Speaker: Dr. Luigi Brugnano, Universita di Firenze
Title: Arbitrarily high-order energy-conserving line integral methods for charged particle dynamics
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Abstract:
The dynamics of a charged particle is described by the system of ODEs

$$\dot{q} = p,\ \dot{p} = p \times L(q) - \nabla U(q), \qquad q, p \in R^3$$

with $-\nabla U(q)$ and $L(q)$ the electric and magnetic fields, respectively. The motion is characterized by the conservation of the energy,

$$H(q,p) = \frac{1}{2} p^T p + U(q),$$

and its correct simulation is important in plasma physics. Inspired by the recent paper and by the talk given by Ernst Hairer at the 2019 RSME meeting in Santander, we studied a novel family of energy-conserving methods for the numerical solution of this problem. The methods, based on the concept of line integral, turn out to be symmetric and of arbitrarily high-order, thus allowing their use as spectral methods in time. This work is joint with Juan I. Montijano and Luis Randez.