University of Oregon
Department of Mathematics

Moursund 2010 Lectures

April 20th – 22nd, 2010

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A tea will precede each lecture at 3:30 p.m. in 219 Fenton

Lecture 1: *Topology of quasi-projective varieties*
4:00 p.m., Tuesday, April 20th, 2010 in 100 Willamette Hall

Alexander polynomial is a classical invariant in knot theory but its construction is group theoretical and as such it can be used to study the groups coming up in algebraic geometry as well. The purpose of these lectures is to describe generalizations of Alexander polynomials and their relation to other algebrao-geometric ob jects and constructions. In the first talk I will discuss several classical problems related to the study of Alexander invariants which include singularities of plane curves and hypersurfaces, characterization of fundamental groups of Kahler, pro jective and quasi-pro jective manifolds, methods for calculation of the fundamental groups of the complements to plane curves, complements to arrangements and their symplectic analogs.

Lecture 2: *Lefschetz methods in topology of algebraic varieties and theory of Alexander invariants*
4:00 p.m., Wednesday, April 21st, 2010 in 125 McKenzie Hall

This lecture describes results which one can obtain using soft Morse theoretical methods including restrictions on the Alexander invariants of the complements to singular divisors in terms of local data and commutativity of the fundamental groups. I also describe relation between Alexander invariants and moduli spaces of ranks one local systems as well as structure results for the latter.

Lecture 3: *Hodge theoretical methods for the study of Alexander invariants*
4:00 p.m., Thursday, April 22nd, 2010 in 282 Lillis Hall

Deligne's theory of differential equations with regular singularities and mixed Hodge theory lead to a structure theorem for the jumping loci of Hodge groups of local systems which eventually allows to calculate Alexander invariants and obtain characterization of Alexander invariants in some cases. I will discuss connection with the study of multiplier ideals and log-canonical thresholds allowing to clarify the structure of Alexander invariants. Application to topology of arrangements of hyperplanes and Bernstein-Sato polynomials and ideals will be discussed.