106929: Topics in Analysis

Spring semester 2020/21

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The course will be devoted to

Normal forms for dynamical systems

Main topics:

1. Vector fields. Equivalence (formal, analytic, smooth, topological). Phase portraits. Flows
2. Linearization. Dynamics defined by linear and linearizable vector fields.
3. Resonant normal form and normal forms by the principal part. Finite determinacy.
4. Using normal forms for analysis of stability, finding stable, unstable and centre manifold.
6. Families of vector fields. Hopf bifurcation
7. Elements of blowing-up technique (desingularization)
8. Relation between local and global classification. Dynamical systems on manifolds. Structural stability.
9. Limit cycles

References:

D.Arrowsmith, An Introduction to Dynamical Systems
V.Arnold, Geometric methods in the theory of ODE's
V.Arnold, Yu. Il'yashenko, Ordinary Differential Equations
(Encycl. of Math. Sci., Dyn. Sys.-1)

The course will be much more accessible than any book on the topics above.

Grade:

Homeworks : 30 points

Activities in the class
(good questions, comments, answering my questions): 20 points

Project to be made during the course: 35 points

Written test (end June): 15 points