BIMA 71 Molecular Cell Biology and Genetics

13.5 credits First cycle G2F

General Information

Main field
Biomedicine

Subject
Genetics and molecular cell biology

Type of course
The course is a compulsory component of semester 3 in the Bachelor’s programme in Biomedicine.

Language of instruction
Swedish and English. Literature in English is included.

Learning Outcomes

Knowledge and learning
On completion of the course, students shall be able to

- describe how gene expression is regulated at different levels, how tissue-specific expression is achieved and exemplify how gene expression can be manipulated and studied experimentally
- account for the molecular mechanisms regulating and controlling cell division and the cell cycle and exemplify how extracellular signals affect cell division
- describe the molecular mechanisms behind DNA damage and repair
- describe and compare different molecular mechanisms through which cell death occurs and explain how this is linked to DNA damage
- explain how molecular defects in a cell can lead to its development into a cancer cell
- explain and compare different principles of how extracellular signals can reach the cell interior, be amplified, transmitted and terminated, and exemplify how signalling pathways are integrated and how specificity can be achieved
- describe the molecular structure and function of extracellular matrices and how cells interact with these and each other
- explain different principles and molecular mechanisms of how and why cells move
- account for basic concepts of hereditary and population genetics and master fundamental genetic calculations
exemplify and explain methods for how the flow from gene to protein can be achieved and observed experimentally.

Students shall be able to account, explain and describe with the terminology used in research literature.

**Competence and skills**

On completion of the course, students shall be able to

- identify and present relevant information from research publications dealing with issues of cell and molecular biology and assess and relate the information to the context of cell biology
- plan and carry out simple experiments on the basis of cell biology issues and established method descriptions, and summarise the laboratory results in writing similar to a scientific paper
- analyse hereditary data and apply fundamental coupling analyses and genetic calculations
- apply critical thinking and logical analysis in the assessment and evaluation of issues in cell biology and genetics.

**Judgement and approach**

On completion of the course, students shall be able to

- reflect on issues of cell biology and genetics and on the ethical principles governing the use and analysis of genetic data

**Course Content**

The course provides a specialisation and development of the courses in biochemistry and elementary cell biology in the first year of the programme. The beginning of the course introduces genetics, including meiosis, Mendelian crosses, quantitative genetics, coupling analysis, population genetics and the ethical aspects of using genetic data. The basics of hypothesis testing and application of the chi-square test are also included. During the remainder of the course, focus is placed on the molecular and cellular mechanisms controlling cells and the basic functions of their environment. One week is devoted to each of the following subjects: transcription and gene regulation, non-coding RNA, the cell cycle and cancer, cellular signalling, and cell interaction and the extracellular matrix and cell movement.

**Subjects examined**

Written exam 5 credits
Oral exam 5 credits
Participation in PBL teaching and literature seminars 2 credits
Participation in laboratory exercises and submission of laboratory report 1.5 credits

**Teaching and Assessment**

The course is based on compulsory group exercises in the form of problem-based learning (PBL) and comprises week-long themes. A typical week starts with an introductory lecture and concludes with a
summarising and/or a more profound lecture. In between, students work in tutorial groups (two meetings per week) and individually. Some components are illustrated in demonstrations/laboratory exercises. Students are trained in reading, extracting relevant content from and orally presenting research articles. Each student will present research articles in tutorial groups of 5–8 students. The presentations include discussion of links to previous course content in which all students in the group are expected to participate.

The learning outcomes of “knowledge and understanding” are examined through a written and oral exam. The learning outcomes of “competence and skills” and “judgement and approach” are examined through a written exam, an oral exam, participation in literature seminars and PBL exercises, participation in laboratory exercises and submission of laboratory reports.

A pass on the written exam is required in order to attend the oral exam.

Grades
The grades Pass or Fail are awarded on the course.

Admission Requirements
To be eligible for the course the course students must have passed courses in basic chemistry 20 credits biostatistics 5 credits, cell biology 10 credits, and completed a course in chemistry of the cell (15 credits).

Literature
Genetics
Strachan and Read, *Human Mol Genetics*, Wiley-Liss
Russell P. J., *iGenetics, a molecular approach*, Pearson

Cell biology and biochemistry
Alberts *Mol Biol of the Cell*, Garland
Stryer, L. *Biochemistry*, Freeman.

Further Information
Major parts of the course correspond to the previous course BIMA30.