**PhD Physics course at Bari University (XXXII Cycle)**

|  |  |
| --- | --- |
| **Title** | Renormalization of field theories and the Renormalization Group |
| **Proponent** | Fulvia De Fazio  Senior Researcher  INFN Sezione di Bari |
| **# CFU**  **(1 CFU = 8 hours)** | 2 CFU (16 hours) |
| **Schedule** | To be agreed with the students on the basis of the other chosen courses |
| **Brief Summary of the course** | Renormalization of field theories will be treated in detail.  The preliminary step of isolating divergences in the calculation of Feynman diagrams will be afforded through the dimensional regularization method.  Interactions will be classified into renormalizable or not after the introduction of the concept of superficial degree of divergence for Feynman diagrams.  Renormalization group functions and equations will be studied, in particular considering the behaviour of the solutions of the latter and the relation to asymptotic freedom in gauge theories. Reference to QED and QCD will be done throughout the whole course. |
| **Programme** | Introductory steps  Dimensional regularization  Renormalizable Interactions  Ward-Takayashi identities  Renormalization and symmetry  Slavnov-Taylor identities  Renormalization Group (RG)  RG equations in the MSbar scheme  Solution of the ‘t Hooft Weinberg equation  Beta function and asymptotic freedom  Anomalous dimensions |
| **Recommended texts** | Peskin and Schroeder - Introduction to Quantum Field Theory  T. Muta – Foundations of Quantum Chromodynamics |
| **Assessment methods** | Interview at the end of the course. |