



Course syllabus for

# **Applications of Methods in Toxicological Research, 16.5 credits**

Tillämpning av metoder inom toxikologisk forskning, 16.5 hp

This course syllabus is valid from spring 2022.

Please note that the course syllabus is available in the following versions:

[Spring2019](#) , [Spring2020](#) , [Spring2022](#) , [Spring2024](#) , [Spring2025](#)

Course code	4TX030
Course name	Applications of Methods in Toxicological Research
Credits	16.5 credits
Form of Education	Higher Education, study regulation 2007
Main field of study	Toxicology
Level	AV - Second cycle
Grading scale	Pass with distinction, Pass, Fail
Department	Institute of Environmental Medicine
Decided by	Utbildningsnämnden IMM
Decision date	2018-10-22
Revised by	Education committee IMM
Last revision	2021-10-04
Course syllabus valid from	Spring 2022

## **Specific entry requirements**

At least the grade Pass for the courses Principles in toxicology, Target organ toxicology - toxicokinetics and toxicodynamics, and Histopathology and clinical pathology within the Master's programme in toxicology.

## **Objectives**

Upon completion of the course, the student should be able to:

Regarding knowledge and understanding

- account for current methods that are used in cellular and molecular toxicology
- account for alternative methods for toxicological testing
- account for statistical methods within cellular and molecular toxicology.

Regarding skills and ability

- plan laboratory experiments that can be used to answer cellular and molecular toxicological issues
- in a safe way implement methods and analyses within toxicological laboratory work including working with toxic chemicals,
- analyse and evaluate results of toxicological laboratory work and, orally and in writing account for and discuss the conclusions,
- analyse and evaluate omics data using bioinformatic tools
- identify and discuss sources of errors, weaknesses, and strengths for different methods within cellular and molecular toxicology and for alternative methods for toxicological testing,
- Identify and apply relevant statistical methods for the analysis of data from laboratory experiments and interpret results and draw statistical conclusions.

Regarding judgement and approach

- make assessments considering scientific and ethical aspects regarding toxicological methodology.

## Content

The course is divided into the following parts:

### **Practical laboratory methods in toxicology, 7.5 hp**

Grading scale: VU

This part contains theory and practical application of current laboratory research methods within toxicology, including alternative methods such as in vitro and alternative animal models.

Laboratory technology and laboratory safety is included. The methods that are included can vary from course to course depending on current research issues. Examples of methods that may be included are: molecular biological methods for the analysis of DNA, RNA levels, protein levels and enzyme activity. Methods within epigenetics. Methods for determination of DNA-damage and cell toxicity. Methods within endocrine toxicology.

### **Alternative methods for toxicity testing, 1.5 hp**

Grading scale: GU

This part contains analysis of need, development, validation and regulatory acceptance of alternative methods (according to 3R) for toxicological testing.

### **Biostatistics, 1.5 hp**

Grading scale: GU

This part contains theory and practically application of basic statistical principles and methods that are applied within experimental toxicological research.

### **Integration of methods in toxicological research, 6.0 hp**

Grading scale: VU

The course is completed with an integrating part where the contents from Practical laboratory methods in toxicology, Alternative methods for toxicological testing, and lectures related to OMICS, in silico technologies and bioinformatics are examined.

## Teaching methods

The teaching includes laboratory sessions (including computer exercises), lectures, written reports and

oral presentations.

## Examination

Practical laboratory methods in toxicology (7.5 credits). The examination consists of individual written laboratory reports. Graded Fail/Pass/Pass with distinction.

Alternative methods for toxicological testing (1.5 credits). The examination consists of individual written reports and oral presentations. Graded Fail/Pass.

Integration of methods in toxicological research (6.0 credits). The examination consists of written examination. Graded Fail/Pass/Pass with distinction.

Biostatistics (1.5 credits). The examination consists of written examination. Graded Fail/Pass.

To get pass with distinction as the final grade of the course pass with distinction is required for both parts: Practical laboratory methods in toxicology and Integration of methods in toxicological research. To pass the whole course the grade pass must have been obtained for all parts of the course.

### Compulsory participation

All practical modules including presentations and occasional lectures (indicated in the schedule) are compulsory.

The course director assesses if, and in that case how, absence can be compensated. Before the student has participated in all compulsory parts or compensated absence in accordance with the course director's instructions, the student's results for respective part will not be registered. Absence from a compulsory activity may result in that the student cannot compensate the absence until the next time the course is given.

If there are special grounds, or a need for adaptation for a student with a disability, the examiner may decide to deviate from the syllabus's regulations on the examination form, the number of examination opportunities, the possibility of supplementation or exemptions from the compulsory section/s of the course etc. Content and learning outcomes as well as the level of expected skills, knowledge and abilities may not be changed, removed or reduced.

## Transitional provisions

After each course, there will be at least 6 occasions for examination within a two-year period after the end of the course.

## Other directives

The course language is English.

Course evaluation will be carried out in accordance with the guidelines established by the Board of Higher Education.

Oral evaluation in the form of course council meetings will be carried out during the course.

## Literature and other teaching aids

### Mandatory literature

#### *Recommended literature*

*Casarett, Louis J.; Doull, John*

**Casarett and Doull's toxicology : the basic science of poisons**

*Klaassen, Curtis D.*

8th ed. : New York : McGraw-Hill, 2013. - 1454 s.

ISBN:9780071769235 (Book + DVD) LIBRIS-ID:14293294

URL: [Contributor biographical information](#)

[Library search](#)

*Hayes, A. Wallace; Kruger, Claire L.*

**Hayes' principles and methods of toxicology**

6. ed. : - xxvi, 2157 p.

ISBN:9781842145364 (hardcover : alk. paper) LIBRIS-ID:16954170

[Library search](#)

Handouts, scientific papers and other assigned literature.