

## **Syllabus Introduction to neuroeconomics: the way brain makes decisions**

Утверждена  
Академическим советом ОП «Реклама  
и связи с общественностью»  
Протокол № 12 от «07» мая 2018 г.

### 1. Course Description

Title of a Course: Introduction to neuroeconomics: the way brain makes decisions

Pre-requisites: for successful completion of the course students are expected to have at least Intermediate level of English.

Course author: Klucharev Vasily

Course Type: this is an elective course for 4<sup>th</sup> year students of BA program in PR and Advertising. The course is based on blended learning format and requires completion of an online course developed by V.Klucharev. Total number of credits for this course is 3. Number of in-class seminar academic hours is 26 and students are expected to spend 88 academic hours for self-learning.

Abstract: Economics, psychology, and neuroscience are converging today into a unified discipline of Neuroeconomics with the ultimate aim of creating a single, general theory of human decision-making.

Neuroeconomics provides biologists, economists, psychologists and social scientists with a deeper understanding of how they make their own decisions and how others decide. Neuroscience, when allied with psychology and economics, creates powerful new models to explain why we make decisions. Neurobiological mechanisms of decision-making, decisions under risk, trust and cooperation will be central issues in this course. You will be provided with the most recent evidence from brain-imaging techniques (fMRI, TMS, etc.) and introduced to the explanatory models behind them.

The course does not require any prior study of economics and neuroscience; however, it might require you to study novel interdisciplinary materials. The course provides an introduction to the methodology, assumptions, and main findings of Neuroeconomics. Our students have different backgrounds; therefore, I have adapted and simplified the course to allow all students to understand the interdisciplinary content. This course will help you to start your progress in the field of Neuroeconomics and to further develop your skills during other more advanced courses and trainings in the future. For some topics, the course will also provide supplementary videos to reveal the opinions of leading experts in the field. Each module provides optional reading material.

The course is linked closely to such disciplines as: microeconomics, research design seminar.

### 2. Learning Objectives

In this class, students will learn how standard assumptions of economic theory could be relaxed to achieve greater psychological realism. The models developed in this class will give students theoretical insight into problems arising in economics and business and enable them to make better predictions and policy suggestions. After this class, students should be able to design and run an experiment in behavioral economics. Students will develop the ability to read academic journal articles in behavioral economics and present methods and findings of these articles

### 3. Learning Outcomes

After completion of this course students will:

- Know key concepts, goals and objectives of neuroeconomics as an interdisciplinary science;
- Know rules of organization and basic schemes for the implementation of research with the use of neuroeconomic tools;
- Know characteristic mistakes that should be avoided when setting goals and formulating conclusions in studies using neuroeconomic tools;
- Be able to compose and describe different neuroeconomic models;
- Be able to analyze advertising campaigns in terms of neuroeconomics;
- Be able to prepare advertising campaign projects based on neuroeconomic knowledge;
- Have skills to use modern tools used in the field of neuroeconomics;
- Have basic terminology of neuroeconomics.

#### 4. Course Plan

Topic 1. This lecture will provide an introduction to the course and a historical overview of the field and will explore major assumptions of Neuroeconomics. We'll discuss the need for Neuroeconomics and the limitations of the traditional fields of economics, psychology, and neuroscience. Can we predict decisions based on neural activity? Can we change human decisions using brain stimulation techniques? Does Neuroeconomics change views on free will and free decisions? This lecture will deal with these and other questions.

Topic 2. Introduction to cognitive neuroscience, brain anatomy, and brain functions and continue with a discussion of various methods of measuring brain activity, including brain imaging methods (EEG, MEG, fMRI), transcranial brain stimulation (TMS), cell recording, and data visualization, and interpretation of the results. The main goal of this lecture is to help you read and understand results of Neuroeconomics papers. Terminology and experimental methods that we will use throughout the whole course are introduced.

Topic 3. Topic 3 is covering the main features of the Diffusion Model, the most popular theoretical model of decision-making in Neuroeconomics. We will apply this model to single-neuron activity in a monkey cortex and to the human brain in order to understand how brains program decisions. For advanced students, an online guest lecture provided by Dr. Sebastian Horn (Max Planck Institute for Human Development, Berlin), who gives a more fundamental explanation of the drift diffusion model.

Topic 4. During this lecture, students will discuss how neurons assign values to different options during the decision-making process. We will also discuss the central role of the nucleus accumbens and orbitofrontal cortex in the valuation process. To make adaptive decisions, we must evaluate the costs and benefits of available options. Neuroeconomics has set itself the ambitious goal of understanding the brain mechanisms that are responsible for these evaluative processes. Neuroeconomics has also focused on describing the neural signals related to learning the value of stimuli and actions.

Topic 5. The influence of emotions on decision-making is largely ignored in decision theories. Our objective in this lecture is to explore the role of emotion in decision-making and to introduce theories and basic findings of Neuroeconomics in this context. For example, the neuroeconomic studies of decision-making in neurological patients who can no longer process emotional information normally suggest that people make judgments based not only on evaluations of the values of options and probabilities of outcomes but often primarily on emotions.

Topic 6. Studies in Neuroeconomics have found evidence suggesting that the brain may employ multiple levels of processing when making decisions, and this conclusion is consistent

with dual-processing theories that have received extensive theoretical consideration in the field of cognitive psychology. During this lecture, we will discuss the classic and cutting-edge research studies supporting dual process theory. Additionally, recommend for students to attend the online guest lecture provided by Dr. Samuel McClure (Stanford University), who is a leading neuroeconomist investigating dual-process mechanisms.

Topic 7. Many of our decisions involve uncertainty or imperfect knowledge about how our choices lead to outcomes. The important aspect of uncertainty most commonly considered by economists and neuroeconomists is risk, which refers to situations in which we know the probabilities of possible outcomes. For example, if you play roulette in Monte Carlo, you are making a decision under risk since you know the probability of winning and thus how much you should expect to lose. Here I will introduce a neuroeconomic approach to studying decisions under risk and an anticipatory affect model suggesting that the balance of activity in the set brain areas (insular cortex and nucleus accumbens) promotes either approach toward or avoidance of risk. Additionally, Dr. Brian Knutson (Stanford University) provides his comments on the functional role of the nucleus accumbens in a guest lecture.

Topic 8. Ancient Greek philosophers observed that we are fundamentally a social species. Indeed, the human brain has evolved to deal with complex social interactions. Day by day, we collectively analyze problems or situations and evaluate alternative courses of action within social groups. Game theory has proven useful in the investigation of the neural basis of social interactions and social decision-making. In particular, researchers have investigated what happens in the brains of subjects involved in games where each player can choose between cooperative and non-cooperative behaviors or between altruistic and selfish behaviors. Here we will apply game theory to studying the neural mechanism of decisions to cooperate or to defect. Mirror neurons mechanism of social interaction are introduced.

Topic 9. Neuroeconomics investigates the origins of human decision-making by examining whether similar choice biases are seen in nonhuman primates, our closest phylogenetic relatives. Comparative studies can identify shared versus human-unique tendencies in decision-making. Here we will compare animal and human decision-making mechanisms. Also the theory of biological markets is introduced. At the beginning of the lecture, students will discuss the ontogenetic origin of human cooperation.

## 5. Reading List

### Required

Kevin N. Ochsner and Stephen Kosslyn (eds) The Oxford Handbook of Cognitive Neuroscience, Volume 1: Core Topics. URL: <http://proxylibrary.hse.ru:2131/view/10.1093/oxfordhb/9780199988693.001.0001/oxfordhb-9780199988693?rskey=xecuCE&result=5>

Kevin N. Ochsner and Stephen Kosslyn (eds) The Oxford Handbook of Cognitive Neuroscience, Volume 2: The Cutting Edges. URL: <http://proxylibrary.hse.ru:2131/view/10.1093/oxfordhb/9780199988709.001.0001/oxfordhb-9780199988709?rskey=xecuCE&result=6>

### Optional

Joan Y. Chiao, Shu-Chen Li, Rebecca Seligman, and Robert Turner (eds) The Oxford Handbook of Social Neuroscience. URL: <http://proxylibrary.hse.ru:2131/view/10.1093/oxfordhb/9780199357376.001.0001/oxfordhb-9780199357376?rskey=xecuCE&result=1>

Jean Decety and John T. Cacioppo (eds) The Oxford Handbook of Social Neuroscience.  
URL:  
<http://proxylibrary.hse.ru:2131/view/10.1093/oxfordhb/9780195342161.001.0001/oxfordhb-9780195342161?rskey=xecuCE&result=2>

Mark S. Blumberg, John H. Freeman, and Scott R. Robinson (eds) Oxford Handbook of Developmental Behavioral Neuroscience. URL:  
<http://proxylibrary.hse.ru:2131/view/10.1093/oxfordhb/9780195314731.001.0001/oxfordhb-9780195314731?rskey=xecuCE&result=3>

## 6. Grading System

The teacher assesses the work of students in the classroom. When evaluating, homework is taken into account, and students take an on-site exam at the end of the course.

The resulting grade for the course work is assessed by the formula:

$$\text{Final grade} = 0.5 * O_{\text{exam}} + * O_{\text{accumulated}}$$

The accumulated grade is an average of an online tests taken by the student during online course completion. The exam grade is based on in-class written exam conducted by students later.

The way rounding estimates: arithmetic - to the whole. Numbers multiples of 0.5 are rounded up (in favor of the student).

## 7. Guidelines for Knowledge Assessment

Examples of exam tasks:

- Describe the diffuse drift model
- Describe the idea of brain stimulation and its application in neuroeconomics
- Describe the neurological basis of conflicting judgments.

## 8. Special Equipment and Software Support (if required)

Students are required to have an access to online-library of HSE, particularly to Oxford Handbooks Online electronic database.