

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 S_n
- Other possible topics
 - The Borel-Weil-Bott theorem
 - Kac Moody algebras, the Virasoro algebra and their highest weight representations