LTCC Advance Course
Title: Inverse Problems

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Basic Details:

- Core Audience: pure and applied

- Course Format: advanced/optional (10 h at 2 hours per week)

Course Description:

- Overview:

The primary goal of the course is to give an introduction to the mathematical theory of inverse problems. We concentrate mainly on the 1-dimensional inverse problem having in mind, however, multidimensional inverse problems. Therefore, out of a variety of methods applicable for the 1-dimensional inverse problems, we choose for this course the Boundary Control (BC) method which may be generalized to (and was actually developed for) the multidimensional inverse problems. If time permits, we would considers the basis of the complex geometric optics approach which is genuinely multidimensional (and is not applicable to the 1-dimensional inverse problems).

Topics:

1. 1-dimensional inhomogeneous wave equation;
2. Controllability and projectors;
3. Gaussian beams;
4. Inverse problem for the 1-dimensional wave equation;
5. Complex geometric optics approach.

- Prerequisites: Background in calculus, including some basic knowledge of partial differential equations (homogeneous wave/string equation, Laplace equation)

Some experience with analysis would be useful.

Literature

–Katchalov, A.; Kurylev, Y. Lassas, M. Inverse boundary spectral problems. Chapman and Hall/CRC Monographs and Surveys in Pure and Applied Mathematics, 123. Chapman and Hall/CRC, Boca Raton, FL, 2001. xx+290 pp.

– Isakov, V. Inverse problems for partial differential equations. Second edition. Applied Mathematical Sciences, 127. Springer, New York, 2006. xiv+344 pp

– Kirsch, A. An introduction to the mathematical theory of inverse problems. Applied Mathematical Sciences, 120. Springer-Verlag, New York, 1996. x+282 pp