

**Alessandro Giuliani**  
University Roma Tre

***Renormalization Group and Critical Phenomena in  
Statistical Mechanics***

Dates: 20h in Jan-Feb 2024.

Period: 2024.01.09 - 2024.02.16

Schedule:

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**January:**

09 Room M6

12 Room M6

19 Room M6

23 Room M6

26 Room M6

**February:**

02 Room M6

**06 Room M4** -> Largo Lungo Tevere Dante n. 376, from 9:00 to 11:00

09 Room M6

**13 Room M4** -> Largo Lungo Tevere Dante n. 376, from 9:00 to 11:00

16 Room M6

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Where: University Roma Tre - Aula M6

- with the exception of february 06 and 13, in M4,  
Largo Lungo Tevere Dante n. 376, from 9:00 to 11:00

## Abstract

The goal of the course is to provide an introduction to perturbative Renormalization Group in the context of  $\phi^4_d$  scalar field models in dimensions  $d \geq 4$ . We will discuss the notions of: scaling dimensions; relevant, marginal and irrelevant operators; effective potentials; flow equation and beta function. We will show that the quartic interaction is irrelevant in dimensions  $d \geq 5$  and marginal with negative beta function (sometimes called 'marginally irrelevant'), in dimension  $d=4$ . Time permitting, we will discuss the definition and construction of the non-trivial fixed point for the  $\phi^4_d$  model in dimension  $d=4-\epsilon$  (Wilson-Fisher fixed point).