International Doctorate in Economic Analysis (IDEA)
Course Outline: Maths Intensive Course
3-7 September, 2007

Instructor: Markus Kinateder, email: mkinateder@idea.uab.es

Placement Test: Monday, September 3rd, ca. 10:30-12:30, Seminar Room.

Schedule: Monday 15:30-17:30; Tuesday to Friday 10:00-13:00; Tuesday and Thursday 14:00-16:00, Room: tba.

Syllabus:

- *(Preliminaries)* Elements of Set Theory; De Morgan Laws; Functions; Restrictions of functions; Image and preimage of a set; Injective, surjective, and bijective functions; Inverse function.
- *(Euclidean Space)* Euclidean Norm and Metric; Open and Closed Sets; Compactness; Heine-Borel Theorem.
- *(Limits and Continuity)* Limit of a function $f : D \subset \mathbb{R}^n \to \mathbb{R}^m$: definition and properties; L'Hôpital's rule; Directional limits; Continuity of a function $f : D \subset \mathbb{R}^n \to \mathbb{R}^m$: definition and properties; Composite function theorem.
- *(Differentiability)* Motivation: a "good" approximation by an affine function; Directional derivatives; Partial derivatives; Differentiability of a function $f : D \subset \mathbb{R}^n \to \mathbb{R}^m$: definition and properties; Differentiability and continuity; C^n class of functions; Chain Rule; Higher order derivatives; Schwarz theorem.
- *(Eigenvalues and Eigenvectors)* Systems of linear equations; Differential and difference equations; Real distinct eigenvalues: diagonalization of matrices; Real repeated eigenvalues: generalized eigenvectors, Jordan canonical form, solving nondiagonalizable difference equations; Symmetric matrices; Definiteness of the quadratic forms.

References:

- Simon, Carl P. and Lawrence Blume (1994), "*Mathematics for Economists*", New York: W.W.Norton and Company Inc.
- de la Fuente, Angel (2000), "*Mathematical Methods and Models for Economists*", Cambridge University Press.
- Munkres, James R. (1975), "*Topology. A First Course*", Englewood Cliffs, New Jersey: Prentice-Hall.
- Greene, William H. (2000), "*Econometric Analysis*", Upper Saddle River, New Jersey: Prentice-Hall. (Chapter 2: *Matrix Algebra*).