



## 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<br>mmegias@uvigo.es  |          |      |            |
| Web                 |  |          |      |            |
| General description | This course introduces the biological principles that govern the development of marine organisms. The course delves into:<br><br>1) The biology of reproduction, development and organogenesis of marine animal species.<br><br>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   | (*)Posuér 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 saibam aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos más amplos (ou multidisciplinares) relacionados coa súa área de estudo.   |
| A3   | (*)Que os estudantes sexan capaces de integrar coñecementos e se enfrentar 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 saibam 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 estudiando 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:   | A1                            |
| - To understand the interactions of the marine organisms and the marine ecosystems and coast systems  | A2                            |
| - To look for the potential economic interest and biotechnology of the marine organisms   | A3                            |
| - 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 | A4                            |
| - to know and be able to handle the methodology of investigation, sampling techniques , instrumental and of analysis of data applied to the marine environment.                             | B1                            |
| - To evaluate the quality and safety of food and of products of transformation and biotechnology of marine origin   | B2                            |
| -To schedule and direct aquariums, museums, centers of environmental interpretation, natural parks and natural spaces protected   | B3                            |
| - To elaborate, argue, interpret, advise and evaluate scientific-technical reports, ethical, legal and socioeconomic related with the marine environment and fishing                        | B4                            |
|   | C2                            |
|   | C3                            |
|   | C8                            |
|   | D1                            |
|   | D2                            |
|   | D4                            |
|   | D5                            |

### Contents

#### Topic

|   |   |
|---|---|
| Gametogenesis and Fecundation           | Spermatogenesis. Structure of spermatozoa. Oogenesis. 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                            | B1 | C2 | D1 |  |
|           |  |               | A2                            | B2 | C3 | D2 |  |
|           |  |               | A3                            | B3 |    | D4 |  |
|           |  |               | A4                            | B4 |    | D5 |  |
|           |  |               | A5                            | B5 |    |    |  |
| Objective | There will be a test consisting of short answer questions related to the topics questions exam 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                            | B1 | C2 | D1 |  |
|           |  |               | A2                            |    | C3 | D4 |  |
| Objective | There will be a test consisting of a question related to the topic of cellular questions exam 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                            | B1 | C2 | D1 |  |
|           |  |               | A2                            |    | C3 | D4 |  |
|           |  |               | A3                            |    |    |    |  |

## 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**, 10º, Sunderland, Mass: Sinauer Associates,, 2013

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

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

### Complementary Bibliography

## Recommendations