

## Hanh Duc Do's Syllabus

**Committee: Prof. M. Zworski (Chair)**

**Prof. M. Rieffel**

**Prof. A. Weinstein**

**Prof. O. Ganor**

### **Symplectic and Poisson Geometry (Geometry)**

1. Symplectic Manifolds and Symplectomorphisms
2. Cotangent Bundle
3. Lagrangian Submanifold and Method of Generating Functions.
4. Local Form, Moser Trick and Darboux-Moser-Weinstein Theory
5. Almost Complex Structure and Kahler Manifold.
6. Hamiltonian Mechanics,
7. Moment Maps, Coadjoint Action and symplectic structure.
8. Symplectic Reduction and Delzant theory
9. Splitting Theorem and Structure of Poisson Manifolds.
10. Poisson Cohomology, Morita Equivalence of Poisson Manifolds.
11. Orbit Method and Geometric quantization.

**Ref:** Ana da Silva: Lecture on symplectic Geometry

Ana da Silva and A. Weinstein: Geometric Models for Noncommutative Algebras

A.A. Kirillov: Element of Representation Theory

### **C\*-algebras (Modern Analysis)**

1. C\*-algebra and Morphism
2. Gelfand-Naimark Theorem
3. Positivity and Approximate Unit
4. Group C\*-algebra
5. Cross Product and dynamical system
6. GNS-Construction, Pure States and Spectral theory.
7. Morita Equivalence of C\*-algebras, Rieffel tensor product and relationships to Representation theory.
8. Noncommutative Tori.
9. Continuous Fields of C\*-algebras, Multiplier Algebras.

**Ref:** P. A. Fillmore: A user's guide to Operator Algebras

A.A. Kirillov: Element of Representation Theory

D.N. Diep: Noncommutative Geometry Methods for Group C\*-algebra

### **Representation Theory (Algebra)**

1. Lie Groups, Lie Algebra.
2. Relation between Lie groups and Lie algebras, exponential map
3. Universal enveloping algebra, Cohomology of Lie algebras
4. Solvable, nilpotent, semisimple, and simple Lie algebras. Classical Theorems.
5. Classification, root systems, Dynkin diagrams, weights and representation theory
6. Orbit Method and Quantization

**Ref:** Fulton & Harris, Representation Theory,

A.A. Kirillov: Element of Representation Theory

A.A. Kirillov: Lecture on Orbit Method