UNIVERSITY OF GOTHENBURG

# DEPARTMENT OF CHEMISTRY AND MOLECULAR BIOLOGY

## BIO406 Advanced Functional Genomics, 15 credits

Avancerad funktionsgenomik, 15 högskolepoäng

*Second Cycle*

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### Confirmation

This course syllabus was confirmed by Faculty of Science on 2012-05-24 and was last revised on 2017-09-21 by Department of Chemistry and Molecular Biology to be valid from 2017-09-22, autumn semester of 2017.

*Field of education:* Science 100%
*Department:* Department of Chemistry and Molecular Biology

### Position in the educational system

This is a course in biology at an advanced level that is designed to provide advanced knowledge in Functional Genomics and Systems Biology. The course is included in the master's program in Genomics and Systems Biology. The course is also offered as a separate course.

| *Main field of studies* | *Specialization* |
|---|---|
| Molecular Biology | A1N, Second cycle, has only first-cycle course/s as entry requirements |
| Biology | A1N, Second cycle, has only first-cycle course/s as entry requirements |

### Entry requirements

Passed courses in Cell Biology, BIO900,15 hec, Molecular Genetics, BIO905, 15 hec, Biological Form and Function, BIO910, 15 hec, Ecology and Evolution, BIO915, 15 hec, and Biodiversity and Systematics, BIO920, 15 hec, and completion of Chemistry, 30 hec or equivalent courses.

English proficiency is required to the level of English 6/English Course B from Swedish Upper Secondary School, or be certified by an international recognized test, for example TOEFL, IELTS. In additon a passed advanced course in Biology is required,

Bioinformatics and Functional Genomics (e.g. BIO210) is recommended or an equivalent course.

## Learning outcomes

After completing the course students will be able to:

*Knowledge and understanding*

- Design and implement simple theoretical models of cellular modules, and to conduct relevant simulations.
- Have an understanding of how the genome-wide technologies transcriptomics, proteomics, metabolomics and phenomics works in theory and practice.
- To conduct experiments in quantitative phenomics.

*Competence and skills*

- Demonstrate the ability to search, read, understand and critically evaluate scientific literature and research information.
- Demonstrate the ability to present, explain and discuss current issues, research findings and issues regarding large-scale genome-wide analysis and systems biology.
- Demonstrate the ability to critically, independently and creatively identify and formulate issues and to plan and carry out advanced tasks within specified time frames.
- Propose and implement large-scale experiments to answer relevant biological questions, including analysis of the strengths and drawbacks of the proposed procedure.
- Interpret large-scale data and assess the various hypotheses in relation to the data presented.

*Judgement and approach*

- Critically review, evaluate and assess the quality of scientific literature and other research information.
- Have a broader understandings about different ethical approaches on how genomics and systems biology affects society and be able to discuss these issues from different perspectives.

## Course content

This course provides an introduction to the theoretical foundations of systems biology and knowledge of relevant advanced experimental methodology. Students learn to create simple mathematical models of cellular modules such as signaling pathways and metabolic systems. Simulation is an integral part of the course to test and verify the models' predictive power. It also deals in both lectures and practical exercises with

various genome-wide technologies (transcriptomics, proteomics, metabolomics and phenomics) that are central to a systems biological attack on biological issues. The course also provides in-depth knowledge of how to experimentally introduce genetic changes in different model systems, which are central to experimentally test given hypotheses.

The course consists of lectures, group exercises, seminars, individual project work and assignments. The course also contains elements that increase understanding and reflection on ethical issues related to the genome-wide methods. The students will also be trained to discuss these issues from different perspectives.

**Form of teaching**

see above.

All schedule events except lectures are compulsory.

*Language of instruction:* English

**Assessment**

The student's knowledge is assessed during the course through the project work. The course ends with an written exam.

Missed compulsory sessions can be made up during the course if possible but otherwise the next time the course runs.

A student who has failed a test twice has the right to change examiner, if it is possible. A written application should be sent to the Department.

**Grades**

The grading scale comprises: Pass with Distinction (VG), Pass (G) and Fail (U).

**Course evaluation**

A written and oral course evaluation is done at the end of the course. The results of the evaluation will be communicated to the students and will function as a guide for the development of the course.