Faculty of Medicine

BIMM18, Biomedicine: Advanced molecular medicine, 30 credits

Biomedicin: Avancerad molekylär medicin, 30 högskolepoäng

Second Cycle / Avancerad nivå

Details of approval

The syllabus was approved by Committee for Biomedical, Medical and Public Health Education on 2015-03-31 and was last revised on 2015-03-31. The revised syllabus applies from 2015-03-31, autumn semester 2015.

General Information

The course is a compulsory component of the Master of Medical Science programme in Biomedicine and is the first semester of the programme.

Language of instruction: English

Main field of studies	*Depth of study relative to the degree requirements*
Biomedicine	A1N, Second cycle, has only first-cycle course/s as entry requirements

Learning outcomes

Knowledge and understanding

On completion of the course, students shall be able to, using correct terminology and a register adapted to informed colleagues,

- argue for the possibilities and limitations of cell culture in biomedical research and applications, and account for the prerequisites for cell culture in vitro
- argue for the possibilities and limitations of animal models in biomedical research and account for the relevant technologies, laws, regulations and ethical rules concerning the treatment of laboratory animals
- account for the reproduction and embryonic development of mice and rats and for methods for the production and genotype and phenotype analysis of genetically modified mice, and analyse disease models in which genetically

modified animals are used
- account for the development, selection, regulation and tolerance mechanisms, and effector function of lymphocytes at cellular and molecular level, and their interaction with the innate immune system in cases of infection, tissue damage and hypersensitivity reactions
- account for primary and secondary immune responses, explain the principles of vaccination, describe symptoms of some common autoimmune diseases and relate them to immunological mechanisms
- account for different types of variables on the basis of scales of measure and describe how they can be presented numerically and graphically
- account for the concepts of random sample, parameter and parameter estimation and how the uncertainty of estimations is related to sample size, and discuss the concepts of generalisability and causality
- set up a null hypothesis and alternative hypothesis and account for the concepts of significance level, statistical strength, confidence intervals and p-value
- select and justify a suitable test for a two sample comparison

Competence and skills
On completion of the course, the students shall be able to

- independently plan and carry out laboratory sessions and self-critically/critically summarise results in writing in relation to previous research and in a style appropriate to the subject
- identify and present relevant information from academic texts dealing with biomedical issues and assess and relate the information to the subject area
- execute appropriate statistical analyses with statistics software and interpret the results
- handle the most common small laboratory animals (mainly mice) and carry out anaesthesia and simple surgical interventions
- propose an appropriate method for producing genetically modified animals for a certain research issue, draw up a time plan, calculate the number of laboratory animals needed and write an application for ethical approval

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

- adopting a constructive and critical approach, analyse and argue for the practical and theoretical conditions for different biomedical research methods, including ethical and environmental aspects, and reflect on alternatives
- assess and critically review media information (radio, television, newspapers, blogs and websites) on biomedical issues
- evaluate their performance in relation to the learning outcomes

Course content

The aim of the course is to prepare students for further studies within experimental medical research by providing them with specialised knowledge within three main fields: cell culture, animal testing models and immunology, and basic knowledge of biostatistics and research communication.

The course starts by providing students with theoretical and practical knowledge of and skills in cultivation of cells in vitro. The students are trained in planning, executing and analysing experiments including cell culture and assessing the situations in which cell culture can be used to solve issues within basic and applied research.

The main field of animal testing models is introduced by sessions in general laboratory animal science including both practical and theoretical knowledge and aiming to provide students with the qualifications required to work with small rodents/lagomorphs in animal facilities. Furthermore, students practise taking ethical positions and writing applications for ethical approval of animal experiments. After that, focus is placed on the reproduction and embryogenesis of mice and rats, highlighting the practical procedure of obtaining preimplantation embryos. The most common methods of generating genetically modified mice are presented in detail and the students are given the opportunity to practise them. The study of the main field is concluded with genotype and phenotype analysis.

The course is completed with studies in advanced immunology at the cellular and molecular level. Different immunological subjects are addressed during thematic weeks and the students are trained so as to be able to compare immunological mechanisms in the case of, for example, infection, tissue damage, vaccination, hypersensitivity or autoimmunity.

The course includes a biostatistics component corresponding to the course? Applied Statistics I, 1.5 credits for which credits can be transferred to third-cycle studies at the Faculty of Medicine, Lund University.

Course design

The teaching is student-centred and includes different components such as problem-based learning in base groups (PBL), team-based learning (TBL) and case methodology. Lectures by active researchers are used both to introduce different subjects and to provide specialisation through clear examples from modern experimental research and integration of the most recent research findings in the teaching. In addition to the reading list, students are to study additional research articles to be discussed during the group exercises. Moreover, the course includes an online module on research on small rodents and lagomorphs.

The skills training takes place in laboratory exercises performed by the students in groups. Written individual reports in the form of miniature articles are to be submitted after each laboratory session.

A text assignment within the main field of animal testing models is to be presented both in speech and writing. Furthermore, the students are to write an application for ethical approval of animal experiments that is to be discussed in a form simulating a meeting of the ethical review board.

Attendance is compulsory for all group components, laboratory sessions and lectures linked to laboratory exercises.

Assessment

The assessment is based on six components, a practical exam, four written exams and a course portfolio.

The practical exam is used to assess the learning outcomes of knowledge and understanding and competence and skills with regard to cell culture.

The written exams are used to assess the learning outcomes of knowledge and understanding.

The course portfolio is used to assess the learning outcomes of competence and skills and judgement and approach through active participation in group and laboratory exercises, oral presentations and written assignments.

Subcourses that are part of this course can be found in an appendix at the end of this document.

Grades

Marking scale: Fail, Pass.
To be awarded a grade Pass on the whole course, students must have been awarded this grade on all components.

Entry requirements

The admission requirements are the same as for the Master's programme in Biomedicine: 180 credits in biomedicine, biotechnology, cell and molecular biology, or medicine, including an independent project (degree project) of at least 15 credits in a subject within biomedicine/science. For admission to the programme, the previous studies must include at least 30 credits of basic chemistry, including at least 15 credits in biochemistry, cell chemistry or the equivalent, at least 45 credits of basic cell biology (cell biology, molecular biology, microbiology, immunology, genetics and/or developmental biology), including at least 5 credits of immunology and 5 credits of microbiology, at least 10 credits of human physiology and at least 30 credits of molecular medicine, pathobiology and/or toxicology. English B/English 6.

Subcourses in BIMM18, Biomedicine: Advanced molecular medicine

Applies from H15

1501 Practical examination - cell culture, 2,0 hp
Grading scale: Fail, Pass
1502 Written exam - cell culture, 3,5 hp
Grading scale: Fail, Pass
1503 Written exam - biostatistics, 1,5 hp
Grading scale: Fail, Pass
1504 Written exam - animal models, 5,5 hp
Grading scale: Fail, Pass
1505 Written exam - immunology, 6,0 hp
Grading scale: Fail, Pass
1506 Portfolio, 11,5 hp
Grading scale: Fail, Pass