I. Topology in Rn
   1. Inner product, norm, metric.
   2. Sequences and limits.
   3. Open, closed and bounded sets.
   4. Continuous and differentiable functions.
   5. Separation theorems.

II. Metric spaces
   1. Metrics and norms.
   2. Sequences and limits.
   3. Cauchy sequences.

III. Parametric optimization problems
   1. Continuity of correspondences.
   2. The Theorem of the Maximum.
   3. Supermodularity and parametric monotonicity.
   4. Applications.

IV. Fixed point theorems
   1. Theorems of Brower and Kakutani.
   2. Theorem of Banach.
   3. Applications.

The course has four parts that we describe below.

(I) "Topology in Rn" is a brief review of the main concepts and properties of the Euclidean space, including open and closed sets, compact sets, sequences, limits, continuity and differentiability of functions, and separation of convex sets;
(II) "Metric Spaces" generalize topological concepts of the Euclidean space to arbitrary sets endowed with a metric, with the objective of understanding Theorem of Banach for contraction mappings;
(III) "Parametric optimization problems" studies parametric continuity and parametric monotonicity of solutions of optimization problems.
(IV) “Fixed point theorems” analyzes the theorems of Brower and Kakutani for functions and correspondences, respectively and the Theorem of Banach for contraction mappings in complete metric spaces.

In parts (II), (III) and (IV), several applications to economic problems are given, as the existence of Nash equilibria in noncooperative games, consumer theory, or the existence of equilibria in a pure exchange economy.

Bibliography

Assessment System: Based in individual homeworks (20%), a mid-term (40%) and a final (40%).
Instructor: Juan Pablo Rincón-Zapatero. Office 15.2.38. jrincon@eco.uc3m.es
TA: