

ΜΑΘΗΜΑ ΚΟΡΜΟΥ ΠΜΣ «ΕΓΚΕΦΑΛΟΣ ΚΑΙ ΝΟΥΣ»: ΠΡΟΓΡΑΜΜΑ ΔΙΑΛΕΞΕΩΝ

ΣΤ ΕΝΟΤΗΤΑ. ΕΙΣΑΓΩΓΗ ΣΤΙΣ ΥΠΟΛΟΓΙΣΤΙΚΕΣ ΝΕΥΡΟΕΠΙΣΤΗΜΕΣ

ΗΜΕΡΟΜΗΝΙΑ	ΩΡΑ	ΤΙΤΛΟΣ ΔΙΑΛΕΞΗΣ	ΔΙΔΑΣΚΩΝ
INTRODUCTION			
ΔΕΥ 10/05/2021	11.00-14.00	Introduction to Computational neuroscience and Matlab Primer 1: Vectors and Matrices, Variance and Covariance, Plotting, Randomness, M-files and functions	ROUSSOS
ΤΕΤ 12/05/2021	11.00-14.00	Matlab primer 2: Basic Mathematical Methods Ordinary Differential Equations, Convolution, Correlation, built-in libraries and toolboxes	GIANNAKAKIS
NEURAL NETWORKS AND LEARNING METHODS			
ΠΑΡ 14/05/2021	11.00-14.00	Principal Component Analysis (PCA)	GIANNAKAKIS
ΔΕΥ 17/05/2021	15.30-18.30	The single neuron model - computational capacity and relative problems, transfer function	HOURDAKIS
ΤΕΤ 19/05/2021	15.30-18.30	Supervised learning, gradient descent, local extrema	HOURDAKIS
ΠΑΡ 21/05/2021	15.30-18.30	Other learning methods: Association learning, Hebb's rule	HOURDAKIS
PROBLEM SOLVING WITH NEURAL NETWORKS			
ΔΕΥ 24/05/2021	15.30-18.30	Problem formulation, data collection and analysis. Practical examples of learning with Neural Networks	HOURDAKIS
COMPUTATIONAL MODELING OF NEURAL SYSTEMS			
ΠΑΡ 28/05/2021	15.30-18.30	Abstract neuron models FitzHugh–Nagumo model, IF, Izhikevich	CHITZANIDI
ΔΕΥ 31/05/2021	15.30-18.30	Neural coding Local/rate coding, population codes, tuning curves, Poisson neurons	HOURDAKIS
BIOPHYSICAL MODELS			
ΤΕΤ 02/06/2021	10.00-13.00	Biophysical neuron models Cable theory, HH equations, compartmental models	POIRAZI
ΠΑΡ 04/06/2021	10.00-13.00	Synaptic plasticity, adaptation and learning	POIRAZI
ΠΑΡ 11/06/2021		EXAM	

Βιβλιογραφία

1. Principles of Computational Modelling in Neuroscience, David Sterratt, Bruce Graham, Andrew Gillies, Bruce Graham, 2011
2. MATLAB for Neuroscientists - An Introduction to Scientific Computing in MATLAB, Wallisch et al, Elsevier, 2014
3. The Handbook of Brain Theory and Neural Networks, Second Edition, Arbib, MIT Press, 2002
4. Dynamical Systems in Neuroscience. Eugene M. Izhikevich MIT Press, 2007
5. Mathematical Foundations of Neuroscience, G. Bard Ermentrout, David H. Terman, Springer Science & Business Media, 2010