

## LACES LECTURES: INTRODUCTION TO SUPERSYMMETRY

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Location: Galileo Galilei Institute, Arcetri (Florence)

Dates: November 21-25, 2016

### SYLLABUS

- Introduction to supersymmetry: what is supersymmetry? Why we introduce it?
- N=1 supersymmetry: algebra and basic physical consequences
- Representations of N=1 algebra. Massive and massless multiplets.
- N-extended supersymmetry: algebra and representations.
- Explicit realization of N=1 representations in terms of fields. Construction of supersymmetric relativistic fields theories.
- N=1 superspace, susy covariant derivatives. General properties. Susy multiplets as superfields. Invariant actions. R-symmetry.
- Wess-Zumino model. Construction in superspace and non-renormalization theorem for the superpotential.
- Abelian and non-abelian N=1,2,4 super Yang-Mills theories. General structure of the renormalizable and susy invariant action.
- Renormalization properties. Non-renormalization theorems. Finiteness of N=4 SYM.
- General structure of beta-functions for SYM theories. Asymptotic freedom. Superconformal field theories.
- Explicit realizations of spontaneous supersymmetry breaking.

### BIBLIOGRAPHY

- 1) M. Sohnius, Introducing supersymmetry, Phys.Rept. 128 (1985) 39-204 (you find it in Inspire)
- 2) J. Terning, Modern Supersymmetry, Oxford Science Publications

3) P. Argyres, Introduction to supersymmetry,  
<http://homepages.uc.edu/~argyrepc/cu661-gr-SUSY/index.html>

4) A. Bilal, Introduction to supersymmetry, hep-th/0101055

5) J. Gates, M. Grisaru, M. Rocek, W. Siegel, Superspace or one thousand and one lessons in supersymmetry, Benjamin Cummings

6) D. Freedman and A. van Proeyen, "Supergravity", (first part).

A rather complete list of reviews and books can be found in:

[http://www.stringwiki.org/wiki/Supersymmetry and Supergravity](http://www.stringwiki.org/wiki/Supersymmetry_and_Supergravity)