Department of Physics, IIT Kanpur
Course handout
Nuclear and Particle physics (PHY 611)

This course aims to provide a basic introduction to the fascinating world of nuclear and particle physics. It is designed for the beginners to give them a broad overview and a foundational flavor of the core concepts in these fields.

Instructor: Swagata Mukherjee. *Email*: swagata@iitk.ac.in
Office: 102, Block A, First floor, Sustainable energy engineering building, Near Media Lab.

Classes on Tuesday 10:30–11:45 and Thursday 12:00–13:15
Tutorial on Monday 10:00–11:00

Recommended mode of contact beyond class timing: Email.
If you want to meet to discuss something about PHY 611, set up an appointment via email.

Books:
(1) Introductory Nuclear Physics by Kenneth S. Krane.
(2) Quarks and Leptons: An Introductory Course in Modern Particle Physics by by Francis Halzen and Alan D. Martin.
(3) Introduction to Elementary Particles by David Griffiths.

Please note that some more references will be given during lectures.

Syllabus of this course:

Nuclear physics
Nuclear force and nuclear models, Nuclear decay, Nuclear reaction kinematics, Scattering and reaction cross section, nuclear reactions (compound nuclear, direct etc.), Breit-Wigner resonance formula, Nuclear fission and fusion.

Particle Physics
Natural Units, Evidence for four fundamental interactions, Leptons and hadrons, Historical introduction to the particle zoo, introduction to cross sections and decay rates, Particle accelerators and detectors, invariance principles and conservation laws of parity, Charge conjugation, Time reversal and CP, CPT theorem, isospin, Strangeness.

Tentative plan for grading:
There will be two quizzes, one mid-semester exam and one end-semester exam in this course. Weightage: End-sem (50%), Mid-sem (30%) Quizzes (10% each).

There will be no makeup exam for the quizzes and the mid-semester exam. It is mandatory to appear for the end-semester examination, otherwise the final grade will be considered incomplete, even if you have total marks more than the final pass marks. Absolute grading will be followed in this course. A zero-tolerance policy for academic misconduct will be followed. Any academic wrongdoing (copying, use of unfair means in exams, impersonating, etc.) will be dealt with very strictly.

Attendance: There will be no marks for attendance, but you should attend all classes. Material taught in the class will NOT be shared in the form of typed or hand-written class-notes. So, for your best interest, try to follow all the classes closely.