**Level**: bachelor

**Course title:** Dynamic Meteorology I

**Status**: obligatory

**ECTS**: 4

**Requirements**: none

**Learning objectives**

Study of causes of atmospheric motions in the non-inertial frame as well as the formulation of equations of motion in various reference frames in order to understand the dynamic phenomena in the atmosphere.

**Learning outcomes**

After completing the course the student should develop:

**General abilities:** ability to follow the literature; preparation of the seminar work.

**Specific abilities:** knowledge of basic physical laws related to the atmospheric motion and about the basic models in the dynamic meteorology. Students should be able to follow higher courses of physics and meteorology module requiring knowledge of dynamic meteorology.

**Syllabus**

*Theoretical instruction*

Basic dimensional analysis in the dynamic meteorology. Basic forces acting at the atmospheric element. Coriolis force. Structure of the static atmosphere. Hydrostatic equation. Pressure as the vertical coordinate. Total differential. Vector form of the equations of motion in the rotating reference frame. Equation of motion in spherical reference frame. Geostrophic approximation. Hydrostatic approximation. Continuity equation. Thermodynamic energy equation. Potential temperature. Static stability. Geostrophic wind. Cyclostrophic and inertial wind.

Trajectories and current lines. Thermal wind. Barotropic and baroclinic atmosphere. Vertical motion. Circulation and vorticity. Equation of vorticity.

Planetary boundary layer. Atmospheric turbulence. Boussinesq approximation. Reynolds' averaging. Equations of motion in the planetary boundary layer. Well mixed boundary layer. Theory of mixing path. Eckman's layers. Modified Eckman's layer. Secondary circulation. Downwards spin.

Quasi-geostrophic analysis. Observed structure of circulation in moderate latitudes. Geopotential tendencies. Diagnosing of vertical motion. Omega equation. Q-vector. Idealized model of the development of baroclinic systems.

*Practical instruction*

Selected problems in Dynamic meteorology. Seminar paper on the subject.

| **Weekly teaching load** | | | | Other: |
|---|---|---|---|---|
| Lectures: 2 | Exercises: | Other forms of teaching: 1 | Student research: | |