ICTP DIPLOMA PROGRAMME IN MATHEMATICS 2015-16

Partial Differential Equations

G. Bellettini (10 lectures : 15 hrs)

Lecture 1, 6/4/2016.
Divergence theorem.
Dirichlet principle. Harmonic functions. Examples.

Lecture 2, 7/4/2016.
Fundamental solution of the laplacian.
Green's identity.

Lecture 3, 8/4/2016.
Surface mean values formula for harmonic functions.
Volume mean values formula for harmonic functions.

Lecture 4, 12/4/2016.
Volume mean value formula. The gradient estimate for harmonic functions.

Lecture 5, 13/4/2016.
Estimates of all derivatives. Analiticity of harmonic functions.
Limits of harmonic functions: the closure and the compactness theorem for harmonic functions.

Lecture 6, 14/4/2016.
Volume mean value formula for sub/super harmonic functions.
The weak maximum/minimum principles for sub/super harmonic functions.
The strong maximum/minimum principles for sub/super harmonic functions.
The strong loca maximum/minimum principles for harmonic functions.
The weak comparison principle.

Lecture 7, 20/4/2016.
Existence of minimizers of Dirichlet problem in Lip_k.
Super/sub minima.

Lecture 8, 21/4/2016.
Comparison principle for sub/super minimizers.
Exercise.

Lecture 9, 22/4/2016.
Existence of minimizers in Lip.

Lecture 10, 27/4/2016.
Poisson formula for the ball.