Current subject area:
Physics

Status	**Course code / number in the book: PP.25/1** ***Quantum statistical physics*** **Taught by: Mykola Stetsko**			
Acad. cycle	**ECTS credits**	**Duration**	**Semester**	**Contact hours**
Bachelor	6	2 semesters	Autumn, Spring	80
Year of study	**Weekly lectures/seminars**		**Prerequisites**	
1st	1/1(Autumn), 2/2(Spring)		Quantum mechanics, Statistical physics	
Languages	**Examination**		**Assessment**	
English	Written exam		100-point scale	

Aims and objectives: provide with knowledge of physical phenomena in quantum statistical physics. Main objectives are to analyze the fundamental problems of quantum statistical physics and develop necessary mathematical methods for the problems of many particle physics. These issues are of particular interest due to its importance for understanding of condensed matter theory.

Intended capabilities: to know basic concepts and methods of quantum statistical physics, namely, second quantization method, coherent states, two-time and Matsubara Green's functions, diagrammatic representation for Matsubara Green's functions, to be capable of solving basic problems of quantum statistical physics.

Description. The course covers the following topics: Second quantization and its application to many-particle physics; Coherent states for Bose and Fermi systems; Two-time Green's functions; Matsubara Green's functions; Diagrammatic representation for Matsubara Green's functions, Dyson equation; Electron-phonon interaction; Basic concepts of superconductivity; Spin and pseudo-spin systems.

Reading list:

1. N. N. Bogoliubov. *Lectures on Quantum Statistics. Problems of Statistical Mechanics of Quantum Systems*. New York: Gordon and Breach, 1967.
2. A. L. Fetter, J. D. Walecka, *Quantum theory of many-particle systems*. N. Y.:McGraw-Hill, 1971.
3. A. E. Zagoskin, *Quantum theory of many body systems*. Berlin, New York, Heidelberg: Springer Verlag, 1998.
4. G. D. Mahan, *Many-Particle Physics*. N. Y.: Plenum press, 1993.
5. J. W. Negele, H. Orland, *Quantum Many-Particle Systems*. Westview Press, 1998.
6. E. Fradkin, *Field Theories of Condensed Matter Systems*. Cambridge: Cambridge University Press, 2013.
7. A. Atland, B. Simons, *Condensed Matter Field Theory*. Cambridge, Cambridge University Press, 2010.