

# Supersymmetry

*JGU Mainz, Special lecture course [08.128.624]  
Winter semester 2019/20*

**Lecturer: Dr. Felix Yu**

**Time: Fridays (Oct. 18 to Feb. 7), 10 AM-12 PM (c.t.)**

**Place: Minkowski Room (Staudinger Weg 7, 05-119)**

One of the grandest ideas ever to arise in quantum field theory, supersymmetry is a monolith that spurred decades of research in particle physics since its invention in the 1970s, holding its place as the most elegant solution to the Standard Model hierarchy problem. Confronted with the current absence of phenomenological evidence for supersymmetry at the LHC, low energy flavor observables, and electric dipole measurements, however, theoretical research in weak scale supersymmetry has all but come to a standstill. Nevertheless, studying supersymmetry is still essential for tackling modern, open questions in field theory involving dualities, non-renormalization, and exactly solvable QFTs, as well as underpinning the ongoing efforts in N=4 Super-Yang-Mills amplitudes.

This lecture series will give a general introduction to N=1 supersymmetry, developing the mathematical formalism of the supersymmetry algebra, superspace, chiral and vector superfields, and the construction of the minimal supersymmetric Standard Model. Subject to the interest of the participants, selected topics in the phenomenology of the MSSM and models of SUSY breaking will be discussed. Further topics include Seiberg duality in supersymmetric QCD, the power of holomorphy and non-renormalization theorems in SUSY, and superconformal theories and associated index theorems.

Attendees are expected to have working knowledge of quantum field theory and the Standard Model of particle physics. Basic knowledge of anomalies and instantons would also be beneficial. This course is not for academic credit.

$$\delta m_s^2 \sim (\lambda - y^2) \Lambda^2$$



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