

Singular limits for Ginzburg-Landau equations

Prof. Giandomenico Orlandi¹, Prof. Matteo Novaga²

¹ *Università di Verona*

Dipartimento di Informatica

Email: Giandomenico.Orlandi@univr.it

² *Università di Padova*

Dipartimento di Matematica Pura ed Applicata

Email: novaga@math.unipd.it

Timetable: 20 hours. Class meets on Wednesday and Friday from 10:30 to 12:30. Room 2BC/30, Torre Archimede. The first lecture will be on Wednesday, April 27, 2011.

Course requirements: Basic knowledge of Functional Analysis and Measure Theory

Examination and grading: Oral exam, seminars

SSD: MAT/05 Mathematical Analysis

Aim: The course will focus on some mathematical aspect of Ginzburg-Landau models, which are commonly used in Physics and Materials science. More specifically, there will be discussed the relation between the singular limits of these models and some (stationary and evolutionary) geometric problem. Particular attention will be paid to the techniques of Calculus of Variations and Geometric Measure Theory required in the analysis of the corresponding partial differential equations

Course contents:

- Minimal surfaces: area functional, first variation, monotonicity formula
- BV functions and finite perimeter sets
- Densities, rectifiable sets and varifolds
- Mean curvature flow: classical and weak formulations
- Gamma-convergence: the Modica-Mortola functional
- Compactness and Gamma-convergence for Ginzburg-Landau functionals
- Analysis of the elliptic and parabolic Ginzburg-Landau equations
- Nonlinear wave equations and Lorentzian minimal surfaces