Course title: Basic interactions and structure of atomic nuclei

Status: elective

ECTS: 30

Requirements: Fundamentals of Nuclear Physics, 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 purpose.

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. Parity nonconservation and V - A structure of weak interactions. Limits (boundaries) of the classical theory. Multipolarization and quantization of the nuclear 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.

Literature

1. D. Jelley: Fundamentals of nuclear physics, Cambrige University Press, Cambridge (1990)
2. W. Burcham, M. Jobes: Nuclear and Particle Physics, Congman, Harlow (1995)
3. P. Marmier, E. Sheldon: Physics of Nuclei and Particles, Acad. Press, New York (1969)
4. Herwig F. Schopper *Weak Interactions and Nuclear Beta Decay,* North Holland Publishing Company 1966
5. Barry R. Holstein *Weak Interactions in Nuclei,* Prinston University Press 1989
6. K. Grotz and H. V. Klapdor *weak Interaction and Nuclear Particle and Astrophysics* , Adam Hilger 1990

Weekly teaching load	Theory: 5	Practise: 15