Level: PhD

Course title: Basic interactions and structure of atomic nuclei

Status: elective

ECTS: 30

Requirements: Contemporary experimental physics III, Nuclear physics

Learning objectives

Gaining knowledge of basic interactions and the structure of atomic nuclei.

Learning outcomes

Students should develop:

- Basic abilities: become familiar with the theoretical principles of nuclear physics.
- Specific abilities: since some technologies are studied in detail, the knowledge could be applied for practical purposes.

Syllabus

Nucleon. Quarks. Mass and binding energy. The shape and dimensions. Electromagnetic moments. Statistics.

Strong interaction - nuclear force. The nature of nuclear forces. Nucleon - nucleon interaction. Exchange forces. Meson theory of nuclear forces. The classical theory of weak interactions and nuclear beta decay. Fermi and Gamow-Teller transitions. Allowed and forbidden transitions-selection rules.

Impairment of parity and V - A structure of weak interactions. Limits (boundaries) of the classical theory.

Multipole development and quantization of the nucleus electromagnetic field. Angular distribution of radiation.

Transition probabilities in single-particle model. Angular correlation and polarization. Models of the nucleus.

Deformed nuclei and collective motion. Alpha decay. Fission and thermonuclear fusion. Gamma emissions.

The transition probabilities. Resonant absorption of electromagnetic radiation. Nuclear reactions. Elastic and inelastic scattering. Reactions through the compound nucleus. Direct reactions.

Weekly teaching load				Other:
Lectures: 5	Exercises:	Other forms of teaching:	Student research: 15	