UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2016/17
Subject (*)	Evolución do Sistema Nervioso		Code	610490022
Study programme	Mestrado Universitario en Neurociencia (Plan 2011)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	2nd four-month period	First	Optativa	3
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Bioloxía Celular e Molecular			
Coordinador	Castro Castro, Antonio Manuel	E-mail	antonio.castro@udc.es	
Lecturers	Castro Castro, Antonio Manuel Folgueira Otero, Mónica Manso Revilla, Maria Jesus Yañez Sanchez, Julian	E-mail	antonio.castro@udc.es m.folgueira@udc.es maria.jesus.manso@udc.es julian.yanez@udc.es	
Web	http://www.usc.es/gl/titulacions/masters_oficiais/neurosci/			
General description	Optional subject focused on the adaptive changes experienced by the nervous system and sensory organs during evolution.			

Study programme competences	
Code	Study programme competences
A3	Explicar o proceso de cambio adaptativo do sistema nervioso dentro do marco evolutivo.
B4	Saiban ler e obter información relevante de publicacións científicas.
C1	Expresarse correctamente, tanto de forma oral coma escrita, nas linguas oficiais da comunidade autónoma.
C3	Utilizar as ferramentas básicas das tecnoloxías da información e as comunicacións (TIC) necesarias para o exercicio da súa profesión e para a aprendizaxe ao longo da súa vida.

Learning outcomes			
Learning outcomes	Study programme competences		
To introduce students to the adaptive changes experienced by the nervous system during the course of evolution.	AR3	BR4	CR1 CR3
To introduce students to the adaptive changes experienced by sensory organs during evolution.	AR3	BR4	CR1 CR3

Contents	
Topic	Sub-topic
Introduction.	1.Concept of evolution. 2.Considerations about evolution: phylogeny, ontogeny, analogy, homology. 3.Levels of organization. Design patterns in animals.
Evolution of the nervous system: from invertebrates to vertebrates.	4.Evolution of neurons. 5.Models of nervous systems. 6.Evolutionary changes of the basic structural units of the central nervous system. 7.Evolutionary changes of the functional circuits of the nervous system in vertebrates.
Evolution of sensory organs: from invertebrates to vertebrates.	8.Photoreception: Evolution of the visual system. 9.Chemoreception: Evolution of taste and olfactory systems. 10.Mechanoreception: Evolution of the ear and lateral line
Practicals	Students will observe under the microscope histological preparations of nervous system and sense organs from different species of vertebrates and invertebrates

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A3	20	30	50
Seminar	A3 B4 C1 C3	5	7	12
Laboratory practice	A3	5	5	10
Mixed objective/subjective test	A3 C1	2	0	2
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
Guest lecture / keynote speech	Teacher will present the main contents of the subject.
Seminar	During these sessions, students (individually or in pairs) will present the work they have carried out under the supervision of the professor. For preparing the seminars, students will use recent scientific reviews and other sources.
Laboratory practice	Students will observe under the microscope various histological preparations of nervous system and sense organs from different species of vertebrates and invertebrates.
Mixed objective/subjective test	Take a written and/or oral test will account for 50% of the final grade.

Personalized attention	
Methodologies	Description
Seminar	Students (in person or online) can do any questions regarding the work they must carry out in the seminars or relating to the rest of the methodologies used. In the case of students with recognition of part-time dedication and assistance exemption, they may make any questions related to the subject by attending individual tutorials or by email.

Assessment			
Methodologies	Competencies	Description	**Qualification**
Seminar	A3 B4 C1 C3	Students must carry out and present a work in relation with the contents of the program.	45
Guest lecture / keynote speech	A3	In order to be evaluated, students must have an active participation throughout the course.	5
Mixed objective/subjective test	A3 C1	Take a written (test questions and/or short-answer questions) and/or oral test about the contents of the program.	50

Assessment comments

Consideracións xerais:
O alumno disporá de dúas
oportunidades oficiais para superar a materia (ver calendario en http://www.usc.es/gl/titulacions/masters_oficiais/neurosci/).
A cualificación de Non
Presentado aplicarase unicamente no caso de que o alumno non participase,
durante o curso, en ningunha actividade da materia.
Aspectos e criterios de avaliación:
1. Alumnado con dedicación completa
Na oportunidade de final de cuadrimestre teranse en conta, para o cómputo da
cualificación global, os distintos apartados recollidos no sistema de
avaliación: a) realización dunha proba mixta sobre os contidos da materia,
representando o 50% da cualificación final, b) a realización e
presentación do traballo suporá o 45% da cualificación final, e c) a
asistencia e participación activa nas clases suporá o 5% da cualificación
final.
Na segunda oportunidade poderase/n
recuperar a/s parte/s non superada/s, exame (proba mixta) e/ou traballo, representando cada
unha destas o 50% da cualificación final.
2. Alumnado con recoñecemento de dedicación a tempo parcial e dispensa
académica de exención de asistencia
Tanto na oportunidade de final de cuadrimestre como na segunda oportunidade
teranse en conta, para o cómputo da cualificación global, a cualificación
obtida no exame (proba mixta) e a correspondente ao traballo, representando cada unha destas
o 50% da cualificación final.

Sources of information

Basic	- Kaas, JH (2007). Evolution of nervous systems: a comprehensive reference. Elsevier Academic Press, Amsterdam - Allman, JM 2003, El cerebro en evolución,1ª edn, Editorial Ariel, Barcelona. - Arendt, D 2003, ?Evolution of eyes and photoreceptor cell types?, Int J Dev Biol, vol.47, pp. 563-571. - Butler, AB & Hodos, W 2005, Comparative vertebrate neuroanatomy, 2nd edn, Wiley-Liss, New York. - Collin, SP, Davies, WL, Hart, NS & Hunt, DM 2009, ?The evolution of early vertebrate photoreceptors?, Phil Trans R Soc B, vol. 364, pp. 2925-2940. - Coyne, JA 2010, Porqué la teoría de la evolución es verdadera, Editorial Crítica, Barcelona. - Eccles, JC 1992, La evolución del cerebro: creación de la conciencia, Editorial Labor,Barcelona. - Fay, RR & Popper, AN 1999, Comparative hearing: fish and amphibians, Springer-Verlag, New York. - Fritzsch,B & Beisel, KW 2001, ?Evolution and development of the vertebrate ear?, Brain Res Bull, vol. 55, pp. 711-721. - Fritzsch, B, Beisel, KW, Pauley, S & Soukup, G 2007, ?Molecular evolution of the vertebrate mechanosensory cell and ear?, Int J Dev Biol, vol. 51, pp. 663-678. - Gehring, WJ 2005, ?New perspectives on eye development and the evolution of eyes and photoreceptors?, J Hereditv, vol. 96, no. 3, pp. 171-184. - Gregory, RL 1997, Eye and Brain, 5th edn, Princeton University Press. - Hubel, DH 2000, Ojo, cerebro y visión, Servicio Publicaciones Univ. Murcia. - Jarman, AP 2002, ?Studies of mechanosensation using the fly?, Human Molecular Genetics, vol. 11, no. 10, pp. 1215-1218. - Jorgensen, JM 1989, Evolution of octavolateralis sensory cells. In: Coombs, S, Görner, P, Münz, H (eds), The mechanosensory lateral line: neurobiology and evolution, Springer-Verlag, New York. - Kaas, JH 2009, Evolutionary neuroscience, Elsevier, Amsterdam. - Kuhlenbeck, H 1967-1970, The central nervous system of vertebrates a general survey of its compararive anatomy with an introduction to the pertinent fundamental biologic and logical concepts, S. Karger, Basil. - Lad,MF 1979, ?Ojos animales donde la imagen se forma mediante espejos?, Investigación y Ciencia, no. 29. - Laget, M 1973, Éléments de neuro-anatomie fonctionnelle, Masson, Paris. - Lamb, TD, 2009, ?Evolution of vertebrate retinal photoreception?, Phil Trans R Soc B, vol. 346, pp. 2911-2924. - Land, MF & Ferdnald, RD 1992, ?The evolution of eyes?, Annual Review of Neuroscience, vol. 15, pp. 1-29. - Manley, GA, Popper, AN & Fay, RR (eds) 2004, Evolution of the Vertebrate Auditory System, Springer-Verlag. - Melver, SB 1985, Mechanorecepcion, In Gilbert, LL & Kerkut, DA(eds), Comprehensive Insect Physiology, Biochemistry and Pharmacology, Pergamont Press, vol. 6, pp. 71-132. - Münz,H(eds) 1989, The mechanosensory lateral line, Springer-Verlag, New York. - Nieuwenhuys, R, ten Donkelaar, HJ & Nicholson, C 1998, The central nervous system of vertebrates, Springer, Berlin. - Nilsson S & Holmgreen S 1993, Comparative physiology and evolution of the autonomic nervous system, Hardwood Academic Publishers, Chur, Switzerland. - Paxinos, G 1995, The rat nervous system, Academic Press, New York. - Roth, G 2013, The long evolution of brains and minds, Springer, Dordrecht. - Shichida, Y & Matsuyama, T 2009, ?Evolution of opsins and phototransduction?, Phil Trans R Soc B, vol. 364, pp. 2881-2895. - Striedter, GF 2005, Principles of brain evolution, Sinauer Associates, Sunderland (Massachusetts). - Swanson, LW 2012, Brain architecture. Understanding the basic plan, 2nd edn, Oxford University Press, New York. - Williamson, R & Chrachri, A 2007, ?A model biological network: the cephalopod vestibular system?, Phil Trans R Soc B, vol. 362, pp. 473-481.
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Neuroanatomía/610490003
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Other comments

UNIVERSIDADE DA CORUÑA

(*)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.