

PHY552, NUCLEAR PHYSICS II, Fall 2021
Prof. Edward Shuryak
(office C139, phone 632-8127)

MoWeFr 8:00AM - 8:53AM, **(or other to be decided at the first lecture) C133 (G.Brown room).**

The first lecture Mon. Aug.23

THE MAIN OBJECTIVE is to introduce graduate students, both THEORISTS and EXPERIMENTALISTS, to
 HADRONIC STRUCTURE AND SPECTROSCOPY, NONPERTURBATIVE QCD, QCD AT FINITE TEMPERATURE
 AND DENSITY,
 HEAVY ION COLLISIONS, PARTON OBSERVABLES, NEUTRON STARS

- * QCD perturbative and non-perturbative, QCD on the lattice
- * Chiral symmetries and their breaking, pions and their interactions
- * Gauge topology: instantons
- * Heavy quarkonia, confinement, flux tubes
- * Spin-dependent forces, from heavy to light quarks
- * Multiquark hadrons
- * Light front observables: distribution amplitudes, Parton distributions etc
- * QCD at finite temperatures, the phase diagram
- * Statistical models and freeze outs in heavy ion collisions
- * Hydrodynamics of quark-gluon plasma, ``large'' vs ``small systems''
- * Unusual kinetics of QGP
- * Photon and dileptons: the penetrating probes
- * A quest for QCD critical point
- * Dense quark matter phases, color superconductivity
- * Nuclear and quark matter in neutron stars

PRE-REQUISITES: Grad. or undergrad general course on Particle/Nuclear physics like NP-I; Statistical Mechanics.
 No textbooks exist which fits it: lecture notes will be provided.

The grade will be based on quality of the presentations
 which students are supposed to give as exam, based on research papers from a supplied list.