

## **PHYS 452. Empirical Foundations of the Standard Model II (3).**

### 1. Phenomenology of strong interactions

Very low energies, pions and photons

Diffraction and rapidity-gap physics

Regge-pole theory, the hadronic spectrum, quark model

Asymptotic freedom and the color-SU(3) model of the strong interactions

Quark and Gluon Jets

Description of the quark-gluon plasma and associated phase transitions

Calculation of hadronic processes with periodic distribution functions.

Heavy-quark physics

### 2. Structure of broken SU(2)XU(1) gauge-symmetric model of the electroweak interactions

Weak currents, the quark mixing matrix

Leptonic interactions

Gauge-boson couplings

CP violation

### 3. Weak Interactions of the Light and Heavy Quarks

#### 4. Baryonic Properties

Symmetry properties and masses

Nuclear Weak Processes

Semileptonic and nonleptonic decays

#### 5. Hadron Spectroscopy

Light mesons and baryons

The heavy quark limit

Charm and B physics

#### 6. Electroweak Gauge Bosons

Neutral weak currents

Determination of the weak mixing angle

Phenomenology of the weak bosons, decays, number of light neutrino generations

Tests for anomalous gauge-boson couplings, radiation zeros

#### 7. Phenomenology of the Higgs Sector

Coupling of the Higgs to quarks and leptons

Mass and coupling of the Higgs boson  
Production and decay of the Higgs boson  
Possible strongly interacting Higgs sector

## 8. Extensions of the Standard Model

Limitations of the Standard Model

Neutrino masses

Fermion nonconservation

Supersymmetry

Cosmological constraints