1077-19-403 **Paul Frank Baum*** (`baum@math.psu.edu`). *K-homology and index theory : Beyond ellipticity.*
This talk will indicate how K-homology can be used to extend the Atiyah-Singer index formula to a naturally arising class of non-elliptic operators. K-homology is the dual theory to K-theory — i.e. K-homology is the homology theory determined by the Bott K-theory spectrum. For a finite CW complex X, the K-homology of X can be defined via functional analysis and this gives the Kasparov groups $KK^*(C(X),\mathbb{C})$. A definition in the spirit of bordism theory uses K-cycles (M,E,φ) where M is a compact Spin^c manifold without boundary, E is a $\mathbb{C}$ vector bundle on M, and φ is a continuous map from M to X.

$$\varphi\colon M \longrightarrow X$$

Denote the K-cycle version of K-homology by $K_*^{top}(X)$. The BD(Baum-Douglas) isomorphism

$$\mu\colon K_*^{top}(X) \longrightarrow KK^*(C(X),\mathbb{C})$$

provides a framework for extending Atiyah-Singer beyond elliptic operators. The talk will first give the basic definitions, and will then show how the BD framework applies to a naturally arising class of hypoelliptic (but not elliptic) operators on contact manifolds. The above is joint work with Erik van Erp. (Received August 29, 2011)