Faculty of Science

# FYST92, Physics: Environmental Measurement Methods, 7.5 credits

*Fysik: Miljömätteknik, 7,5 högskolepoäng*

**Second Cycle / Avancerad nivå**

## Details of approval

The syllabus was approved by The Education Board of Faculty of Science on 2024-12-09. The syllabus comes into effect 2024-12-09 and is valid from the autumn semester 2025.

## General information

The course is an elective course at advanced level for a Bachelor or Master of Science degree in Physics or Environmental Science.

*Language of instruction:* English

| *Main field of study* | *Specialisation* |
|---|---|
| Physics | A1N, Second cycle, has only first-cycle course/s as entry requirements |
| Environmental Science | A1N, Second cycle, has only first-cycle course/s as entry requirements |

## Learning outcomes

The aim of the course is that the student, after completing the course, should have acquired an understanding of advanced measurement techniques specifically applied to air pollution problems, and how these techniques can be used to provide a basis for assessments of environmental and health risks caused by anthropogenic emissions. The course also aims to stimulate a reflective approach to how various everyday human activities affect our environment and health, and to provide the ability to evaluate environmental issues from a scientific perspective in working life and social debate.

The course also aims to train ability in planning and performing measurements and investigating environmental problems using these measurements and measurement techniques, and to be able to determine the causes (sources) of these problems, and what measures are appropriate to reduce the impact on the environment and humans, and to be able to present these plans, measurements and conclusions to

specialists and public stakeholders.

## Knowledge and understanding

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

- describe and understand different environmental problems in air quality and other environmental areas from a scientific perspective
- explain how different environmental measurement techniques function for different purposes
- explain how a source/receptor model works for quantifying how much different sources contribute to different pollution levels
- explain how a municipality or region uses different measurement and modelling systems to compile and evaluate data on its environmental problems
- describe how an investigation of an environmental problem can be planned and investigated using different theoretical, modelling and experimental tools, and how this affects society and what abatement measures can be used.

## Competence and skills

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

- formulate questions aimed at clarifying risks to the human environment and health associated with an environmental impact, such as in air pollution.
- plan a modelling strategy, or measurement strategy to investigate an environmental problem with associated models and measurement methods within a given framework, like a consultant-based or research-oriented methodology according to the acquired knowledge of the measurement methodology and the environmental problem
- install and carry out experiments aimed at answering the question posed about the environmental problem
- analyse and evaluate environmental data in order to answer the research question
- present the results of the evaluation orally and in writing and propose and discuss appropriate abatement strategies.

## Judgement and approach

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

- discuss how various everyday human activities affect our environment and health
- integrate knowledge of environmental measurement techniques and air quality issues
- integrate knowledge from a comprehensive set of data and material for problem-solving
- interpret and critically review measurement and modelling data from advanced data collection
- reflect on the scale of environmental problems, and the feasible options to solve the problem within the framework of economic, social and environmental sustainability

- propose and argue for the solutions we can have for the environmental problem
- evaluate how environmental control and strategies for evaluation are carried out by real actors in the field.

## Course content

The course covers :

- various air quality problems and their environmental and health effects
- physical and chemical processes in air pollution
- different physical and chemical measurement and analysis methods for environmental issues
- measurement and modelling strategies for air pollution control within counties or municipalities
- source/receptor modelling of source contributions in outdoor environments
- planning of measurement strategy, preparation of instruments, execution of experiments, data analysis and evaluation and summarising the extent of the environmental problem and its abatement potentials, and
- environmental radioactivity, exposure and biomarkers, and remote sensing methods.

## Course design

The teaching consists of lectures, a laboratory session, a project, assignments, exercises, and excursions. Participation in the laboration, project and excursions is mandatory.

## Assessment

Examination takes place:

- in writing in the form of an exam at the end of the course
- with a written report and oral presentation of the laboratory and project work
- with written assignments

For students who do not pass the regular exam, an additional exam is offered in close connection to the regular exam.

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

## Grades

Grading scale includes the grades: Fail, Pass, Pass with distinction
The grading scale for laboratory reports, oral presentations and assignments is Fail, Pass. The grading scale for written exams and project reports is Fail, Pass, Pass with distinction. The limit for Pass is 50% and the limit for Pass with distinction is 75%.

A passing grade for the entire course requires a passed written exam, a passed laboratory and project report and oral presentation, passed reports from the assignments, and participation in all mandatory parts.

The final grade is determined by weighting the results of the written exam and the project report, which is graded according to an assessment template. The weighting is two thirds from the written exam, and one third from the project report. The pass mark is 50% and the pass wiht distinction mark is 75%.

## Entry requirements

Admission to the course requires knowledge equivalent to 90 credits in natural sciences, including knowledge equivalent to FYSB24, Physics: Atomic and Molecular Physics, 7.5 credits. General entry requirements and English 6/B.

## Further information

The course replaces FYST38, Physics: Environmental Metrology, 7.5 credits and cannot be included in the degree together with this course.

The course is co-taught with FKFN35, Environmental Metrology 7.5 credits, which is a course at Lund University of Technology, LTH.

The course examination is scheduled in accordance with LTH's examination schedule.

The course is given at the Department of Physics, Lund University.