SSM
Scuola Superiore Meridionale

Course title:

Quantum Field Theory on Curved Spaces

Duration [number of hours]**: 12**

PhD Program [MERC/MPS/SPACE]**: SPACE**

Name and Contact details of unit organizer:

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Course Description [max 150 words]**:**

The laws of nature are written in the language of Quantum Field Theory. From Quantum ElectroDynamics (QED) to the Standard Model, all forces of nature are formulated in this powerful language which unifies Lorentz symmetry and Quantum Mechanics. While most of these theories are formulated on Minkowski space, our universe has a non-vanishing cosmological constant or underwent an exponentially fast expansion called "Inflation". In this course we will introduce the basic tools to understand Quantum Fields on curved backgrounds, from canonical quantisation and path integral to Black Holes and Inflation, arriving to the most modern developments which are centered around the "Holographic Principle".

Syllabus:

1. Introduction to Quantum Field Theory
2. Path Integral Quantisation
3. Rindler Space & Unruh Temperature
4. Quantum Fields and Black Holes: Black Hole Information Paradox
5. Quantum Fields and Inflation
6. Holographic principle

Assessment:

Homework Problems

Suggested reading and online resources:

1. Lectures notes
2. "Quantum Fields in Curved Spaces", N. D. Birrel & P. C. W. Davis, Cambridge University Press
3. "TASI Lecture on Inflation", D. Baumann, arXiv:0907.5424