



Information about the subject

Degree: Bachelor of Degree in Marine Sciences

Faculty: Faculty of Veterinary Medicine and Experimental Sciences

Code: 273001 **Name:** Aquaculture

Credits: 6,00 **ECTS Year:** 3 **Semester:** 2

Module: Professional

Subject Matter: Marine living resources **Type:** Compulsory

Department: Oceanography and Environment

Type of learning: Classroom-based learning

Languages in which it is taught: Spanish

Lecturer/-s:

273A

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Module organization

Professional

Subject Matter	ECTS	Subject	ECTS	Year/semester
Oceanography	36,00	Chemical Oceanography	6,00	3/1
		Geological Oceanography	6,00	3/1
		Marine Biology and Biological Oceanography	6,00	3/1
		Methods in Oceanography I: Physical and Geological	6,00	3/2
		Methods in Oceanography II: Chemical and Biological	6,00	3/2
		Physical Oceanography	6,00	3/1
Marine living resources	12,00	Aquaculture	6,00	3/2
		Fisheries	6,00	3/2
Marine and Coastal Management	18,00	Coastal Planning and Management	6,00	4/1
		Legislation and Economy	6,00	4/1
		Marine Pollution	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.
- R2 The student knows the zootechnical fundamentals of captive production of aquatic organisms.
- R3 The student knows and applies the fundamentals of aquaculture engineering to the design and operation of aquaculture facilities.
- R4 The student recognizes the environmental and socioeconomic implications of aquaculture.
- R5 The student develops breeding plans for aquaculture facilities.
- R6 The student manages small-scale marine crops.
- R7 The student understands conceptually and values the importance of the study of aquaculture in the context of today's science and society, and of oceanography in particular.
- R8 The student prepares reports and makes valid judgements on various aspects of the study of living marine resources.
- R9 The student relates the theoretical and practical contents through works and assigned tasks.



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	Students are able to apply knowledge to their work in a professional way and have the competences enabling them to state and defend views and opinions as well as perform problem-solving tasks in their field of study.				X
CB4	Command of a foreign language			X	
CB5	Students develop the necessary learning skills to undertake further studies with a high level of autonomy.				X

GENERAL		Weighting			
		1	2	3	4
CG1	Capacity to analyze and synthesize				X
CG2	Capacity to organize and plan				X
CG3	Mastering Spanish oral and written communication			X	
CG5	Knowing and applying Basic ITC skills related to marine science			X	
CG6	Capacity to manage information (capacity to look for and analyze information coming from different types of sources)				X
CG7	Decision making			X	
CG8	Capacity to work in interdisciplinary and multidisciplinary team			X	
CG9	Interpersonal skills			X	
CG10	Critical and self-critical capacity			X	



CG11	Capacity to learn				X
CG12	Capacity to adapt to new situations			X	
CG13	Capacity to produce new ideas (creativity)		X		
CG14	Leadership abilities.	X			
CG16	Capacity to apply theoretical knowledge			X	
CG17	Research skills			X	
CG18	Sensibility to environmental issues.			X	

SPECIFIC	Weighting			
	1	2	3	4
CE3	Knowing basic market economy techniques related to marine resources		X	
CE4	Understanding laws regulating use of marine resources and environment	X		
CE5	Applying marine environment use planning techniques as well as resource sustainable management			X
CE8	Identifying and analyzing new problems and proposing solution strategies		X	
CE9	Knowing how to carry out experiments and measurements both in the laboratory and during sample collection		X	
CE10	Knowing how to use planning, designing and implementing research tools while surveying and assessing results	X		
CE11	Knowing how to do fieldwork and laboratory experiments in a safe and responsible way, promoting teamwork		X	
CE13	Looking for and assessing different kinds of marine resources		X	
CE17	Developing training programs for marine and coastal areas	X		



CE19 Deeply understanding operating systems of maritime orientated companies, identifying their problems and proposing solutions

x

CE20 Mastering practical use of models, including new data for validation, improvement and development of models

x

Assessment system for the acquisition of competencies and grading system

Assessed learning outcomes	Granted percentage	Assessment method
R1, R2, R3, R4, R5, R7	50,00%	Written test with theoretical and practical questions
R1, R5, R6	30,00%	Delivery of guided assignments, whose objectives and contents will be proposed by the teacher
R6	10,00%	Laboratory test
R5, R7	10,00%	Oral presentation

Observations

* It is necessary to obtain a grade greater than or equal to 5 in all tests in order to average.

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 Teacher presentation of contents, analysis of competences, explanation and in-class display of skills, abilities and knowledge.
- M2 Group work sessions supervised by the professor. Case studies, diagnostic tests, problems, field work, computer room, visits, data search, libraries, on-line, Internet, etc. Meaningful construction of knowledge through interaction and student activity.
- M3 Activities carried out in spaces with specialized equipment.
- M4 Supervised monographic sessions with shared participation.
- M5 Application of multidisciplinary knowledge.
- M6 Personalized and small group attention. Period of instruction and/or guidance carried out by a tutor to review and discuss materials and topics presented in classes, seminars, readings, papers, etc.
- M8 Set of oral and/or written tests used in initial, formative or additive assessment of the student.
- M9 Group preparation of readings, essays, problem-solving, seminars, papers, reports, etc. to be presented or submitted in theoretical , practical and/or small-group tutoring sessions. Work done on the university e-learning platform (www.plataforma.ucv.es)
- M10 Student's study: Individual preparation of readings, essays, problem-solving, seminars, papers, reports, etc. to be presented or submitted in theoretical, practical and/or small-group tutoring sessions. Work done on the university e-learning platform (www.plataforma.ucv.es).



IN-CLASS LEARNING ACTIVITIES

	LEARNING OUTCOMES	HOURS	ECTS
ON-CAMPUS CLASS M1	R1, R2, R3, R4, R7, R8	28,00	1,12
PRACTICAL CLASSES M2	R5, R7, R8, R9	16,00	0,64
LABORATORY M3	R6, R7, R8, R9	8,00	0,32
SEMINAR M4	R1, R2, R3, R4, R7, R8	2,00	0,08
GROUP PRESENTATION OF ASSIGNMENTS M5	R1, R2, R5, R7, R8, R9	2,00	0,08
TUTORIAL M6	R1, R2, R3, R4, R5, R6, R8, R9	2,00	0,08
ASSESSMENT M8	R1, R2, R3, R4, R7, R8	2,00	0,08
TOTAL		60,00	2,40

LEARNING ACTIVITIES OF AUTONOMOUS WORK

	LEARNING OUTCOMES	HOURS	ECTS
GROUP WORK M9	R5, R7, R8, R9	40,00	1,60
INDEPENDENT WORK M10	R1, R2, R3, R4, R5, R6, R7, R8, R9	50,00	2,00
TOTAL		90,00	3,60



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 an environment interaction.



Organization of the practical activities:

	Content	Place	Hours
PR1.	Manages laboratory marine cultures.	Laboratory	8,00
PR2.	Elaborates production models for aquaculture farms.	Computer	12,00
PR3.	Technical visit to land based fish farm	Technical visit	2,00
PR4.	Technical visit to sea cages 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	17,00	34,00
DIDACTIC UNIT III: AQUACULTURE ENGINEERING PRINCIPLES	10,00	20,00
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.

AQUATIC HEALTHCARE

A. DAVID SCARFE, CHENG-SHENG LEE, PATRICIA J. O'BRYEN. AQUACULTURE BIOSECURITY: PREVENTION, CONTROL, AND ERADICATION OF AQUATIC ANIMAL



DISEASE. Wiley-Blackwell 2006

FIGUERAS HUERTA A. (Coord.), B. NOVOA GARCÍA (Coord.) FUNDACION ACUICULTURA.

ENFERMEDADES DE MOLUSCOS BIVALVOS DE INTERÉS EN ACUICULTURA.

MUNDI-PRENSA LIBROS, S.A. 2012

RONALD J. ROBERTS. FISH PATHOLOGY, 4th Edition, Wiley-Blackwell April 2012.

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: