

Physics G8070 – Particle Physics II – Spring 2007

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Class MW 10:35 – 11:50 in 831

Office hours: stop by, or make an appointment.

Class web page: <http://www.phys.columbia.edu/~kabat/particlesII/index.html>

Grading: 60% homework, 40% final.

The course will cover supersymmetry and some of its many applications.

Prerequisites

A semester of quantum field theory and a semester of standard model particle physics. The material on supergravity and extended susy will require some background in general relativity and / or differential geometry (metrics, connections, curvature).

Course outline

1. Supersymmetric quantum mechanics
2. Supersymmetric field theories in 3+1 dimensions
3. Classical vacuum structure of susy field theories
4. Supersymmetric standard model
5. Supergravity in 3+1
6. Maximally extended supersymmetry: strings, branes and duality

References

The main references for the course are

Wess & Bagger, *Supersymmetry and supergravity*

The formalism, the whole formalism, and nothing but the formalism. Still the best reference for the construction of supersymmetric field theories.

S. P. Martin, *A supersymmetry primer* [hep-ph/9709356]

Takes a phenomenological approach. Writes down supersymmetric theories with a minimum of baggage then develops the supersymmetric extension of the standard model.

I'm not sure of the best references on maximally extended supersymmetry. Some possibilities are

B. de Wit, *Supergravity* [hep-th/0212245]

This might be the best reference, although there's more here than we'll be able to cover.

Green, Schwarz and Witten, *Superstring theory* vol. 2

There's some material on supergravity in chapter 13.

Polchinski, *String theory* vol. II

Supergravity appears in chapter 12, and spinors and supersymmetry are reviewed in appendix B.

Another possibly useful reference is

J. Lykken, *Introduction to supersymmetry* [hep-th/9612114]

Similar to Wess & Bagger, but includes some material on extended supersymmetry at the end.