

Level: bachelor				
Course title: Atmospheric Radiation				
Status: elective				
ECTS: 6				
Requirements: none				
Learning objectives Providing the basic knowledge about the electromagnetic radiation in the atmosphere, its origin, transfer, absorption and scattering and their consequences to short-term and long-term atmospheric processes.				
Learning outcomes Student should develop: General abilities: basic knowledge in this field, following the literature, analysis of various solutions and the choice of most adequate solution, application in practice and other subjects. Subject-specific abilities: knowledge of radiometric quantities and laws of their transfer; knowledge of the radiation laws – substance interaction, in particular various types of spectra; understanding the solar energy transfer to Earth; understanding of the influence of radiative processes to climate.				
Syllabus <i>Theoretical instruction</i> Basic ideas about radiation. Photometric and radiometric quantities and units. The notions of absorption and scattering (Rayleigh and Mie). Thermal radiation. Kirchhoff's law. Black body radiation. Rayleigh-Jeans and Planck theory. Radiation transfer. Transfer equation. Bouguer-Berr-Lambert law. Schwartzschild equation. Transfer equation for stratified atmosphere. Foundations of atomic physics. Atomic spectra, structure and models of atom. Foundations of quantum mechanics and probabilistic interpretation of the wave function. Schroedinger equation: linear harmonic oscillator, hydrogen atom. Quantum mechanics of many-electron atoms and molecules. Emission and absorption of light. Spectra, width and shape of spectral lines. Lasers. Molecular spectra – general theory, rotational, vibrational and electron spectra. Sun as an energy source. Earth's orbit around the Sun - Earth insolation theory of M. Milanković. Solar spectrum and solar constant. Insolation distribution. Calculation of heating. Absorption of Solar radiation in atmosphere. Absorption in ultraviolet range of spectrum. Photochemical processes and forming of ozone layer. Absorption in visible and close infrared range of spectrum. Calculation of heating due to Solar radiation absorption. Infrared radiation transfer in the atmosphere. Spectrum of thermal IR radiation, its transfer through atmosphere and greenhouse effect. IR absorption spectra of atmospheric gasses. IR radiation transfer in stratified atmospheres. The concept and application of the transmission function. Theoretical band models. Influence of CO ₂ to climate. <i>Practical instruction</i> Problem solving, seminars.				
Weekly teaching load				Other:
Lectures: 3	Exercises: 1	Other forms of teaching: 1	Student research:	