

# PHYS 6633-001: Advanced Topics In Theoretical Physics

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Fall 2024 MW: 8:30 AM - 9:59 AM, DRL 4E19

Office hours: MW: 10 AM - 11 PM and by appointment

## Topics Covered

The course will focus on D=4 N=1 supersymmetric Yang-Mills theory. Detailed aspects of the effective Lagrangian, the particle spectrum, non-renormalization theorems and supersymmetry breaking will be addressed. As the next step, the N=1 supergravity generalization will be studied, including the structure of the effective Lagrangian and the consequences of the spontaneous supersymmetry breaking there. Time-permitting, connections to string theory will be pointed out. Specific applications to particle physics will be covered.

The lectures will be accompanied by additional reading material prior and after the lectures. Students would also be assigned advanced reading topics which they would present in class. The exams would consist of a few homework assignments and up to two in-class presentations of assigned topics. I shall be available for extensive after-class discussions and support.

## Key references:

S. Martin Review on Supersymmetry:

<https://inspirehep.net/literature/448462>;

<https://arxiv.org/abs/hep-ph/9709356>

J. Wess & J. Bagger book on Supersymmetry and Supergravity

H.-P. Nilles Review on Supergravity: <https://inspirehep.net/literature/194173>;

<https://www.sciencedirect.com/science/article/pii/0370157384900085?via%3Dihub>

Grading: homework (50%), in-class presentation (50%)