </ul>	13,5	40 %
	<ul style="list-style-type: none"> <li>• Work group/ small group [case studies; exercises; demonstration; laboratory practices; etc.]</li> </ul>	9,0	27 %
II. STUDENT'S AUTONOMOUS ACTIVITIES (Autonomous work)	<ul style="list-style-type: none"> <li>• Individual work [case studies, exercises, reports, etc.]</li> </ul>	52,5	33 %
<b>Assessment instruments</b>			
<ul style="list-style-type: none"> <li>- Online test of case studies</li> <li>- Exercises</li> <li>- Class assessment (questions)</li> <li>- Reports</li> <li>- Final test</li> </ul>			
<b>Monitoring mechanisms</b>			
<ul style="list-style-type: none"> <li>- Class assistance</li> <li>- Use and participation in the virtual platform</li> <li>- Assistance to tutorial classes</li> </ul>			

<b>BIBLIOGRAPHY</b>
<b>Recommended bibliography</b>
<p>Basic bibliography</p> <ul style="list-style-type: none"> <li>- Integrated Greenhouse Systems for Mild Climates (Christian von Zabeltitz)</li> <li>- Greenhouse Technology and Management (N. Castilla). CABI</li> <li>- Principles of Horticultural Physiology (E.F. Durner)</li> </ul> <p>Complementary bibliography</p> <ul style="list-style-type: none"> <li>- Greenhouse ecosystems. Ecosystems of the world 20 (G. Stanhill and H.Z. Enoch)</li> <li>- Soilless Culture: Theory and Practice (M. Raviv &amp; J.H. Lieth)</li> </ul>
<b>Bibliography existing in the library of the University of Almeria</b>
<a href="http://almirez.ual.es/search/e?SEARCH=BASES AGRONOMICAS DE LOS CULTIVOS PROTEGIDOS">http://almirez.ual.es/search/e?SEARCH=BASES AGRONOMICAS DE LOS CULTIVOS PROTEGIDOS</a>

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**WEB ADRESSES**

<http://www.juntadeandalucia.es/agriculturaypesca/ifapa/web/ifapa/productos/publicacionesypatentes>  
*Manejo del clima en el invernadero mediterráneo. IFAPA*

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