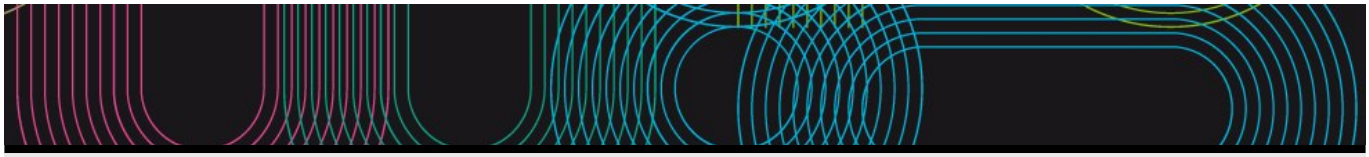

IDENTIFYING DATA				
Biology: Basic laboratory techniques				
Subject	Biology: Basic laboratory techniques			
Code	V02G030V01203			
Study programme	(*)Grao en Bioloxía			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	9	Basic education	1st	2nd
Teaching language	Spanish			
Department	Functional Biology and Health Sciences Plant Biology and Soil Sciences Biochemistry, Genetics and Immunology			
Coordinator	Gil Martín, Emilio			
Lecturers	Álvarez Otero, Rosa María Barreal Modroño, M. Esther Gallardo Medina, Mercedes Gallego Veigas, Pedro Pablo García Molares, Aida Gil Martín, Emilio Longo González, Elisa Lopez Patiño, Marcos Antonio Miguel Villegas, Encarnación de Otero Rodiño, Cristina			
E-mail	egil@uvigo.es			
Web				
General description	Experimental subject designed to reach specific skills of handling, extraction and processing of biological samples, as well as their morphological, structural, functional and analytical characterization in the laboratory. The acquisition of these scientific and technical specific competences will be achieved through the assimilation of scientific and technical knowledge and the development of instrumental routines of general application in experimental biology. Furthermore, they will also provide the students with essential skills (transversal competences), which are pivotal for understanding specific topics of subjects in subsequent courses.			

Competencies	
Code	
A1	Students should prove understanding and knowledge in this study field that starts in the Secundary Education and with a level that, even though it is suppported in advanced books, also includes some aspects that involve knowledge from the vanguard of the study field.
A2	Students should know how to apply their knowledge to their work or vocation in a professional way. They also should have the competences that are usually proved through the elaboration and defence of arguments and the resolution of problems within their study field.
A3	Students should prove ability for information-gathering and interpret important data (usually within their study field) to judge relevant social, scientific or ethical topics.
A4	Students should able to communicate information, ideas, issues and solutions to all audiences (specialist and unskilled audience).
B2	Ability of reading and analizing scientific papers and having critical assessment skills to understand data collection, deducing the main idea from the least relevant ones and basing on the correponding conclusions.
B3	Acquisition of general knowledge about the basic subjects of biology, both at theory and experimental level, without dismissing a higher specialization in subjects that are oriented to a concrete professional area.
B4	Ability in handling experimental tools, both scientific and computer technology equipment that support the search for solutions to problems related to the basic knowledge of biology and with those of a concrete labour context.
B7	Collection of information about issues of biologic interest, analysis and emission of critical opinions and reason them including the reflection about social and/or ethical aspects related to the issue.
B10	Development of analytic and abstraction skills, the intuition and the logical and rigorous thought through the study of biology and its uses.

B11	Ability to communicate in detail and clearly: knowledge, methodology, ideas, issues and solutions to all audiences (not only qualified but unskilled in Biology).
B12	Ability to identify their own educational necessities in the biology field and in concrete labour areas and to organize their learning with a high grade of autonomy in any context.
C1	Obtaining, managing, preserving, describing and identifying current biological organisms and fossils.
C3	Identifying, analysing and characterizing biological samples, including those of human origin, and possible anomalies.
C4	Isolating, analysing and identifying biomolecules, viruses, cells, tissues and organs.
C5	Growing microorganisms, cells, tissues and organs.
C6	Assessing and interpreting metabolic activities.
C8	Assessing the functioning of physiological systems by the interpretation of parameters
C31	Knowing and handling technical and scientific apparatus.
D1	Development of capacity of analysis and synthesis
D2	Acquisition of the organization and planning capacity for tasks and time
D4	Acquisition of foreign language knowledge related to the study field
D6	Research and interpreting of information from different sources
D7	Resolution of issues and decision making in an effective way
D8	Development of the ability of independent learning
D9	Ability to work in collaboration or creating groups with an interdisciplinary character
D10	Development of the critical thinking
D13	Sensitivity for environmental issues
D14	Adquisition of abilities in the interpersonal relationships
D15	Development of creativity, initiative and enterpreneurial spirit
D16	Acceptance of a quaility commitment
D17	Development of the self-criticism ability

Learning outcomes

Expected results from this subject	Training and Learning Results			
Understand the of basic techniques for harvesting, culture and breeding of living beings.	A1 A2 A3	B3 B4	C1 C5 C31	D2 D4 D6 D7 D8 D9 D13 D14 D15 D16
To know the basic techniques of preparation and processing of biological samples.	A1 A2 A3	B3 B4	C1 C3 C31	D2 D4 D6 D7 D8 D9 D13 D14 D15 D16
To know and to handle the basic techniques of observation, identification and analysis of biological samples.	A1 A2 A3	B3 B4	C3 C4 C31	D1 D2 D4 D6 D7 D8 D9 D10 D13 D14 D15 D16 D17

Apply the knowhow of basic laboratory techniques to isolate, identify, manage and analyze specimens and samples of biological origin, including viruses, as well as to characterize their cellular and molecular constituents.	A1 A2 A3	B3 B4 B10	C1 C3 C4 C5 C31	D2 D4 D6 D7 D8 D9 D10 D13 D14 D15 D16 D17
Analyze the operation of living beings and be able to understand their vital parameters.	A2 A3	B2 B3 B7 B10 B11	C6 C8	D1 D4 D6 D8 D10 D15 D16 D17
To know and to use appropriately the concepts, specific terminology and scientific-technical instrumentation related to the basic laboratory techniques	A1 A2 A3 A4	B3 B4 B11 B12	C31	D4 D6 D7 D8 D9 D13 D14 D15 D16

Contents

Topic	
MODULE I. TECHNIQUES FOR THE PROCESSING AND OBSERVATION OF BIOLOGICAL SAMPLES	Unit 1. Fundamentals and types of optical microscopes and stereomicroscopy. Unit 2. Specimen fixation and inclusion. Unit 3. Fundamentals of microtomy. Types of microtomes and their handling. Unit 4. General staining techniques. Processing and observation of stained sections.
MODULE II. EXPERIMENTATION WITH MICROORGANISMS	Unit 1. Sterilization. Disinfection and asepsis. Unit 2. Elaboration of culture media. Unit 3. Culture of microorganisms and viruses. Unit 4. Biological risks.
MODULE III. EXPERIMENTATION WITH PLANTS IN THE LABORATORY	Unit 1. Germination. Unit 2. Plant cultivation. Unit 3. Analysis and interpretation of the results.
MODULE IV. EXPERIMENTATION WITH ANIMALS IN THE LABORATORY	Unit 1. Animals for research. Animal models and their basic characteristics. Unit 2. Legislation on experimentation with animals. Theoretical aspects about basic manipulation of living animals. Unit 3. Treatments administration and sampling in experimental animals.
MODULE V: PROCESSING AND ANALYTICAL TECHNIQUES OF BIOLOGICAL SAMPLES	Unit 1. Techniques for sample preparation. Unit 2. Techniques for sample concentration. Unit 3. Techniques for sample separation. Unit 4. Techniques for sample analysis.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	20	50	70
Laboratory practices	56	84	140
Introductory activities	1	0	1
Other	2	12	14

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

Methodologies

	Description
Lecturing	Teacher dissertation about the scientific concepts and technical guidelines needed for the acquisition of specific competences in manipulation, processing and analytical characterization of biological samples in the laboratory. The master sessions are complemented with individual and group activities to strengthen the more relevant learning objectives. Depending on the case, these activities may be carried out in the classroom or during the autonomous work time. All of them may be computed for evaluation.
Laboratory practices	Activities carried out in the laboratory. They involve the application to specific experimental goals of the knowledge and guidelines treated in the master sessions. In addition to the experimental work, laboratory practises include individual or group tasks aimed at promoting the acquisition of the specific and transversal competences of the subject. They can be performed either in the laboratory or as part of the student's autonomous work. Moreover, they will be computed for evaluation.
Introductory activities	Initial lecture for the presentation of the subject. A detailed academic information will be provided, along with specific instructions for the follow-up of training activities and the achievement of learning objectives.

Personalized attention

Methodologies	Description
Lecturing	The master sessions will be dynamical discussions open to the active participation of students, and incorporate test and other examination modalities to check the learning progress of each student and thus advise, if necessary, personalized reinforcement actions. It also contemplates the possibility of monitoring autonomous work or solving doubts arising by e-mail. On the other hand, it is established a reserve of 6 h/week/professor for tutoring and management of requests and/or learning problems they are encountering. The timetable of these tutorials will be announced by the responsible (coordinator) in the initial conference (Introductory activities) of the subject, and will be also available online in the virtual platform TEMA and website of the Faculty.
Laboratory practices	Teachers will provide individualized attention to each student during laboratory practises, providing the support they need for a correct understanding of the experimental objectives, the methodology required or the specific techniques to be carried out. Once the experimental procedures have been completed, each student or work-group will be supervised and will receive ad hoc feedback based on the results obtained.

Assessment

Description	Qualification	Training and Learning Results

Other	CONTINUOUS EVALUATION (CE, 76% of the final score). The knowledge and practical skills developed in master sessions and laboratory practises will be evaluated by a plethora of means, including tests and/or short-answer questions, problems or case studies to be resolved, as well as the elaboration of an experimental memory. Moreover, the systematic observation of the students involvement, their attitude and the quality of their work, will be also taken into account. The contribution of CE from different Modules to the final score is: Module I: 16% Module II: 16% Module III: 12% Module IV: 12% Module V: 20% An essential requirement to pass the subject is to achieve in each Module a minimum score corresponding to the 40% of the maximum assigned to each one. FINAL INTEGRATING TEST (FIT, 24% of the final score). The fundamental contents and aptitudes of the subject will be evaluated in an obligatory, written examination. By means of several types of questions and exercises, the degree to which each student, relating and integrating the theoretical and applied knowledge acquired in the different Modules, is able solving a real experimental case, will be evaluated. If FIT s score does not reach the 40% of maximum, the subject will be considered suspended. The score corresponding to the CE of different Modules will be published at least one week before the date of FIT.	100	A1 A2 A3 A4	B2 B3 B4 B7 B10 B11 B12	C1 C3 C4 C5 C6 C8 C31	D1 D2 D4 D6 D7 D8 D9 D10 D13 D14 D15 D16 D17

Other comments on the Evaluation

The experimental Modules will be held from 10:00 to 14:00. The academic period for the different Modules comprises from January 21 to March 15, 2019. The days corresponding to each Module and experimental group can be consulted on the website of the Faculty (http://bioloxia.uvigo.es/es/docencia/horarios).

The presentation of the subject by the coordinator will take place on January 21, from 9:00 to 10:00 in classroom no. 1.

Attendance at all classrooms is MANDATORY to APPROVE THE SUBJECT, unless justified absence by reasons officially established; illness or federated sport competitions.

The 1st FIT date is Wednesday, April 3, 2019, from 15:00 to 17:00, in classroom no. 1. The ulterior official dates can be consulted on the website of the Faculty (http://bioloxia.uvigo.es/gl/docencia/exames). The classrooms and laboratories of the different Modules will be publicly published by the Faculty (they can be consulted on its website), and will also be communicated by the coordinator in the initial lecture.

The student suspended in TBL will receive as final score the lowest obtained among those obtained in CE and FIT.

In order to be evaluated as "Not presented", it will be necessary to have no evidence of attendance to the classes nor to have performed CE and FIT tests.

The different parts of the subject that have been approved (CE and FIT), will be kept for the current academic year.

Sources of information

Basic Bibliography

Bancroft, J.D. & Gamble, M., **Bancroft's theory and practice of histological techniques, 7th ed**, Churchill Livingstone-Elservier Corp,

Madigan, M.T., Martinko, J.M., Dunlap, P.V. & Clark, D.P., **Brock Biology of Microorganisms, 13th ed**, Pearson Corp,

Taiz, L. & Zeiger, E., **Plant Physiology, 6ª ed**, Sinauer Associates, Inc., Publishers,

Zúñiga, J., Tur J.A., Milocco, S.N. & Piñeiro R., **Ciencia y tecnología en protección y experimentación animal**, 2001; McGraw-Hill Interamericana,

Wilson K. & Walker J., Eds., **Principles and Techniques of Biochemistry and Molecular Biology, 7th ed**, Cambridge University Press,

Complementary Bibliography

MÓDULO I,

Kiernan, J.A., **Histological and Histochemical Methods: Theory and Practice, 4th ed**, Scion Publishing,

MÓDULO II,

Wiley, J.M., Sherwood, L.M. & Woolverton, C.J., **Microbiología, 7ª ed**, Prescott, Harley, Klein. McGraw-Hill,
MÓDULO III,
Azcón-Bieto, J. & Talón, M., **Fundamentos de Fisiología Vegetal, 2ª ed**, McGraw-Hill Interamericana,
MÓDULO IV,
Rodríguez Martínez J., Hernández Lorente MD. & Costa Ruiz J., **Introducción a la experimentación con animales**, Servicio de Publicaciones de la Universidad de Murcia,
MÓDULO V,
Pingoud A., Urbanke C., Hoggett J. & Jeltsch A., **Biochemical methods**, Wiley□VCH,

Recommendations

Subjects that continue the syllabus

Biochemistry I/V02G030V01301
Biochemistry II/V02G030V01401
Botany I: Algae and fungi/V02G030V01302
Botany II: Archegonia/V02G030V01402
Animal and plant histology and cytology I/V02G030V01303
Animal and plant histology and cytology II/V02G030V01403
Genetics I/V02G030V01404
Microbiology I/V02G030V01304
Zoology 1: Non-arthropod invertebrates/V02G030V01305
Zoology 2: Arthropod invertebrates and chordates/V02G030V01405

Subjects that are recommended to be taken simultaneously

Biology: Basic field and remote sensing techniques/V02G030V01202
Statistics: Biostatistics/V02G030V01204

Subjects that it is recommended to have taken before

Physics: Physics of biological processes/V02G030V01102
Mathematics: Mathematics applied to Biology/V02G030V01103
Chemistry: Chemistry applied to biology/V02G030V01104