ICTP DIPLOMA PROGRAMME IN MATHEMATICS 2017-18

ODE and Dynamical Systems

S. Luzzatto (20 lectures :30 hrs)

1) Basic concepts and examples of discrete and continuous time dynamical systems, ODEs as vector fields, existence and uniqueness of solutions for ODEs, conjugacy and structural stability.

2) One-dimensional linear maps and interval diffeomorphisms, classification up to topological and smooth conjugacy.

3) Local dynamics, two-dimensional linear maps with real and complex eigenvalues, local linearization of contracting fixed points.

4) Chaotic dynamics, symbolic dynamics, dynamically defined cantor sets, full branch maps.

5) Invariant measures. Poincaré Recurrence. Convergence of time averages. Existence of invariant measures for continuous maps.

6) Ergodic measures. Birkhoff's Ergodic Theorem. Ergodic decomposition.

7) Unique ergodicity. Circle rotations. Benford's distribution.

8) Full branch uniformly expanding maps. Invariance and ergodicity of Lebesgue measure.