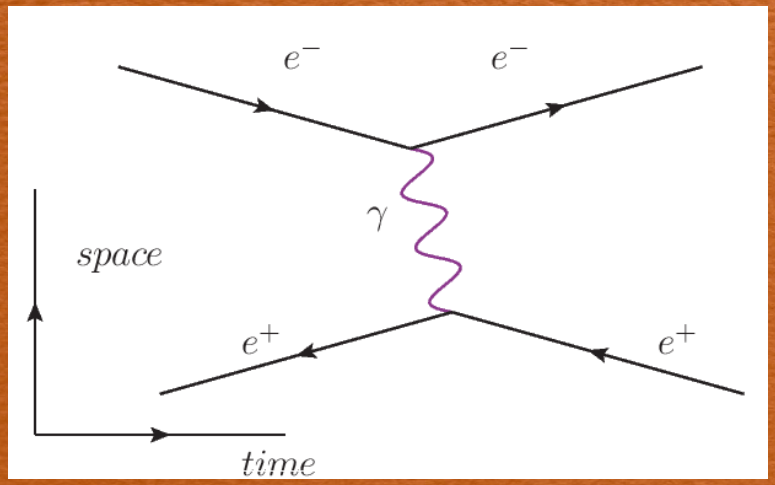
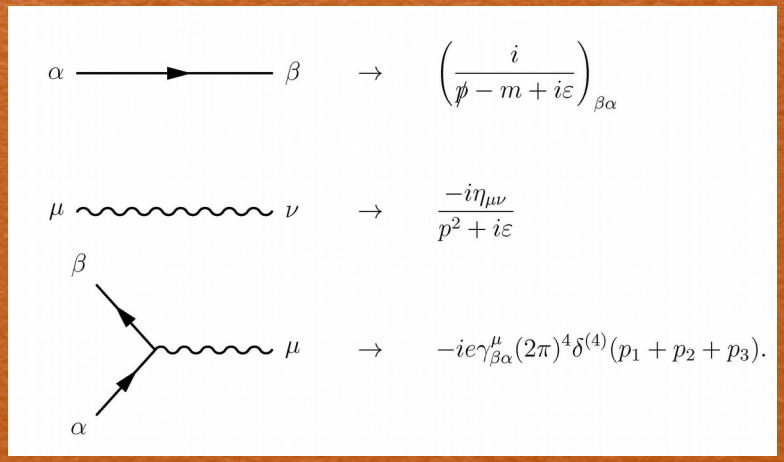
Particles & Symmetries

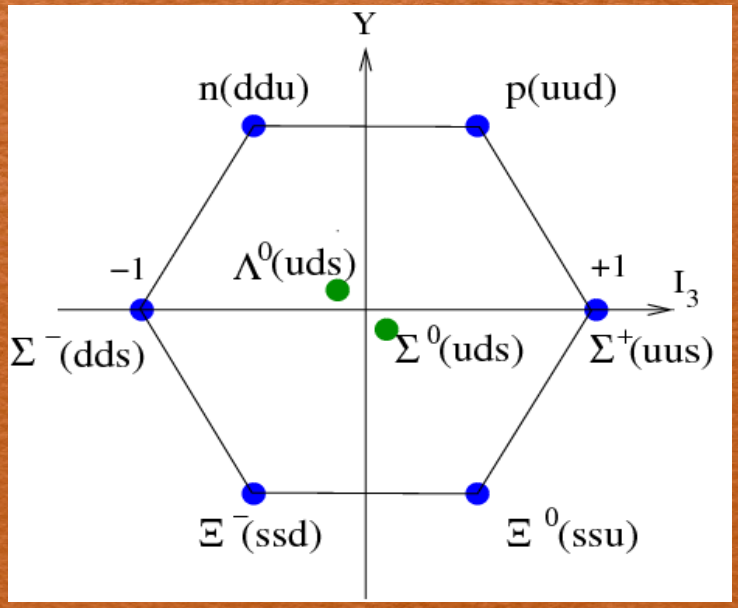
(G.Moreau)





Chapter 1: Introduction to Fundamental Interactions

The Klein-Gordon Equation for scalar fields
Time-dependent perturbation theory in quantum mechanics
Application to processes (spin 0) in Quantum ElectroDynamics
Introducing the propagators and Feynman diagrams
Calculation of basic (anti-)particle reactions
Symmetries of particles/reactions (spacetime, internal, gauge)
Computation of cross sections [e+e-, e- μ - scatterings]
Experiments: collisions, kinematics and conservation laws



Chapter 2: Hadron Synthesis

Symmetries in Hilbert spaces, transformation generators
Isospin group SU(2), flavour and color groups SU(3)
Product of group representations (isospin composition)
The quark model, gluons, quark-gluon plasma
Asymptotic freedom, main hadron properties
Phenomenology of hadrons: pion, resonances, strangeness
Experimental proofs: hadrons versus partons

The Major course constitutes preparatory lectures for the Minor courses and Tools (of the 2nd semester):

- « Astrophysics and Astroparticles »
- « Experiments and Applications in Sub-atomic Physics »
- « General Relativity and Cosmology »
- « Advanced Mathematical Methods ».