

## Molecular Imaging and Digital Pathology

Molekylär bildbehandling och digital patologi

6.0 credits

Programme course

8BKG66

Valid from: 2022 Spring semester

<b>Determined by</b>	<b>Main field of study</b>	
Chairman of The Board for First and Second Cycle Programmes	Medical Biology	
<b>Date determined</b>	<b>Course level</b>	<b>Progressive specialisation</b>
2019-09-12	First cycle	G2X
<b>Revised by</b>	<b>Disciplinary domain</b>	
Chairman of The Board for First and Second Cycle Programmes	Medicine, Natural sciences	
<b>Revision date</b>	<b>Subject group</b>	
2020-09-11; 2021-05-03	Medical Biology	
<b>Offered first time</b>	<b>Offered for the last time</b>	
Spring semester 2021		
<b>Department</b>	<b>Replaced by</b>	
Medicinska fakulteten		

## Course offered for

- Experimental and Industrial Biomedicine
- Bachelor´s Programme in Experimental and Industrial Biomedicine

## Entry requirements

To enter the course requires at least 90 credits from semester 1-4 in the Bachelor's Programme in Experimental and Industrial Biomedicine

## Intended learning outcomes

### *Knowledge and understanding*

Having completed the course, the student is expected to be able to:

- Explain fundamental preparation techniques of tissues, cells and small organisms in different microscopic techniques within light-, fluorescence- and electron-microscopy
- Explain the difference between different microscopic techniques and describe their advantages and disadvantages
- Explain how a digital image is retrieved and what a digital image means, and describe advantages and disadvantages with accepted imaging processes
- Explain key concepts and principles of accepted image adjustments and analyses, and describe risks with digital imaging
- Describe how different microscopic techniques and imaging methods can be used to assess diseases

### *Skills and abilities*

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

- Suggest a relevant preparation technique and microscopic method to solve a given scientific question
- Correctly use light-, fluorescence- and electron-microscopy for studies of biological material, both living and after fixation
- At the basic level, apply software-based imaging for analysis of digital images

### *Judgement ability and approach*

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

- Reflect on possibilities and limitations of different microscopic techniques, sample preparations and digital images when analyzing cells, tissues and small organisms
- Critically review and evaluate reliability of microscopic images, both in raw format and after digital imaging

## Course content

The course gives an introduction to different imaging techniques in research and health care that will provide the student with a basic ability to assess and communicate results from imaging- based studies and to suggest suitable microscopic methods for different medical and biomedical questions.

The course provides knowledge about sample preparation of tissues, cells and small organisms, retrieval of digital images and key concepts in imaging aimed for students within the biological and medical sciences. It gives the students theoretical and practical knowledge to understand both basic and advanced microscopic techniques and how these techniques are preferably used to solve different scientific questions. Digital imaging techniques are also used for studies of biological samples. In the course includes specific techniques and methods for microscopy in different structural levels (light- fluorescence- and electron-microscopy) and digital analyse of tissues, cells and model organisms.

The course encompasses the fields of medical imaging science, physiology, anatomy, pathology, and molecular biology and cell biology that are integrated with biomedical laboratory techniques, biomedical ethics and scientific approach.

## Teaching and working methods

At the Faculty of Medicine and Health Sciences student centred and problem-based learning make up the foundation of the teaching. The student takes responsibility for, studies and researches current content of the courses and study programme. The methods of the course work challenge the students to independently formulate questions for learning, to seek knowledge and in dialogue with others judge and evaluate achieved knowledge. Students in the Bachelor's programme in Experimental and Industrial Biomedicine work together in groups based on reality based and course related biomedical issues to apply their knowledges, develop their own learning, contribute to the fellow students' learning and to practice cooperation. Throughout the study programme theory is integrated with practical modules. The course methods and integration modules stimulate and support the student's ability to apply their knowledge and professional competence.

Work methods used on this course are lectures, seminars and laboratory sessions.

## Examination

The form of examination is an individual written examination and an individual written report. In addition, active participation in compulsory components is

required to pass the course.

Compulsory elements include seminars, laboratory sessions with associated reports and assignments.

The written examination and the written report may be performed an unlimited number of times by those students who have not achieved a passing grade. Completion of the written report is limited to two times.

Examination and teaching are normally done in English.

### **Grades**

The course is graded with the grades Fail or passing grades 3-5, where 3 corresponds to approved, 4 corresponds to approved with credit and 5 corresponds to approved with distinction. An aggregation of the grades from the individual written exam and the individual written report forms the basis of the final grade of the course.

If special circumstances prevail, and if it is possible with consideration of the nature of the compulsory component, the examiner may decide to replace the compulsory component with another equivalent component.

### **Application for examination**

Instructions on how to apply for examinations are given prior to the beginning of each course.

### **Re-examination**

The date for re-examination should normally be announced by the date of the regular examination at latest; in which case the scope must be the same as at the regular examination.

### **Examination for students with disabilities**

If the LiU coordinator for students with disabilities has granted a student the right to an adapted examination for a written examination in an examination hall, the student has the right to it.

If the coordinator has recommended for the student an adapted examination or alternative form of examination, the examiner may grant this if the examiner

assesses that it is possible, based on consideration of the course objectives.

An examiner may also decide that an adapted examination or alternative form of examination if the examiner assessed that special circumstances prevail, and the examiner assesses that it is possible while maintaining the objectives of the course.

### **Nomination of another examiner**

A student who has taken two examinations in a course or a part of a course without obtaining a pass grade is entitled to the nomination of another examiner, unless there are special reasons to the contrary.

## Grades

Four-grade scale, LiU, U, 3, 4, 5

## Course literature

A literature reference list must be set no later than two months before the course begins by the programme committee for the Bachelor's Programme in Experimental and Industrial Biomedicine. There is no compulsory course literature.

## Other information

Planning and implementation of the course is to be based on the wordings in the course syllabus. A course evaluation is compulsory for each course and should include how the course is in agreement with the course syllabus. The course coordinator will analyse the course evaluation and propose appropriate development of the course. The analysis and proposal will be returned to the students, the Director of Studies, and as needed to the Education Board, if related to general development and improvement.

The course is carried out in such a way that knowledge of gender, gender identity/expression, ethnicity, religion or other belief system, disability, sexual orientation and age is addressed, highlighted and communicated as part of the programme.

If the course is cancelled or undergoes major changes, examination is normally offered under this course syllabus, at a total of three occasions, within/in connection to the two following semesters, of which one in close proximity to the first examination.