Level: master

Course title: Nuclear energetics

Status: obligatory

ECTS: 6

Requirements: Atomic physics, Physics of ionized gasses, Nuclear physics

Learning objectives

Introduction to the basic principles of fission and fusion energetics as well as to controlled fission and fusion facilities.

Learning outcomes

Upon completion of the course, students should possess:

- General abilities: getting a general picture of the modern nuclear energetics.
- Subject specific abilities: understanding and learning the general principles of transformation of nuclear energy and techniques and technologies that accompany this energy transformation.

Syllabus

Theoretical instruction

Nuclear fission (chain reaction, critical mass, reaction cross-section. multiplication factor). Fission reactors. (Homogeneous and heterogeneous reactors. Reactor contamination. Change of multiplication factor - reactor regulation. Reactor types.) Basic scheme of nuclear fission power plant. Nuclear fusion. (Fusion reactions - cross-section. Energy balance in fusion reactors.) Fusion plasma heating methods. (Ohms heating. Magnetic mirror trap. Heating by adiabatic and shock compression. Pinches. Instability of Pinches. Fusion plasma confinement. (Magnetic confinement - tokamak. Inertial confinement. Interaction of the laser beam with target.) Energetics of target microexplosion. Energetic of thermonuclear power plant with inertial confinement.

Practical instruction

Exercises are of demonstrative type. They include visits to the nuclear reactor at the Vinca Institute and work on the plasma sources at the Laboratory of Physical Electronics.

Weekly teaching load				Other:
Lectures: 3	Exercises: 2	Other forms of teaching:	Student research:	