Title: Quantitative Index Theory, Scalar Curvature and Mathematical Physics

Course Description: Index theory studies the solutions to differential equations on geometric spaces, their relation to the underlying geometry and topology, and applications to physics.
If the space of solutions is infinite dimensional, it becomes necessary to generalise the classical Fredholm index using tools from the K-theory of operator algebras.
This leads to higher index theory, a rapidly developing subject with connections to noncommutative geometry, large-scale geometry, manifold topology and geometry, operator algebras, and mathematical physics. The purpose of this course is to introduce students to the basic techniques of quantitative index theory
and its applications to quantitative behavior of scalar curvature in geometry and general relativity in mathematical physics. This course will be
be self-contained.

Avg Amount of Time Dedicated Per Week: 5-10 hours