Molecular Imaging and Digital Pathology

Programme course

6.0 credits

Molekylär bildbehandling och digital patologi

8BKG66

Valid from: 2021 Spring semester

Determined by
Chairman of The Board for First and Second Cycle Programmes

Date determined
2019-09-12

Revision date
2020-09-11

Main field of study
Medical Biology

Course level
First cycle

Advancement level
G2X

Course offered for
- 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 digitalimages

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.

The examiner can decide to replace the compulsory element with an equivalent task if there are special reason to do so and if it is possible regarding the character of the compulsory element.

Examination and teaching are normally done in English.

Application for examination / written exam
Instructions on how to apply for examinations are given prior to the beginning of each course.

Retake of examination
Point of time for retake examination must normally be announced no later than the time of the regular examination. The extent of the retake examination must be the same as the regular examination.

Examination of students with functional disabilities
If LiU's coordinator for students with functional disabilities has issued a student the right to customized examination at a written hall examination the student has the right to this. If the coordinator instead has given the student a recommendation of customized examination or alternative examination form, the examiner can decide on this if the examiner consider it possible based on the objectives of the course.

Change of examiner
A student who has obtained a failing grade twice for a course or a part of a course is, after request, entitled to be appointed another examiner, unless there are special reasons to the contrary.

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.

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.

Department
Medicinska fakulteten