Let $G$ be a compact Lie group acting on a topological space $M$. For the topologists, the equivariant cohomology of $M$ is defined to be the ordinary cohomology of the space $(M \times E)/G$, where $E$ is any contractible topological space on which $G$ acts freely. (This definition does not depend on the choice of $E$.)

The notion of equivariant cohomology plays an important role in symplectic geometry, algebraic geometry, representation theory and other areas of mathematics.

If $M$ is a finite-dimensional manifold there is an alternative way of defining the equivariant cohomology groups of $M$ involving de Rham theory.

We will prove the Berline-Vergne localization formula (which is a generalization of the Duistermaat-Heckman Theorem) expressing integrals of equivariant forms as sums over fixed points.

Other topics in class may include equivariant vector bundles and equivariant characteristic classes, Goresky-Kottwitz-MacPherson Theorem (GKM Theory), Guillemin-Sternberg supersymmetry formalism and a proof that the twisted de Rham complex indeed computes equivariant cohomology.

References

