

PHYS 859B FALL 2026

3 credits

Instructor: Raman Sundrum

Class times: Tue, Thu 11am - 12.15pm

### THE GENERATION OF HIERARCHICAL STRUCTURE IN PARTICLE PHYSICS

This is an advanced graduate course in theoretical particle physics. It is intended for students that have completed a year of quantum field theory (at the level of PHYS 624, 851), or roughly at the level of understanding the basics of Gauge Theory, the Higgs mechanism, Loops and Renormalization. It also assumes a familiarity with the Standard Model of particle physics as well as with the basics of General Relativity.

In these lectures, I will introduce the key extensions of relativistic spacetime, namely supersymmetry and extra dimensions, as well as strongly-coupled field theory and non-perturbative phenomena. These ingredients may play important roles Beyond the Standard Model, in particular in shaping the hierarchical structure of particle physics. I will discuss how the new physics is constrained by the host of existing precision data and LHC searches, and will discuss its prospects for future discovery.

The requirements for getting course credit will be discussed at the first meeting of class.

I will be making up my own lectures, so there is no text book as such, but my TASI 2022 summer school lecture notes e-Print: [2306.07173](https://arxiv.org/abs/2306.07173)[hep-ph] provide a good guide to a good portion of the course. I may suggest other reading material as the course progresses.