

# Numerical methods for ill-posed problems

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**Timetable:** 16 hrs. Lectures on September 2012 (see the calendar), 8 hrs in Room 2BC/30 and 8 hrs. in Numlab Laboratory, Torre Archimede.

**Course requirements:** numerical linear algebra. In particular, singular value decomposition and iterative methods.

**Examination and grading:** Project on a specific method.

**SSD:** MAT/08 Numerical Analysis

**Aim:** The course will begin with a quick introduction to ill-posed problems. Regularization methods and parameter choice methods are discussed. An application to image deblurring problems is presented in detail and some numerical experiments are proposed.

## Course contents:

- Ill-posed problems: definition and examples.
- Direct methods: truncated SVD and Tikhonov method.
- Iterative methods: Landweber method, CGLS, iterated Tikhonov.
- Parameter choice methods: generalized cross validation (GCV), discrepancy principle, and L-curve.
- Fast Fourier transform (FFT) and discrete cosine transform.
- Image deblurring.
- Some numerical experiments with Matlab.