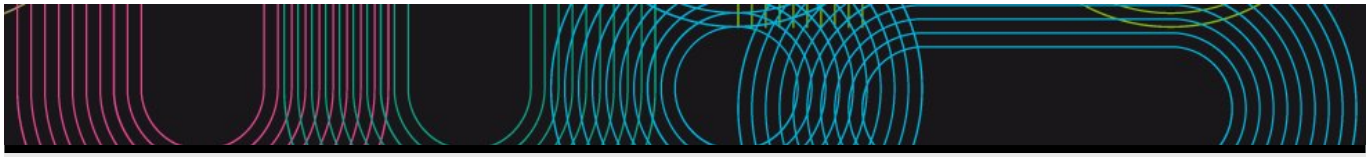

IDENTIFYING DATA				
Biology of the Development of Marine Organisms				
Subject	Biology of the Development of Marine Organisms			
Code	V02M098V01212			
Study programme	Máster Universitario en Biología Marina			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Optional	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Megías Pacheco, Manuel Rodríguez Díaz, Miguel Angel			
Lecturers	Megías Pacheco, Manuel Rodríguez Díaz, Miguel Angel			
E-mail	miguelangel.rodriguez.diaz@usc.es mmegias@uvigo.es			
Web				
General description	This course introduces the biological principles that govern the development of marine organisms. The course delves into: 1) The biology of reproduction, development and organogenesis of marine animal species. 2) The general cellular mechanisms underlying the processes of differentiation and development. The teaching of this subject includes lectures, resolution of questions and other activities proposed by the teachers. In the lectures, the concepts outlined in the syllabus will be developed. Exercises and activities will allow solving, discussing and arguing about issues of general and current interest in the field of developmental biology.			

Training and Learning Results	
Code	
A1	(*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.
A2	(*)Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
A3	(*)Que os estudantes sexan capaces de integrar coñecementos e se enfrontar á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.
A4	(*)Que os estudantes saiban comunicar as súas conclusións, e os coñecementos e razóns últimas que as sustentan, a públicos especializados e non especializados dun xeito claro e sen ambigüidades.
A5	(*)Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun xeito que terá que ser, en grande medida, autodirixido e autónomo.
B1	Utilización de criterios y métodos científicos en el planteamiento y resolución de problemas aplicando los conocimientos adquiridos
B2	Búsqueda, análisis e integración de información a partir de diferentes fuentes y capacidad para su interpretación y evaluación
B3	Aprendizaje de diversas técnicas y métodos analíticos tanto en el medio natural como en el laboratorio
B4	Desarrollo de habilidades en el manejo y tratamiento de herramientas, matemáticas, estadísticas e informáticas
B5	Desarrollo de la habilidad de elaboración, presentación y defensa de trabajos e informes técnicos
C2	Conocimiento de la diversidad de organismos marinos y sus estrategias adaptativas
C3	Conocimiento y comprensión de las interacciones de los organismos marinos y los ecosistemas marinos y costeros

C8	Conocimiento y manejo de la metodología de investigación, de las técnicas muestreo e instrumentales y de análisis de datos aplicados al medio marino
D1	Desarrollo de las capacidades comprensivas, de análisis y síntesis
D2	Desarrollo de la capacidad de razonamiento crítico y autocrítico
D4	Desarrollo de la capacidad para actualizar el conocimiento de forma autónoma
D5	Desarrollo de las habilidades de comunicación y discusión de planteamientos y resultados

Expected results from this subject

Expected results from this subject	Training and Learning Results
That the student: - To understand the interactions of the marine organisms and the marine ecosystems and coast systems - To look for the potential economic interest and biotechnology of the marine organisms - To purchase knowledge, identify and evaluate the environmental quality of the marine environment and of the valid legislation. It can carry out the direction of environmental consulting - to know and be able to handle the methodology of investigation, sampling techniques , instrumental and of analysis of data applied to the marine environment. - To evaluate the quality and safety of food and of products of transformation and biotechnology of marine origin -To schedule and direct aquariums, museums, centers of environmental interpretation, natural parks and natural spaces protected - To elaborate, argue, interpret, advise and evaluate scientific-technical reports, ethical, legal and socioeconomic related with the marine environment and fishing	A1 A2 A3 A4 A5 B1 B2 B3 B4 B5 C2 C3 C8 D1 D2 D4 D5

Contents

Topic	
Gametogénesis and Fecundation	Spermatogenesis. Structure of spermatozoa. Ovogenesis. Hormonal control. Egg structure. Fertilization: contact and recognition of gametes. Prevention of polyspermy. Activation of the egg metabolism.
Early development.Organogenesis	Cleavage. Cleavage patterns. Gastrulation. Embryonic germ layers. Ectodermal, mesodermal and endodermal derivatives. Principles of organogenesis. Evo-Devo.
Main processes and development concepts	Phases of ontogenetic development. Developmental patterns in animal models. Determination, differentiation, growth, morphogenesis and body pattern formation. Pattern alterations: mutations of developmental genes. Modifications of the body plan in postembryonic development: heterochrony and allometry. Techniques.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	15	34.95	49.95
Presentation	1	0	1
Seminars	4	16	20
Objective questions exam	1	0	1
Objective questions exam	1	0	1

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Lecturing	The teacher explains the contents of the subject, the theoretical bases of the main topics of the marine animal developent.
Presentation	The organization and the guidelines of the course will be explained.
Seminars	Activities of different types that students will carry out individually or in groups, aimed at deepening their knowledge of the subject.

Personalized assistance

Methodologies	Description

Lecturing	The teachers will attend to any questions that may arise during the lecture sessions. These doubts will also be attended to during tutoring hours.
Seminars	Any questions regarding the subject will be solved by e-mail or in person These doubts will also be answered during tutoring hours.
Presentation	The students will be able to ask any questions related to the organization of the course.

Assessment

	Description	Qualification	Training and Learning Results			
Seminars	There will be a continuous evaluation of the student's work in the seminars.	30	A1 A2 A3 A4 A5	B1 B2 B3 B4 B5	C2 C3	D1 D2 D4 D5
Objective questions exam	There will be a test consisting of short answer questions related to the topics of spermatogenesis and early development, where the knowledge acquired by the students will be assessed, as well as their ability to use this knowledge to solve problems.	40	A1 A2 A3	B1	C2 C3	D1 D4
Objective questions exam	There will be a test consisting of a question related to the topic of cellular differentiation and establishment of body axes, where the knowledge acquired by the students will be assessed, as well as their ability to use this knowledge in the resolution of problems.	30	A1 A2 A3	B1	C2 C3	D1 D4

Other comments on the Evaluation

The date for the evaluation tests will be announced at the beginning of the course and will appear in the schedule. In order to pass the course, a minimum of 40% of the maximum score in each of the objective question tests and in the activities carried out in the seminars will be required. If the 40% is exceeded in all the evaluated tests and activities, the mark to pass the course must be equal or higher than 5. The tests in which less than 40 % is obtained can be repeated in the second opportunity call. Those test with a mark higher than 50 % of the maximum score must not be repeated in the second opportunity call. Those students that do not score 5 points in the overall grade will have to repeat all those tests where the grade was lower than 50%.

Sources of information

Basic Bibliography

BROWDER, L.W. et al., **Development Biology.**, 3º, Philadelphia: Saunders College,, 1991

GILBERT, S. F., **Developmental Biology**, 10ª, Sunderland, Mass: Sinauer Associates,, 2013

WOLPERT, L. ET AL. ., **Principles of Development**, 6ª, Oxford: Oxford University Press, 1919

NORRIS D.O. et al, **Hormones and Reproduction of Vertebrates - Vol 1: Fishes**, 1ª, Academic Press, 2010

Complementary Bibliography

Recommendations