



*Programme syllabus for*

# **Master's Programme in Molecular Techniques in Life Science, 120 credits**

*Masterprogrammet i molekylära tekniker inom livsvetenskaperna, 120 hp*

## **Basic programme information**

Programme code	5MT15
Name of the programme	Master's Programme in Molecular Techniques in Life Science
Number of credits	120.0 credits (120.0 ECTS credits)
Starting date	The syllabus applies to students who commence their studies in or after autumn 2015.
	Approved revisions of the syllabus are described under the heading Transitional Provisions.
Decision date	2014-06-17
Decided by	Board of Higher Education
Last revision	2017-12-21
Revised by	Board of Higher Education
Reference number	3-2235/2017
Specific eligibility requirements	A Bachelors degree or a professional degree worth at least 180 credits. At least 10 credits should be in theoretical mathematics and 20 credits in life sciences (such as cell biology, biochemistry, microbiology or molecylar biology). And proficiency in English equivalent to English B/English 6.
Main field of study	Molecular Life Science
Qualification	Medicine masterexamen med huvudområdet molekylära livsvetenskaper <i>Degree of Master of Medical Science (120 credits) with a Major in Molecular Life Science</i>
	The programme leads to a joint degreebetween Karolinska Institutet, KTH Royal Institute of Technology and Stockholm University. Certificate is issued by KTH Royal Institute of Technology.
	A student who fulfils the requirements for the award of a qualification shall, upon request, be provided with a certificate.

## Outcomes

### Outcomes of second cycle education according to the Higher Education Act

Second-cycle courses and study programmes shall be based fundamentally on the knowledge acquired by students during first-cycle courses and study programmes, or its equivalent.

Second-cycle courses and study programmes shall involve the acquisition of specialist knowledge, competence and skills in relation to first-cycle courses and study programmes, and in addition to the requirements for first-cycle courses and study programmes shall:

- further develop the ability of students to integrate and make autonomous use of their knowledge,
- develop the students' ability to deal with complex phenomena, issues and situations, and
- develop the students' potential for professional activities that demand considerable autonomy, or for research and development work.

### Outcomes of the Degree of Master according to the Higher Education Ordinance

#### *Knowledge and understanding*

For a Degree of Master students must

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

#### *Skills and abilities*

For a Degree of Master students must

- demonstrate an ability to 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, thus contributing towards the development of knowledge, and to evaluate this work,
- demonstrate an ability in both national and international contexts to clearly present and discuss their conclusions and the knowledge and arguments behind them, in dialogue with different groups, orally and in writing, and
- demonstrate the skill required to participate in research and development work or to work independently in other advanced contexts.

#### *Judgment and approach*

For a Degree of Master 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.

## Content and structure

This is a cross-disciplinary programme that focuses on the latest techniques in the life sciences and how

they can be applied in basic medical research, prevention, diagnostics and treatment. The programme thus provides an in-depth specialist expertise in the theory and practice of translational medicine, molecular biology, biophysics, and bioinformatics; an in-depth understanding of scientific methods and solid practical training in written and oral presentation.

The three universities contribute state-of-the-art courses within the fields in which they conduct internationally distinguished research and education.

The core of the programme - the latest techniques in life sciences including high-throughput biology - is addressed in terms 1 to 3. The theory and practice are studied particularly in the courses *Genetics*, *Bioinformatics*, *Comparative Genomics*, *Biophysical Chemistry*, *Identification of Biomarkers* and *Analysis of data from large-scale molecular biology experiments*.

Knowledge and understanding of translational medicine is given particularly in the courses *Frontiers in Translational Medicine* and *Drug Development*.

### **Scientific knowledge, competence and approach**

Students have the possibility of acquiring individual in-depth knowledge of the main field of study and in-depth knowledge of methods and training in autonomy in the courses *Project in molecular life science* and in *Degree project in molecular life science, advanced level*.

Proficiency and ability to communicate both orally and in writing and to tackle a scientific issue with a correct methodological and ethical approach is trained in the courses *Applied Communication* and *Frontiers in the Life Sciences 1, 2 and 3*.

## **Transitional provisions**

The specific eligibility requirements regarding mathematics was, for students admitted to the program in the fall of 2015 and 2016, *10 credits in mathematics*. The rest of the specific eligibility requirements remain the same.

## **Other guidelines**

### **Grading scale**

The courses are graded according to each institution's guidelines. The grading scale is detailed in the course syllabus.

### **Language of instruction**

The teaching language is English.

### **Specific eligibility requirements within the programme**

There are specific eligibility requirements for the courses within the programme. The eligibility requirements can be found in the syllabi. In cases where the requirements are connected to the admission to a later term, they are described on the programme website. There may also be specific eligibility requirements within a specific term if a course requires certain prior knowledge.

## Study plan with constituent courses

Applicable to students admitted from semester 2018 or later

Year	Name of the course	Credits	Cycle	Main field of study	
1	Genetics	5	Second	Molecular Life Science	KI
1	Frontiers in Translational Medicine	16.5	Second	Molecular Life Science	KI
1	Applied Communication	7	Second	Molecular Life Science	KI
1	Applied Programming for Life Science 1	1.5	Second	Molecular Life Science	KI
1	Bioinformatics	7	Second	Molecular Life Science	SU
1	Comparative Genomics	7.5	Second	Molecular Life Science	SU
1	Structure and Dynamics of Biological Membranes	7	Second	Molecular Life Science	SU
1	Applied Programming for Life Science 2	1.5	Second	Molecular Life Science	SU
1	Methods in Molecular Life Science	7	Second	Molecular Life Science	SU
2	Applied Gene Technology and Large-Scale Data Analysis	7.5	Second	Molecular Life Science	KTH
2	Clinical Applications of Biotechnology	6	Second	Molecular Life Science	KTH
2	Applied Programming for Life Science 3	1.5	Second	Molecular Life Science	KTH

*Elective courses, two out of the three\* following courses are to be chosen.*

2	Systems Biology*	7.5	Second	Molecular Life Science	KTH
2	Drug Development*	7.5	Second	Molecular Life Science	KTH
2	Project in Molecular Life Science*	7.5	Second	Molecular Life Science	KTH
2	Degree project, Molecular Techniques in Life Science, Second Cycle	30	Second	Molecular Life Science	SU/KI/KTH

Applicable to students admitted autumn semester 2017

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Year	Name of the course	Credits	Cycle	study	
1	Genetics	5	Second	Molecular Life Science	KI
1	Frontiers in Translational Medicine	16.5	Second	Molecular Life Science	KI
1	Applied Communication	7.5	Second	Molecular Life Science	KI
1	Frontiers in Life Science 1	1	Second	Molecular Life Science	KI
1	Frontiers in life science 2	1	Second	Molecular Life Science	SU
1	Bioinformatics	7,5	Second	Molecular Life Science	SU
1	Comparative genomics	7,5	Second	Molecular Life Science	SU
1	Biophysical chemistry	7	Second	Molecular Life Science	SU
1	Project in molecular life science	7	Second	Molecular Life Science	SU
2	Frontiers in life science 3	1	Second	Molecular Life Science	KTH
2	Proteomics	6	Second	Molecular Life Science	KTH
2	Applied gene technology	5	Second	Molecular Life Science	KTH
2	Drug development	6	Second	Molecular Life Science	KTH
2	Project in molecular life science	5	Second	Molecular Life Science	KTH
2	Analysis of data from high throughput molecular biology experiments	7	Second	Molecular Life Science	KTH
2	Degree project in molecular life science, second Cycle	30	Second	Molecular Life Science	SU/KI/KTH

**Applicable to students admitted from autumn semester 2016**

Year	Name of the course	Credits	Cycle	Main field of study	
1	Genetics	5	Second	Molecular Life Science	KTH
1	Frontiers in Translational Medicine	16.5	Second	Molecular Life Science	KI
1	Applied Communication	7.5	Second	Molecular Life Science	KI
				Molecular	

1	Frontiers in Life Science 1	1	Second	Life Science	KI
1	Frontiers in Life Science 2	1	Second	Molecular Life Science	SU
1	Bioinformatics	7.5	Second	Molecular Life Science	SU
1	Comparative Genomics	7.5	Second	Molecular Life Science	SU
1	Biophysical Chemistry	7	Second	Molecular Life Science	SU
1	Project in Molecular Life Science	7	Second	Molecular Life Science	SU
2	Frontiers in Life Science 3	1	Second	Molecular Life Science	KTH
2	Proteomics	6	Second	Molecular Life Science	KTH
2	Applied Gene Technology	5	Second	Molecular Life Science	KTH
2	Drug Development	6	Second	Molecular Life Science	KTH
2	Project in Molecular Life Science	5	Second	Molecular Life Science	KI
2	Analysis of Data From High Throughput Molecular Biology Experiments	7	Second	Molecular Life Science	KTH
2	Degree project, Molecular Techniques in Life Science, Second Cycle	30	Second	Molecular Life Science	SU/KI/KTH