

<https://agenda.infn.it/e/EICschool2023/eicschool2023@lists.infn.it>

## Bulletin # 1

February 10<sup>th</sup>, 2023

# First European School on the Physics of the Electron-Ion Collider Corigliano-Rossano, June 18-22, 2023

We are delighted to announce the **First European School on the Physics of the Electron-Ion Collider**, an initiative promoted by INFN and University groups in Italy currently active in the Electron-Ion Collider (EIC) project.

The EIC is the world's first polarized electron-nucleon and electron-nucleus collider planned to start operations in 2031 at Brookhaven National Laboratory (Upton, New York). The EIC will be a discovery machine for unlocking the secrets of the "glue" that binds the building blocks of visible matter in the universe.

The key physics questions that the EIC will address are:

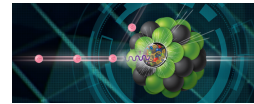
- How do the nucleonic properties such as mass and spin emerge from partons and their underlying interactions?
- How are partons inside the nucleon distributed in both momentum and position space?
- How do color-charged quarks and gluons, and jets, interact with a nuclear medium? How do the confined hadronic states emerge from these quarks and gluons? How do the quark-gluon interactions create nuclear binding?
- How does a dense nuclear environment affect the dynamics of quarks and gluons, their correlations, and their interactions? What happens to the gluon density in nuclei? Does it saturate at high energy, giving rise to gluonic matter or a gluonic phase with universal properties in all nuclei and even in nucleons?

The school is conceived as a natural "European counterpart" of the well-established school run by the Center for Frontiers in Nuclear Science (CFNS), also a co-promotor of this school. The school is ideally suited for Master students close to graduation and PhD students in nuclear and particle physics. The school is also very well suited for postdocs moving to the EIC physics from other fields. Although the school is promoted and organized by Italian institutions, we strongly encourage the participation of young international students interested in the Physics of the EIC.

**The school will run from Sunday, June 18<sup>th</sup> to Thursday, June 22<sup>nd</sup>, 2023.** It will be hosted in the conference hall of the [BV Airone](#) Resort, a touristic village immersed in the green of lush gardens, few meters away from the Ionian sea, on the Eastern coast of Calabria in the province of Cosenza. The BV Airone Resort is close to the village of Corigliano-Rossano, a splendid example of a medieval historical center dominated by the Ducal Castle and an ideal place to start exploring a territory full of naturalistic, historical, and archaeological treasures.

The scientific program of the school will give a broad introduction to the Physics of Deep Inelastic Scattering (DIS) and the rich physics program of the EIC and its experimental program. In this first edition we also propose a special focus on Transverse Momentum Dependent parton distributions (TMDs) and their extraction in Semi-Inclusive DIS (SIDIS) processes. Hands-on sessions will complement the lectures.





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## Topics

- A general and historical introduction to DIS with a description of the main experiments and their detectors, where fundamental DIS measurements were performed
- The physics of the EIC: general introduction to the new facility and its physics discovery potential
- A theoretical introduction to TMDs, their classification and the study of the SIDIS process. Preferred channels for extracting gluon TMDs at the EIC, and hints on the physics of heavy flavors
- An introduction to nuclear parton distributions: definition of observables, relevant variables, factorization theorems and extraction from data
- Overview of experimental results obtained so far for TMDs, and foreseen impact of the EIC on these measurements
- Hadron (hybrid) spectroscopy
- Modern techniques of data analysis based on Machine Learning applied to DIS
- Monte Carlo event generators for the EIC
- The ePIC detector and the Italian contribution to the EIC

## Announced lecturers

Pietro Antonioli (INFN - Bologna)  
Alessandro Bacchetta (Pavia University and INFN)  
Andrea Bressan (Trieste University and INFN)  
Francesco G. Celiberto (FBK - Trento)  
Matteo Cerutti (Pavia University and INFN)  
Silvia Dalla Torre (INFN - Trieste)  
Annalisa D'Angelo (Tor Vergata University and INFN)  
Abhay Deshpande (Stony Brook University and CFNS - USA)  
Enrico Tassi (University of Calabria, INFN - Cosenza)  
Giacchino Vano (INFN - Bari)  
Pia Zurita (Regensburg University - Germany)

Detailed information on the school and how to register are available at the school's web site:

<https://agenda.infn.it/e/EICschool2023/>

Registration to the school opens with the release of this bulletin.

We hope to see many young students attending the school!

Enrico Tassi and Marcella Capua  
University of Calabria and INFN  
EIC School LOC co-chairs

Pietro Antonioli  
INFN Bologna  
EIC School LOC coordinator

### Local Organizing Committee

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Jakub Wagner (NCBJ - Poland)

