Level: bachelor

Course title: Introduction to meteorology I

Status: obligatory

ECTS: 8

Requirements: none

Learning objectives

Students should get fundamental knowledge about the processes in atmosphere and impact of weather and climate on environment. Main aim of this course is to make students familiar with the basic laws of statics and dynamics of atmosphere, thermodynamics and stability of atmosphere, energy balance of the Earth-atmosphere system and water balance of the Earth surface. Upon graduation, students should be well educated and ready to apply skills in practice, become experts for various fields of meteorology with high level of understanding of essential processes in atmosphere, seeking for new approaches.

Learning outcomes

Experts with academic education, who possess knowledge in meteorology and climatology, which upgrades the high school knowledge in geography and physics. One has the ability to understand and analyze processes in the Earth-atmosphere system and to present results of his research to other colleagues and wide audience. In addition, one has skills to use the known solutions for new problems, and to understand mathematical and numerical methods in environmental modelling. One is qualified to work in various scientific institutes, agricultural institutes and institutes for monitoring and environmental protection. One has the ability for independent work and further improvements.

Syllabus

Theoretical instruction

Introduction. Meteorological elements. Weather and climate. Meteorological observations. Origin of atmosphere. Atmospheric layers and constituents. Vertical distribution of pressure and density of air. Atmospheric water vapour. Definition. Daily and annul variation of atmospheric humidity. Impact of urban and rural areas on air humidity. Variation with height. Distribution on Earth surface. Statics of atmosphere. Gas laws. Hydro static equation. Geo potential. Daily and annual variation of atmospheric pressure. Adiabatic processes of atmosphere. Dry and wet bulb processes. Condensation level. Phen. Thermodynamic stability of atmosphere. Solar radiation. Electromagnetic spectra. Basic radiation laws. Solar spectra. Distribution of solar radiation at Earth surface. Attenuation of solar radiation in atmosphere. Direct, diffuse and global radiation. Reflected radiation. Photometry. Optical characteristics of atmosphere. Longwave radiation at Earth surface and atmosphere. Empirical equations. Mechanism of energy transfer in atmosphere. Energy balance of Earth-atmosphere system. Vertical profile of radiation above and within canopy layer. Energy balance of soil and water. Energy transfer through the soil. Daily and annual variation of soil temperature. Depth variation. Heating and cooling of ocean. Energy balance of atmosphere. Heating and cooling of air. Daily and annual variation of air temperature. Inversions. Frost. Evaporation. Water balance. Daily and annual variation of evaporation. Methods for evaporation calculation. Condensation and sublimation of water vapour in atmosphere. Condensation nuclei. Cooling. Fog. Clouds and their micro structure. Cloud morphology. Thunderstorms. Daily and annual variation of cloudiness. Cloud precipitation. Classification. Growth of cloud elements. Rain and snow formation. Hail. Chemistry of rain. Daily and annual variation of precipitation. Distribution of precipitation. Snow.

Practical instruction: Exercises

Weekly teaching load				Other:
Lectures: 4	Exercises: 2	Other forms of teaching:	Student research:	