



## Information about the subject

**Degree:** Bachelor of Science Degree in Veterinary Medicine

**Faculty:** Faculty of Veterinary Medicine and Experimental Sciences

**Code:** 1260401 **Name:** Aquaculture

**Credits:** 6,00 **ECTS Year:** 4 **Semester:** 2

**Module:** Module of Animal Production

**Subject Matter:** Animal Production **Type:** Compulsory

**Department:** Animal Production and Public Health

**Type of learning:** Classroom-based learning

**Languages in which it is taught:** Spanish

### Lecturer/-s:

1264A      Jeronimo Chirivella Martorell (**Responsible Lecturer**)      [jeronimo.chirivella@ucv.es](mailto:jeronimo.chirivella@ucv.es)



## Module organization

### Module of Animal Production

Subject Matter	ECTS	Subject	ECTS	Year/semester
Animal Production	30,00	Animal production and genetic improvement I	6,00	4/1
		Animal production and genetic improvement II	6,00	4/2
		Aquaculture	6,00	4/2
		Economy and Business in the veterinarian domain	6,00	3/2
		Nutrition and animal feeding	6,00	4/1



## Learning outcomes

At the end of the course, the student must be able to prove that he/she has acquired the following learning outcomes:

- R1 The student identifies the main aquaculture productions and knows how and where they are produced.
- R2 The student knows the zootechnical fundamentals of captive production of aquatic organisms.
- R3 The student knows and applies the principles of aquaculture engineering to the design and operation of aquaculture facilities.
- R4 The student recognises the environmental and socio-economic implications of aquaculture.
- R5 The student elaborates breeding plans for aquaculture facilities.
- R6 The student manages small-scale marine crops.
- R7 The student produces reports and makes valid judgements on various aspects of the study of aquaculture.
- R8 The student connects the theoretical and practical contents through projects and assignments.
- R9 The student understands conceptually and values the importance of the study of aquaculture in the context of present-day science and society, and of veterinary medicine in particular.



## Competencies

Depending on the learning outcomes, the competencies to which the subject contributes are (please score from 1 to 4, being 4 the highest score):

BASIC		Weighting			
		1	2	3	4
CB2	Capacity to apply knowledge to work or occupation in a professional way and have the competences that are proved by preparing and arguing topics and problem-solving in their specific field of study.				X
CB3	Capacity to gather and interpret relevant data usually within their specific field of study and capacity to make judgments that include reflection on relevant social, scientific or ethical issues.				X
CB4	Capacity to communicate information, ideas, problems and solutions at specialist and non-specialist levels.				X
CB5	Capacity to develop those learning skills needed to undertake further studies with a high degree of autonomy.				X
GENERAL		Weighting			
		1	2	3	4
CG0	Capacity to speak well in public.		X		
CG3	Understanding and applying control of animal breeding, management, health, reproduction, protection, and feed as well as improving production.				X
CG4	Understanding and applying methods and processes for obtaining efficient animal products under optimal conditions and costs, and assessing environmental impacts.				X
CG5	Understanding and applying laws, regulations and administrative provisions in all areas of the veterinary profession and public health, understanding the ethical implications of health in a changing global context.				X
CG6	Developing professional practice, acquiring skills related to teamwork, with an efficient use of resources and quality management.				X



CG7 Identifying emerging risks in all areas of the veterinary profession.

X

SPECIFIC		Weighting			
		1	2	3	4
E44	Knowing and applying the basics of animal production: traditional and modern systems.				X
E45	Knowing and applying raw materials for animal feeding: characteristics, production and preservation.		X		
E46	Knowing and applying the basics of animal nutrition, ration formulation and feed manufacturing.		X		
E49	Knowing and applying genetics to health improvement programs.		X		
E50	Knowing and applying strategies and procedures to output.				X
E51	Knowing and applying the fundamentals of livestock facilities and environmental hygiene.				X
E52	Knowing and applying the principles of production and marketing process.			X	
E53	Knowing and applying sustainable development.				X
E54	Knowing and applying aquaculture.				X
TRANSVERSAL		Weighting			
		1	2	3	4
T1	Capacity of analysis, synthesis, implementation of knowledge for problem-solving and decision-making.				X
T2	Understanding and applying the scientific method to professional practice including evidence-based medicine.				X
T3	Basic knowledge of the veterinary profession: legal, economic, administrative, planning and time management issues and the veterinarians' society together with the importance of monitoring quality, standardization and protocols of veterinary practice.	X			



T4	Mastering fluency in oral and written mother tongue communication, listening and responding effectively using a language appropriate to audience and context.			X
T6	Using information technology to communicate, share, search for, collect, analyze and manage information, especially related to the veterinarian practice.		X	
T7	Ability to adapt to new situations, self-critical ability, being aware of personal limitations and understanding when and where seeking and obtaining advice and professional help.			X
T8	Efficient and effective work, both independently and as a member of a multidisciplinary team or unit, showing respect, appreciation and sensitivity to the work of others.		X	
T9	Keeping an ethical behaviour in the exercise of given responsibilities toward the profession and society.		X	
T10	Ability to learn, to research, and to be aware of the need to keep knowledge updated, and attending training programs.			X



## Assessment system for the acquisition of competencies and grading system

Assessed learning outcomes	Granted percentage	Assessment method
	55,00%	Written assessment of acquired knowledge and skills. The test may consist of a series of open-ended questions or multiple-choice questions about the theoretical contents of the module and/or practical exercises (problem-solving).
	10,00%	Evaluation of the use of the practical lessons in the classroom, of problems or computer science, seminars and tutorials, by means of participation, computer-supported problem solving and the elaboration of the corresponding reports.
	15,00%	Evaluation of the practical laboratory work, which must demonstrate the competences acquired by the student and his or her ability to use them to solve the different situations and problems that arise in a laboratory; this assessment may consist of one of the following methods, or a combination of several of them: an individual written test, the individual or group performance of a laboratory experience, the delivery of an individual or group report on the work carried out in the laboratory.
	10,00%	Evaluation of group work through a system of continuous assessment throughout the course based on the delivery of assignments the objectives and content of which will be proposed by the teacher.
	10,00%	Evaluation of activities in which the student must do some research individually and structure information related to each of the topics through a system of continuous assessment throughout the course based on the delivery of papers, the objectives and contents of which will be proposed by the teacher.



## Observations

\* In order to pass the subject the student must pass every assessment test and activity separately.

## MENTION OF DISTINCTION:

According to Article 22 of the Regulations governing the Evaluation and Qualification of UCV Courses, the mention of "Distinction of Honor" may be awarded by the professor responsible for the course to students who have obtained, at least, the qualification of 9 over 10 ("Sobresaliente"). The number of "Distinction of Honor" mentions that may be awarded may not exceed five percent of the number of students included in the same official record, unless this number is lower than 20, in which case only one "Distinction of Honor" may be awarded.

## Learning activities

The following methodologies will be used so that the students can achieve the learning outcomes of the subject:

- M1 On-site training activity aimed primarily at acquiring knowledge acquisition skills. It is characterised by the fact that students are spoken to. Also called master class or exposition, it refers to the oral presentation made by the teacher, (with the support of blackboard, a computer and a projector for the display of texts, graphs, etc.), in front of a group of students. They are expository, explanatory or demonstrative sessions of contents. The size of the group is determined by the limit or physical capacity of the classroom; therefore, it is a single group.
- M2 On-site training activity aimed primarily at obtaining knowledge application and research skills. Knowledge is built through interaction and activities. The activity consists of supervised monographic sessions with shared participation (teachers, students, experts). The size of the group is variable, from one large group to various small groups, with a minimum of 6 students to ensure interaction. The evaluation will be based on follow-up records kept by the teacher. Participation and the development of the capacity to problematize should be taken into account.
- M3 On-site group-work training activity oriented toward problem solving under the supervision of a teacher. It would correspond to "Animal-free supervised practical work", type e1, from the European evaluation of EAEEV. The size of the group is variable, in a range of 10 to 20 students, to differentiate it from a master class.





- M4 On-site training activity in groups that takes place in the classroom. It includes working with documents and formulating ideas without handling animals, organs, objects, products, or corpses (e.g., work with articles or documents, clinical case studies, diagnostic analyses, etc.). It would correspond to "Animal-free supervised practical work", type e1, from the European evaluation of EAEVE. The size of the group is variable, in a range of 10 to 20 students.
- M5 On-site training activity in groups that takes place in the Computer Lab where the computer is used as support for learning. It includes work with computer models, specific software, Web queries, etc. It would correspond to "Animal-free supervised practical work", type e1, from the European evaluation of EAEVE. The size of the group is variable, in a range of 10 to 20 students.
- M6 On-site training activity in groups carried out in the laboratory. It includes the sessions where the students develop laboratory experiments, make dissections or use the microscopes for the study of histological or histopathological samples actively and autonomously, under the supervision of the professor. It also includes work with healthy animals, objects, products, corpses (e.g., animal handling, bacteriological practices, physiology or biochemistry, meat inspection, etc.). It would correspond to the "Supervised practical non-clinical animal work" type e2 of the European evaluation of EAEVE. The size of the group is variable, in a range of 10 to 20 students.
- M7 On-site training activity that is defined as the clinical practical work developed in the Veterinary Clinical Hospital or clinical centres ascribed to the University, as well as itinerant clinical practices, mainly with ruminants, equids, pigs, birds and aquatic animals. Also included are necropsies, surgical workshops and training in clinical examination techniques or diagnosis with healthy patients. In these practical sessions the student will always work with animals, which can be healthy (e.g. propaedeutic or obstetrics) or clinical cases (individual or collective), including a protocol or work scheme, being supervised by a teacher and assuming the provision of a service. This type of training corresponds to type e3 of the EAEVE European evaluation called "Clinical Training" (strickly hands-on)". The size of the group will be 5 students or fewer.
- M8 A set of on-site training activities carried out by the teacher to provide personalised attention to the student or in small groups with the aim of reviewing and discussing the materials and topics presented in classes, seminars, readings, carrying out projects, etc. The aim is to ensure a truly comprehensive education of the student rather than a mere transfer of information. It is, therefore, a personalized assistance relationship in which the tutor assists, facilitates and guides one or more students in the learning process.



- M9 Set of processes that attempt to evaluate the learning outcomes of students expressed in terms of acquired knowledge, capacities, skills or abilities developed and manifested attitudes. It covers a wide range of activities that can be developed for students to demonstrate their training (e.g. written, oral and practical tests, projects or assignments). It also includes the Official Calls.
- M10 Autonomous training activity, including activities and coursework, bibliographic searches. The results obtained from unsupervised group and teamwork will be evaluated, with particular attention paid at the time of evaluation to the acquisition of specific knowledge development skills through group work.
- M11 Autonomous training activities related to personal study, or the preparation of individual course assignments. The individual preparation of readings, essays, problem solving, papers, reports, etc. will be evaluated through presentations or submissions during theoretical classes, practical classes, seminars and/or tutorials. The evaluation of the submitted papers will consider the structure of the paper, the quality of the documentation, originality, spelling and presentation.



## IN-CLASS LEARNING ACTIVITIES

	LEARNING OUTCOMES	HOURS	ECTS
Theoretical lessons (TL) M1	R1, R2, R3, R4, R9	30,00	1,20
Seminars (S) M2	R1, R2, R3, R4, R7, R9	4,00	0,16
In-Classroom Practice (ICP) M4	R1, R5, R7, R8, R9	2,00	0,08
Computer Practice (CoP) M5	R2, R5, R7, R8, R9	12,00	0,48
Laboratory Practice (LP) M6	R6, R7, R8, R9	8,00	0,32
Tutorial M8	R1, R2, R3, R4, R5, R6, R7, R8, R9	2,00	0,08
Evaluation (Ev) M9	R1, R2, R3, R4, R7, R9	2,00	0,08
<b>TOTAL</b>		<b>60,00</b>	<b>2,40</b>

## LEARNING ACTIVITIES OF AUTONOMOUS WORK

	LEARNING OUTCOMES	HOURS	ECTS
Group work M10	R1, R2, R5, R7, R8, R9	20,00	0,80
Individual work M11	R1, R2, R3, R4, R5, R6, R7, R8, R9	70,00	2,80
<b>TOTAL</b>		<b>90,00</b>	<b>3,60</b>



## Description of the contents

Description of the necessary contents to acquire the learning outcomes.

### Theoretical contents:

Content block	Contents
DIDACTIC UNIT I: INTRODUCING AQUACULTURE	Chapter 1. Introduction: definition and concept; goals; production systems; state-of-art and prospects.
DIDACTIC UNIT II: BIOLOGICAL AND ZOO-TECHNICAL PRINCIPLES FOR FINFISH AQUACULTURE	Chapter 2: Aquaculture nutrition: feeding behavior; nutritional and energetic requirements. Chapter 3: Aquaculture feeding I: assistant cultures: microalgae. Chapter 4: Aquaculture feeding II: assistant cultures: rotifer. Chapter 5: Aquaculture feeding III: assistant cultures: brine shrimp. Chapter 6: Aquaculture feeding IV: artificial diets. Chapter 7: Finfish reproduction in aquaculture. Chapter 8: Larval rearing in finfish. Chapter 9: Farming finfish: pre-on-growing and on-growing
DIDACTIC UNIT III: AQUACULTURE ENGINEERING PRINCIPLES	Chapter 10: Water as living support for aquaculture. Chapter 11: Design and management of land-based fish farms; requirements, supplying and treatment of water. Chapter 12: Design and management of sea cages.
DIDACTIC UNIT IV: AQUACULTURE AS SUSTAINABLE ECONOMIC ACTIVITY	Chapter 13: Aquaculture and environment interaction.



## Organization of the practical activities:

	Content	Place	Hours
PR1.	Production models for aquaculture farms	Computer	12,00
PR2.	Small-scale marine cultures management	Laboratory	8,00
PR3.	Technical visit to a land-based fish farm.	Technical visit	2,00
PR4.	Technical visit to an off-shore fish farm.	Technical visit	2,00

## Temporary organization of learning:

Block of content	Number of sessions	Hours
DIDACTIC UNIT I: INTRODUCING AQUACULTURE	2,00	4,00
DIDACTIC UNIT II: BIOLOGICAL AND ZOO-TECHNICAL PRINCIPLES FOR FINFISH AQUACULTURE	19,00	38,00
DIDACTIC UNIT III: AQUACULTURE ENGINEERING PRINCIPLES	8,00	16,00
DIDACTIC UNIT IV: AQUACULTURE AS SUSTAINABLE ECONOMIC ACTIVITY	1,00	2,00



## References

### **AQUACULTURE TEXTBOOKS:**

BARNABÉ, G. Y OTROS COLABORADORES. BASES BIOLÓGICAS Y ECOLÓGICAS DE LA ACUICULTURA. ACRIBIA 1996  
BROWN, L. ACUICULTURA PARA VETERINARIOS. ACRIBIA 2000  
JOHN S. LUCAS, PAUL C. SOUTHGATE. AQUACULTURE: FARMING AQUATIC ANIMALS AND PLANTS, 2nd Edition, Wiley-Blackwell January 2012.

### **FISH FARMING AND FISH MANAGEMENT:**

AMOS RICHMOND, QIANG HU. HANDBOOK OF MICROALGAL CULTURE: APPLIED PHYCOLOGY AND BIOTECHNOLOGY, 2nd Edition. Wiley-Blackwell 2013.  
FELICITY HUNTINGFORD, MALCOLM JOBLING, SUNIL KADRI.(EDITORS). AQUACULTURE AND BEHAVIOR. Wiley-Blackwell 2012.  
LINDSAY G. ROSS, BARBARA ROSS. ANAESTHETIC AND SEDATIVE TECHNIQUES FOR AQUATIC ANIMALS, 3rd Edition. Wiley-Blackwell 2008.  
MICHALIS PAVLIDIS (EDITOR), CONSTANTINOS MYLONAS (EDITOR). SPARIDAE: BIOLOGY AND AQUACULTURE OF GILTHEAD SEA BREAM AND OTHER SPECIES. Wiley-Blackwell 2011.  
MORETTI, A., PEDINI, M., CITTOLIN, G Y GUIDASTRI, R. MANUAL ON HATCHERY PRODUCTION OF SEABASS AND GILTHEAD SEABREAM. Vol. I. FAO (1999).  
MORETTI, A., PEDINI, M., CITTOLIN, G Y GUIDASTRI, R. MANUAL ON HATCHERY PRODUCTION OF SEABASS AND GILTHEAD SEABREAM. Vol. II. FAO (1999).  
RAM C. BHUJEL. STATISTICS FOR AQUACULTURE. Wiley-Blackwell 2009.  
ROAR GUDDING (Editor), ATLE LILLEHAUG (Editor), ØYSTEIN EVENSEN (Editor). FISH VACCINATION. Wiley-Blackwell 2014.  
VOLLMANN-SCHIPPER, F. TRANSPORTE DE PECES VIVOS. ACRIBIA 1978

### **FACILITY DESIGN AND MANAGEMENT:**

BEAZ PALEO, JOSÉ DANIEL. INGENIERÍA DE LA ACUICULTURA MARINA: CULTIVO DE MOLUSCOS Y CRUSTÁCEOS EN EL MAR. Fundación Observatorio Español de Acuicultura - CSIC, 2011  
MALCOLM BEVERIDGE. CAGE AQUACULTURE. Wiley-Blackwell 2004.  
M.B. TIMMONS/ J.M. EBELING/ AND R.H. PIEDRAHITA. ACUICULTURA EN SISTEMAS DE RECIRCULACIÓN (Spanish Edition). Cayuga Aqua Ventures, LLC, 2009.  
ODD-IVAR LEKANG . AQUACULTURE ENGINEERING, 2nd Edition. Wiley-Blackwell 2013.

### **NUTRITION AND FEEDING**

FUNDACION ACUICULTURA. LA NUTRICIÓN Y ALIMENTACIÓN EN PISCICULTURA. MUNDI-PRENSA LIBROS, S.A. 2012



GUILLAUME, J. Y OTROS. NUTRICIÓN Y ALIMENTACIÓN DE PECES Y CRUSTÁCEOS.  
MUNDI-PRENSA LIBROS, S.A. 2003

## **GENETICS AND BIOTECHNOLOGY**

FUNDACION ACUICULTURA. GENÉTICA Y GENÓMICA EN ACUICULTURA. TOMO I:  
GENÉTICA. MUNDI-PRENSA LIBROS, S.A 2012  
FUNDACION ACUICULTURA. GENÉTICA Y GENÓMICA EN ACUICULTURA. TOMO II:  
GENÓMICA. MUNDI-PRENSA LIBROS, S.A. 2012

## **REPRODUCTION**

CARRILLO ESTEVEZ, MANUEL ADRIAN. LA REPRODUCCIÓN EN PECES: ASPECTOS  
BÁSICOS Y SUS APLICACIONES EN PISCICULTURA. MUNDI-PRENSA LIBROS, S.A. 2012



## Addendum to the Course Guide of the Subject

Due to the exceptional situation caused by the health crisis of the COVID-19 and taking into account the security measures related to the development of the educational activity in the Higher Education Institution teaching area, the following changes have been made in the guide of the subject to ensure that Students achieve their learning outcomes of the Subject.

**Situation 1: Teaching without limited capacity** (when the number of enrolled students is lower than the allowed capacity in classroom, according to the security measures taken).

In this case, no changes are made in the guide of the subject.

**Situation 2: Teaching with limited capacity** (when the number of enrolled students is higher than the allowed capacity in classroom, according to the security measures taken).

In this case, the following changes are made:

### 1. Educational Activities of Onsite Work:

All the foreseen activities to be developed in the classroom as indicated in this field of the guide of the subject will be made through a simultaneous teaching method combining onsite teaching in the classroom and synchronous online teaching. Students will be able to attend classes onsite or to attend them online through the telematic tools provided by the university (videoconferences). In any case, students who attend classes onsite and who attend them by videoconference will rotate periodically.

In the particular case of this subject, these videoconferences will be made through:

☒ Microsoft Teams

☒ Kaltura





## **Situation 3: Confinement due to a new State of Alarm.**

In this case, the following changes are made:

### **1. Educational Activities of Onsite Work:**

All the foreseen activities to be developed in the classroom as indicated in this field of the guide of the subject, as well as the group and personalized tutoring, will be done with the telematic tools provided by the University, through:

☒ Microsoft Teams

☒ Kaltura

Explanation about the practical sessions:

In the case of confinement due to a new alarm state, the practical laboratory sessions will be moved to a new date as soon as the health situation allows. As a non-face-to-face alternative, they will be replaced by video-tutorials of the techniques to be used, and the analysis and guided discussion of the results based on data provided by the teacher.



## 2. System for Assessing the Acquisition of the competences and Assessment System

### ONSITE WORK

#### Regarding the Assessment Tools:

☒ The Assessment Tools will not be modified. If onsite assessment is not possible, it will be done online through the UCVnet Campus.

☐ The following changes will be made to adapt the subject's assessment to the online teaching.

Course guide		Adaptation	
Assessment tool	Allocated percentage	Description of the suggested changes	Platform to be used

The other Assessment Tools will not be modified with regards to what is indicated in the Course Guide.

#### Comments to the Assessment System: