PHYS 859 FALL 2025

Instructor: Raman Sundrum. Classtimes: Tu + Thu 10.30am - Noon

SUPERSYMMETRY AND COMPOSITENESS

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. A familiarity with the Standard Model at the level of PHYS 751 will be helpful, as will familiarity with General Relativity.

I will present the dominant paradigms beyond the Standard Model, Supersymmetry and particle Compositness, and show how they can address the mysteries underlying the observed hierarchical structure of particle physics. I will show how these overarching frameworks correlate the diverse array of experimental tests of particle physics from the past and into the future, ranging from tests of the electric-dipole moment of the electron to new resonances at future colliders.

Prerequisites:
Intended for students that have completed a year of quantum field theory (at the level of PHYS 624 and PHYS 851) as well as having some familiarity with the Standard Model and General Relativity.

This is a regular 3 credit course. 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 the following TASI summer school reviews will provide some background material:

https://arxiv.org/pdf/hep-th/0508134

https://arxiv.org/pdf/2306.07173

https://arxiv.org/pdf/1008.2570