



**Karolinska  
Institutet**

*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	5MT23
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 2023.
	Approved revisions of the syllabus are described under the heading Transitional Provisions.
Decision date	2022-05-17
Decided by	Committee for Higher Education
Reference number	3-1701/2022
Specific eligibility requirements	A Bachelor's degree or a professional degree worth at least 180 credits. At least 10 credits should be in mathematics and at least 20 credits in life sciences (such as cell biology, biochemistry, microbiology, gene technology, or molecular biology). Proficiency in English equivalent to English B/English 6.
Main field of study	Molecular Life Science
Qualification	Degree of Master of Medical Science (120 credits) with a Major in Molecular Life Science <i>Medicine masterexamen med huvudområdet molekylära livsvetenskaper</i>
	The programme leads to a joint degree between Karolinska Institutet, KTH Royal Institute of Technology and Stockholm University. Certificate is issued by KTH Royal Institute of Technology.
	Upon request, a student who meets the requirements for a qualification is to receive a diploma.

## 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 firstcycle 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 (120 credits) according to the Higher Education Ordinance

#### *Knowledge and understanding*

For a Degree of Master of Science (120 credits) the student shall

- demonstrate knowledge and understanding in the main field of study, including both broad knowledge of the field and a considerable degree of specialised knowledge in certain areas of the field as well as insight into current research and development work, and
- demonstrate specialised methodological knowledge in the main field of study.

#### *Competence and skills*

For a Degree of Master of Science (120 credits) the student shall

- demonstrate the ability to critically and systematically integrate knowledge and analyse, assess and deal with complex phenomena, issues and situations even with limited information
- demonstrate the ability to identify and formulate issues critically, autonomously and creatively as well as to plan and, using appropriate methods, undertake advanced tasks within predetermined time frames and so contribute to the formation of knowledge as well as the ability to evaluate this work
- demonstrate the ability in speech and writing both nationally and internationally to report clearly and discuss his or her conclusions and the knowledge and arguments on which they are based in dialogue with different audiences, and
- demonstrate the skills required for participation in research and development work or autonomous employment in some other qualified capacity.

#### *Judgment and approach*

For a Degree of Master of Science (120 credits) the student shall

- demonstrate the ability to make assessments in the main field of study informed by relevant disciplinary, social and ethical issues and also to demonstrate awareness of ethical aspects of research and development work
- demonstrate insight into the possibilities and limitations of research, its role in society and the responsibility of the individual for how it is used, and
- demonstrate the ability to identify the personal need for further knowledge and take responsibility for his or her ongoing learning.

## Content and structure

This cross-disciplinary programme focuses on the latest techniques within the life sciences and how they can be applied in basic medical research, and in disease prevention, diagnostics and treatment. The programme thus provides in-depth specialist expertise in the theory and practice of translational medicine, molecular biology, bioinformatics, and data analysis, an in-depth understanding of scientific methodology, and thorough practical training in written and oral presentation.

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

The core of the programme - the latest techniques in life sciences, including high-throughput biology - is addressed in semesters 1 to 3. Courses in semester 1 provide a foundation in genetics and genomics, translational research and biostatistics, which are corner stones of the programme. Additionally, a course that focuses on communication and professional development broadens training in key competences. The second semester focuses on specialist skills in molecular life science with courses in programming, bioinformatics, state-of-the art methodologies, and comparative genomics.

The second year of the programme offers in depth training in high-throughput methodologies and data analysis. Elective courses offer students the option of performing a research project within a topic relevant for the programme, or specialisation within the fields of systems biology or drug development. The degree project runs throughout the fourth semester and involves in-depth study of an area relevant for the programme. Through the degree project, students strengthen their grasp of the scientific process and their ability to critically evaluate information, which provides an excellent preparation for third-cycle education or for a future career in the life sciences.

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

The programme provides broad knowledge within the field of molecular life science with a focus on methods and findings in frontline research. During the programme, students are trained to search and critically assess information as well as discuss ethical aspects of research. Practical skills form an essential component of the programme, trained primarily in the form of individual research projects. The individual degree project focuses on scientific methodology and analysis as well as on oral and written communication.

### **Practice Integrated Learning**

Practice integrated learning is a generic term for the pedagogical models that are based on interaction and integration between higher education and working life. Practice integrated learning may take the form of placements, study visits, observing teaching activities, staff exchange training schemes or field studies within outpatient and in-patient healthcare, social care or other relevant activities.

Within the Master's Programme in Molecular Techniques in Life Science, practice integrated learning takes place through the performance of research projects in laboratories in the academic or life science sectors and through active engagement with research teams.

### **Internationalisation**

The programme is international in its entirety. All courses have an international perspective and address global aspects of molecular life science. In semester four, students can perform their Master's thesis abroad.

### **Elective courses**

In the third semester, students can choose two out of three 7.5-credit elective courses. These courses enable students to expand their specialist knowledge in areas that may facilitate future employability. As one of the options, students can immerse themselves in a research project within a topic relevant for the

programme.

## **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 language of instruction 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's website. There may also be specific eligibility requirements within a specific term if a course requires certain prior knowledge.

## Study plan with constituent courses

Semester	Course name	Credits	Mainfield of study	Cycle	University
1	Molecular Genetics and Genomics	5	Molecular Life Science	Second	KI
1	Applied Communication	6	Molecular Life Science	Second	KI
1	Frontiers in Translational Medicine	13	Molecular Life Science	Second	KI
1	Biostatistics	6	Molecular Life Science	Second	KI
2	Programming Techniques for Life Science	7.5	Molecular Life Science	Second	SU
2	Bioinformatics	7.5	Molecular Life Science	Second	SU
2	Methods in Molecular Life Science	7.5	Molecular Life Science	Second	SU
2	Comparative Genomics	7.5	Molecular Life Science	Second	SU
3	Applied Gene Technology and Large-Scale Data Analysis	7.5	Molecular Life Science	Second	KTH
3	Applied Proteomics	7.5	Molecular Life Science	Second	KTH
3	Elective courses <i>Two out of the three* following courses are to be chosen</i>		Molecular Life Science	Second	KTH
3	Systems Biology*	7.5	Molecular Life Science	Second	KTH
3	Drug Development*	7.5	Molecular Life Science	Second	KTH
3	Project in Molecular Life Science*	7.5	Molecular Life Science	Second	KTH
3	Degree Project in Molecular Life Science, Second Cycle	30	Molecular Life Science	Second	KI/SU/KTH