Electron-Ion Collider Physics

Lecture 1 & 2 (Day 1)

— Overview of the Plan for 4 days 8 hrs of lectures on EIC
— Introduction to the Electron Ion Collider (EIC)
— High level introduction to the physics case for the EIC: Compelling open questions in QCD
— History: Investigations in nuclear and particle physics over the last 100 years
>> In search of the fundamental structure of matter: experiments that changed the way we think about nature
>> Discovery of atomic nuclei, protons and neutrons, and quarks

Lecture 3 & 4 (Day 2)
— Deep inelastic scattering (DIS)
Kinematics of fixed target & collider experiments
— Spin structure of the proton: The spin crisis
Inclusive, semi-inclusive deep inelastic scattering; Why not exclusive DIS?
Limitations of fixed target experiments
Measurement of hadronic final states: Particle Identification (PID) detectors
— DIS with nuclei in fixed target
EMC effect in nuclei

Lecture 5 & 6 (Day 3)
— Physics at a Collider:
Relativistic Heavy Ion Collider
Polarization in RHIC and polarimetry (magnitude and orientation)
Results and limitations
— Transverse spin puzzles
— Physics with nuclei
What does p-A collisions teach us? What could it not?

Lecture 7 & 8 (Day 4)
— Polarized electron-proton collisions at the EIC
Solving the nucleon spin & mass puzzle?
Imaging of quarks and gluons in nucleons.
— Gluons in nucleons and nuclei:
Do they saturate?
Measuring gluon separation at the EIC
— EIC
The machine, challenges, and accelerator challenges
The EIC detector design concepts: how to design a detector
Project: status and prospects