Physics 659 Course Outline

Review + New → Renew Material

1) SM
2) Spinor Interlude
3) SM in left-handed fields
4) Susy & Superspace
5) MSSM

Course Outline

I) MSSM in component fields
- A) Susy Y-M action — W-Z gauge
- B) Matter Kähler potential & gauge fields
- C) Superpotential & Yukawa interactions
- D) MSSM Scalar Potential
  1) EWSB
  2) μ-problem

II) MSSM (s)Particle Spectrum
- A) Gauge & Matter Fields
  1) Gauge Fields G, A, $W^{\pm}$, Z
  2) Matter Fermions — quarks & leptons
  3) 8 Higgs Scalars
     a) Charged Scalars: $H^{\pm}$, $\pi^{\pm}$ (Goldstone)
     b) Neutral Pseudoscalars: A, π^0 (Goldstone)
     c) Neutral Scalars: H, h

II. B.) Sparticle Spectrum
1) Gluinos
2) Charginos
3) Neutralinos
4) squarks & sleptons

III) MSSM Interactions & Radiative Corrections
A) Terms in $\mathcal{L}_{int}$
B) Top quark corrections to Higgs masses
C) β-functions
D) Unification

IV) Selected Topics Due to SUSY
A) SUSY Flavor & CP issues
B) Radiative EWSB
C) $b \to s\gamma$
D) Δa_μ
E) Dark Matter, Neutralino Relic Density
F) Neutrino Masses – See-Saw Mechanism

V) SUSY GUTs
A) SU(5)
B) SO(10)
C) Unification, Proton decay, m_b/m_τ, gravity corrections, ν-Masses

VI) Supergravity

VII) Susy Breaking
A) Gravity mediated
B) Gauge mediated
C) Anomaly medcated.

Conventions: (Bjorken & Drell)

$$g^{\mu\nu} = \eta^{\mu\nu} = (+,-,-,-)$$

$$\epsilon^{0123} = +1$$

$$\{\gamma^\mu, \gamma^\nu\} = 2\eta^{\mu\nu}$$

See Physics 658 notes for more detail
