

# ICTP DIPLOMA PROGRAMME IN HIGH ENERGY, COSMOLOGY AND ASTROPARTICLE PHYSICS 2017-2018

## SYLLABUS

### **Susy Field Theory** - {12 Lectures = 18 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 Supersymmetry breaking**

- 6.1 Vacuum in supersymmetric theories
- 6.2 The goldstone theorem and the goldstino
- 6.3 F-term breaking
- 6.4 Pseudomoduli space: quantum corrections
- 6.5 D-term breaking