Exotic Statistics (lecturer: Dr. Andrij Rovenchak)

[2 ECTS credits]

Lectures

- 1. Introduction: Grand canonical ensemble. Notion of statistics. Energy level occupation. Statistical-mechanical approaches
- 2. Gentile statistics. Derivation of the Gentile distribution function. Polychronakos statistics. Haldane–Wu statistics.
- 3. Nonextensive Tsallis statistics and it modifications.
- 4. *q*-deformations and statistics
- 5. Quantum-mechanical approaches to statistics generalization. Anyons.
- 6. Basics of the group theory. Lie groups. SU(n), braid group.
- 7. Establishing links between different statistics types. Virial and cluster expansions.
- 8. Parabosons and parafermions. Operator realizations of fractional statistics.

Seminars

- 1. Thermodynamic properties of systems obeying the Gentile statistics.
- 2. Derivation of the distribution functions in the Polychronakos and Haldane–Wu statistics.
- 3. Polychronakos statistics with a complex parameter: a 1D oscillator system.
- 4. Nonextensive statistics. Canonical and grand-canonical formulation in various generalizations of the Tsallis statistics.
- 5. Basics of the *q*-calculus.
- 6. Elements of the group theory.
- 7. Anyon statistics. Integer and fractional quantum Hall effects.
- 8. Anyon statistics. Second virial coefficient. Links between various statistics types.

Grading plan:

Total:	100%
Mid-term and final tests $(2 \times 20\%) =$	40%
Seminar reports (average):	40%
Work during seminars:	20%

Grading scale: 90-100 = A; 81-90 = B; 71-80 = C; 61-70 = D; 51-60 = E