Physics 7687
String Theory
Fall 2024

Lecturer: Liam McAllister
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Lecture: Wednesdays, 6pm-8pm, Rockefeller 231.

Textbooks:

- *String Theory* by Polchinski is the main text. We will use both volumes.

Other recommended references include:

- *Superstring Theory* by Green, Schwarz, and Witten.

- *String Theory in a Nutshell* by Kiritsis.

- *A First Course in String Theory* by Zwiebach (for background material).

- *Basic Concepts of String Theory* by Blumenhagen, Lüst, and Theisen.

Problem sets: Problem sets will be assigned every week, and are due at the start of lecture on the stated due date. Late homeworks will be accepted but docked 10%. Homeworks turned in more than one week late will not be accepted for credit.

Final project: The final project will be a written analysis of a significant result from the literature, to be chosen in consultation with me. This report will be due on December 11.

Office hours: Weekly, at times TBD.

Grading: This course is graded on a Satisfactory/Unsatisfactory (S/U) basis. The necessary and sufficient conditions for an S are a score of $> 50\%$ on the homework **and** a satisfactory performance on the final project.

Syllabus: This is an introductory course in string theory. We will work through the foundations of the theory and then develop prerequisites for understanding contemporary research. Topics include:

- Quantization of the bosonic string.

- Conformal field theory.

- The Polyakov path integral.

- Tree-level and one-loop amplitudes in the bosonic string.

- T-duality, D-branes, orbifolds, and orientifolds.

- Quantization of the superstring.

- Dualities.

- Calabi-Yau compactifications and mirror symmetry.

Prerequisites: A working knowledge of quantum field theory and general relativity.