



Teaching Guide

Teaching Guide				
Identifying Data			2015/16	
Subject (*)	Botánica sistemática: Fanerogamia		Code	610G02025
Study programme	Grao en Bioloxía			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Third	Obligatoria	6
Language	SpanishGalician			
Teaching method	Face-to-face			
Prerequisites				
Department	Bioloxía Animal, Bioloxía Vexetal e Ecoloxía			
Coordinador	Sahuquillo Balbuena, Elvira	E-mail	elvira.sahuquillob@udc.es	
Lecturers	Fagúndez Díaz, Jaime Pimentel Pereira, Manuel Sahuquillo Balbuena, Elvira	E-mail	jaime.fagundez@udc.es m.pimentel@udc.es elvira.sahuquillob@udc.es	
Web				
General description	We will integrate information on the morphology, anatomy, reproductive biology and ecology of Spermatophytes in order to understand the processes that led to their evolutionary origin and current diversity. We will also study some of the most ecologically and economically important seed plant families in temperate areas of the Northern Hemisphere, and the plant formations where they most commonly appear (forests, shrublands, grasslands and marginal habitats). By the end of the course you will have a thorough understanding of the evolution of seed plants and you will be able to identify specimens belonging to the main plant families growing in NW Iberian Peninsula. The knowledge acquired during this course is useful in many different professional fields such as teaching, scientific research, environmental assessment, agriculture, ethnobotany, etc.			

Study programme competences

Code	Study programme competences
A1	Recoñecer distintos niveis de organización nos sistemas vivos.
A2	Identificar organismos.
A4	Obter, manexar, conservar e observar espécimes.
A6	Catalogar, avaliar e xestionar recursos naturais.
A7	Reconstruír as relacións filoxenéticas entre unidades operacionais e pór a proba hipóteses evolutivas.
A9	Identificar e utilizar bioindicadores.
A11	Identificar e analizar material de orixe biolóxica e as súas anomalías.
A19	Analizar e interpretar o comportamento dous seres vivos.
A20	Muestrear, caracterizar e manexar poboacións e comunidades.
A22	Descibir, analizar, avaliar e planificar o medio físico.
A23	Avaliar o impacto ambiental. Diagnosticar e solucionar problemas ambientais.
A26	Deseñar experimentos, obter información e interpretar os resultados.
A27	Dirixir, redactar e executar proxectos en Bioloxía.
A29	Impartir coñecementos de Bioloxía.
A30	Manexar adecuadamente instrumentación científica.
A31	Desenvolverse con seguridade nun laboratorio.
A32	Desenvolverse con seguridade no traballo de campo.
B1	Aprender a aprender.
B2	Resolver problemas de forma efectiva.
B3	Aplicar un pensamento crítico, lóxico e creativo.
B5	Traballar en colaboración.
B8	Sintetizar a información.
B9	Formarse unha opinión propia.



B10	Exercer a crítica científica.
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Learning outcomes			
Learning outcomes	Study programme competences		
Understand the evolutionary processes that have led to the current diversity of Spermatophytes.	A1 A2 A29	B1 B3 B8 B9	
Understand the life cycles of the different groups of Spermatophytes, as well as the links among them and with their precursors.	A1 A2 A6 A7 A19 A20	B1 B3 B8	
-Understand the taxonomic arrangement of seed plants that mirrors the evolutionary relationships among the different plant groups.	A1 A7	B1 B2 B3 B8	
-Acquire observation, description and identification skills focused on the seed plants, particularly on those groups that are more ecologically and economically important.	A2 A4 A6 A9 A11 A19 A23 A27	B1 B2 B3 B5 B10	
-Learn the basic methods to study seed plant species and communities in the field and in the laboratory.	A2 A4 A6 A9 A22 A27 A29 A30 A31	B1 B2 B3 B5 B9	
-Encourage the students to learn and research more on the diversity of seed plants, especially those groups that grow around them and are important in NW Iberian Península.	A4 A9 A29 A32	B2 B3 B8	
-Learn how to manage the different sources of information available (bibliography, internet, etc) in an adequate and critical manner.	A23 A26	B3 B8	

Contents	
Topic	Sub-topic



Lectures. Part I. Introduction	Unit 1.- SPERMATOPHYTES : Taxonomy and phylogeny. Main characters that define Spermatophytes. The seed as a structure: the first seed. Relationships between the Spermatophytes and the heterosporous ferns. Unit 2.- The origin of Spermatophytes: Progymnosperms. Evolution and diversity of Spermatophytes. Main differences between Gymnosperms and Angiosperms.
Lectures. Part II. Gymnosperms	Unit 3.- Morphology and anatomy of Gymnosperms. Reproductive structures: Gymnospermic flowers and inflorescences. Life cycle in Gymnosperms: Development of the male and the female gametophytes. Fecundation and formation of the seed in Gymnosperms. Unit 4.- Systematics of Gymnosperms. Characterization of the different evolutionary groups: Divisions Pteridospermophyta, Cycadophyta, Ginkgophyta, Gnetophyta and Coniferophyta Unit 5.- Division Coniferophyta: evolution, diversity and main defining characters. Important families of Coniferophyta in the Iberian Peninsula: Families Pinaceae, Cupressaceae and Taxaceae.
Lectures. Part III. Angiosperms	Unit 6. Angiosperms: Defining characteristics I. Vegetative traits. Defining characteristics II. Reproductive traits. Reproductive Biology: Flowers and inflorescences in the Angiosperms. Evolution of the flower as a structure. Development of the male and female gametophytes. Seeds and fruits: structure and dispersal. Unit 7.- Origin and diversification of Angiosperms: Theories and ideas. Origin and characterization of the main evolutionary groups: different classification systems. Differences between the ANITA clade, magnoliids, monocots and eudicots. Unit 8.- Forests: different concepts of forest. Evolution of forests. Environmental importance of NW Iberian forests. Main families forming forests in temperate regions of the northern hemisphere: Families Fagaceae, Betulaceae, Salicaceae, Oleaceae, Rosaceae, Lauraceae, Caprifoliaceae, Aquifoliaceae, Ulmaceae. Unit 9.- Shrublands: Different concepts of shrublands. Evolution of shrublands. Environmental importance of NW Iberian shrublands. Main families forming shrublands in temperate regions of the northern hemisphere. Families Fabaceae, Ericaceae, Cistaceae, Lamiaceae. Unit 10.- Grasslands: Concept and diversity. Evolution of grasslands. Main families forming grasslands in temperate regions of the northern hemisphere. Families Poaceae, Cyperaceae, Juncaceae, Asteraceae, Araceae, Ranunculaceae. Unit 11. Plants at the margin. Diversity of plant communities in wetlands and coastal areas. Some important families being part of wetland and coastal communities in temperate areas of the northern hemisphere. Families Caryophyllaceae, Chenopodiaceae, Plumbaginaceae, Nymphaeaceae, Lentibulariaceae, Lemnaceae, Zosteraceae, Potamogetonaceae. Unit 12.- Plant domestication. Some economically important families: Brassicaceae, Solanaceae, Apiaceae, Myrtaceae, Rutaceae, Liliaceae s. lat., Iridaceae, Orchidaceae.
Lectures. Part IV. Biogeography	Unit 13.- Biogeography: Floristic Kingdoms. Phytochorology: plant distribution areas. Potential vegetation and vegetation series. Unit 14.- Plant biodiversity and conservation. Ex situ and in situ conservation. Endemic, rare and threatened plants in the Iberian Peninsula. Invasive plants. Global strategies for biodiversity conservation.



Seminars (2 hours)	Seminar 1: Gymnosperms: compared analysis of their life cycles. Basic concepts on Gymnosperms. The students will take a test on the diversity and characteristics of Gymnosperms. Seminar 2: Angiosperms: study of their life cycle. Compared analysis of the life cycles of angiosperms, gymnosperms and heterosporous ferns. The students will take a test on the life cycles of angiosperms, gymnosperms and heterosporous ferns Seminar 3: Angiosperms. Compared analysis among the most important families in herbaceous, shrubby and forest plant communities in NW Iberian Peninsula. Seminar 4: Angiosperms. Study of economically important plant families. Analysis of plant groups adapted to extreme environments. Biogeography and plant conservation.
Fieldwork	Seed plant diversity in Galicia. We will observe plant diversity in areas that are especially important due to their endemism, the rarity of their flora, etc.
Laboratory sessions	Session 1.- Observation, analysis and identification of gymnosperms. Session 2.- Observation, analysis and identification of angiosperms: Common families in NW Iberian Peninsula I. Session 3.- Observation, analysis and identification of angiosperms: Common families in NW Iberian Peninsula II. Session 4.- Observation, analysis and identification of angiosperms: Common families in NW Iberian Peninsula III. Session 5.- Observation, analysis and identification of angiosperms: Common families in NW Iberian Peninsula IV. Session 6.- Observation, analysis and identification of angiosperms: Common families in NW Iberian Peninsula V. Session 7.- Observation, analysis and identification of angiosperms: Common families in NW Iberian Peninsula VI.
Projects	Two projects will be carried out. Both projects will focus on the study of different morphological, biological and evolutionary traits of the spermatophytes. Special attention will be paid to plant diversity in NW Iberian Peninsula.

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student's personal work hours	Total hours
Guest lecture / keynote speech	A1 A2 A4 A19 B1 B3 B8	21	52.5	73.5
Seminar	A7 A26 B9 B10	7	17.5	24.5
Laboratory practice	A2 A6 A9 A11 A30 A31 A32 B2 B5	14	7	21
Field trip	A20 A22	7	0	7
Case study	A23 A27 A29	0	22	22
Personalized attention		2	0	2
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Guest lecture / keynote speech	All basic concepts and ideas will be explained during the 50 minutes-long lectures. Lessons have been planned so students can acquire the required knowledge gradually. The teachers will use power point presentations that will be available in the moodle platform. Attendance is not compulsory, but it is strongly recommended.



Seminar	Seminars are intended to reinforce the knowledge acquired during lectures. All basic concepts will be revised during seminars using different exercises, mostly tests and ?mute-diagrams? representing the life cycles of the different plant groups under study. Attendance and participation in seminars are compulsory.
Laboratory practice	The students will analyse and manipulate different representatives of some of the families studied during lectures. In the laboratory sessions, the students will use identification keys and floras to identify the plants brought by the teachers. They will also analyse the different characters that highlight the adaptation of the specimens to the environments ?and ecosystems- where they grow.
Field trip	A one day-long field trip guided by the teachers will take place towards the end of the semester. During the field trip, representatives of some of the families studied in lectures will be observed, together with the environments where they grow. Additionally, we will visit some of the areas of Galicia where the level of endemism is higher, and we will analyse the mechanisms that have led to such endemism. Attendance to the excursion is voluntary.
Case study	The students will apply the knowledge acquired during lectures and laboratory sessions in two different projects (phylogenetic and floristic). Detailed instructions on how to carry out the projects will be given during seminars, and further guidance will be given through tutorial sessions with the lecturers. Projects will be conducted by groups of 2-3-4 students.

Personalized attention

Methodologies	Description
Case study Guest lecture / keynote speech Seminar Field trip Laboratory practice	All students are welcome to consult the teachers any doubt that might arise from the different activities included in the course. Teacher are available on Tuesdays, Wednesdays and Thursdays 11:30-13:30h.

Assessment

Methodologies	Competencies	Description	Qualification
Case study	A23 A27 A29	The quality, originality and clarity of the projects will be considered in the final grade. The following competencies will be assessed: -A23, A27, A29	28
Guest lecture / keynote speech	A1 A2 A4 A19 B1 B3 B8	All students will have to take a written exam that will include multiple choice questions, short answer questions and essay questions. The following competencies will be assessed: -A1, A2, A4, A19, B1, B3, B8	55
Seminar	A7 A26 B9 B10	Attendance and participation will be valued The following competencies will be assessed: A7, A26, B9, B10	1
Field trip	A20 A22	Attendance and participation will be valued The following competencies will be assessed: -A20, A22	1



Laboratory practice	A2 A6 A9 A11 A30 A31 A32 B2 B5	The students will have to answer a written test per each laboratory session. Tests will be handed over at the end of each session. Once all the laboratory sessions are over, all students will have to take a visu exam. Each student will have to recognise 10 species from a list of 75 that will be given to the students at the beginning of the semester. The list includes some of the most common species in the NW Iberian Peninsula. The following competencies will be assessed: -A2, A6, A9, A11, A30, A31, A32, B2, B5	15
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Assessment comments

All students will have two chances for passing the course. To use the first chance, the students will need to participate in at least 70% of the activities. Also, the students will need to get at least 4,0 out of ten points in the written exam, the laboratory sessions (including the visu test) and the projects for these parts to be considered for the final grade. To pass the course, students will need an average grade of 5.0.

In the second chance students will need to improve their grades in the different parts (written exam, visu exam and projects) until they earn a 5.0. Parts graded with less than 4.0 will always have to be repeated. In this second chance, the visu exam will include 15 plants from the list. Qualifications obtained in the different activities (projects, laboratory, etc) will NOT be kept from one year to the next.

Sources of information

Basic	Contenidos teóricos: CARRIÓN, JS (2003). Evolución vegetal. DM editores. Murcia. DIAZ-GONZALEZ, T.E.; FERNÁNDEZ-CARVAJAL, M.C. & FERNÁNDEZ, J. A.(2004). Curso de Botánica. Ediciones Trea, Gijón. FONT QUER, P. (1985). Diccionario de botánica. Labor, Barcelona. IZCO, J.; BARRENO, E.; BRUGUÉS, M.; COSTA M.; DEvesa, J.; FERNÁNDEZ, F.; GALLARDO, T.; LLIMONA, X; SALVO, E; TALavera, S. & VALDÉS, B. (2004). Botánica. McGraw-Hill, Madrid. JUDD WS, CAMPBELL Ch., KELLOG EA, STEVENS PF & DONOGHUE MJ (2008). Plant Systematics. A phylogenetic approach. Sinauer Associates, Inc. Sunderland. USA STRASBURGER, E., F. NOLL, H. SCHENCK & A.F.W. SCHIMPER. (2004) Tratado de Botánica (actualizado por P. SITTE et al.) Omega, Barcelona. Prácticas: AIZPURI, I.; ASEGINOLAZA, C.; URIBE-ECHEBERRÍA, P.M.; URRUTIA, P. & ZORRAKIN, I. (2000). Claves ilustradas de la Flora del País Vasco y territorios limítrofes. Servicio Central de Publicaciones del Gobierno Vasco. CASTROVIEJO, S. et al (2001) Claves de Flora Ibérica, vol. I. Real Jardín Botánico, Madrid. GARCÍA, X.R. (2008) Guía das plantas de Galicia. Xerais. GARCÍA ROLLÁN, M. 1996. Atlas clasificatorio de la Flora de España Peninsular y Balear. 2 Vols. Mundi Prensa, Madrid. LEMEY, P; SALEMI, M & VANDAMME, AM. (2003). The phylogenetic handbook: a practical approach to phylogenetic analysis and hypothesis testing. Cambridge University Press. Cambridge.
Complementary	Teoría: BRAUN-BLANQUET, J. (1979) Fitosociología: base para el estudio de las comunidades. Ed. Blume. Madrid. COSTA TENORIO, M., C. MORLA JUARISTI & H. SAINZ OLLERO (1998). Los bosques ibéricos. Una interpretación geobotánica. Geo-Planeta S.A. Barcelona. CRONQUIST, A. (1991). Introducción a la Botánica. C.E.C.S.A., México. HEYWOOD, V.H. (1985). Las plantas con flores. Reverté. Barcelona. RAVEN, P.H., EVERT, R.F. & EICHHORN, S.E. (1991-1992). Biología de las plantas I,II. Reverté. Barcelona. RODRÍGUEZ IGLESIAS, F. (2005) Galicia Naturaleza. Botánica I. Hércules de Ediciones, S.A., A Coruña. Prácticas: BONNIER, G. & De LAYENS, G. (1993). Claves para la determinación de plantas vasculares. Omega, Barcelona. MANOBENS, R. M^a (1988) Botánica, instruccions per als recol·lectors de plantes: l'herbari. Preparació i documentació. Generalitat de Catalunya. MAYOR, M. & T.E. DÍAZ (2003) La flora Asturiana. Ayala, Oviedo.

Recommendations

Subjects that it is recommended to have taken before



Histoloxía/610G02008

Organografía microscópica/610G02009

Xenética/610G02019

Iniciación á Botánica: Botánica xeral/610G02023

Botánica sistemática: Criptogamia/610G02024

Fisioloxía vexetal: Fisioloxía vexetal I/610G02027

Fisioloxía vexetal: Fisioloxía vexetal II/610G02028

Subjects that are recommended to be taken simultaneously

Xenética molecular/610G02020

Xenética de poboacións e evolución/610G02021

Fisioloxía vexetal aplicada/610G02029

Subjects that continue the syllabus

Xeobotánica: Xeografía botánica/610G02026

Other comments

-Students

should work regularly on the course and make use of the suggested bibliography.

-Given the

workload of the third year of the degree in Biology, students should try to

finish the projects as soon as possible.-All students are expected to make appointments

with the teachers to discuss the different activities included in the course,

especially as regards the projects.

(*)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.