PhD Physics course at Bari University (XXXIV Cycle)

Title	Hadron Physics
Proponent	Giuseppe Eugenio Bruno
# CFU (1 CFU = 8 hours)	2
Schedule	February
Brief Summary of the course	Hadrons are the particles that feel the strong nuclear force. This force is described by the theory of QCD, a field theory whose constituents are quarks (the particles) and gluons (the force carriers). The study of Hadron Physics is part of a wide spectrum of research that aims to describe the nature of the matter that we observe in the Universe. It sits at the interface between particle-, or high-energy physics, and nuclear physics. From particle physics it shares a "reductionist" philosophy - a desire to understand everything from basic constituents. On the other hand it involves the study of the structure of composite particles, and thus shares a great deal of common ground with nuclear structure physics, such as a study of effects that are "emergent properties" due to the interaction of several constituents. An overview of the forefronts of the broad field of hadron physics will be given in the first half of the course. In the second half the focus will be on two : i) the physics of the quark gluon plasma and ii) the physics of the proton as studied from DIS and future prospects.
Programme	QCD, confinement and the structure of the hadrons. **Hadron spectroscopy:** overview. **Recent achievements and state ofthe art in Hadron structure:** electromagnetic form factors and the proton radius puzzle; Nucleon form factors. Parton distribution function. **Hadronic interactions. Hadron physics at high energy densities:** the quark gluon plasma. **Future:** the Electron Ion Collider
Recommended texts	To be defined

Assessment methods	Solution of numerical exercises and/or oral examination