Level: bachelor

Course title: Fluid mechanics

Status: elective

ECTS: 6

Requirements: none

Learning objectives

Introduction to the basic laws of fluid statics and dynamics in order to enable more efficient following the courses of the physics of continuum as well as dynamic meteorology.

Learning outcomes

After completing the course, students should develop:

General abilities: following the literature; search and using the Internet.

Specific abilities: adopting the knowledge from fluid mechanics and understanding the basic laws determining their motion.

Syllabus

Theoretical instruction

The notion of fluid. Fluid statics. Free liquid surface. The concept of pressure. Pressure transfer in fluids – Pascal theorem. Torricelli's barometer. Manometers. Pressure distribution in compressible fluid. Barometric formula. Archimedes law. The equilibrium of a solid body in the fluid. Ideal fluid dynamics. Continuity equation for the fluid flow. The equation of motion of the ideal fluid. Bernoulli's equation. The application of Bernoulli's equation. The application of the momentum conservation law to fluids. Dynamics of real fluids. Viscosity.

The measurement of the dynamic and kinematic coefficient of viscosity. Laminary and turbulent flow of the viscous fluids. The motion of solid body through fluid. Resistance forces in the turbulent fluid flow. Dynamical buoyancy. Magnus effect. Upward forces on the airplane wing.

The phenomena at the liquid-gas boundary. Surface tension. Laplace equation. Capilarity. Wetting angle. Drop creation. The methods for measuring the surface tension coefficient.

Practical instruction

Selected experimental exercises: Measurement of the coefficient of surface tension by the drop method. Mariotte’s bottle and the determination of the coefficient of liquid flow contraction. The determination of the shape coefficient for the medium resistance. The determination of the coefficient of viscosity with flow viscosimeter. The determination of the coefficient of surface tension by drop method. The determination of the temperature dependence of the coefficient of viscosity using Hoeppler viscosimeter.

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