Level: bachelor

Course title: Symmetries in physics

Status: Elective

ECTS: 6

Requirements: Fundamentals of mathematical physics, Mathematical physics, Quantum mechanics.

Learning objectives
Students will gain an extensive knowledge of the application of symmetries in physics.

Learning outcomes
After taking the course, students should have developed:
General abilities: basic knowledge of this field, following the literature, analysis of various solutions and the choice of the most adequate solution, application in practice and other subjects.
Subject-specific capabilities:
- mastering the elements of application of symmetries in physics.

Syllabus
Theoretical instruction
Fundamentals of finite and Lie groups. Symmetries in classical and quantum physics. Wigner's theorem. Bloch theorem. Time translations. Unitary group U(n). Special unitary group SU(n). Identical particles. Angular momenta. Clebsh - Gordan coefficients. Wigner – Eckart theorem. Symmetry group of hydrogen atom. Lorentz group. SU(n) group and elementary particles.
Practical instruction
Problem solving. Homeworks. Seminars.

Reading list:

1. J. P. Elliot, P. G. Dawber, Symmetry in Physics, London, Macmillan, 1979.
2. M. Hamermesh, Group Theory and its Application to Physical Problems, Dover Publications, 1989.
3. W. Greiner, B. Muller, Quantum Mechanics: Symmetries, Springer, 2nd edition, 2004.

Weekly teaching load				Other
Lectures: 3	Exercises: 1	Seminars: 1	Student research:	