Syllabus, Particle Physics, Fall 2014

Instructor:	Dr. Stefan Bathe
E-Mail:	stefan.bathe@baruch.cuny.edu
Office:	Baruch: Room 940, 17 Lexington Ave
	Graduate Center: TBA
Office hours:	by appointment
Phone:	646-660-6272

Class Schedule: Th 9:30am–12:40pm, Graduate Center, room 3209.

Objectives:
The class is intended as an introduction to elementary particle and nuclear physics. Key experimental observations that lead to our current understanding of particle physics and their theoretical interpretation will be discussed. The emphasis is on the phenomenology. Rigorous mathematical discussion of quantum field theory will be left to the complementary QFT course.

Pre-requisite: The class is open to first, second, and third year graduate students; undergraduate students are asked to check with the instructor first.

Preparation: Studying the recommended texbook(s); reviewing lecture notes; homework.

Resources:

- **Recommended textbooks:** Introduction to Elementrary Particles, by David Griffiths (2008); Quarks and Leptons: An Introductory Course in Modern Particle Physics, by Francis Halzen and Alan D. Martin (1984); Introduction to High Energy Physics, by Donald H. Perkins (2000).
- **Particle Data Group web site:** http://pdg.lbl.gov

Covered Material:

2 Quantum Chromodynamics

3 Weak Interactions

4 Decays

6 Relativistic kinematics (if interest)

1 Lorentz transformations

2 Four-vectors

3 Energy and momentum

4 Collisions

7 Symmetries

1 Angular momentum

2 Flavor

3 Parity, Charge Conjugation, and CP

4 Neutral kaons and CP violation

5 Time reversal and TCP theorem

8 Bound states

1 Schroedinger Equations and Hydrogen

2 Fine Structure, Lamb Shift, and Hyperfine Splitting

3 Positronium

4 Quarkonium, Charmonium, and Bottomonium

5 Light Quark Mesons

6 Baryons

9 Scattering

1 Cross sections

2 Fermi's Golden Rule

10 Recent developments

1 The Higgs Boson

2 Grand Unification

3 Matter/Antimatter Asymmetry

4 Supersymmetry, Strings, and Extra Dimensions

5 Dark Matter/Dark Energy

Homwework: Weekly homework will be assigned and graded.
Exams: One final exam.
Grades: (percent of course grade)

- homework: 50 %.
- final exam: 50%.