



## CORE FACILITIES

### **SC00028 Introductory Course to Image Analysis in Life Science, 2 credits**

Introduktionskurs i bildanalys inom Life Science, 2 högskolepoäng

*Third-cycle level / Forskarnivå*

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#### **Confirmation**

This syllabus was confirmed by the Council for PhD Education at Sahlgrenska Academy on 2018-12-12, and is valid from Autumn semester 2018.

#### ***Responsible Department***

Core Facilities, Sahlgrenska Academy

#### **Entry requirements**

Admitted to postgraduate education.

The course is an elective course within the third cycle at Sahlgrenska Academy.

#### **Learning outcomes**

After completing the course the student is expected to be able to:

##### ***Knowledge and understanding***

- Explain fundamental notions on computerized image analysis, such as digitizing, image enhancement, segmentation and classification of features.
- Describe the proper image acquisition needed for image analysis.
- Describe fundamental notions of Image Ethics: What type of image processing is acceptable for publication and what type is non-acceptable.
- Carry out a image analysis project on a specific problem in the student's own research area.

##### ***Competence and skills***

- Use software for solving image analysis problems.
- Perform manual and automatic measurements using the freely available image analysis software tools
- Perform object segmentation, quantification and tracking of using the freely available

image analysis software tools.

### ***Judgement and approach***

- Understanding when image analysis can be a solution to a specific problem and when it will probably fail.
- Analyse and outline the steps necessary to solve a realistic image analysis problem in the student's own research area.

## **Course content**

Overview – This is a compact, hands-on image analysis course. The example material used is mainly fluorescent bio-images, but the underlying concepts taught apply also to images from electron microscopy and medical imaging modalities.

Content – The focus of the course is on reaching a broad understanding of computerized image analysis in Life Science and a basic understanding of the theory and algorithms behind the image analysis methods and tools. Hands-on exercises that will teach a broad functionality of these tools and the concepts needed for building suitable workflow for a given application.

This course provides:

- basic concepts of digital images,
- basic computerized image analysis methods and computer exercises
- visualization of multi-dimensional data, • image processing in preparation for analysis,
- noise and image enhancement
- binary operations,
- object / particle analysis and intensity and morphometric measurements,
- tracking of particles cells movement,
- automatically analyzing large datasets.

We will address the issues of image ethics and proper image acquisition for image analysis. The course will also offer an introduction to a number of freely available software tools (Image/Fiji, ilastik), and the commercial software (MatLab, Imaris), preparing the students to start using image analysis in their own research.

The course will be conducted in the computer classroom, one user for each computer. It will consist of both theoretical and practical classes with demos and hands-on analysis of image examples.

## **Types of instruction**

Lectures, computer exercises, oral presentation, written report.

### ***Language of instruction***

The course is given in English.

## **Grades**

The grade Pass (G) or Fail (U) is given in this course.

## Types of assessment

The examination will be divided into:

- three computer exercises, both to get familiar with the interfaces of common software and to solve realistic image processing problems
- a project (oral presentation and written report), where the course participants apply the collected knowledge to a project within their own domain

A doctoral student who has failed a test twice has the right to change examiners, if it is possible. A written application should be sent to the Institute.

## Course evaluation

There will be a written evaluation of the different parts of the course. The results of the evaluation will be communicated to the students and will function as a guide for the development of the course.

## Other information

The syllabus was confirmed by the Council for PhD Education on 2017-03-07 and was revised 2018-02-20 to be valid from autumn semester 2018 (Dnr.: U 2017/543). It was entered into FUBAS in December 2018.