COURSE GUIDE: 2016-17

COURSE DETAILS			
Name	Agricultural Entomology		
Code:	25153310	Plan:	Grado en Ingeniería Agrícola (Plan 2015)
Academic year:	2016-17	Level:	Engineer's Degree
Course:	3	Type:	Optional
Academic quarter:	First		

TIME DISTRIBUTION IN ACCORDANCE WITH REGULATION			
ECTS:	6	In-class hours:	45
		Not in-class hours:	105
		Total time (in hours):	150
USE OF VIRTUAL PLATFORM:		Multimodal	

DATOS DEL PROFESORADO			
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ACTIVITIES ORGANIZATION		
Planned activities for learning and workload distritution per activity (in hours)		
I. STUDENT'S ACTIVITIES (In-class / Online)	• Seminar	0,0
	• Teaching groups	26,0
	• Work group / small group	19,0
	Total In-class/Online time ...	45,0
II. STUDENTS'S AUTONOMOUS ACTIVITIES (not in-class)	• (Work in group, individual work)	105
	Total Not In-class time ...	105
TOTAL WORKING HOURS		150,0

ELEMENTS OF INTEREST FOR COURSE LEARNING
Planned activities for learning and workload per activity (in hours)
The content of the course is focused on phytophagous species that are economically important as crop pests: Taxonomy, organization, physiology, development and behavior of pest animals, mainly arthropods. Taxonomy and recognition of extensive arable crop pests. Pest species of cereals, legumes, industrial crops and stored products: descriptions, biology, ecology, damage thresholds of intervention, and control methods. Agroecosystem: natural control and natural enemies (predators, parasitoids and entomopathogens). Strategies and tactics for pest control: Chemical methods, biological control, interference methods (hormones and semiochemicals), physical methods, agronomic methods, and integrated pest control (IPM). The course content is structured in 3 blocks of theory (28.0 hours): Fundamentals of agricultural entomology, crop pest species of and pest control methods; 2 blocks of lab sessions (9.0 hours): identification of pests and their natural enemies, pest identification for field crops; and finally a block of 4 assignments on the subjects of the course (8.0 hours).
Other courses related
25104211 Agricultural Chemistry and Plant Development 25102202 Crop Science 25103226 Extensive Herbaceous and Energy Crops
Mininum knowledge requiered to deal with the Course
25101106 Biology

COMPETENCIES
General competencies
General objetives of the University of Almeria • Basic knowledge of the profession • Knowledge of a second language • Skill in the use of ICT • Capacity and self-criticism • Ability to learn to work independently
Other general objetives • To understand and acquire knowledge • Application of knowledge • Ability to make judgments
Specific competencies development
CTE02: “Protección de Cultivos contra Plagas” (Crop Protection)
LEARNING OBJETIVES/OUTCOMES
Introduction to general Agricultural Entomology and its position in the Crop Protection and in the Agronomy. Knowledge in arthropods causing damage in crops. Study of the characteristics of insect and mite pests. Knowledge of methods of chemical pest control. Study and know the natural enemies of arthropod pests. Knowing the biological control methods and application techniques. Other methods of pest control. Study and know the main species crop pests.

CONTENTS			
Module	**THEMATIC UNIT I: AGRICULTURAL ENTOMOLOGY**		
Content			
	Theme 1. ANIMALS ENEMIES OF CULTIVATED PLANTS 1.1. Enemies of crops and objectives of Agricultural Entomology. 1.2. Main zoological groups with agricultural interest. 1.3. Characteristics and relative importance like pest of various animal groups. 1.4. General characteristics and classification of Arthropods.		
Learning system and methodology			
System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Teaching group	Class		1,0
Description of autonomous workload			
Content			
	Theme 2. INSECT ORGANIZATION 2.1. Introduction. 2.2. General organization of an adult insect. 2.3. External structure: Tegument. Moulting process. 2.4. Body and its parts. Appendices.		

	2.5. Introduction to internal structure and physiology of insects

Learning system and methodology

System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Teaching group	Class		2,0

Description of autonomous workload

Content

	Theme 3. INSECT BIOLOGY. 3.1. Embryonic and postembryonic development. Types. 3.2. Features of phases: egg, nymph/larvae and pupa. 3.3. Reproduction in insects. 3.4. Life cycle in phytophagous insects. 3.5. Seasonal adaptations: Diapause and quiescence.

Learning system and methodology

System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Teaching group	Class		2,5

Description of autonomous workload

Content

	Theme 4. ORGANIZATION AND BIOLOGY OF PHYTOPHAGOUS MITES. 4.1. General organization of mites. 4.2. External structure: Tegument and its parts. 4.3. Internal structure and physiology of mites. 4.4. Development and phases: egg, larvae, nymph and adult. 4.5. Life cycles in phytophagous mites.

Learning system and methodology

System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Teaching group	Class		1,5

Description of autonomous workload

Content

	Theme 5. ECOLOGY OF ARTHROPOD PESTS. 5.1. Agroecosystem: Definition, structure and determining factors. 5.2. Population dynamic of arthropod pests. 5.3. Arthropod-Plant interactions.

Learning system and methodology

System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Teaching group	Class		1,5

Description of autonomous workload

Content

	Theme 6. PEST CONTROL METHODS. 6.1. Definitions: economic importance pest, economic damage, intervention threshold. 6.2. Main methods of pest control. 6.3. Cultural or agronomic methods. 6.4. Relations between pest ecology and control methods employed.

Learning system and methodology

System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Teaching group	Class		1,0

Description of autonomous workload

Module	**THEMATIC UNIT II: CROP PESTS AND THEIR MANAGEMENT**

Content

	Theme 7. COLEOPTERA. 7.1. Characteristics of order and main families. 7.2. Characteristics of the main families of agricultural interest. 7.3. Main incidence pest species. 7.4. Natural enemy species.

Learning system and methodology

System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Teaching group	Class		1,5

Description of autonomous workload

Content

	Theme 8. LEPIDOPTERA. 8.1. Characteristics of order and main families. 8.2. Characteristics of the main families of agricultural interest. 8.3. Main pest species.

Learning system and methodology

System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Teaching group	Class		1,5

Description of autonomous workload

Content

	Theme 9. DIPTERA. 9.1. Characteristics of order and main families. 9.2. Characteristics of the main families of agricultural interest. 9.3. Main incidence pest species. 9.4. Natural enemy species.

Learning system and methodology

System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Teaching group	Class		1,0

Description of autonomous workload			
Content			
	Theme 10. THYSANOPTERA. 10.1. Characteristics of order and main families. 10.2. Characteristics of the main families of agricultural interest. 10.3. Main incidence pest species. 10.4. Natural enemy species.		
Learning system and methodology			
System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Teaching group	Class		1,0
Description of autonomous workload			
Content			
	Theme 11. ORTHOPERA. 11.1. Characteristics of order and main families. 11.2. Locust phases theory. 11.3. Locust species: *Dociostaurus maroccanus* and *Schistocerca gregaria.*		
Learning system and methodology			
System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Teaching group	Class		1,0
Description of autonomous workload			
Content			
	Theme 12. HEMiPTERA 12.1. Characteristics of order and main families. 12.2. Characteristics of the main families of agricultural interest. 12.3. Main incidence pest species. 12.4. Natural enemy species.		
Learning system and methodology			
System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Teaching group	Class		1,5
Description of autonomous workload			
Contenido/Tema			
	Theme 13. ACARI. 13.1. Characteristics of order and main families. 13.2. Main incidence pest species. 13.3. Natural enemy species.		
Learning system and methodology			
System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Teaching group	Class		1,0

Description of autonomous workload			
Module	**THEMATIC UNIT III: PEST CONTROL**		
Content			
	Theme 14: INTEGRATED PEST CONTROL 14.1. Pest control in sustainable agricultura. IPM: Concept and definitions 14.2. IPM: Program design, management and implementation. 14.3. Sampling, monitoring and forecasting. 14.4. New European legislative framework for pest control.		
Learning system and methodology			
System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Teaching group	Class		2,0
Description of autonomous workload			
Content			
	Theme 15: CHEMICAL CONTROL IN IPM 15.1. Pesticides: Definition, market, development, and formulation 15.2. Insecticides 15.3. Acaricides 15.4 Problems with chemical pest control 15.5. Insecticide/acaricide resistance 15.6. Integration chemical and biological control of arthropod pests		
Learning system and methodology			
System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Teaching group	Class		2,0
Description of autonomous workload			
Content			
	Theme 16: MACROBIOLOGICAL PEST CONTROL 16.1 Natural control: Concepts and factors 16.2. Natural enemies of arthropod crop pests 16.3. Entomophagous: Predatory and parasitoid species 16.4. Biology of entomophagous 16.5. Introduction to the macrobiological pest control		
Learning system and methodology			
System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Teaching group	Class		2,0
Description of autonomous workload			
Content			
	Theme 17: MICROBIOLOGICAL PEST CONTROL 17.1. Entomopathogens: An introduction 17.2. Entomopathogenic groups: Virus, bacteria, fungi, and nematodes 17.3. Pest control methods with entomopathogen agents		
Learning system and methodology			

System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Teaching group	Class		2,0
Description of autonomous workload			
Content			
	Theme 18: OTHER PEST CONTROL METHODS IN IPM 18.1. Introduction 18.2. Physical methods 18.3. Cultural methods 18.4. Genetic methods 18.5. Interference methods: Hormones and pheromones		
Learning system and methodology			
System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Teaching group	Class		2,0
Description of autonomous workload			

Module	**LABORATORY CLASSES.** **UNIT I: IDENTIFICATION OF PESTS AND THEIR NATURAL ENEMIES**
Content	
	Lab Session 1. Collecting and field techniques, mounting and preservation of insect and acari pests. External extructure of arthopods.
Learning system and methodology	

System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Working Group / Small Group	Laboratory work		0,5
Description of autonomous workload			
Content			
	Lab Session 2. Identification of Orthoptera, Thysanoptera and Hymenoptera with agricultural interest.		
Learning system and methodology			

System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Working Group / Small Group	Laboratory work		1,5
Description of autonomous workload			
Content			
	Lab Session 3. Identification of Lepidoptera and Diptera with agricultural interest.		
Learning system and methodology			

System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Working Group / Small Group	Laboratory work		2,0
Description of autonomous workload			
Content			
	Lab Session 4. Identification of Hemiptera with agricultural interest.		
Learning system and methodology			
System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Working Group / Small Group	Laboratory work		2,0
Description of autonomous workload			
Content			
	Lab Session 5. Identification of Coleoptera and Acari with agricultural interest.		
Learning system and methodology			
System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Working Group / Small Group	Laboratory work		2,0
Description of autonomous workload			
Module	**LABORATORY CLASSES** **UNIT II: IDENTIFICATION OF INTENSIVE CROP PESTS**		
Contenido/Tema			
	Lab Session 6. Identification of own collected material I.		
Learning system and methodology			
System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Working Group / Small Group	Study of cases		0,5
	Laboratory work		0,5
Description of autonomous workload			
Content			
	Lab Session 7. Identification of own collected material II. Preparing own collection.		
Learning system and methodology			

System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Working Group / Small Group	Laboratory work		1,0
Description of autonomous workload			

Module	**ASSIGNMENTS. UNIT I: GENERAL ENTOMOLOGY**
Content	
	Assignment 1: Preservation of own collection material. Which are pests?
Learning system and methodology	

System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Working Group / Small Group	Search, consultation and information processing		0,5
	Reporting		0,5
Description of autonomous workload			
Recolección y preparación de colección de especies de artrópodos plagas y sus enemigos naturales.			

Module	**ASSIGNMENTS. UNIT II: CROP PESTS**
Content	
	Assignment 2: Own collection. Pest and natural enemies: identification.
Learning system and methodology	

System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Working Group / Small Group	Search, consultation and information processing		1,0
	Reporting		0,5
Description of autonomous workload			
Identification of the insects and mite species collected in the assignment 2 and delivery of a entomological collection.			

Module	**ASSIGNMENTS. UNIT III: PEST CONTROL METHODS.**
Content	
	Assignment 3: Annotated bibliography
Learning system and methodology	

System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Working Group / Small Group	Search, consultation and information processing		1,0
	Reporting		0,5

Description of autonomous workload
Handling of Scientific Journal and papers on pest control issues (arthropod species).

Module	ASSIGNMENTS. UNIT III: PEST CONTROL METHODS
Content	
	Assignment 4: Case study: Pest control (arthropods) according to IPM rules.

Learning system and methodology			
System	*Learning procedures and activities*	*Observations*	*Hours In-class/On line*
Working Group / Small Group	Study of cases		1,0
	Evaluation of results		1,0
	Formulation of hypotheses and alternatives		1,0

Description of autonomous workload
Making A Work application of the current rules of IPM in a given crop (pest species). Delivery of work, presentation and discussion from the same.

EVALUATION SYSTEM
Assessment criteria
GRADING: Your final grade will be based on exams, written and oral presentations and an insect/mite collection as follow: Component Points LECTURE (50 %) ≤ 5.0 Exam LAB (30%) ≤ 3.0 Attending sessions Collection ASSIGNMENTS (20%) ≤ 2.0 Oral presentations Reports
Percentages Assessment Activities to be performed by students

	Actividad	*(Nº horas)*	*Porcentaje*
I. STUDENT'S ACTIVITIES (In-class/Online)	• Big group	(0)	0 %
	• Teaching group	(26)	50 %
	• Working Group / Small Group	(19)	30 %
II. STUDENT'S AUTONOMOUS ACTIVIETIES (Autonomous work)	• (Working Group / Small Group)	(105)	20 %

Assessment instruments

- Tests, exercises, practical cases.
- Final assessment of reports, etc.
- Final tests with multiple choices.

Monitoring mechanisms

- Attendance and participation in classrom activies
- Submission of learning activities
- Submissión of learning activities for laboratory work
- Entomological collection of insects and mites
- Attendance at tutorials

BIBLIOGRAPHY

Recommende readings

Books in Spanish:

ALCÁZAR, M.D.; BELDA, J.E.; BARRANCO, P.; CABELLO, T. Parasitoides de especies plaga en hortícolas de invernaderos de Almería. - Bibliografía básica

CABALLERO, P.; FERRÉ, J. (Eds.) Bioinsecticidas: fundamentos y aplicaciones de *Bacillus thuringiensis* en el control integrado de plagas. *(*Bibliografía básica

CABELLO, T.; TORRES, M.; BARRANCO, P. Plagas de los cultivos: Guía de identificación *(.)* - Bibliografía básica

DeBACH, P Lucha biológica contra los enemigos de las plantas. Bibliografía básica

DeBACH, P. (Ed.) Control biológico de las plagas de insectos y malas hierbas. - Bibliografía básica

DRIESCHE, B.G. VAN; HODDLE, M.S.; CENTRE, T.D. Control de plagas y malezas por enemigos naturales. - Bibliografía básica

DOMINGUEZ GARCÍA-TEJERO, F. Plagas y enfermedades de las plantas cultivadas. - Bibliografía básica

GARCÍA MARÍ, F.; COSTA, J.; FERRAGUT, F. Plagas agrícolas. *(.)* - Bibliografía básica

JACAS, J.A.; URBANEJA, A. (Eds.) Control biológico de plagas agrícolas. - Bibliografía básica

LIÑAN VICENTE, C. de (Ed.) Vademecun de productos fitosanitarios y nutricionales. - Bibliografía básica

NIETO NAFRÍA, J.M.; MIER DURANTE, M.P. Tratado en Entomología. - Bibliografía básica

PLANES, S.; CARRERO, J.M.. Plagas del campo - Bibliografía básica

Books in English:

ALFORD, D.V. (1999) A textbook of agricultural entomology. Blackwell Science Ltd.

ALTIERI, M.A.; NICHOLLS, C.I. (2005) Agroecology and the search for a truly sustainable agriculture. United Nations Environment Programme.

DeBACH, P.; ROSEN, D. (1991) Biological control by natural enemies.Cambridge University Press.

DENT, D. (2000) Insect pest management. CABI International – Basic reading

DRIESCHE, B.G. VAN; HODDLE, M.S.; CENTRE, T.D. (2008) Control of pests and weeds by natural enemies. Blackwell Publishing.

GULLAN, P.J.; CRANSTON, P.S. (2014). The insects: An outline of Entomology. John Willey &Dons. Ltd.

MORALES-RAMOS, J.A.; GUADALUPE, M.; SHAPIRO-ILAN D.I.(2014) Mass production of beneficial organisms. Elsevier-AP.

RAVENSBERG, W.J.(2011) A roadmap to the successful development and commercialization of microbial pest control products for control of arthropods. Springer.

ZHANG, Z.Q. (2013) Mites of greenhouses: Identification, biology and control. CABI International.

Bibliografy in the System Information Library UAL

You can see the literature currently in the Library Management System at the following address:

http://almirez.ual.es/search/x?SEARCH=25153310

WEBS