

ICTP DIPLOMA PROGRAMME IN HIGH ENERGY PHYSICS 2012-13

SYLLABUS

Susy Field Theory - {14 Lectures = 21 hours} M. Bertolini

1 Supersymmetry: a bird eyes view

- 1.1 What is supersymmetry?
- 1.2 What is supersymmetry useful for?
- 1.3 Some useful references

2 The supersymmetry algebra

- 2.1 Lorentz and Poincaré groups
- 2.2 Spinors and representations of the Lorentz group
- 2.3 The supersymmetry algebra

3 Representations of the supersymmetry algebra

- 3.1 Massless supermultiplets
- 3.2 Massive supermultiplets
- 3.3 Representation on fields: a first try

4 Superspace and superfields

- 4.1 Superspace as a coset
- 4.2 Superfields as fields in superspace
- 4.3 Supersymmetric invariant actions - general philosophy
- 4.4 Chiral superfields
- 4.5 Real (aka vector) superfields

5 Supersymmetric actions: minimal supersymmetry

- 5.1 $N=1$ Matter actions
- 5.2 $N=1$ Super Yang-Mills
- 5.3 $N=1$ Gauge-matter actions

6 Theories with extended supersymmetry

- 6.1 $N=2$ supersymmetric actions
- 6.2 $N=4$ supersymmetric actions
- 6.3 On non-renormalization theorems

7 Supersymmetry breaking

- 7.1 Vacuum in supersymmetric theories
- 7.2 The goldstone theorem and the goldstino
- 7.3 F-term breaking
- 7.4 Pseudomoduli space: quantum corrections
- 7.5 D-term breaking