UNIVERSIDADE DA CORUÑA

Teaching Guide			
Identifying Data			2018/19
Subject (*)	Biological and Computational Models of Knowledge Representation	Code	610490017
Study programme	Mestrado Universitario en Neurociencia (Plan 2011)		

Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	2nd four-month period	First	Optional	3

Language	Spanish		
Teaching method	Face-to-face		
Prerequisites			
Department	Computación		
Coordinador	Paz López, Alejandro	E-mail	alejandro.paz.lopez@udc.es
Lecturers	Paz López, Alejandro	E-mail	alejandro.paz.lopez@udc.es
Web	www.usc.es/neurosci		
General description	To introduce students to some of the techniques of knowledge representation in Intelligent Systems. On the other hand, to see an example of distributed knowledge representation compatible and based on some biological system for the representation of knowledge.		

Study programme competences / results	
Code	Study programme competences / results
A4	Explicar o funcionamento das neuronas dende o nivel molecular ao celular.
A5	Describir a relación entre as canles iónicas e o comportamento neuronal.
A9	Comprender as bases biolóxicas da cognición e das emocións con especial énfase en procesos de atención, aprendizaxe, memoria e control executivo, tendo en conta os cambios que se producen coa idade.
B4	Saiban ler e obter información relevante de publicacións científicas.
B5	Saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en ámbitos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa neurociencia.
B8	Saiban traballar en grupos de carácter multidisciplinar
B10	Posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun modo que haberá de ser en boa medida autodirixido ou autónomo.

Learning outcomes			
Learning outcomes	Study programme competences / results		
Understand the neurobiological basis on which adaptive systems are based, from which they derive their structure and functionalities	AR4 AR5		
To understand the characteristics of natural knowledge and its representation and to know the mode of reasoning of the adaptive systems and of the different methods for their learning	AR4 AR9	BR8 BR10	
To study the fundamental process of modeling an adaptive system	AR4 AR9	BR4 BR5 BR8 BR10	

Contents	
Topic	Sub-topic
1. HISTORICAL AND BASIC CONCEPTS OF ADAPTATIVE SYSTEMS	1.1 Evolución histórica e precursores. 1.2 Nacemento.

2. MODELOS	2.1 Proceso de Modelización. 2.2 Comparación entre o elemento biolóxico e o formal.
3. O COÑECEMENTO NATURAL E A SÚA REPRESENTACIÓN.	3.1 Características do coñecemento do mundo real. 3.2 Formas de representación do coñecemento.
4. RAZOAMENTO E APRENDIZAXE.	4.1 Modos de Razoamento. 4.2 Tipos de Aprendizaxe.
5. METODOLOXÍA EN SISTEMAS ADAPTATIVOS	5.1 Introducción. 5.2 Etapas da Metodoloxía.
6. APLICACIONS BÁSICAS DOS SISTEMAS CONEXIONISTAS	6.1 Consideracións previas. 6.2 Aplicacións.

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A4 A5 A9	10	20	30
Collaborative learning	B8	10	10	20
Supervised projects	B4 B5 B10	5	20	25
Personalized attention		0		0
(*)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	Content of the subject
Collaborative learning	Comments on scientific articles and practical exercises
Supervised projects	Carrying out a paper on one of the themes of the subject

Personalized attention	
Methodologies	Description
Supervised projects Collaborative learning	Atencíon nas horas de tutoría para guiar a elaboración dos traballos en grupo.

Assessment			
Methodologies	Competencies / Results	Description	Qualification
Supervised projects	B4 B5 B10	Works to increase knowledge about the contents of the subject	30
Guest lecture / keynote speech	A4 A5 A9	Assessment by examination of short or development questions	50
Collaborative learning	B8	Debates and comments in class about the contents of theory	20

Assessment comments

Sources of information

Basic	Arbib M.A.: "Cerebros, Máquinas y Matemáticas". Ed. Alianza Universidad. Madrid. 1987.Arbib, M.A.: ?The handbook of brain theory and neural networks?. Cambridge, Massachusetts. MIT Press. 1995.Grossberg, S.: "Neural Networks and Natural Inteligence". Editor: MIT Press, 1988.Hertz, J., Krogh, A. & Palmer, R.: "Introduction to the Theory of Neural Computation". Santa Fe Institute, Addison-Wesley Editores 1991.Hinton, G.E.: ?How Neural Networks Learn from Experience?. Scientific American, 267, 144-151. 1992.McCulloch, W. S., and Pitts, W.: "A Logical Calculus of the Ideas Inmanent in the Neural Nets". Buletin of Mathematical Biophysics, vol. 5, pp. 115-137. 1943.McCulloch, W.S., Arbib, M.A. & Cowan, J.D. "Neurological Models and Integrative Processes". In Yacovits, Jacobi and Goldstein. Ed. Selft-Organizing Systems.Spartan bocks. Washington. 1969.Minsky, M. & Papert, S.: "Perceptrons". Cambridge, MIT Press. 1988. Ramón y Cajal, S.: "Textura del Sistema Nervioso del Hombre y los Vertebrados". tomo I. Ed. Alianza. 1989.Rosenblueth, A., Wiener, N, and Bigelow, J.: "Behavior, Purpose and Teleology". Phylosophy of Science nº10, pp. 18-24. 1943.Rumelhart, D.E., Widrow, B. & Lehr, M. A.: "The basic ideas in neural networks". Comm. ACM. Num 37. pp 87-92. 1994.
Complementary	

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

(*)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.