

Master of Science in Molecular Medicine

This programme description is valid for students admitted in the academic year 2017/2018. It was approved by the Faculty of Medicine and Health Sciences on 23 March 2017.

Facts about the Programme of Study

Programme code: MSMOLMED

Webpage: www.ntnu.edu/studies/msmolmed

Title of the degree: Master of Science in Molecular Medicine

ECTS credits: 120

Duration: Two years (four semesters)

Host Faculty: Medicine and Health Sciences

Host Department: Clinical and Molecular Medicine

Introduction

The field of Molecular Medicine is often referred to as “tomorrow’s medicine”. It aims to provide a molecular understanding of how normal cellular processes change, fail or are destroyed by disease.

The mapping of the human genome in 2003 was a turning point, and our knowledge and understanding of molecules in living organisms are advancing at a fast rate. Modern technologies such as high-throughput analyses (sequencing, microarray and proteomics) enable us to study thousands of genes and proteins simultaneously. This provides the foundation for a totally new understanding of biological systems and generates fresh hypotheses about the importance of genes and proteins for different diseases.

The MSc in Molecular Medicine is administered by the Department of Laboratory Medicine, Children’s and Women’s Health at the Faculty of Medicine and Health Sciences.

Learning Objectives

The graduated candidate should be able to:

- demonstrate a strong background in molecular medicine (i.e. molecular/cell biology relevant to medical applications) and have practical skills relevant for the field;
- describe the organization of the human genome and its functional regulation (i.e. replication, gene expression, genome maintenance, and signal transduction principles);
- describe the impact of genes, inheritance and environment on disease, and understand how normal cellular processes change, fail or are destroyed by disease development, in particular for common diseases such as cancer, diabetes, and heart disease;
- explain principles of molecular diagnostics and advantages/limitations of its applications;
- recognize and explain current strategies and state-of-the-art approaches within functional genomics;
- collect relevant background information about topics within molecular medicine;
- present, evaluate and discuss scientific results in English (orally and in writing);
- reflect upon the existence of ethical aspects in an inter-cultural setting, sound experimental approaches and scientific thinking.
- discuss and solve relevant cases or problems in international teams/groups

Target Groups and Admission Requirements

Admission requirements to the MSc in Molecular Medicine is a bachelor's degree (or an equivalent 3-year education) in biology, biomedical science, biotechnology, chemistry or similar, with an average grade of C or higher. A solid background in cell- and molecular biology is highly recommended within the bachelor's degree.

International applicants need to submit proof of English proficiency (TOEFL, IELTS, APIEL or University of Cambridge test). More details about the language requirements are available at www.ntnu.edu/studies/langcourses/languagerequirements. Applicants who are not citizens of the European Union (EU) or the European Economic Area (EEA) need to provide a financial guarantee to get a residence permit in Norway.

Teaching Methods, Learning Activities and Student Social Activities

In 2005 the Laboratory Centre opened at Øya campus in Trondheim. In this building students get to work in high-tech laboratory environments side by side with researchers both from NTNU and St. Olav's Hospital.

The teaching methods and learning activities include lectures, colloquiums, problem-based learning (PBL), team-based learning (TBL), seminars, demonstrations, excursions, practical training, self-tuition, and independent work. During the work with the master's thesis the student will do research in our well-equipped laboratories.

SOMA is the master's students' own social student organization. SOMA has various activities during the semesters, including welcome parties and other activities for new students, excursions, courses and much more. For more information, visit SOMA's blog: <http://somantnu.blogspot.com>

Compulsory HSE Training

All master's students must participate in compulsory Health, Safety and Environment (HSE) training. This includes a HSE lecture and a fire protection course, both held in the first two weeks of the semester. When these activities have been completed, the student must pass an electronic test. This is to be done by 1 September. If the student fails to do so, the access card to the campus/hospital buildings will be withdrawn.

Programme Structure

The MSc is a two-year, full-time programme of study starting in the autumn semester. There are two main components:

- Master's thesis (60 credits)
- Theoretical and methodological courses (totalling 60 credits). Three courses, making up 30 credits, are compulsory. The remaining courses, adding up to 30 credits, are selected from lists of electives. Ideally, electives should be linked to the topic of the master's thesis.

There are two lists of elective courses (see below). *Two courses* must be selected from 'Electives 1'. The remaining elective courses can be chosen from both 'Electives 1' and 'Electives 2'. Additional relevant courses may be taken at NTNU or other educational institutions subject to the approval of the Faculty of Medicine.

A master's thesis agreement, including a project description, must be submitted by 15 March in the second semester. Potential projects will be presented in advance.

Master's Thesis

MOL3901	Thesis in Molecular Medicine	60 credits
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Compulsory Courses

MOL3100	Introduction to Molecular Medicine with Project	15 credits	Autumn
MOL3101	Practical Molecular Medicine (Laboratory Course)	7.5 credits	Spring
EiT	Experts in Teamwork – Interdisciplinary Project	7.5 credits	Spring

Electives 1

BI3016	Molecular Cell Biology	7.5 credits	Autumn
MOL3001	Medical Genetics	7.5 credits	Spring
MOL3005	Immunology	7.5 credits	Autumn
MOL3007	Functional Genomics	7.5 credits	Spring

Electives 2

BI3013	Experimental Cell and Molecular Biology	7.5 credits	Autumn
BI3018	Patenting and Commercialization of Biotech and Medtech Inventions	7.5 credits	Spring
KLH3100	Introduction to Medical Statistics	7.5 credits	Autumn
MOL3009	Biobanking	7.5 credits	Autumn
MOL3010	Animal Cell Culture	7.5 credits	Autumn
MOL3014	Nanomedicine I – Bioanalysis	7.5 credits	Autumn
MOL3015	Nanomedicine II – Therapy	7.5 credits	Spring
MOL3018	Medical Toxicology	7.5 credits	Spring
MOL3020	Virology	7.5 credits	Spring
MOL3021	Bioinformatics – Applied Project	7.5 credits	Spring
MOL3022	Bioinformatics – Method Oriented Project	7.5 credits	Spring
MOL3023	Molecular Medical Microbiology with Essay	7.5 credits	Autumn
NEVR8014	Laboratory Animal Science for Researchers	7.5 credits	Autumn

Some of the elective 2 courses may be cancelled if few students register for the examination.

Experts in Teamwork (EiT) is taught intensively in January in the first academic year. Read more about EiT at www.ntnu.edu/eit

Model of the MSc Programme (Example)

Year 1		Year 2	
<i>1st semester (autumn)</i>	<i>2nd semester (spring)</i>	<i>3rd semester (autumn)</i>	<i>4th semester (spring)</i>
Introduction to Molecular Medicine with Project	Experts in Teamwork	Thesis in Molecular Medicine	
	Practical Molecular Medicine		
Elective course	Elective course		
Elective course	Elective course		

Please note that this is only a suggestion. The student can choose to start with the thesis already in the first year and postpone one or more of the elective courses to the second year.

The student must have passed all examinations in compulsory and elective courses before he/she can submit the thesis.

Innovation and Entrepreneurship

The programme of study uses novel and alternative teaching methods in addition to lectures, challenging the students to take an active involvement in their learning. The master's thesis is written on basis of the individual student's experiments and research under professional supervision. The courses aim to be of high relevance to future employment. For instance, in the course BI3018 (Patenting and Commercialization of Biotech and Medtech Inventions) the students will acquire knowledge about how to transform a research project into a commercial product.

Course Descriptions

The course descriptions are available at www.ntnu.edu/studies/courses