Study program	Level of studies		**Third cycle**	
	Title of the study program		**Doctoral studies in physics**	
Course title	**QUANTUM COLLISION THEORY**			
Course ID	Semester	Course status	ECTS credits	Teaching hours
PTH7071	**I/II**	**Elective**	**10**	**30**
Course aims and expected learning outcomes	The aim of the course is to expand knowledge of non-relativistic quantum collision theory. Expected learning outcomes: Mastering the mathematical apparatus of non-relativistic quantum collision theory. Getting acquainted with the applications of non-relativistic quantum collision theory. Ability to solve complex problems in non-relativistic quantum collision theory.			

COURSE CONTENT

Mathematical foundations. Scattering operator for a single particle. Scattering cross sections expressed by the S-matrix. Scattering particles with and without spin. Invariance principles and conservation laws. The Green's operator and the T-matrix. The Born series. Stationary states in the scattering process. Resonances. Dispersion relations and complex angular moments. Multichannel scattering: scattering operator, scattering cross sections, invariance principles and stationary wave functions. Multichannel resonances. Scattering of identical particles.

LITERATURE

1. J. R. Taylor, *Scattering theory: The quantum theory of nonrelativistic collisions*, John Wiley & Sons, New York, 1972.
2. S. Sunakawa, *Kvantovaja teorija rassejanija*, Mir, Moskva, 1979.
3. Dževad Belkić, *Principles of quantum scattering theory*, Institut of Physics Publishing, Bristol, 2004.
4. C. J. Joachain, *Quantum collision theory*, North-Holland, Amsterdam, 1975.
5. L. D. Landau, E. M. Lifšic, *Teoretičeskaja fizika. Tom III: Kvantovaja mehanika. Nereljativistkaja teorija*, Nauka, Moskva, 1989.

ASSESSMENT OF LEARNING

Assessment Method	Points
Homeworks	20
Seminar paper	40
Final exam	40
Total	100

Remarks