

Course Syllabus: THE ARTISTIC BRAIN: BIOLOGY AND COMPUTATION BEHIND MUSIC

Language of Instruction: English or Spanish

Professor: Fernando Giráldez (MELIS) and Perfecto Herrera (DTIC)

Professor's Contact and Office Hours: 9 to 17h

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Course Contact Hours: 15 hours

Recommended Credit: 2 ECTS credits

Weeks: 1 (3th -7th JULY)

Course Prerequisites: There are no prerequisites for this course.

Language Requirements: Recommended level in the European Framework B2 (or equivalent: Cambridge Certificate if the teaching language is English, DELE or 3 semesters in the case of Spanish)

Course structure: Workshop

Course classification: Introductory

Course Description:

Science and art are rooted in our perception of the world. The course is aimed at exploring the biology perception and its implications on how we experience music. It is a discussion on beauty and the brain, a discussion on the history of breakthroughs and the irresistible attraction of music for humans.

The course starts with a general overview of how our senses build up a representation of the world, with reference to the auditory systems. We look at the biological and evolutionary roots of musical perception. This will lead us to a general discussion on beauty and art: the notion of artists as intuitive neuroscientists, the perceptual grammar of art, aesthetic universals, and computational aesthetics (can a machine be "creative"? can an algorithm decide on aesthetic properties?)

Learning Objectives:

To learn the basis of the neuroscience of perception.

To explore general concepts about music and the biology of music.

To better appreciate music from another perspective.

To appreciate science and the arts as elements of culture.

Course Workload

The course is based on discussion sessions and lectures. Typically, students will read 3-4 short papers (two-three pages), 5 fragments or book chapters and write 2-3 short papers/reports (one page) along the course. There will be two quiz tests and a final exam.

Methods of Instruction:

The course will blend short talks with reverse class and discussion seminars and demos.

Method of Assessment

Continuous evaluation: Intermediate evaluations will be based on quizzes, assignments, and participation in the discussions:

- 1) Quiz tests 1-4 (50%)
- 2) Class participation (50%)

Absence Policy

Attending class is mandatory and will be monitored daily by professors. The impact of absences on the final grade is as follows:

Absences	Penalization
Up to one (1) absence	2 points subtracted from final grade (on a 10 point scale).
Two (2) absences	The student receives an INCOMPLETE for the course

The BISS 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, etc.) will be analyzed on a case-by-case basis by the Academic Director of the UPF Barcelona International Summer School.

Classroom Norms:

No food or drink is permitted.

There will be a ten-minute break during the class.

Students must come to class fully prepared.

Course contents and schedule:**Monday July 3rd: BRAIN AND PERCEPTION****Goal 1: To understand the architecture of the brain and the senses.**

Introduction and “Brain history”. Basic concepts of brain organization for *neophytes*.

The senses and the arts: how we see the world. The irresistible attraction of the senses. The organization of sensory systems. “Every animal lives in its own world”.

Practical activities. Questions and problems on sensation and perception.

Reading assignments:

Plato “The Allegory of the Cave : Plato “The Allegory of the Cave”

Robson, D. (2011) *A brief history of the brain*. New Scientist

<https://www.newscientist.com/article/mg21128311-800-a-brief-history-of-the-brain/?ignored=irrelevant#.VK--p96rPIM>

Tuesday July 4th: THE BIOLOGY OF HEARING

Goal 2: To understand how we hear.

From waves to sound, from sound to music. From “hair cells” to hearing. Sound localization and categorization: what we learn from owls and bats. Practical activities. Sound Perception and Cognition. Practical activities: Auditory demonstrations of perceptual processes.

QUIZ-1

Reading assignments:

Vilis L9 (2021) Hearing <http://www.tutis.ca/Senses/L9Auditory/L9Auditory.swf>

Wednesday July 5th: THE ELEMENTS OF MUSIC

Goal 3: To experience and understand the elements of sound and music.

Auditory perception: making sense of our sonic world. Loudness. Periodicity, tonality, and noisiness. Timbre sensations. Fusion and fission of sound. Auditory and musical illusions. Practical activities. Auditory demonstrations. musical illusions. Commented music listening.

QUIZ-2

Reading assignments:

[Deutsch, D. \(2010\). Hearing music in ensembles, Physics Today 63, 2, 40](#)

Thursday July 6th: MUSIC IN THE BRAIN

GOAL 4: To understand how and why music works.

What is the game of music? Consonance and dissonance. Time is the matter of music. Expectation. The “what” and the “when”. Practical activities. Auditory demonstrations. Musical illusions. Commented music listening.

QUIZ-3

Reading assignments:

Margulis, E. The appetite for music. In "The psychology of music. A very short introduction". Oxford, OUP. Chapter 7.

Friday July 7th FINALE: FROM HAIR CELLS TO ECTASY

GOAL 5: To understand why we like music and how we give it aesthetic value

Music and emotions. Beauty in the brain, beauty and the brain. Art, technologies and the brain. Music Universals.

Class review and general discussion

QUIZ-4

Recommended bibliography:

On neurobiology

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

UTHealth (2014) *Neuroscience Online*. An electronic textbook for the Neurosciences, University of Texas, Dept. Neurobiology and Anatomy

<http://nba.uth.tmc.edu/neuroscience/s2/index.htm>

Vilis, T. (2014) *The Physiology of the Senses* ^[L]_[SEP] Transformations for Perception and Action <http://www.tutis.ca/Senses/index.htm>

On the neuroscience of music

Hudson, D. Is music an evolutionary adaptation? *Ann N Y Acad Sci*. 2001,930: 43-61. 10.1111/j.1749-6632.2001.tb05724.x.

Brattico E., Brattico P. J., Vuust P. (2017). Global sensory qualities and aesthetic experience in music. *Front. Neurosci.* 11:159. 10.3389/fnins.2017.00159

Brattico, E., & Pearce, M. (2013). The neuroaesthetics of music. *Psychology of Aesthetics, Creativity, and the Arts*, 7(1), 48-61.

Giraldez, F. (2016) *Brain and music: looking for universal rules*, translation from *Sonograma Magazine* 32 Oct. 2016 "El cerebro y la música: buscando reglas universales" <http://sonograma.org/2016/10/cerebro-musica-reglas-universales/>

Pressnitzer, D., Suied, C., Shamma, S. (2011). Auditory scene analysis: The sweet music of ambiguity, *Frontiers in Human Neuroscience*, 5, 1662-5161.

Purves, D. (2017). *Music as Biology: The Tones We Like and Why*. Harvard University Press

Complementary readings

Ball, P. (2010). *The music instinct: how music works and why we can't do without it*. London: The Bodley Head

Bowling, DL and Purves, D. (2015) [A biological rationale for musical consonance. Proc. Natl. Acad. Sci. USA, 11:11155-60](#)

Levitin D.J and Tirovolas A.K. (2009) *Current advances in the cognitive neuroscience of music*. Ann N Y Acad Sci. 1156:211-31

Purves, D (2021) *Purves Lab Sound and Music* <https://purveslab.net/sound-and-music-2>

Wolfe et al. (2021) *Sensation and Perception* (6th Ed.) Web activities

Last rev. January 2023.