

ICTP DIPLOMA PROGRAMME IN MATHEMATICS 2018-19

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.