



CORSO DI DOTTORATO

16 MAGGIO 2022 – 09 GIUGNO 2022

- **SPEAKERS**

Carlo Mercuri (Swansea University)

Riccardo Molle (Universita' di Roma "Tor Vergata")

TITLE: On some classes of nonlinear and nonlocal elliptic PDEs on \mathbb{R}^N

ABSTRACT

This is an introductory course to the language, concepts, and methods for nonlinear PDEs in unbounded domains. We will review classical approaches mainly based on the direct method of the Calculus of Variations, to study some classes of nonlinear elliptic PDEs on \mathbb{R}^N . We will mainly consider two 'toy problems': the Choquard equation, and the nonlinear Schrödinger-Poisson-Slater equation. Although these equations share some features, such as non-linearity and nonlocality, they require a separate analysis. Emphasis will be given to the variational formulation of these equations, to their functional setting and relevant compactness properties. Known results will be discussed, as well as suggestions for new research projects in this area.

The first part of the course will be devoted to some basic concepts of the variational approach to nonlinear analysis, based on extending Calculus to infinite dimensional Banach spaces. Some elementary tools in critical point theory will be introduced, such as the Lagrange multipliers rule and the Mountain Pass Theorem. These can help identify nontrivial solutions to PDEs, characterised in terms of 'energy levels'. Some exercises will be discussed, as a preparation to the second part of the course. Students who already know these tools can skip this part and attend directly the second part of the course. We will give a more detailed description of the program later.



SCHEDULE

- *) Lunedì' 16 maggio 11-13 Aula DAL PASSO Carlo Mercuri -
Lezione introduttiva -
- *) Mercoledì' 18 maggio 16-18 Aula D'Antoni Riccardo Molle
- *) Venerdì' 20 maggio 16-18 Aula D'Antoni Riccardo Molle
- *) Lunedì' 23 maggio 16-18 Aula D'Antoni Riccardo Molle
- *) Mercoledì' 25 maggio 16-18 Aula D'Antoni Riccardo Molle
- *) Venerdì' 27 maggio 16-18 Aula D'Antoni Riccardo Molle
- *) Martedì' 31 maggio 11-13 Aula DAL PASSO Carlo Mercuri
- *) Venerdì' 3 giugno 11-13 Aula DAL PASSO Carlo Mercuri
- *) Martedì' 7 giugno 14-16 Aula DAL PASSO Carlo Mercuri
- *) Giovedì' 9 giugno 14-16 Aula DAL PASSO Carlo Mercuri

NOTA: *Da indicare sulla pagina web del corso che gli orari sono modificabili in base alle esigenze degli studenti interessati, compatibilmente con la disponibilità delle aule.*