

Gene Technology and Transgenic Models

Genteknologi och transgena modeller

6.0 credits

Programme course

8BKG33

Valid from: 2022 Spring semester

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|-------------------------------------------------------------|----------------------------------|-----------------------------------|
| Determined by | Main field of study | |
| Chairman of The Board for First and Second Cycle Programmes | Medical Biology | |
| Date determined | Course level | Progressive specialisation |
| 2018-09-04 | First cycle | G2X |
| Revised by | Disciplinary domain | |
| | Medicine | |
| Revision date | Subject group | |
| 2020-09-11; 2021-05-03 | Medical Biology | |
| Offered first time | Offered for the last time | |
| Autumn semester 2019 | | |
| Department | Replaced by | |
| Institutionen för biomedicinska och kliniska vetenskaper | | |

Course offered for

- Bachelor´s Programme in Experimental and Industrial Biomedicine

Entry requirements

General entry requirements for undergraduate studies
and

English corresponding to the level of English in Swedish upper secondary
education (English 6)

And

Chemistry, Mathematics and Biology corresponding to the level in Swedish upper
secondary education (Chemistry 2, Mathematic 4 and Biology 2)

Exemption from Swedish 3

Intended learning outcomes

Knowledge and understanding

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

- Describe methods of genetic modification in mammals.
- Describe the importance of genomic context to the expression of genes and transgenes.
- Understand developments that have resulted in modern transgenic approaches.
- Explain how different transgenic models can be used to elucidate specific disease mechanisms.
- Understand the limitations and possibilities of transgenic disease models.

Skills and abilities

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

- Plan strategies for the genetic manipulation and isolation of mutants in various model organisms, including fruit flies, yeast and mice.
- Identify potential problems of various transgenic strategies within biomedical research.
- Apply genetic engineering tools to manipulate the genome and the transcriptomes of human cells.
- Critically evaluate the results of biomedical research based on transgenic models.

Judgement ability and approach

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

- Demonstrate a well-founded and critical approach to assessing the advantages and disadvantages of using various transgenic methods in order to solve specific biomedical problems
- Evaluate ethical problems pertaining to the use of transgenic models in biomedical research

Course content

The aim of the course is to introduce newly developed and popular methods of genome editing, including CRISPR/Cas9 and related systems, that exist today and to illustrate their potential significance to modern medicine. Gene expression analysis is also included as an approach to phenotyping cells and organisms. Specific emphasis will be placed on the historical developments that have made these techniques possible. Mouse systems are generally used as the model when studying human disease mechanisms, and the course will therefore focus primarily on these models but will also cover other model systems in which genetic engineering is often applied. The laboratory sessions will focus on the manipulation of embryonic stem cells from mice as a key step in generating genetically modified mouse lines. The course encompasses Mendelian genetics, recombinant DNA technology and methods relating to programmable nucleases. The course encompasses the fields molecular biology and medical genetics.

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 stimulates and support the student's ability to apply their knowledge and professional competence.

Work methods used in this course are lectures, tutorial groups, seminars and skills training in the form of laboratory sessions.

Examination

The forms of examination are one individual written and one individual practical exam. In addition, active participation in compulsory components is required to pass the course. Compulsory course elements include tutorial groups, laboratory sessions, seminars, reports and written assignments.

Resource-demanding examinations, in this syllabus the individual practical examination, are limited to five attempts. The written examination may be performed an unlimited number of times by those students who have not achieved a passing grade.

Grades

The grades for the course are either fail (F) or grades 3-5, where 3 corresponds to pass, 4 corresponds to satisfactory and 5 corresponds to excellent. An overall assessment of both written and practical examinations form the basis for the final grade in 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 conducted in such a way that there are equal opportunities with regard to sex, transgender identity or expression, ethnicity, religion or other belief, disability, sexual orientation and age.

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.

If special circumstances prevail, the vice-chancellor may in a special decision specify the preconditions for temporary deviations from this course syllabus, and delegate the right to take such decisions.