Faculty of Science

NGEA24, Dynamic Meteorology 1, 7.5 credits

Dynamisk meteorologi 1, 7,5 högskolepoäng

First Cycle / Grundnivå

Details of approval

The syllabus was approved by Study programmes board, Faculty of Science on 2017-03-19 to be valid from 2017-03-19, spring semester 2017.

General Information

The course is a compulsory course at first cycle level for Scientific Bachelor's programme with a specialisation in meteorology and bio-geophysics that is given jointly of the Department of physics and the Department of physical geography and ecosystem sciences. The course can also be taken as elective course in other programmes but requires relatively extensive prior knowledge in physics.

Language of instruction: English

Main field of studies	*Depth of study relative to the degree requirements*
Physical Geography and Ecosystem Analysis	G2F, First cycle, has at least 60 credits in first-cycle course/s as entry requirements
Atmospheric Sciences and Biogeochemical Cycles	G2F, First cycle, has at least 60 credits in first-cycle course/s as entry requirements
Physics	G2F, First cycle, has at least 60 credits in first-cycle course/s as entry requirements

Learning outcomes

The course has as aim to give the student a general understanding of processes in the atmosphere and how these influence the atmospheric circulation in different scales (global, regional and locally) that in turn influence the weather. The course gives an introduction to processes in the boundary layer and advanced knowledge of the dynamics of the atmosphere and the structure of movements in the atmosphere. The course covers basic physical components in modern meteorology that is necessary for carry out and interpret the results of weather forecast modelling. The course is given

during the second year of the programme and gives prior knowledge to the advanced course Dynamic meteorology 2. Together, these two courses provide the theoretical knowledge that is needed to be able to work with weather forecasts as a professional.

Knowledge and understanding

On completion of the course, the students shall be able to:

- describe and explain forces and balanced flows in the atmosphere
- account for the vector form of the momentum equation in rotating coordinate systems
- describe analysis of movement equations in different scales,
- account for thermodynamic processes in a dry atmosphere
- account for components such as balanced flow, thermal wind, vertical movements, pressure gradients, vorticity and potential vorticity.

Competence and skills

On completion of the course, the students shall be able to:

- derive and differentiate basic equations and apply these on given problems
- use basic equations and scale analysis for meteorological applications
- apply circulation theorems.

Judgement and approach

On completion of the course, the students shall be able to:

- understand and evaluate the importance of different processes in the atmosphere and be able to distinguish these,
- understand and evaluate the basic physical background for numerical weather forecast models.

Course content

The course consists of four main components:

1. Introduction to dynamic meteorology that contains components as scale analysis and basic forces in the atmospheric circulation. In this part, a study visit to SMHI or other relevant operational meteorology stakeholder organisation is included.

2. Forces, basic laws, concepts and balanced flows. Total differentiation, the momentum equation in rotating coordinate system, component equations in spherical coordinate systems (rotating and spherical coordinate system is needed to describe our atmosphere that rotates and has a spherical form), scale analysis of different motion equations, the continuity equation and thermodynamics in a dry atmosphere.
3. Applications of basic equations and scale analysis. The component consists of basic equations for isobaric coordinates, balanced flows, thermal winds, vertical movements in the atmosphere as well as air pressure and tendencies in the lower parts of the atmosphere.
4. Circulation, vorticity and divergence. In this section, the circulation theorem is treated, vorticity and potential vorticity.

Apart from these thematic parts contains the course components that intend to increase the student's ability to read and understand physical and mathematical relationships, derive and differentiate equations that are relevant for the contents of the course. Also a certain measure of oral and written presentation is trained in the course.

Course design

The teaching consists of lectures, calculation exercises and seminars. Participation in seminars and calculation exercises are compulsory. The course also contains study visits as a compulsory component.

Assessment

Examination takes place via written assignments and presentations in seminars during the course and through a written examination. For students who have failed the regular examination, additional occasion in close connection to this is offered.

In consultation with Disability Support Services, the exam may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equal to that of a student without a disability.

Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: Fail, Pass, Pass with distinction.
To pass in the whole course is required approved examination as well as passed written assignments. The same grading scale is used on all components. Final grade is decided by joining the results of examination and written assignments. How this

joining is designed be informed latest at the course introduction.

Entry requirements

For admission to the course, Basic university qualification is required, physics knowledge equivalent to FYSB11 Basic quantum mechanics, 7.5 credits, and FYSB12 basic statistical physics and quantum statistics, 7.5 credits as well as basic knowledge in climatology equivalent to the course NGEA21 The Climate system, 15 credits.

The overview FYTA14 Fluid dynamics, 7.5 credits, be recommended but are not formal entry requirements.

Further information

The course may not be included in a degree together with METC01 Dynamic meteorology and numerical weather forecasts 7.5 credits, or NGEA16 Dynamic meteorology and numerical weather forecasts, 7.5 credits.

Subcourses in NGEA24, Dynamic Meteorology 1

Applies from V17

1701 Dynamic Meteorology 1, 7,5 hp
Grading scale: Fail, Pass, Pass with distinction