ESI Erwin Schrödinger International Institute for Mathematics and Physics

universität wien

DVR 0065528

ESI SENIOR RESEARCH FELLOW LECTURE COURSE
Winter Term 2022/23

The Erwin Schrödinger International Institute for Mathematics and Physics (ESI) of the University of Vienna offers the following Lecture Course held by a Senior Research Fellow in residence during the Winter Term 2022/23:

Introduction to Non-commutative Geometry
John Barrett (U of Nottingham)

Lecture Course (260024 VU): October 3 - 24, 2022
Time: 14:00 - 15:30
Start: Monday, October 3, 2022
Further dates: Every Monday and Wednesday
Last Lecture: Monday, October 24, 2022

Venue: Erwin Schrödinger Institute, Schrödinger Lecture Hall

Abstract:
The course describes the spectral triple approach to non-commutative geometry and its use in high-energy physics. It describes the mathematical formalism of spectral triples, some simple examples, and their use in the description of the standard model of particle physics. The second part of the course focusses on an approach to quantum gravity based on integration over the data of a spectral triple.

Content of the lecture course:
The following topics will be covered: Manifolds as commutative spectral triples. Fuzzy spaces as non-commutative geometries. The non-commutative formalism for spectral triples. Simple examples of NC spectral triples such as the fuzzy sphere and the fuzzy torus. The internal space of the standard model of particle physics as a non-commutative geometry. Products of spectral triples and the almost-commutative models for particle physics; quantum topics such as fermion doubling and the relation between Lorentzian and Euclidean formalisms. Integrals over finite spectral triples, numerical and analytic results. The relation to quantum gravity.

Aims for the course:
The course will introduce the spectral triple description of geometry based on the Dirac operator. It is explained how it can be generalised to non-commutative geometry in a way that captures some of known structure of high-energy physics. The course will then outline an approach to quantum geometry that uses non-commutative spectral triples.

For more information please visit the ESI website: https://www.esi.ac.at/events/e473/

Christoph Dellago
Director