

Course title: Neurosciences and the Humanities: brain, philosophy and art.

Language of instruction: English

Professor: Fernando Giraldez

Professor's contact and office hours:

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Course contact hours: 45

Recommended credit: 3 US credits-5 ECTS credits

Course prerequisites: There are no prerequisites for this course.

Language requirements: None

Number of students (max.): 20

Course focus and approach:

Neurosciences study the brain, from genes and cells to behavior and it has provided radical new clues about how the brain works. This knowledge has strong implications for many areas of human activity outside the conventional environment of medicine or psychology, and expands to economics, laws, philosophy or art. On the other hand, Neuroscience has attracted the attention of society, sometimes beyond evidence. The course focuses on a solid dialogue between neurosciences and humanities.

1

Course description:

This is an accessible account of selected areas of Neurosciences of particular interest for Humanities and Social Sciences. The course starts with a general overview of the brain to then review how the sensory systems build up a representation of the world, with particular reference to the visual and auditory systems. Then we analyze examples of the constructive character of perception, brain categorization, and the construction of sensory images, space and movement. Finally, we address the question of consciousness and perception of self, to discuss the implications of Neurosciences in the foundations of knowledge, Law and Arts.

Learning objectives:

Major goals are:

- 1) To understand the basic principles of brain function.
- 2) To understand the neural basis of perception.
- 3) To be able to apply knowledge in Neurosciences to central problems of Philosophy, Law, Communication and Arts.

Course workload: The course is based on discussion sessions and lectures. Students will read 4 short papers (two-three pages), 5 fragments or book chapters and write 2-4

short papers/reports (one page) along the course. Students will do a 10 minute oral presentation to the class. There will be a mid-term and a final exam.

Teaching methodology: The course will combine a set of lectures and seminars with activities based on flipper classroom. Lectures are intercalated with discussion sessions. Materials, calls presentations, handouts and readings will be available in advance through the Aula Global. There will be some selected lectures given by guest speakers. Seminars consist of problem solving, paper discussions and general discussions with invited speakers. Demonstrations include animations and interactive materials. It is expected that students contribute with their own background to discussions and works.

Assessment criteria:

Midterm exam: 30%

Final exam: 30%

Class participation: 20%

Student's talk (Chalk-talk): 20%

Midterm and final exams are of essay-type with short questions and problems. Each exam covers about half of the subject, respectively.

Class participation is evaluated from class activities, questions, comments, etc. and also from "bring your artwork" task and discussion. Simple attendance does not fill the participation slot.

Student's talks (STs, chalk-talks). Students will make an oral presentation to their classmates and teachers. They will select a topic from a list of articles uploaded in the Aula Global, although they may propose their own before week 5. Students have to deliver an abstract by week 8, when presentations begin. The activity includes: 1) One page abstract of no more than 550 words (Arial 10) containing the relevant information and three references. A figure may be included if appropriate. 2) A talk of 10 minutes + 10 minutes discussion. The presentation is on the blackboard, a so-called "*chalk talk*" (no PowerPoint allowed).

Absence policy

After the add/drop, all registrations are considered final and **HESP Absence Policy** begins to apply. For the academic year **2018-2019**, such policy is as follows:

Attending class is mandatory and will be monitored daily by professors. Missing classes will impact on the student's final grade as follows:

Absences	Penalization
<i>Up to two (2) absences</i>	<i>No penalization</i>
<i>Three (3) absences</i>	<i>1 point subtracted from final grade (on a 10 point scale)</i>

Four (4) absences	2 points subtracted from final grade (on a 10 point scale)
Five (5) absences or more	The student receives an INCOMPLETE ("NO PRESENTAT") for the course

The PEHE/HESP attendance policy **does not distinguish between justified or unjustified absences**. The student is deemed responsible to manage his/her absences.

Emergency situations (hospitalization, family emergency...) will be analyzed on a case by case basis by the Academic Director of the HESP.

Classroom norms:

- No food or drink is permitted in class
- Students will have a ten-minute break every one-hour session.

Weekly schedule

Week 1 Introduction to the course

Lesson 1. Introduction to the course I

Optical illusions show how we see a TED talk by Beau Lotto

https://www.ted.com/talks/beau_lotto_optical_illusions_show_how_we_see

Seminar 1.

Lesson 2 Introduction to the course II From genes to neurons and circuits. What is inside the brain.

Seminar 2. Discussion

Reading assignments:

What is Neuroscience? BrainFacts.org

<http://www.brainfacts.org/about-neuroscience/what-is-neuroscience/>

Do we see reality as it is? a TED talk by Donald Hoffman:

https://www.ted.com/talks/donald_hoffman_do_we_see_reality_as_it_is

Week 2 What is perception? The representation of the world

Lesson 3. The representation of the world: the sensory systems. The organization of sensory systems: parallel processing sensory receptors, brain localization, distortion, top-down and bottom-up processing.

Seminar 3. The Sensory Systems

Lesson 4. The visual world: from the retina to the brain. Why we like line drawings?. Rods and cones. Retinal processing and contrast. The smile of Mona Lisa.

Seminar 4. What happens in the retina

Reading assignments:

Vilis, T. (2014) L1The eye <http://www.tutis.ca/Senses/L1Eye/L1eye.swf>
BrainFacts.org A primer on the brain and Nervous System.
 Chapter 3, 18-24 [http://www.brainfacts.org/~media/Brainfacts/Article Multimedia/About Neuroscience/Brain Facts book.ashx](http://www.brainfacts.org/~media/Brainfacts/Article_Multimedia/About_Neuroscience/Brain_Facts_book.ashx)

Week 3 The visual brain: shapes and space in art

Lesson 5. The visual areas in the brain. How do we identify objects? Feature extraction. The brain is kantian: brain categorisation, shape and objects. The conceptual neurons "face cells", the "object cells". Bosch and "the garden of earthly delights"

Seminar 5. The visual cortex

Lesson 6. The construction of space colour and movement. Binocular cues and monocular spatial reconstruction. From Fra Angelico to Sorolla: looking at the history of painting. Magritte and Picasso: how to subvert the law. Colour in the brain. Movement in the brain.

Seminar 6. Space, colour and movement

Reading assignments:

Vilis, T L2 The visual cortex <http://www.tutis.ca/Senses/L2VisualCortex/l2v1.swf>
 ZEKI, S. (1997) The Wodhull Lecture: visual art and the visual brain. Proc. Royal Institution of Great Britain, pp29-63 <http://www.vislab.ucl.ac.uk/pdf/Woodhull.pdf>

4

Week 4 The visual brain: colours, art and brain.

Lesson 7: Student's artwork project: bring your own artwork I

Seminar 7: Student's artwork project: bring your own artwork II

Reading assignments:

Vilis, T. (2014) L1The eye <http://www.tutis.ca/Senses/L1Eye/L1eye.swf>
 Vilis, T L2 The visual cortex <http://www.tutis.ca/Senses/L2VisualCortex/l2v1.swf>

Lesson 8. Neuroscience and art. Beauty and meaning. The evolutionary history of beauty and the history of art. Aesthetic universals?. Artists as intuitive neurologists. Is cubism a *neurological fiasco*?

Seminar 8 Neuroscience and art and general MT *pre-exam* review.

Reading assignments:

Livingstone, M. (2014) *Vision and Art: The Biology of Seeing*, Harry N. Abrams Pub.
 See also: (2009) What art can tell us about the brain. Lecture at the University of Michigan <http://www.youtube.com/watch?v=338GgSbZUYU>

Week 5 Art and Brain

Visit to the Museu Nacional d'Art de Catalunya (MNAC)

Mid-term exam

Week 6 Brain and Music.

Lesson 9 Hearing. The inner ear. The auditory brain. Auditory objects. Sound localisation: what we learn from owls and bats

Seminar 9. Audition demos and questions. MT exam review.

Reading assignments:

Vilis (2014) L9 Hearing <http://www.tutis.ca/Senses/L9Auditory/L9Auditory.swf>

Lesson 10. Music, hearing and brain: from hair cells of ecstasy. Pitch, tones and octaves. The constancy of musical scales.

Seminar 10: The musicians as magicians: music tells a lot about the brain.

Reading assignments:

Zatorre & Salimpoor (2013) From perception to pleasure: music and its neural substrates. Proc Natl Acad Sci U S A. 110 Suppl 2 :10430-7
http://www.pnas.org/content/110/Supplement_2/10430.long

Week 7 Neurosciences and Philosophy

Lesson 11 Perception and knowledge: the myth of the cave and the neurosciences. The question of how we know the world.

Seminar 11 Reading on knowledge.

Reading assignments: Plato, The Republic, book VII:

<http://www.gutenberg.org/files/1497/1497-h/1497-h.htm>

Noam Chomsky (2011) The machine, the ghost and the limits of understanding
<https://www.youtube.com/watch?v=D5in5EdjhD0>

Lesson 12 Genes and culture I: Early experience and perception. The “critical periods” of post-natal development. Brain plasticity: interactions between the brain and the environment.

Seminar 12 Genes and culture

Reading assignments: Kandel, E (2013) The new science of mind and the future of knowledge. Neuron, 80: 546-560

Week 8 Neurosciences and Philosophy

Lesson 13 Genes and culture II The question of “nature and nurture”. Correlation and causation. Genes, environment and chance. Chance and necessity.

Seminar 13 Discussion seminar

Reading assignments:

Moore, D.S. and Shenk, D. (2017) The heritability fallacy WIREs Cogn Sci 2017, 8:e1400. doi: 10.1002/wcs.1400
 Critical periods. Society for Neurosciences <http://www.brainfacts.org/Brain-Basics/Brain-Development/Articles/2012/Critical-Periods>

ST1 Student term paper presentations

Week 9 Student's "chalk-talks"

ST2 Student term paper presentations

ST3 Student term paper presentations

Week 10 Student's "chalk-talks"

ST4 Student term paper presentations

General discussion and *pre-exam* review seminar.

Week 11 Final exam

Final exam

Required readings:

Textbooks on Neuroscience

KANDEL, E.R., SCHWARTZ, J.H., JESSEL, T.M., SIEGELBAUM, S.A. and HUNDSPEETH, A.J. (2013) ch. 16, 21, 25-31, 61 Principles of Neural Science. Fifth Edition. McGraw-Hill, New York, USA

WOLFE ET AL. (2015) ch. 1-11. Sensation and Perception. 5th ed, Sinauer Ass., Inc. Publishers, USA

Online books

VILIS, T. (2014) The Physiology of the Senses Transformations for Perception and Action <http://www.tutis.ca/Senses/index.htm>

UTHealth (2014) Neuroscience Online. An electronic textbook for the Neurosciences, University of Texas, Dept. Neurobiology and Anatomy <http://nba.uth.tmc.edu/neuroscience/>

PURVES, D. et al Neuroscience, 2nd ed.

<http://www.ncbi.nlm.nih.gov/books/NBK10799/?term=neuroscience>

STANFORD Encyclopedia of Philosophy <http://plato.stanford.edu/>