

**The questions below for the oral exam are not an exhaustive list but are just a few examples:**

Generalized Potential Theory and applications

Configuration space

Space tangent to a trajectory in the configuration space

Lagrangian systems

Trajectory deformations considering non-fixed extremes and non-synchronous trajectories

Hamilton functional and Hamilton principle

Gauge invariance of the first variation of Hamilton functional, applications

Functional Action, Isoenergetic Deformations and Maupertuis Principle of Least Action.

Geodesics and applications

Brachistocrona theory

Connection between the Principle of Least Action and Fermat's Principle

Symmetries and conservation laws, Noether's theorem.

Phase space, Hamilton equations and applications.

Canonical transformations and application examples

Hamilton-Jacobi theory and application examples

Poisson brackets and connection with the computation of prime integrals

Poisson's parenthesis and connection with canonical transformations

Two-body problem

Variational principles in the theory of electromagnetic fields in the space of events