

PSYB17-130 Introduction to Neuroscience

Aim of the course

Aim of the course:

The main objective of the course is to give an overview on the basic methods, shared disciplinary concepts and current theoretical models of Neuroscience, as a timely and developing multidisciplinary approach in understanding our brain.

Learning outcome, competences

knowledge:

- Psychophysiological, Neuroscience and Neuroanatomy concepts
- Current methods and main objectives in Neuroscience
- Basics in Neuroanatomy

attitude:

- Utilisation of knowledge in scientific communication, presentation

skills:

- Skills of applying main methods
- Skills of identifying related neurological and neuroanatomical structures of psychological functions

Content of the course

Topics of the course

In modular structure, covering the following fields of research

Psychophysiology

5x3 hours

- Methods in neuroscience
- Psychopharmacology
- Wakefulness, sleeping and attention regulation
- Affective processes, stress
- Learning and memory

The neuroscience of main psychological functions

3x1,5 hours

- Perception
- Object perception
- Attention

Affective Neuroscience

3x 1,5 hours

Physiological needs and brain regulation

- Psychology and physiology of Pain
- Neuronal basis of social perception and empathy

Introduction to Neurology and Neuroanatomy

3x3 hours or 6x1,5 hours

Computational methods in Neuroscience and Consciousness

2x3 hours

- Neural coding
- Consciousness
- Computational methods in neuroscience

Learning activities, learning methods

Lectures and interactive discussions

Evaluation of outcomes

Learning requirements, mode of evaluation, criteria of evaluation:

requirements

- Reliable basic knowledge in the domain of neuroscience and neuroanatomy

mode of evaluation: written exam

criteria of evaluation:

- Knowledge on basic concepts and the skill of utilizing the models of neuroscience adequately

Reading list

Psychophysiology:

Mandatory readings:

- Neil R. Carlson: *Foundations of Physiological Psychology*, Allyn and Bacon, 1999
- John T. Cacioppo: *Handbook of Psychophysiology*, Cambridge Univ Press, 2007
- Jerry W. Rudy: *The Neurobiology of Learning and Memory*, Sinauer Associates, Inc. Publishers, 2008
- Kenneth Hugdahl: *Psychophysiology*, Harvard Univ. Press, 2001

Consciousness:

Mandatory Reading list:

- Koch C, Massimini M, Boly M, Tononi G. (2016) Neural correlates of consciousness: progress and problems. *Nat Rev Neurosci.* 17(5):307–21. doi: 10.1038/nrn.2016.22.

Recommended:

- Cohen MA, Dennett DC (2011) Consciousness cannot be separated from function. *Trends Cogn Sci.* 15(8):358–64. doi: 10.1016/j.tics.2011.06.008.

Neural coding:

Mandatory Reading list:

- John von Neumann Neumann *The Computer and the Brain* (The Silliman Memorial Lectures Series)

Recommended:

- Engel AK, Singer W. (2001) Temporal binding and the neural correlates of sensory awareness, *Trends Cogn Sci.* 5(1):16–25. PMID: 11164732

Computational methods in neuroscience

Mandatory Reading list:

Stiefel KM, Ermentrout GB. (2016) NEURONS AS OSCILLATORS. *J Neurophysiol.* jn.00525.2015. doi: 10.1152/jn.00525.2015.

Recommended:

- Peter Dayan: *Theoretical neuroscience (Computational and Mathematical Modeling of Neural Systems)*
- Rieke F Warland D, van Steveninck R, Bialek W: *Spikes: Exploring the Neural Code (Computational Neuroscience)*

