

Variational methods in quasiconformal geometry and nonlinear elasticity, spring 2012

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Lecturer

[Tadeusz Iwaniec](#)

Scope

5 cu.

Type

Advanced studies

The course is about Sobolev mappings between domains in the Euclidean n -space which satisfy certain nonlinear partial differential equations (PDEs). They appear in Geometric Function Theory (GFT) as quasiconformal mappings and as mappings of finite distortion. In materials science, on the other hand, such mappings are studied as deformations of elastic bodies. Both theories are governed by the energy functionals defined on a class of Sobolev mappings, predominantly homeomorphisms. The central issues are about existence, uniqueness and regularity of the energy-minimal deformations, also about the associated phenomena such as occurrence of cracks and fractures. Understanding the topological curiosities of cracks seems to be worth the effort of developing this subject into a viable theory. Theoretical prediction of failure of bodies caused by cracks and fractures is a good motivation that should appeal to mathematical analysts and researchers in the engineering fields.

Moral of the Lectures. If one dark rainy night you find yourself in the midst of Sobolev Mappings, Nonlinear PDEs and Variational Integrals, then you should remind yourself that you may cleverly exploit the ideas and methods of **Quasiconformal Geometry** and thereby see the light.

"Every block of stone has a statue inside it and it is the task of the sculptor to discover it."

Michelangelo di Lodovico Buonarroti Simoni

Heart-felt welcome to everybody

Tadeusz Iwaniec

FiDiPro, Helsinki University

Prerequisites

I will assume basic knowledge of measure theory, integration, analytic functions and some functional analysis.

To make these lectures available to students whose mathematical knowledge may be limited, every effort will be made to reduce to a minimum the technical details and mathematical requirements. No prior exposure to these topics is assumed.

Lectures

Weeks 3-9 and 11-18, Friday 12-14 in room C123. The first lecture is on Friday the 20th of January.

Easter holiday 5.4.-11.4.

Exams

There will be no exams or exercise sessions held. Instead, students will be evaluated based on their participation on the lectures. You are invited to pursue the exercises given occasionally during the course.

Bibliography

Notes will be provided during the course.

Registration at the first lecture.