Syllabus

MA822–Topics in Geometry and Topology – Spring 2008
Atiyah-Singer Index Theory in Commutative and Noncommutative Geometry

Time: TR 9:30-11
Instructor: Steve Rosenberg
Office Hours: W 11-1, 2-3 or by appointment in MCS248
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This course will cover the Atiyah-Singer index theorem and its generalizations to noncommutative geometry. The first part of the course will cover the standard AS index theorem. We’ll discuss the classical examples (Gauss-Bonnet theorem, Hirzebruch-Riemann-Roch theorem, Hirzebruch signature theorem, A-genus), and cover enough of Hodge theory, characteristic classes, and heat flow methods to sketch a convincing proof. The second part of the course will cover elements of noncommutative geometry, focusing on the concepts of cyclic cohomology, spectral triples, and the Connes-Moscovici local index theorem. As a test case of our understanding of the material, let’s try to see that the Connes-Moscovici theorem generalizes the Atiyah-Singer theorem.