

Syllabus

**ECON 405: NEUROECONOMICS**  
**University of Southern California**  
**Spring 2016**

Schedule: Tue-Thu 16:00 – 17:50

Class Location: MHP 105

Instructor: Prof. **Giorgio Coricelli**      Office Hours: Wednesday 10:00 – 12:00

Office: KAP 306D

Phone: 213-740-3517

e-mail: [giorgio.coricelli@usc.edu](mailto:giorgio.coricelli@usc.edu)

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

TA: Brenton Keller      Office Hours: Thu 14:00-16:00

e-mail: [brenton.keller@usc.edu](mailto:brenton.keller@usc.edu)

Prerequisites for the course: ECON 303

Textbook: *Neuroeconomics*, Decision Making and the Brain, 2<sup>nd</sup> 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

**Paper presentation:** Students will be divided into groups half way through the semester. As a group students will be assigned one paper to be presented in a 15 min presentation.

**Grading:**

Paper & class participation 10%

Problem sets 10%

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 12 | Lecture 1: Introduction (CH 1)   |
| Thu 14 | Lecture 2: Experimental Methods in Cognitive Neuroscience (CH 5, CH 6) |
| Tue 19 | Lecture 3: Neural foundation of economic preferences I (CH 8)          |
| Thu 21 | Lecture 4: Neural foundation of economic preferences I (CH 8)          |
| Tue 26 | Lecture 5: Reward processing mechanisms I (CH 15)                      |
| Thu 28 | Lecture 6: Reward processing mechanisms II (CH 15)                     |

**February**

|               |   |
|---------------|---|
| Tue 2         | Lecture 7: Multiple systems for value learning (CH 21)                          |
| Thu 4         | Lecture 8: Multiple systems for value learning II (CH 21)                       |
| Tue 9         | Lecture 9: Summary of lectures 1-8. Discussion (TA)                             |
| <b>Thu 11</b> | <b>Midterm 1</b>  |
| Tue 16        | Lecture 10: Decision Theory: Risk and uncertainty I (Ch 9)                      |
| Thu 18        | Lecture 11: Decision Theory: Risk and uncertainty II (Appendix Prospect theory) |

Tue 23            Lecture 12: Neural correlates of Risk and uncertainty I (Ch 9)  
Thu 25            Lecture 13: Neural correlates of Risk and uncertainty II (Ch 9, R)

### **March**

Tue 1             Lecture 14: Neural basis of intertemporal choice (CH 10)  
Thu 3             Lecture 15: Decision Biases in the Brain (CH 24)

Tue 8             Lecture 16: Basic Process: Emotion and Cognition (R)  
Thu 10            Lecture 17: Neuroeconomics of Emotion (CH 12, R)

14-20 Spring Recess

Tue 22            Lecture 18: Summary of lectures 10-17. Discussion (TA)  
Thu 24            **Midterm 2**

Tue 29            Lecture 19: The social brain I (CH 27, R)  
Thu 31            Lecture 20: Experimental Game theory I (CH 2)

### **April**

Tue 5             Lecture 21: Experimental Game theory II (CH 2)  
Thu 7             Lecture 22: Measuring social preferences (CH 11)

Tue 12            Lecture 23: Altruism and Fairness (CH 11, R)  
Thu 14            Lecture 24: Reputation and Trust in economic exchange (CH 25, R)

Tue 29            Lecture 25: The neural Basis of Strategic Choice (CH 25, R)  
Thu 21            Lecture 26: Neural basis of social comparison and social conformity (CH 11, R)

Tue 26            Lecture 27: Neuro-finance I (R)  
Thu 28            Lecture 28: Neuro-finance II (R) + Discussion (TA)

### **May**

**Final exam**

**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*