GROUPS AND REPRESENTATIONS II (SPRING 2007):
SYLLABUS

• Survey and history of representation theory; generalities about quantization and representation theory
• Characters and generalities about representation theory of finite groups
• Review of Fourier analysis, representations of abelian groups
• Representations of compact Lie groups
  – Peter-Weyl theorem
  – Maximal tori, review of roots and weights
  – Weyl integral formula, character formula and dimension formula
  – Topology and geometry of G/T
  – Borel and Parabolic Subgroups, flag manifolds
  – Induced representations and Frobenius reciprocity
  – Borel-Weil theorem
  – Examples, representations on homogeneous polynomials
  – Applications of SU(2) and SU(3) representations in physics
• Hamiltonian mechanics, symplectic geometry, geometric quantization and the orbit method
• Projective representations
• The Spinor Representation
  – Spin(2n) as a double cover of SO(2n)
  – The Clifford Algebra, Canonical Anticommutation Relations
• The Metaplectic Representation
  – The Heisenberg algebra and group, Canonical Commutation Relations
  – Stone-von Neumann Theorem.
  – The Metaplectic double cover of Sp(2n) and the Metaplectic Representation
  – Theta functions
• Correspondence between representations of GL(n) and Sn
• Other possible topics
  – The Borel-Weil-Bott theorem
  – Kac Moody algebras, the Virasoro algebra and their highest weight representations