

MATHEMATICAL ECONOMICS

ARKADI PREDTETCHINSKI (UM)

Aims/Description

This course covers elements of General Equilibrium Theory and Cooperative Games. A small number of fundamental results in this area will be studied in some detail. The aim of the course is to become familiar with some of the mathematics routinely used in modern Economics.

Credits

6 ECTS.

Time Schedule

See NAKE course program: Blocks 1 and 2. There will be 10 lectures of 2 hours each.

Examination

Oral exam.

Course program

Topic I. *The core and equilibrium.* The fuzzy core. The core–equilibrium equivalence result of Debreu and Scarf.

Topic II. *Balancedness and core.* Bondareva–Shapley balancedness for TU–games. Scarf balancedness for NTU–games. Non–emptiness of the core of an economy.

Topic III. *Correspondences. The properties of excess demand.* Upper and lower hemi–continuity of correspondences. Berge’s maximum principle. Excess demand of an economy and its basic properties.

Topic IV. *Existence of equilibrium.* The fixed point theorems of Brouwer and Kakutani. Existence of Walrasian equilibrium.

Topic V. *Regular economies.* The Inverse Function theorem, the Implicit Function theorem, the Transversality theorem. Regularity and local uniqueness of equilibria.

Literature

Survey articles and books

W. Hildenbrand and A.P. Kirman: Equilibrium analysis. North Holland, 1988.

A. Mas-Colell: The Theory of General Economic Equilibrium: A Differential Approach. Cambridge: Cambridge University Press, 1985.

Handbook of Mathematical Economics, K.J. Arrow and M.D. Intriligator, Editors, K.J. Arrow and M.D. Intriligator.

- Chapter 15 (Volume II). G. Debreu: Existence of competitive equilibrium.
- Chapter 17 (Volume II). E. Dierker: Regular economies.
- Chapter 18 (Volume II). W. Hildenbrandt: Core of an economy.

Handbook of Game Theory with Economic Applications, R.J. Aumann and S. Hart, Editors, North-Holland, Amsterdam, 1992.

- Chapter 12 (Volume I). Y. Kannai, The core and balancedness.

Original articles

1. J.-P. Aubin: “Cooperative fuzzy games,” *Mathematics of Operations Research*, **1**: 1–13, 1981.
2. R.J. Aumann: “The core of a cooperative game without side payments,” *Transactions of American Mathematical Society*, **98**, 539–552, 1961.
3. G. Debreu: “Economies with a finite set of equilibria”, *Econometrica*, **38**, 387-392, 1970.
4. G. Debreu and H. Scarf: “A limit theorem on the core of the economy,” *International Economic Review*, **4**: 235–246, 1963.
5. E. Dierker: “Two Remarks on the number of equilibria of an economy,” *Econometrica*, **40**: 951–953, 1972.
6. L.S. Shapley: “On balanced sets and cores,” *Naval Research Logistics Quarterly* **14**: 453-460, 1967.
7. H. Scarf: “The core of an n -person game,” *Econometrica*, **35**: 50-69, 1967.