

## Master of Science in Biotechnology

Study programme valid from: 2008/09

Study programme approved: 2008-05-15

In addition to the study programme for the Master of Science in Biotechnology, the general regulations for and information from the Faculty of Engineering at Lund University also apply.

### 1 Aims and Goals

#### 1.1 Aims

This Master of Science programme aims to provide students with the necessary knowledge, skills and values to make them attractive on the labour market in both government service and industry. The programme is designed with foreign students in mind. The goal is to produce graduates who can work at an advanced level thanks to in-depth theoretical studies given in a practical engineering context.

The programme of study aims to meet the needs of graduate engineers who will work as professionals in government and industry and also gives eligibility for studies at the doctoral level.

The programme offers:

- in-depth knowledge in an area of specialisation in engineering or the natural sciences
- the ability to plan, execute and evaluate experiments in both the laboratory and on a large scale; the ability to use theoretical models to describe physical, biological and chemical processes; and the ability to assess the applicability and limitations of these models in various contexts
- the ability to choose and design technologies for the industrial manufacture of bio-based products, with due regard to raw materials, energy, economics and sustainability in the system of industrial bio-technology
- the ability to create and develop products
- the ability to benefit from specialised literature.

#### 1.2 Goals of the Master of Science in Biotechnology

General objectives are stated in the Higher Education Ordinance 1993:100. The following is a detailed realisation of these outcomes.

##### *Objectives*

To satisfy the requirements of the Degree of Master of Science in Biotechnology, the student must demonstrate the knowledge and skills required to work independently in research and development or other equally qualified employment in biotechnology.

##### *Knowledge and understanding*

To be conferred with the Degree of Master of Science in Biotechnology the student must:

- demonstrate in-depth knowledge of the scientific foundations of the disciplines in engineering and the natural sciences that constitute the field of biotechnology
- demonstrate an ability to analyse both complete systems and the constituent parts of the industrial manufacture of products using biological catalysts
- demonstrate an insight into how different sub-systems co-operate with each other
- demonstrate an insight into current research and development in the field

##### *Skills and Abilities*

To be conferred with the Degree of Master of Science in Biotechnology the student must:

- demonstrate an ability to identify, formulate and treat complex issues in the field of biotechnology from an holistic perspective and in an independent manner
- be able to analyse and evaluate critically various technical solutions in the field
- demonstrate an ability to participate in research and development projects in biotechnology
- demonstrate an ability to acquire new knowledge in the field and to integrate this with existing knowledge
- demonstrate an ability to plan and execute advanced assignments in the field in an independent manner

- demonstrate an ability to develop and design industrial biotechnological systems and processes with regard to human needs and conditions, and the goals of society, both local and global, for sustainable development,
- demonstrate an ability to give a clear account of his/her level of knowledge and various types of project work, both orally and in writing, in an international context; this involves the reporting of background material, studies and findings for both specialist and non-specialist audiences.

##### *Critical Judgement and Evaluation*

To be conferred with the Degree of Master of Science in Biotechnology the student must:

- demonstrate an ability to make judgements with regard to relevant scientific, social and ethical aspects in the field
- demonstrate an ability for working in a team and for cooperation with variously constituted groups and
- demonstrate an ability to identify his/her need of further knowledge in the field and continuously deepen and widen his/her knowledge and skills in the field.

### 2 The Scope and Levels of the Programme

#### 2.1 The Scope of the Programme

The Master of Science programme is a 2-year graduate programme comprising 120 higher education credits.

#### 2.2 Levels

The courses included in the programme have been divided into levels of difficulty. The level is stated in the syllabus for each course. The levels used are Level 1 and Level 2. These levels are defined in the Higher Education Act Chapter 1 §§ 8-9. In the Faculty of Engineering, the courses at Level 1 are further divided into Level 1a and Level 1b, in-depth studies. Level 1b in-depth studies denotes a progression in difficulty from Level 1a.

The courses at Level 2 can constitute specialist studies in a Master's degree.

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## 3 The Structure of the Programme

The course covers 120 higher education credits of which 15 credits are compulsory courses, 75 credits compulsory alternative courses and 30 credits are the degree project for a Master of Science. The profiles in the course for the academic year 2008-2009 are based on two specialisations available in the Master of Science in Engineering programme in Biotechnology, namely Bioprocess Technology and Molecular Biotechnology. The choice of courses has been extended to include relevant courses from specialisations to enable greater specialisation.

### 3.1 Courses Offered in the Master of Science in Biotechnology

The courses included in the program are detailed in the curriculum and schedule.

### 3.2 Degree Project

To satisfy the requirements of a Master of Science in Biotechnology, the student must have completed an independent study (degree project) of at least 30 credits which has been examined at the Faculty of Engineering, Lund University. The degree project must be completed in accordance with the approved syllabus for the programme in Master of Science in engineering with the exception of the number of credits required for eligibility. The student may commence work on the degree project when he/she has completed at least 50 higher education credits that can be included in his/her degree.

The degree project is to be in a relevant field of study.

## 4 Grading

Grades are given for the full courses and interim tests. The interim tests for each course are given in the relevant syllabi. For each full course the scale of Fail, 3, 4, 5 or Fail/Pass is used. In cases where divergent grades are used for interim courses this is stated in the syllabus. In the degree certificate only completed full courses which the student has passed (Pass, 3, 4, 5) are included. Grades in the Swedish educational system are goal-oriented, i.e. the student's achievements are measured in relation

to the goals for the programme of study and bear no relation to any ranking of a particular group of students.

## 5 Degree

### 5.1 Course Requirement

To be awarded a Master's Degree in Biotechnology the student shall have successfully completed 120 higher education credits in the courses specified of which the degree project shall constitute 30 higher education credits. At least 90 higher education credits, which also include the degree project, are to be taken at the Faculty of Engineering, Lund University. The number of credits at Level 2 shall be at least 75 higher education credits and include the degree project.

### 5.2 Degree Certificate and Title

When the requirements of the degree programme have been satisfied, the student has the right, on application, to be given a degree certificate for the Degree of Master of Science (two years) in Biotechnology.

## 6 Specific Admission Requirements

### 6.1 Eligibility

To be eligible for the programme of study in the Master of Science in Biotechnology, applicants are required to have a Swedish engineering degree of at least 180 higher education credits, or a bachelor's degree in food technology, biotechnology/engineering or medical technology, or an equivalent degree representing at least three years of study, from a foreign institute of higher education. The educational programme or courses that entitle admission to the programme must include microbiology and biochemistry. From their first university degree, students must have prior knowledge in mathematics on a university level. A knowledge of and skills in work in the laboratory are also required. Students are required to have a good knowledge of English. Applicants from Nordic countries are assumed to satisfy the basic requirements of knowledge of English. Other applicants are expected to satisfy the following requirements: TOEFL at level 550 (213 for computer-based TOEFL and 80 for on-line TOEFL) or more, IELTS 6.0, or the Cambridge Certificate of

Proficiency. Exemption can be made for students with English as their mother tongue or who have completed a higher education course in English that satisfies eligibility requirements.

## 6.2 Selection Criteria

The applicant is accepted, in the first instance, on the basis of his/her grade or equivalent. The grade is considered together with the content of the degree constituting the basis for the applicant's eligibility. Equal opportunities apply and students from the under-represented gender are given priority in cases of equal merits.

## 7 Accreditation

### 7.1 Accreditation of an Entire course

Students have the right, on request and following examination, to have previous studies accredited. Decisions regarding accreditation are taken by the Board of Undergraduate Studies. In deciding on accreditation an assessment is made on whether previous studies can be considered to be equivalent to a specific course in the programme or whether previous studies are consistent with the goals of the programme. Both content and level will be assessed. The decision taken will decide whether the course replaced is included in the degree certificate or whether the course that is accredited is included. The decision by the board will state which course is to be included in the degree certificate. At least 90 higher education credits, which also include the degree project, are to be studied at the Faculty of Engineering, Lund University. Courses that are cited as satisfying the admission requirements for the programme cannot be accredited.