

# Syllabus

for course at advanced level

**Turbulent Boundary Layers in the Atmosphere and Ocean**  
**Turbulenta gränsskikt i atmosfär och hav**

**7.5 Higher Education  
Credits**  
**7.5 ECTS credits**

<b>Course code:</b>	MO8010
<b>Valid from:</b>	Autumn 2017
<b>Date of approval:</b>	2017-03-13
<b>Department</b>	Department of Meteorology
<b>Main field:</b>	Meteorology
<b>Specialisation:</b>	A1F - Second cycle, has second-cycle course/s as entry requirements

## Decision

This syllabus has been approved by the Board of Science at the Faculty of Science, at Stockholm University 2017-03-13.

## Prerequisites and special admittance requirements

Knowledge corresponding to Atmospheric Physics and Chemistry, 30 HECs (MO4000) or Meteorology I, 15 HECs (MO8001) and Meteorology II, 7.5 HECs (MO8002). Also required is knowledge equivalent to English B/6.

## Course structure

Examination code	Name	Higher Education Credits
8010	Turbulent Boundary Layers in Atmosphere and Ocean	7.5

## Course content

This course covers turbulent mixing and exchange processes in the atmospheric and oceanic boundary layers. Exchange of momentum, heat, energy and water is described with turbulence and similarity theories. The content is:

- the observed structure of the boundary layer
- Reynold's partitioning and averaging
- turbulence energy and turbulent fluxes
- observational techniques and methods of analysis
- the closure problem
- the turbulent kinetic energy equation
- similarity theory, e.g. the Monin-Obukhov theory
- the Ekman layer
- turbulence spectra
- dispersion in the boundary layer

## Learning outcomes

- After the course, the student is expected to be able to:
- discuss the effect of turbulence on weather and climate
  - explain how the stability affects turbulence
  - explain Reynold's equation and summarise the closure problem
  - apply similarity theory on boundary layer problems

## **Education**

The teaching consists of lectures, exercises and laborations. Participaton in laborations and the associated group tutorials is compulsory. If there are special reasons, the Examiner may, after consulting the course teacher, allow the student to omit certain parts of the compulsory teaching.

## **Forms of examination**

- a) Examination is done by a written test.
- b) Grading is done on a seven-step scale: A = Excellent B = Very good C = Good D = Satisfactory E = Sufficient Fx = Failed, some more work is required F = Failed, a lot more work is required.
- c) The grading criteria are handed out at the beginning of the course.
- d) For passing the course, at least grade E is required, as well as passed written presentations of laborations and participation in all compulsory teaching.
- e) Students that do not pass the regular test have the right to take further tests as long as the course is given. The number of tests is not limited. As "tests" are understood also other compulsory parts of the course. Students that have passed a test are not allowed to attempt another test in order to receive a higher grade. Students that have failed an examination twice, for a course or part of a course, have the right to request that another Examiner is appointed, unless special reasons speak against this. The request for this should be directed to the Board of the department. The course has at least two examination occasions per academic year the years teaching is given. Intermediate years at least one examination occasion is given.
- f) A student who receives grade Fx has the opportunity to do additional work in order to reach grade E. The Examiner decides what additional work is required and the criteria to pass. The additional work should be performed prior to the next examination occasion.

## **Interim**

Students may request that the examination is performed according to this syllabus even after it has ceased to be valid. However, this may be done no more than three times during a two-year period after the course was last given. The request for this should be directed to the Board of the department.

## **Limitations**

The course may not be included in a degree together with Meteorology, 20p (ME1170), Turbulent Boundary Layers in the Atmosphere and Ocean, 7.5p (MO7005) or equivalent.

## **Misc**

The course is a part of the Master's programme in Meteorology, Oceanography and Climate, but may also be taken as an individual course.

## **Required reading**

The course literature is published on the Department of Meteorology's website at least two months prior to course start.