Advanced QFT – Supersymmetry – 118107 (Shlomo Razamat).

• **Contact information:** – Room 707 (Lidow building seventh floor), email: razamat@physics.technion.ac.il.

• **Office hours:** – Please drop by between 9:00 – 15:00 or schedule a meeting online through email.

• **Grading:** – 25% Home exercises (approximately one exercise every couple of weeks, five-six sets per course). To get full grade not all problems need to be solved. 75% Presentation (about 45 min-1 hour) of one of the classic papers/results on supersymmetry at the end of the course.

• **Syllabus:** – Supersymmetric quantum mechanics. Supersymmetry algebra. Representations of supersymmetry. Superspace. QFTs with supersymmetry in four dimensions: Wess-Zumino models and gauge theories. Spontaneous breaking of supersymmetry. Non-renormalization theorems. SQCD and Seiberg dualities. Extended supersymmetry and Seiberg-Witten theory*. Supersymmetric localization*.

• **Assumptions:** – Quantum mechanics, Relativity, reasonable familiarity with quantum field theory.

• **Material:** – Primary source:

– P. Argyres, Introduction to Global Supersymmetry   ;
(http://homepages.uc.edu/ argyrepc/cu661-gr-SUSY 1996 (I) and 2001 (II) versions)

More references:

– Tachikawa, https://arxiv.org/pdf/1812.08946.pdf

– Weinberg, Quantum Theory of Fields III

– Wess and Bagger, Supersymmetry and Supergravity

– Hori et al, Mirror Symmetry

– Strassler, An Unorthodox introduction to supersymmetric gauge theory.
        (http://arxiv.org/pdf/hep-th/0309149v1.pdf)

– Terning, Modern supersymmetry: dynamics and duality

– Dine, Supersymmetry and string theory

• **First lecture further reading:** – Argyres (II) sections 1.1-1.2; Hori etal, Mirror Symmetry, chapters 9 and 10. F. Cooper etal, Physics Reports 251 (1995) 267; Witten, Supersymmetry and Morse theory, J. Differential Geometry 17 (1982) 66.