

PHYS 578 – String Theory

— Autumn 2023 —

Instructor: Justin Kaidi

Course Syllabus

Course description

This course will provide an introduction to String Theory, the leading candidate for a theory of quantum gravity. After discussing the general motivation, we will cover topics such as conformal field theory, bosonic and superstring sigma models, their light-cone and covariant quantizations, the Polyakov path integral, and string scattering amplitudes. If time permits, we will also discuss simple string compactifications and dualities. Knowledge of Quantum Field Theory will be assumed. This class will be primarily aimed at Physicists, but may be of interest to Mathematicians as well.

Prerequisites: Passing grades in PHYS 570 and 571 are highly recommended.

Grading

This is a C/NC class. Grades will be determined based on homeworks, of which there will be (tentatively) eight. The lowest homework grade will be dropped.

References

The main textbooks will be Green-Schwarz-Witten, *Superstring Theory* (second edition) and Polchinski, *String Theory*. Some additional useful references are the following:

Textbooks:

- *Basic Concepts of String Theory*, R. Blumenhagen, D. Lüst, S. Theisen, Springer (2013);
- *String Theory and M-Theory*, K. Becker, M. Becker, J. Schwarz, Cambridge Univ. Press (2006);
- *String Theory and Particle Physics*, L.E. Ibáñez, A.M. Uranga, Cambridge Univ. Press (2012);

- *A First Course in String Theory*, Barton Zwiebach, Cambridge Univ. Press (2009);

Lecture Notes:

- *Lectures on String Theory*, D. Tong;
- *String Theory for Mathematicians*, E. D'Hoker (IAS 1997);