



ÖREBRO UNIVERSITY  
SCHOOL OF SCIENCE AND TECHNOLOGY

**Programme Syllabus<sup>1</sup>**  
Reg. no. CF 52-617/2008

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## **MOLEKYLÄR MEDICINSK BIOLOGI, 120 HÖGSKOLEPOÄNG**

### ***Molecular Medical Biology, 120 Higher Education Credits***

The study programme was instituted and the programme syllabus established on 12 October 2006, by the Faculty Board of Medicine, Natural Sciences and Technology. The programme syllabus was last amended on 24 November 2008, by the Faculty Board of Natural Science and Technology.

### **1 GENERAL**

The study programme in Molecular Medical Biology comprises 120 higher education credits and leads to a Degree of Master (Two Years) in the main field of study, biology. The aim of the programme is to educate future scientists for life science and preclinical research and to (through co-operation with trade and industry) prepare students for a future in the pharmaceutical and process industries.

### **2 AIMS AND OBJECTIVES**

#### **2.1 General aims for second level education**

Second level education shall essentially build on the knowledge that students acquire in first level education or corresponding knowledge.

Second level education shall involve a deepening of knowledge, skills and abilities relative to first level education and, in addition to what applies to first level education, shall

- further develop the students' ability to independently integrate and use knowledge;
- develop the students' ability to deal with complex phenomena, issues and situations; and

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<sup>1</sup> The English translation of the programme syllabus was last amended on 19 December, 2008.

- develop the students' potential for professional activities that demand considerable independence or for research and development work.

(Chapter 1, Section 9, Higher Education Act)

## **2.2 Objectives for the programme in Molecular Medical Biology**

Objectives (in addition to the general aims stated in Chapter 1, Section 9 of the Higher Education Act)

### *Knowledge and understanding*

For a Degree of Master (Two Years) students must

- demonstrate knowledge and understanding in their main field of study, including both broad knowledge in the field and substantially deeper knowledge of certain parts of the field, together with deeper insight into current research and development work; and
- demonstrate deeper methodological knowledge in their main field of study.

### *Skills and ability*

For a degree of Master (Two Years) students must

- demonstrate an ability to critically and systematically integrate knowledge and to analyse, assess and deal with complex phenomena, issues and situations, even when limited information is available;
- demonstrate an ability to critically, independently and creatively identify and formulate issues and to plan and, using appropriate methods, carry out advanced tasks within specified time limits, so as to contribute to the development of knowledge and to evaluate this work;
- demonstrate an ability to clearly present and discuss their conclusions and the knowledge and arguments behind them, in dialogue with different groups, orally and in writing, in national and international contexts; and
- demonstrate the skill required to participate in research and development work or to work independently in other advanced contexts.

### *Judgement and approach*

For a Degree of Master (Two Years) students must

- demonstrate an ability to make assessments in their main field of study, taking into account relevant scientific, social and ethical aspects, and demonstrate an awareness of ethical aspects of research and development work;
- demonstrate insight into the potential and limitations of science, its role in society and people's responsibility for how it is used; and
- demonstrate an ability to identify their need of further knowledge and to take responsibility for developing their knowledge.

(Appendix 2, Higher Education Ordinance)

*In addition to the above, Örebro University has the objective that students on completion of the study programme shall:*

- have acquired knowledge of the regulations in place for managing laboratory animals and genetically modified organisms, as well as knowledge of how to write an ethical application;
- have acquired knowledge of and practical skills in handling pathogenic organisms.

### **3 PROGRAMME DETAILS**

#### **3.1 General organisation and content of the programme**

The programme is organised as follows:

- 1) studies comprising 120 higher education credits which leads to a Degree of Master (Two Years) in the main field of study, biology; or
- 2) completion after studies of 60 higher education credits leading to a Degree of Master (One Year) in the main field of study, biology.

The programme focuses on preparing for future research studies in the life science and medical preclinical fields. The programme comprises a number of compulsory courses. It is possible for the student to complete the studies at the one-year master level with an independent project of 15 higher education credits.

#### **3.2 Courses within the programme**

##### **Year 1**

*Science Methodology, Biology, second level, 15 higher education credits*

The course aims at providing the student with a deeper understanding of scientific hypotheses building and how a scientific project is carried out from idea to product. The course will also provide an insight into how to communicate scientific information and write a research application. This course is only available as part of the two-year master programme.

*Molecular Medical Techniques, Biology, second level, 15 higher education credits*

The course discusses global methods (bioinformatics, function genomics, proteomics, metabolom studies, etc.) as well as focused methods (biochemistry, molecular biology, structural biology, transgenic technology, microscopies, etc.). The course contains theoretical modules as well as laboratory work.

*Model Systems, Biology, second level, 15 higher education credits*

The theoretical part of the course presents an overview of the various model systems used in life science. It comprises bacteria, yeast, animal models such as *Caenorhabditis elegans* (*C. elegans*), banana flies, zebra fish, chickens, mice, rats, plant models, and experimental models such as stem cells and other *in vitro* models. The course discusses the types of biological/medical questions that can be studied in the different model systems. The pros and cons of the different models will be illuminated, as well as which research methods are used for each system. The course also includes the regulations surrounding the use of laboratory animals and genetically modified organisms (GMO). Furthermore, the pros and cons as well as ethical aspects of models will be discussed in seminars. The course includes laboratory modules within selected model systems. A theoretical assignment with

the planning of a research project and the writing of an ethical application for animal testing is included in the course.

*New and Emerging Diseases, Biology, second level, 15 higher education credits*

The course contains two theoretical modules of which the first treats viruses, bacteria and other pathogens and their effects on inflammations and other disease effects. The second illuminates global environmental changes with focus on new emitted chemical substances and their effects. The course also contains a theoretical project where the students are offered an opportunity to deepen their knowledge in a relevant question.

*Degree Project, Biology, 15 higher education credits*

The student completes an independent research assignment, including compiling relevant literature, planning and designing experimental (or corresponding) work. The student processes and presents the results both orally and in writing. This course is only available as part of the one-year master programme.

## **Year 2**

*Drug Development, Biology, second level, 15 higher education credits*

The course discusses how pharmaceutical candidates can be discovered (discovery phase), how to enhance them (development phase), and how strong candidates are tested, first in a laboratory (preclinical testing) and then on humans in clinical studies (clinical trials, phase I-IV). The course will also bring up legal issues of pharmaceutical permits. The course comprises theoretical as well as laboratory modules. This course is only available as part of the two-year master programme.

*Project Work, Biology, second level, 45 higher education credits*

The student completes an independent research assignment, including compiling relevant literature, planning and designing experimental (or corresponding) work. The student processes and presents the results both orally and in writing.

### **3.3 Teaching methods**

Teaching is mainly provided through lectures and seminars. Laboratory modules and independent theoretical projects are also included in the programme. The study programme is designed to stimulate critical reflection, the ability to seek out and evaluate information, the ability to independently follow the development of knowledge, and the ability to communicate orally and in writing. For further information, see individual course syllabuses.

## **4 INTERNATIONAL STUDENT EXCHANGE**

The master programme is open to international student exchange.

## **5 GRADES AND EXAMINATION**

Unless otherwise prescribed in the course syllabus, a grade is to be awarded on completion of a course. The grade is to be determined by a teacher specifically appointed by the higher education institution (an examiner) (Chapter 6, Section 18, Higher Education Ordinance).

Unless the higher education institution prescribes another grading system, one of the following grades is to be used: fail, pass or pass with distinction (Chapter 6, Section 19, Higher Education Ordinance).

The Vice-Chancellor has decided that all schools hosting foreign exchange students shall report grades using both the Swedish grading scale and the ECTS grading scale (Vice-Chancellor Decision no. 26/2002, reg. no. 42-2002).

In case the Vice-Chancellor allows departure from the three-step grading scale this is clear from the syllabus.

Some modules, such as journal clubs, the seminar series, research retreats, laboratory work and independent assignments, are compulsory. For details regarding compulsory modules and their scope, see individual course syllabuses.

For further information, see local examination regulations.

## **6 QUALIFICATIONS**

### ***Degree of Master of Science (One Year)***

A Degree of Master of Science (One Year) is obtained after the student, in addition to having obtained a first level qualification, has completed course requirements of 60 higher education credits, including

- at least 45 higher education credits on the second level, including
  - at least 30 higher education credits with in-depth studies within a main field of study;
  - an independent project (degree project) of at least 15 higher education credits within the main field of study.
- at least 15 higher education credits within another natural science main field of study/other natural science main fields of study, unless such credits are already included in previously obtained qualifications

### ***Degree of Master of Science (Two Years)***

A Degree of Master of Science (Two Years) is obtained after the student, in addition to having obtained a first level qualification, has completed course requirements of 120 higher education credits, including

- at least 90 higher education credits on the second level, including
  - at least 60 higher education credits with in-depth studies within a main field of study;
  - an independent project (degree project) of at least 30 higher education credits within the main field of study.
- at least 30 higher education credits within another natural science main field of study/other natural science main fields of study, unless such credits are already included in previously obtained qualifications

Objectives, see section 2.2.

For further information, see local qualifications regulations.

## **7 ELIGIBILITY REQUIREMENTS**

### **7.1 Eligibility requirements on admission to the programme**

To be eligible for the programme the applicant must hold a first level qualification of at least 180 higher education credits (basic eligibility for admission to second level education according to Chapter 7, Section 28 of the Higher Education Ordinance), including at least 90 higher education credits with increasingly in-depth studies in one of the main fields of study: biology, biomedical laboratory science, chemistry or medicine; and knowledge of English corresponding to “English Course B” from the Swedish Upper Secondary School (special eligibility for admission to second level education according to Chapter 7, Section 31 of the Higher Education Ordinance).

Applicants who do not have “English Course B” from the Swedish Upper Secondary School or corresponding knowledge, must have their knowledge of English documented by an internationally recognised proficiency test and enclose the test results in their application.

For further information, see local admission regulations.

### **7.2 Eligibility requirements on admission to courses within the programme**

In order to gain admission to courses within the programme, students must meet the prescribed special eligibility requirements. In order to begin either of the independent project courses, 15 or 45 higher education credits, the previous courses in the programme must be completed. The special eligibility requirements are stated in the individual course syllabuses.

## **8 SELECTION**

The places on the programme are distributed proportionally to the number of qualified applicants whose main field of study is biology, chemistry and medicine/biomedical laboratory science respectively, and other applicants. Within each group, eligible applicants are ranked based on the total number of completed higher education credits on the last application date.

## **9 TRANSFER OF CREDITS FOR PREVIOUS STUDIES**

Decisions regarding transfer of credits for a course in a general qualification are, if the evaluation is made in connection with a request for a degree certificate and if the evaluation is regarded as a routine matter, made by process manager of Student Services (see delegations in education matters).

Decisions regarding transfer of credits in all other cases are made by the head of school in question (see delegations in education matters).

For further information, see local credit transfer regulations.

## **10 MISCELLANEOUS**

The language of tuition is English and the programme is open to both Swedish and foreign students.

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### **ENTRY-INTO-FORCE AND TRANSITIONAL PROVISIONS (CHAPTER 6, SECTION 17, HIGHER EDUCATION ORDINANCE)**

This programme syllabus shall be in effect from the autumn semester 2009.

Students who commenced the programme in the autumn semester of 2008 have the right to complete their studies in accordance with the programme syllabus established on 12 October 2006, until the end of the spring semester of 2011.