

## PhD in Statistics

Functional Analysis – Academic year 2013

G. TREU

### *Prerequisite*

Sequences of real numbers: limit of a sequence, Cauchy sequences, subsequences. Series of real numbers: convergence and convergence criteria. Differential and Integral Calculus in  $\mathbb{R}$  and in  $\mathbb{R}^n$ .

### *Syllabus*

Convergence notions for sequences of functions. Functions series: power series, Taylor series, Fourier series.

Measure theory: Caratheodory construction of a measure. Examples: the Lebesgue measure, the Lebesgue-Stieltjes measure, probability measures in continuous and discrete spaces. The definition of integral in a measure space. In particular: the Lebesgue integral.

Functions spaces  $C^k$ ,  $L^p$ ,  $W^{1,p}$ : definitions and basic properties. Hilbert spaces: definitions and basic results. The space  $L^2$ .

### *Course schedule*

Thursday 10/01, 9.00-12.00

Thursday 17/01, 9.00-12.00

Thursday 24/01, 9.00-12.00

Thursday 31/01, 9.00-12.00

Thursday 14/02, 9.00-12.00

Thursday 21/02, 9.00-12.00

Thursday 28/02, 9.00-12.00

Some seminars will be scheduled during the course.

*References*

Fusco, Marcellini, Sbordone, *Analisi Matematica 2*, Liguori

Kreyszig, *Introductory functional analysis with applications*, Wiley

Friedman, *Foundations of modern Analysis*, Dover

Brezis, *Analisi Funzionale*, Liguori

Rudin, *Real and complex analysis*, Mc Graw-Hill

Rudin, *Functional Analysis*, Mc Graw-Hill