Level: bachelor

Course title: Physics of hydrosphere and oceanology

Status: elective

ECTS: 6

Requirements: passing the examination in Physics of lithosphere

Learning objectives

Introducing students to the basic phenomena of the movement of water on Earth's surface. Thoroughly examining the movement of water in the near atmosphere (cloud physics), the principles of movement in water courses (rivers) and the characteristics of the movement of water in large troughs (seas and oceans). Introduction and modelling of dynamic processes of movement of water masses in static and rotating systems.

Learning outcomes

Upon completion of the course, students should have developed:

- General skills: following the professional literature; ability to analyse and select the most appropriate solutions. Mastering the basic techniques of modelling physical processes using mathematical models.
- Subject-specific skills: understanding the specific terminology. Understanding of the basic laws of fluid motion in a variety of circumstances. The ability to identify and explain the specific processes that occur in the natural fluid and complex interactive circumstances.

Syllabus

Theoretical instruction

The hydrological cycle and water phase transformations. Physical properties and processes in the air. Evaporation. Homogeneous and heterogeneous nucleation. Growth, population and evolution of rain drops. Creation of precipitation in warm clouds, and the growth of ice crystals. The radar equation and types of precipitation. The water movement in open channels, hydrographer equation. Soil moisture, drain and infiltration. Water movement through soil: equilibrium and nonequilibrium conditions. Methods for determining and predicting the drain. Time-dependent flows. Flows in channels and their forcing. Waves on the ocean surface. Tides. The processes at the atmosphere-ocean boundary (storm waves, free oscillations). The state equation. Topographic waves (Kelvin’s, coastal topographic, internal waves). Conservation equation of mass and motion in a rotating coordinate system. Conservation of vorticity and vortex waves. Gravity-inertial waves. Baroclinic and barotropic circulations. Wind flows. The vertical processes in the oceans. The general circulation of the ocean and topography.

Practical instruction

Demonstrations and experimental exercises that accompany the course content. Solving the given problems using the appropriate computational models.

Weekly teaching load				Other:
Lectures: 3	Exercises: 1	Other forms of teaching: 1	Student research:	