ECON0106: **Microeconomics**

Choice and Game Theory

University College London

2024-25. Term 1

Contact Information: Duarte Gonçalves* (duarte.goncalves@ucl.ac.uk).
Office: Room 112, Drayton House. Office Hours: By appointment via email.

Meeting Times and Location:
Time: Monday 12:00-14:30 and Thursday 13:00-15:00.
Location: 222 Euston Road, room G01.

This term we will have 19 lectures:
September (1 lecture): 30.
October (9 lectures): 3, 7, 10, 14, 17, 21, 24, 28, and 31.
November (7 lectures): 4, 7, 11, [14 no lecture], 18, 21, 25, and 28.
December (3 lectures): 2, 5, [9 no lecture], and 12.

The lectures start on time. Please don't be late.

Teaching Assistant: William/Yanziyi Zhang (yanziyi.zhang.19@ucl.ac.uk).
Office Hours: TBA

Recitation: Thursday, 17:00-18:00. TBC

Description: ECON0106 is the core microeconomics course in the doctoral sequence in economics. Term 1 provides an introduction to the analysis of behaviour, both in individual choice contexts, as well as in settings of strategic interaction.
In the first half of the term, we will lay out the foundations for the analysis of choice and examine the behavioural implications underlying specific preference representations, which we will then connect with the study of consumer theory. We then turn to choice under risk and under uncertainty. During the second half of the term we will focus on modeling of behaviour of interacting agents.

Prerequisites: This is a graduate economics class intended for the first-year students of the doctoral program in Economics. This course pressuposes prior exposure to analysis in metric spaces and linear algebra (e.g., you should be familiar with the mathematical appendix of MWG – see reference below).

Course Materials: The course will be based on lecture notes, which I will make available online before or shortly after the corresponding lecture.

*How to pronounce my first name: 'doo art'.

A textbook that will be useful for the entire term (and beyond) is the following:

- (MWG) Mas-Colell, Whinston, and Green (1995). **Microeconomic Theory**.

For the first half of the term, covering choice theory, I will supply lecture notes for each topic. Useful textbooks are

- Rubinstein (2018). **Lecture Notes in Microeconomic Theory**.
- Kreps (2012). **Microeconomic Foundations I**.
- Kreps (1988). **Notes on the Theory of Choice**.
- Kreps (1990). **A Course in Microeconomic Theory**.

For the second half of the term, I will rely almost entirely on these excellent lecture notes

- Kartik. **Lecture Notes for 1st Year Ph.D. Game Theory**

which I will make available online (with Navin's permission). I will provide lecture notes for specific topics not covered there. Other materials you may want to consult (or at least be aware of) are

- Fudenberg, and Tirole (1991). **Game Theory**.
- Osborne, and Rubinstein (1994). **A Course in Game Theory**.
- Maschler, Solan, and Zamir (2013). **Game Theory**.

Grading: Your grade for this term will be given by the weighted average of three components: problem sets (30 pts), a written test (45 pts), and a written assignment (25 pts).

Problem Sets: There will be 10 problem sets for a total of 30 points (3 pts each), and with about 3 questions. The problem sets are posted every week and due the following Monday at the beginning of the lecture. The goal is that you have them back at most 2 weeks after handing them in. The problem sets will be marked on a check plus (100%) / check (75%) / check minus (50%) / zero (0%).

I expect most to have a check, some to have a check plus, and hope no one gets a check minus (much less a zero). Check pluses are given when everything is almost perfect and (up to minor issues) can almost be used as the solutions; i.e. 90-100%. A check means that everything is mostly correct, although it's not fantastic; this should capture 60-90%. A check minus is, say, a 40-60%. A zero is not cause for despair (it happens if you skip a problem set), but it is a sign that action is needed as something is not right in how you're tackling the material.

My hope is that you get three things out of the problem sets:

(i) You keep up with the material and get to understand the topics better.

(ii) You get to know your classmates and share the joys and pains of grad school together. Note that they are also the people you are most likely to co-author with.

(iii) Learn LaTeX.

You are *encouraged* to work with your classmates in solving them, but *you must type up and turn in your own answers*. You are not allowed to use AI-powered engines to solve the questions. All work is to be typed in LaTeX and you will need to submit both a .pdf file and the .tex files along all other raw files needed to compile the .pdf, if any (e.g., .bib files, images, preambles, etc).

Written Test: The test will be individual, in-person, during lecture time, on the 12th December. Details are to be determined and will be discussed at the beginning of the term.

Written Assignment: A fundamental part of research is being able to learn about related literature. The goal of this assignment is that you develop a survey of the literature on a topic in (micro)economic theory. This assignment is meant to foster your ability to search, summarise, and discuss the literature related to a topic.

The written assignment is individual, so everyone needs to choose a different topic. The expectation is that you are able to present the motivation behind the topic, summarise the main results and recent developments, and possibly discuss how to advance the literature — by highlighting gaps in the literature or by proposing how to use these results. You are naturally not expected to master all the related literature, but rather to find, present, and discuss some relevant literature. The survey should have *up to* 5 pages (1.5cm margin, 1.35 spacing, font 12) and is due on 23 December.

The assignment is mostly open-ended: its purpose is to get you started in thinking about how to use what you learn for your own research. You should find a topic related to class material that inspires you.

You will find a list of suggested topics here: (to be updated). `https://docs.google.com/spreadsheets/d/1nAjW5yn8MjVOzfoFSnDDzPzp47mstOP02rph7M2ypVg/edit?usp=sharing`. On the tab "Topics for Assignment" you have a list of suggested topics for the written assignment. Please write down your name next to the topic you would like to work on for the assignment. The assignment is first-come-first-served. If you prefer to work on a topic that is not listed, please sign up for office hours.

Regrading: Students have at most seven days after the problem set or exam has been graded and handed back to introduce a complaint regarding a grade. Requests for regrading must be sent to me via email and include (i) a copy of the entire assignment, (ii) your answers, and (iii) a .pdf document (typed up) where you explain why you are asking for the assignment to be regraded. If I find the request to be well-motivated, the entire assignment will be regraded,

which may result in an overall higher or lower grade.

Class Policies:

– Ask questions, google, work together with to your colleagues, browse wikipedia and stack exchange, come to office hours, read other books/papers.

– Come to class prepared (and willing) to participate.

– Show your work (derivations) and cite your sources. Do not plagiarise; do not cheat.

– Using mobile phones in the classroom is not allowed.

– You can (and I would encourage you to) use a tablet to take notes, and nothing else.

– While it will be allowed, please avoid using a laptop to take notes during the class as it is very distracting for your colleagues.

– Respect your classmates and instructor by limiting yourself to class-related activities.

– Try to be on time.

Why Economic Theory? Economic theory provides you with tools that enable you to develop models. We need models to

– Explain puzzling phenomena: what is the mechanism driving a particular regularity?

– Make predictions: if we observe a change in the environment, how will agents react?

– Develop counterfactual analysis: what would the effect of a given policy be?

When developing new models, these ocasionally led to discovering new regularities (that are then tested). Which leads to another purpose of theory: determining the whether a model is a good approximation of reality, that is, whether is captures the relevant features of the environment they are meant to describe. Namely,

– Identifying models: e.g., can we recover the model from observable data?

– Derive testable implications: e.g., is the model falsified by existing data?

This is then used in empirical research to obtain identification restrictions that you can use in empirical analysis, as well as with a structure that you can estimate from the data to do counterfactuals.

A good command of theory is important regardless of your field of specialisation. The first year in the doctoral programme is likely the time where you will have the last broad exposure before becoming an expert in a particular topic.[†] You should take this opportunity to learn as

[†]I would strongly suggest taking other economic theory courses and keeping up-to-date with the frontier in the field: there is abundant evidence on the sizeable returns to taking a novel theoretical approach/model/concept/tool to a particular setting or to the data (in IO, macro, health, labour, education, political economy, trade, etc).

much and as best as you can.

Course Outline:

1. **Choice, Preferences, Utility**: Choice to Preferences, α, β, WARP, Choice/Preferences to Utility
2. **Structural Properties of Preferences and Utility Representations**: Continuity and Debreu's Theorem, Monotonicity, Convexity, Separability, Homotheticity, Quasi-linearity
3. **Optimal Choice and Consumer Theory**: Utility Maximisation Problem, Correspondences, Expenditure Minimisation Problem, Afriat's Theorem
4. **Monotone Comparative Statics of Individual Choices**: Lattices and Strong Set Order, (Quasi)supermodularity, Strong Monotone Comparative Statics
5. **Expected Utility**: von-Neumann–Morgenstern Representation Theorem
6. **Risk Attitudes**: Risk Aversion, Arrow-Pratt Measure, CARA, DARA, Examples
7. **Stochastic Orders**: FOSD, Likelihood Ratio Order, SOSD, Mean-preserving spreads
8. **Uncertainty**: Subjective Expected Utility, Bayesian Updating, Uncertainty Aversion
9. **Stochastic Choice**: Random Utility and Discrete Choice, Luce's Model
10. **Dominance and Rationalisability**: Primitives of Normal-Form games, Strict and Weak dominance, Iterated Elimination of Dominated Strategies, Rationalisability, Examples and Applications, Level-k
11. **Nash Equilibrium**: Definition, Existence, Interpretation, Examples, Robustness, Correlated Equilibrium
12. **Games of Incomplete Information**: Bayesian-Nash Equilibrium, Purification, Envelope Theorem(s), Auctions, Global Games
13. **Monotone Comparative Statics in Games**: Tarski Fixed-Point Theorem, Weak Set Order, LCKK Fixed-Point Theorem, Monotone Comparative Statics on Fixed Points, Applications to Games with Strategic Complementarities
14. **Extensive-Form Games and Equilibrium Refinements**: Primitives of normal- and extensive-form games, Kuhn's Theorem, Backward Induction, Subgame Perfection, Applications, (Weak) Perfect Bayesian Equilibrium, Sequential Equilibrium, Examples
15. **Repeated Games**: Finitely Repeated Games, One-Shot Deviation Principle, Folk Theorem(s), Connection to Dynamic Choice and Dynamic Programming, Examples

The course outline is provisional and will depend on how quickly we cover the topics listed; I may skim or skip some of the topics.