



Teaching Guide				
Identifying Data				2021/22
Subject (*)	Developmental Biology	Code	610G02010	
Study programme	Grao en Bioloxía			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Fourth	Optional	6
Language	SpanishGalician			
Teaching method	Face-to-face			
Prerequisites				
Department	Bioloxía			
Coordinador	Yañez Sanchez, Julian	E-mail	julian.yanez@udc.es	
Lecturers	Yañez Sanchez, Julian	E-mail	julian.yanez@udc.es	
Web				
General description	Development is an outstanding process of selfconstruction (and also renovation) of all multicellular organisms from the unicellular condition. This course is an optional subject in the second semester of 4th year (8th semester) in which it integrates information and biological knowledge taken in previous years. This course cover the study of the cellular basis and molecular mechanisms involved in the process of ontogenetic development of multicellular organisms, especially in the processes of differentiation and morphogenesis, emphasizing primarily in the development of metazoans.			
Contingency plan	<p>In case of capacity problems in the spaces designated for the realization of face-to-face activities, additional spaces will be reserved in which the students will be able to follow the activities through the MS TEAMS platform. In the case of practical lessons, the groups will be split according to the capacity of the laboratory.</p> <p>In case the circumstances prevented the presence in the Faculty, the modality by distant teaching would be passed respectively with the following assumptions:</p> <ol style="list-style-type: none"> <li>1. Modifications in the contents. No modifications are expected.</li> <li>2. Methodologies <ul style="list-style-type: none"> <li>* Teaching methodologies that are maintained Planned methodologies will be maintained</li> <li>* Teaching methodologies that change If necessary, the practical sessions in the laboratory will be adapted to existing conditions and will be replaced by telematic activities (videos, case studies, analysis and interpretation of data, images or processes, ...)</li> </ul> </li> <li>3. Mechanisms for personalized attention to students. Personalized attention will be maintained but in a virtual way (email, MS teams, ...)</li> <li>4. Modifications in the evaluation. If necessary, telematic means will be used for the evaluation. <ul style="list-style-type: none"> <li>* Evaluation observations: No comment</li> </ul> </li> <li>5. Modifications to the bibliography or webography. If necessary, additional free access means and sources will be provided</li> </ol>			

Study programme competences / results	
Code	Study programme competences / results
A1	Recoñecer distintos niveis de organización nos sistemas vivos.
A4	Obter, manexar, conservar e observar espécimes.
A26	Deseñar experimentos, obter información e interpretar os resultados.
A29	Impartir coñecementos de Bioloxía.
A30	Manexar adecuadamente instrumentación científica.
A31	Desenvolverse con seguridade nun laboratorio.
B1	Aprender a aprender.



B4	Traballar de forma autónoma con iniciativa.
B6	Organizar e planificar o traballo.
B8	Sintetizar a información.
B10	Exercer a crítica científica.
B11	Debater en público.
B13	Comportarse con ética e responsabilidade social como cidadán e como profesional.

Learning outcomes			
Learning outcomes	Study programme competences / results		
Understand the fundamentals, processes and trends of developmental of multicellular organisms.	A1 A4 A29	B1 B4 B8 B11	
To study the cellular and molecular mechanisms underlying developmental processes, particularly those involved in the differentiation and morphogenesis	A1 A4 A29	B4 B8 B11	
To know and be familiar with the methodologies, experimental processes, instrumentation and technical terms, based on the scientific method to the study of Developmental Biology	A26 A30 A31	B6 B10 B13	

Contents	
Topic	Sub-topic
I. Concepts and Processes of Development from a historical perspective	Multicellularity, Morphogenesis and differentiation. Epigenesis vs. Preformation. Mosaic and regulative development . Induction. Ontogeny and Phylogeny.
II. Gametogenesis and the beginning of Development	Spermatogenesis. Oogenesis. Fertilization. Parthenogenesis.
III. Early Development	Segmentation Gastrulation Organization of body patterns Neurulation and neural crest Somitogenesis Extraembryonic membranes Gestation and Placentation
IV. Differentiation mechanisms and Organogenesis	Development of the nervous system and sense organs Development of muscle and the tetrapode limbs Development of the vertebrate circulatory system Development of the vertebrate urogenital system
V. Further topics of Development	Overview of plant development. Metamorphosis and regeneration Environmental interactions with animal development Developmental mechanisms in the evolutionary change



Practical lessons	<p>Comparative study of spermatogenesis and oogenesis</p> <p>Studies on Planarian regeneration</p> <p>Observation and study of invertebrate fertilization</p> <p>Observation of fish and amphibian early development</p> <p>Observation of chick early development and organogenesis</p>
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Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student's personal work hours	Total hours
Introductory activities	A1	1	0	1
Guest lecture / keynote speech	A1 B1	21	54.6	75.6
Directed discussion	A29 B1 B4 B6 B8 B10 B11 B13	7	24.5	31.5
Laboratory practice	A4 A26 A30 A31 B13	14	14	28
Mixed objective/subjective test	A1	2.5	8	10.5
Personalized attention		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	
Methodologies	Description
Introductory activities	This session consists of a presentation of the subject, which sets out and explains the purpose and objectives of the subject, its structure, activities, evaluation criteria, etc ... (all contained in summary in the teaching guide) and where student can solve any queries related to them.
Guest lecture / keynote speech	Lectures last 50 minutes and will focus on those relevant topics of the course program, which the student should be read before .
Directed discussion	Each seminar session will be presented and discussed among participants about a scheduled topic. Students should prepare their own theme or part of the intended subject assigned. The teacher will assist any questions that may arise along the preparation.
Laboratory practice	The practices are an essential complement to the theoretical lessons which addresses some of the processes of animal development and elaborates on some of them.
Mixed objective/subjective test	The examination shall be written and consist of short answer questions of the contents treated in lectures, seminars and practical lessons.

Personalized attention	
Methodologies	Description
Directed discussion	the lecturer will assign a particular topic each student within the general theme for each seminar discussion. Moreover, the student is free to discuss any concerns during the keynote sessions and practices, and also have the opportunity to resolve any questions about these subject or activities in personal tutorials

Assessment			
Methodologies	Competencies / Results	Description	Qualification
Mixed objective/subjective test	A1	the examination will be written and consist of short answer questions, doing schemas, definitions ...	70



Directed discussion	A29 B1 B4 B6 B8 B10 B11 B13	For each seminar session the student must give a talk on a topic previously assigned and give the teacher a brief one-page summary including the main ideas of the subject worked. In the seminar session, the ideas in common will be discussed among participants. Both the presentation and the discussion will be valued. The 8 seminars represent the 30 percent of the final grade (each seminar is worth 0,375 points over 10). Abstracts not presented and defended in the seminar session will not be assessed.	30
Others			

Assessment comments



It is not necessary to achieve a minimum score on the topics of discussion and / or consideration for the calculation of the final grade. In the second call only the score of written exam in which knowledge derived from theoretical, practical sessions and seminars will be assessed, will be considered.

The fraudulent performance of the tests or evaluation activities, once verified, will directly imply a failure grade "0" in the contents of the corresponding opportunity.

Exceptionally, in case the student under justified reasons (students with part-time dedication and academic exemption or specific circumstances of learning and support for diversity) or supervening circumstances, cannot take all the continuous assessment tests, appropriate alternative measures or activities there will be adopted that do not affect the student rating.

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It will be considered not submitted the student who does not make the final exam based on short answer questions



## Sources of information

<b>Basic</b>	<ul style="list-style-type: none"><li>- Gilbert, S.F. (2004, 2014). <i>Biología del Desarrollo/ Developmental Biology</i>. Panamericana/SINAUER</li><li>- Wolpert, L. (2010/ 2011). <i>Principios del desarrollo/ Principles of Development</i>. Panamericana/ Oxford University Press</li></ul> <p>ENLACES DE INTERÉS: <i>Developmental Biology (8th Edition)</i> The virtual embryo Zygote Amphibian embryology tutorial with QuickTime movies. Anatomy of the 24, 48, 72 and 120 hours Zebrafish (Danio rerio) Embryo. <i>Developmental Biology ON LINE!</i>. Fly Morph-o-genesis Medakafish developmental stage map. Stages of Zebrafish Development The Interactive Fly The Multi-Dimensional Human Embryo. I Embryo Images The Visible Embryo Morphing Embryos The Xenopus Molecular Marker Resource Society of developmental biology</p>
<b>Complementary</b>	<ul style="list-style-type: none"><li>- Browder L.W., Erikson C.A., and Jeffrey W.R. (1991). <i>Developmental Biology</i>. Saunders</li><li>- Kalthoff, K. (1996). <i>Analysis of Biological Development</i>. Mc Graw-Hill</li><li>- Müller A.W. (1997). <i>Developmental Biology</i>. Springer-Verlag</li><li>- Carlson, B.M (2000). <i>Embriología Humana y Biología del Desarrollo</i>. Harcourt</li><li>- Gilbert S.F., Epel D (2009). <i>Ecological Developmental biology</i>. Sinauer</li></ul>

## Recommendations

### Subjects that it is recommended to have taken before

Biology: Basic Levels of Organisation of Life I (Cells)/610G02007  
Biology: Basic Levels of Organisation of Life II (Tissues)/610G02008  
Biochemistry I/610G02011  
Biochemistry II/610G02012  
Genetics/610G02019  
Animal Physiology I/610G02035  
Animal Physiology II/610G02036

### Subjects that are recommended to be taken simultaneously

### Subjects that continue the syllabus

### Other comments

Assistance is recommended to all keynote sessions so as active participation in the seminars. It is very positive to consult own before the issue to be addressed in the lectures so as to study throughout the course to strengthen knowledge and to better understand the new content that will be treated.

(\*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.