

Syllabus

ECON 405: NEUROECONOMICS
University of Southern California
Spring 2020

Schedule: Tue-Thu 16:00 – 17:50

Class Location: THH 114

Instructor: Prof. **Giorgio Coricelli** Office Hours: Thu 14:00 – 15:00

Office: KAP 306D

Phone: 213-740-3517

e-mail: giorgio.coricelli@usc.edu

web: <https://dornsife.usc.edu/coricelli>

TA: **Zhen Chen**

e-mail: zhenc@usc.edu

Office Hours (KAP 363): Thu 9:00-11:00 and Fri 9:00-11:00

Prerequisites for the course: ECON 303

Textbook: *Neuroeconomics*, Decision Making and the Brain, 2nd Edition, Edited by Glimcher and Fehr, 2014. Additional readings (see list below) will be uploaded online.

Throughout the course, the primary goals are to:

- Learn about the academic field of neuroeconomics, its major theories, results, and debates
- Become a critical consumer of research findings by learning the methodological standards for evaluating the soundness of such studies
- Develop the ability to effectively write and speak about decision theories, results, and debates
- Acquire some practical skills for designing and analyzing an experiment in the field of neuroeconomics

Description of the course:

The first part of the course will focus on neuroscience as a new lens on decision-making. We will focus primarily on studies of the neural basis of human behavior. This part will include a special focus on (i) the reward system; (ii) reinforcement learning; (iii) the neural basis of choice under risk and uncertainty; (iv) intertemporal choices; (v) preferences and relative rewards; (vi) the role of emotion in decision-making. The second part will focus on (i) Experimental Game theory; (ii) social preferences; (iii) strategic choice; and (vi) neuro-finance

Problem sets: Due at the beginning of class on the due date

Exams: Two midterms, and a final exam

Grading:

Problem sets 20%

Midterm 1 20%

Midterm 2 20%

Final exam 40%

Grade Determination and Final Examination Details:

Tests and final exams are marked on a numerical (percentage) basis, and then converted to letter grades.

A+ 95 - 100 B+ 80 - 84 C+ 65 - 69 D+ 50 - 54

A 90 - 94 B 75 - 79 C 60 - 64 D 45 - 49

A- 85 - 89 B- 70 - 74 C- 55 - 59 F 0 - 44

Course Outline:

The objective of this course is to introduce basic and advanced elements of Neuroeconomics.

The topics to be covered and the required readings (Chapters from the Textbook

Neuroeconomics (CH) and **Readings (R)**) are:

January

Tue 14	Lecture 1: Introduction (CH 1)
Thu 16	Lecture 2: Experimental methods in Cognitive Neuroscience (CH 5)
Tue 21	Lecture 3: The computation of stimulus values in a simple choice I (CH 8)
Thu 23	Lecture 4: The computation of stimulus values in a simple choice II (CH 8)
Tue 28	Lecture 5: Neural foundation of economic preferences (CH 8)
Thu 30	Lecture 6: Reward processing mechanisms I (CH 15)

February

Tue 4	Lecture 7: Reward processing mechanisms II (CH 15). Problem set 1 assigned
Thu 6	Lecture 8: Multiple systems for value learning (CH 21)
Tue 11	Lecture 9: Summary of lectures 1-8. Problem set 1 due before class. Discussion
Thu 13	Midterm 1
Tue 18	Lecture 10: Decision Theory: Risk and uncertainty I (CH 9)
Thu 20	Lecture 11: Decision Theory: Risk and uncertainty II (Appendix Prospect theory)
Tue 25	Lecture 12: Neural correlates of Risk and uncertainty I (CH 9)
Thu 27	Lecture 13: Neural correlates of Risk and uncertainty II (CH 9, R)

March

Tue 3 Lecture 14: Neural basis of intertemporal choice (CH 10). **Problem set 2 assigned**
Thu 5 Lecture 15: Decision Biases in the Brain (CH 24).

Tue 10 Lecture 16: Summary of lectures 10-16. **Problem set 2 due before class.** Discussion
Thu 12 **Midterm 2**

15-22 Spring Recess

Tue 24 Lecture 17: Neuroeconomics of Emotion (CH 12, R)
Thu 26 Lecture 18: The social brain I (CH 27, R)

Tue 31 Lecture 19: Experimental Game theory I (CH 2)

April

Thu 2 Lecture 20: Experimental Game theory I (CH 2)

Tue 7 Lecture 21: Measuring social preferences (CH 11)
Thu 9 Lecture 22: Altruism and Fairness (CH 11, R)

Tue 14 Lecture 23: Reputation and Trust in economic exchange (CH 25, R)
Thu 16 Lecture 24: The neural Basis of Strategic Choice I (CH 25, R)

Tue 21 Lecture 25: The neural Basis of Strategic Choice II (CH 25, R)
Thu 23 Lecture 26: Neural basis of social comparison and social conformity (CH 11, R).
Problem set 3 assigned

Tue 28 Lecture 27: Neuro-finance (R)
Thu 30 Lecture 28: Summary of lectures 18-27. **Problem set 3 due before class.** Discussion

May

Final exam Thursday May 7 2020 4:30 p.m. THH 114

List of readings (R):

- R1. Fiorillo CD, Tobler PN, Schultz W (2003) Discrete coding of reward probability and uncertainty by dopamine neurons. *Science* 299 (5614), 1898
- R2. Tom et alii (2007). "The neural basis of loss aversion in decision making under risk". *Science*. 26 January 2007: Vol. 315 no. 5811 pp. 515-518
- R3. Preuschoff, P Bossaerts, and S R Quartz. Neural differentiation of expected reward and risk in human subcortical structures. *Neuron*, 51(3):381–390, 2006.
- R4. Ming Hsu et alii (2006). Neural Systems Responding to Degrees of Uncertainty in Human Decision-Making. *Science*. 9 December 2005: Vol. 310 no. 5754 pp. 1680-1683
- R5. On the relationship between emotion and cognition, by Pessoa, *Nature Review Neuroscience*, 2008
- R6. The somatic marker hypothesis: A neural theory of economic decision, by Bechara and Damasio, *Games and Economic Behavior*, 2002
- R7. Coricelli G, Dolan RJ, Sirigu A (2007). Brain, emotion and decision-making: the paradigmatic example of regret. *Trends in cognitive sciences* 11 (6), 258-265
- R8. Rizzolatti G., Fadiga L., Gallese V., Fogassi L. Premotor cortex and the recognition of motor actions. *Cogn. Brain Res.*, 3 (1996), 131-141.
- R9. Amodio, D. M., & Frith, C. D. (2006). Meeting of minds: The medial frontal cortex and social cognition. *Nature Reviews Neuroscience*, 7, 268-277
- R10. Sanfey, A.G. (2007). Social decision-making: Insights from Game Theory and Neuroscience. *Science* 318, 598-602.
- R11. Fehr E and Camerer CF (2007). Social neuroeconomics: the neural circuitry of social preferences. *Trends in Cognitive Sciences*, 11, 419-427.
- R12. King-Casas et alii (2005). Getting to Know You: Reputation and Trust in a Two-Person Economic Exchange. *Science* 1 April 2005: Vol. 308 no. 5718 pp. 78-83
- R13. Coricelli, G., and Nagel, R. (2009). "Neural correlates of depth of strategic reasoning in medial prefrontal cortex". *Proceedings of the National Academy of Sciences USA*, 106, 23, pp. 9163-8.
- R14. Klucharev V, Hytönen K, Rijpkema M, Smidts A, Fernández G (2009) Reinforcement learning signal predicts social conformity. *Neuron*. 15;61(1):140-51.
- R15. Bault, N., Joffily, M., Rustichini, A., Coricelli, G. (2011). "Medial prefrontal cortex and striatum mediate the influence of social comparison on the decision process". *Proceedings of the National Academy of Sciences USA*. PNAS Sep 20;108(38):16044-9.
- R16. In the Mind of the Market: Theory of Mind Biases Value Computation during Financial Bubbles, by DeMartino et al, 2013 *Neuron*