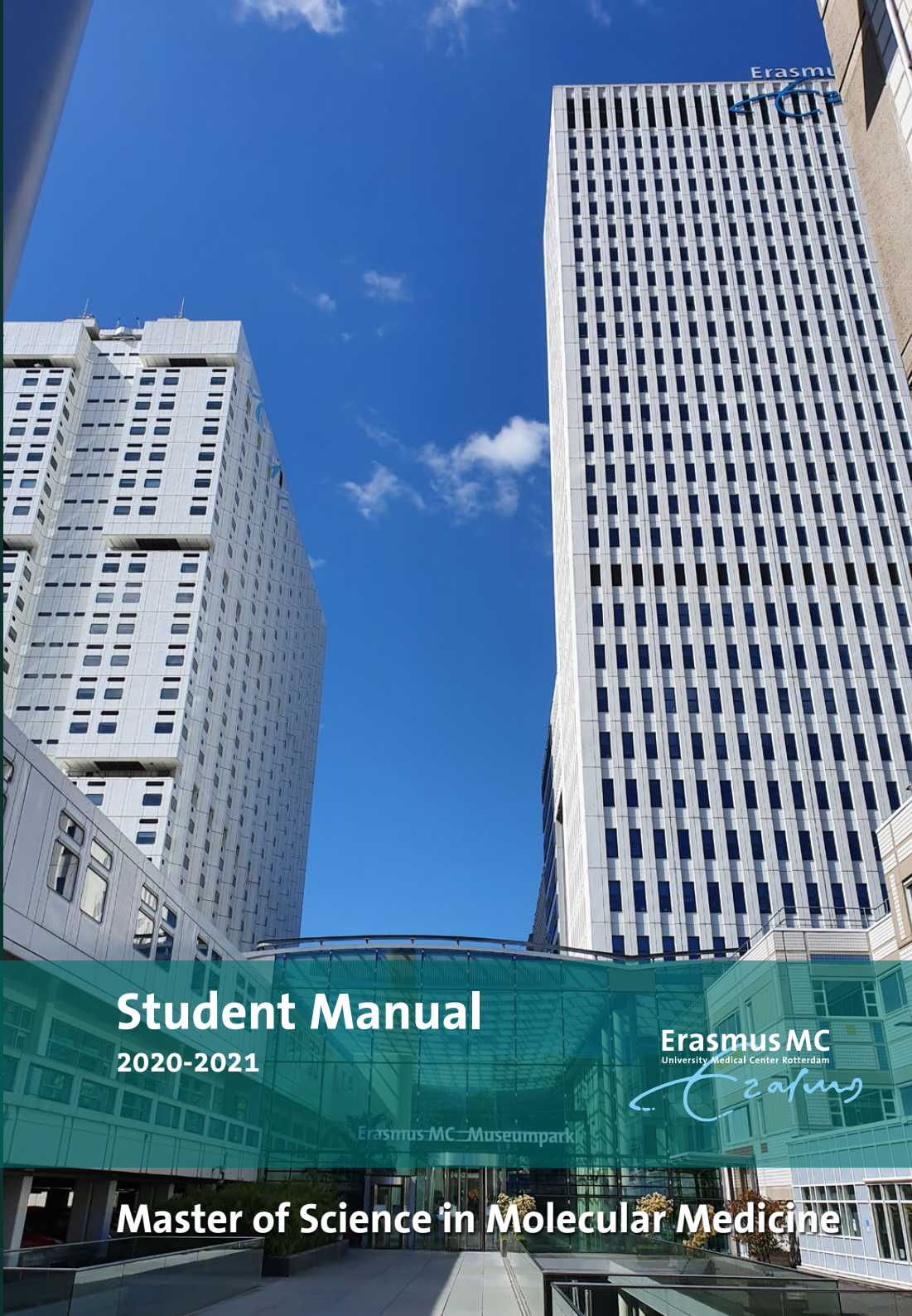

Student Manual

2020-2021

Erasmus MC
University Medical Center Rotterdam

Master of Science in Molecular Medicine

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Images: *students in class, July 2020, backside cover students in the lab, June 2019.*
Photography: Marjoleine van Berckel Bik / Ruud Koppenol

Parts of this text are taken from the Rotterdam School of Management handbook for new students. Used by kind permission of Recruitment & Admissions (BSc and MSc), RSM, Erasmus University.

Contents

Introduction

Developments in molecular and cell biology, such as studies on human genome variation and the control of stem cells, are reshaping many aspects of medical diagnosis and treatment. The rapid advancement of modern biomedical and computational technologies in this new century promises to provide many new tools to gain in-depth knowledge of the fundamental molecular and cellular mechanisms controlling health and disease.

The Erasmus MC **Master of Science in Molecular Medicine** program is a two-year, 120 EC points, research master's program, focusing on molecular cell biology, developmental biology, and molecular genetics. We aim to bring students to the forefront of current developments in biomedical science. In 1999, the course program was given for the first time to a group of Erasmus MC medical students; accreditation by the Dutch-Flemish Accreditation Organization (NVAO) followed in 2004, 2010, and was renewed in 2016.

The Erasmus MC departments clustered under Biomedical Sciences are responsible for the MSc Molecular Medicine program. Teachers, course directors, and chairpersons of the MSc program are affiliated with the postgraduate schools *Molecular Medicine* (MolMed) and *Medical Genetics Center South-West Netherlands* (MGC), both recognized by the Royal Netherlands Academy of Arts and Sciences (KNAW), and work in 20 different research departments within Erasmus MC. Teachers and course directors are leading scientists in the field of biomedical research.

Many MSc graduates continue their careers as PhD students at Erasmus MC or elsewhere.

This manual is intended as a curriculum guide for our students and prospective students. We appreciate comments and suggestions for improvement.

Terms and definitions

Erasmus MC and Erasmus University:
Erasmus MC – University Medical Center Rotterdam is a combination of the academic general hospital, the Sophia children's hospital, the Daniel den Hoed cancer clinic, and the medical faculty educational and research institutes of Erasmus University Rotterdam (EUR). Erasmus MC currently has around 14,000 employees, more than 2,000 students of medicine, and approximately 210 research master students, of which around 40 are enrolled in the MSc Molecular Medicine.

Biomedical Sciences:
The Erasmus MC – Biomedical Sciences organizational unit comprises the research departments of Biochemistry, Bioinformatics, Cell Biology, Developmental Biology, Molecular Genetics, Genetic Identification and Neuroscience, as well as the Erasmus Stem Cell Institute, the Optical Imaging Center, and the Proteomics and Biomics Center. Biomedical Sciences organizes the MSc programs in Molecular Medicine and Neuroscience, and has its own teaching program for PhD students.

Erasmus MC Graduate School:
Erasmus MC possesses (or participates in) five postgraduate schools, that offer research training and courses to PhD students. PhD students as a rule perform a research project of four years, and then write up their thesis. Erasmus MC currently has around 1200 PhD students. In the Netherlands, PhD students are regarded as employees and receive a salary with social benefits. The five Erasmus MC postgraduate schools are the *Medical Genetics Center South-West Netherlands* (MGC), *Molecular Medicine* (MolMed), *Cardiovascular Research School EUR* (COEUR), *Netherlands Institute of Health Sciences* (NIHES), and the *Research School Neurosciences Amsterdam Rotterdam* (ONWAR).
The Erasmus MC MSc Molecular Medicine program is affiliated with the postgraduate schools *Medical Genetics Center South-West Netherlands* (MGC) and *Molecular Medicine* (MolMed). The postgraduate schools and research master's programs combined make up the Erasmus MC Graduate School.

Faculty:
MSc Molecular Medicine faculty members are Erasmus MC research scientists with life science backgrounds in biology, biochemistry, and medicine. Faculty are affiliated with the postgraduate schools MGC and MolMed.

Course directors:
Course directors are MSc faculty members, organizing and coordinating the various components of the MSc program.

Research supervisor:
The supervisor is the principal investigator of a research project performed by the student in year 1 or year 2. Since the research topic and lab of choice will change in the transition from year 1 to year 2, students will have two supervisors. The tutor (see below) does not need to be one of the supervisors.

Tutor:
The tutor is a faculty member who is appointed to guide the student throughout the course of the MSc program. She or he acts as a personal mentor. Each student chooses her or his tutor from the list of faculty, or can propose additional names. It is possible to have two tutors, for example one with a basic/biomedical background and one with a clinical background.

Admissions committee:
The admissions committee is responsible for the admission of candidate students. Members of the admissions committee are the chairpersons, the program director, and occasionally one of the course directors.

Examination committee: (*Examencommissie*):
The MSc examination board carries formal responsibility for the outcome of all exams of the program. There is one board for all bachelor and master programs (including medicine). There is a separate chamber of the examination board for the combined five Erasmus MC research master programs. The MSc examination board chair reports to the dean of Erasmus MC. The board will delegate specific responsibilities to the MSc Molecular Medicine admissions committee. *See also page 59*.

MSc program board: (*Opleidingscommissie research master opleidingen*):
The MSc program board is responsible for continuous evaluation of the educational contents of the five Erasmus MC research master's programs.
The program board consists of five MSc faculty members (including the committee chair) and five MSc students: one for each Erasmus MC research master. Chairpersons and program directors are excluded from this committee. *See also page 59-60*.

Aims and objectives

The goal of the two-year **Master of Science in Molecular Medicine** program is to educate students to become researchers in biomedical and translational medical research.

The MSc program is modelled after renowned international research master's programs, such as those at Yale or Harvard University, in which the students are required to take on independent research projects, while following a number of relevant theory courses.

The courses of year 1 will provide students with the basic intellectual and technical knowledge, and establish the important framework necessary for development of a research proposal and subsequent performance of laboratory research.

The research projects provide the hands-on experience in top research laboratories at Erasmus MC, under the guidance of faculty members. During the laboratory periods students will develop technical skills and test their hypotheses. They will learn the principles of performing well-controlled experiments, and the interpretation, presentation, and publication of results.

On successful completion of all steps in the curriculum, including writing and defending the MSc thesis, the students are awarded the Master of Science Molecular Medicine degree.

1.1 Educational concepts

The following educational concepts are taken into consideration, when we determine the best way to offer course contents, and when student performance is evaluated:

1. Students have an active and self-directing attitude
2. Students are taught in small groups
3. In all parts of the program that involve (laboratory) practices, a master-apprentice relationship exists between the research supervisor and the student.
4. The study program has an open structure with ample choice between different areas of research.

5. Textbooks courses: students are offered the loan of these books. Reading materials are offered alongside with the evolving research training periods. Selected articles and presentations will be offered online (SIN-Online).
6. Theory classes and lab practices are offered both separately and integrally.
7. Through repetition and application, students are stimulated to keep on using once acquired knowledge and experience.

1.2 End goals

The end goals of the combined Erasmus MC research masters, including the MSc Molecular Medicine, were laid down as follows:

1. The student is able to put in words a relevant problem and translate this into a research question.
2. The student is able to conduct elaborate literature investigations, related to the research question.
3. The student is able to translate a research question into a research proposal.
4. The student is able to apply knowledge on research methods and biostatistic analytical methods, as well as ethical principles, when drafting a research proposal.
5. In collaboration with other research group members, the student is able to set up and conduct a research project, collect data, analyze data, and come to conclusions.
6. The student is able to write down research findings in the form of a draft manuscript, which in collaboration with a research supervisor is developed into a scientific article, suitable for publication in an international, peer-reviewed magazine.
7. The student is able to estimate the relevance of basic scientific results for clinical practices.
8. The student is able to translate a clinical research question into an advice for basic scientific investigation.
9. The student is able to propose new healthcare policies, based on relevant research findings and literature investigations.

1.3 Student competences

MSc Molecular Medicine students are expected to meet the end goals of the educational program by acquiring a set of competences, as they progress through the various course modules:

1. Knowledge of methods and techniques
    a. Knowledge of scientific research methods
    b. Knowledge and mastery of laboratory research skills
2. Scientific thinking and acting
    a. The ability to formulate a hypothesis and translate this into a research question
    b. The ability to gather, select, and structure information, based on a research question
    c. The ability to set up and conduct a research project in collaboration with others; collect data, perform analyses, and draw conclusions
    d. The ability to express an opinion based on available scientific information, while taking current values and standards into account
3. Critical attitude
    a. The ability to read critically and purposefully
    b. The ability to ask critical questions with regard to the quality of scientific research
    c. The ability to ask critical questions with regard to scientific research findings, and estimate their value.
4. Written communication
    a. The ability to formulate in written form
    b. The ability to structure in written form
    c. The ability to present in written form
5. Oral communication
    a. The ability to formulate orally
    b. The ability to structure orally
    c. The ability to present orally
    d. The ability to discuss
6. Project management
    a. The ability to work in a group on a project basis
    b. The ability to examine and discuss the work of one's own and of others, in a critical and creative way
    c. The ability to get the work done within the time available

7. Attitude
    a. The ability to reflect on one's thoughts and actions, and see them in relation to the surrounding world
    b. The ability to see in perspective the 'degree of truth' of scientific knowledge

1.4 Dublin descriptors

The student competences listed above are based on the end goals for the combined Erasmus MC research master's programs, and on the quality descriptors as adopted by the EU Joint Quality Initiative in 2004: the *Dublin descriptors*.
The Dublin descriptors are:

1. **Knowledge and understanding:**
   The student has demonstrated knowledge and understanding that is founded upon and extends and/or enhances that typically associated with bachelor's level, and that provides a basis or opportunity for originality in developing and/or applying ideas, often within a research context.
2. **Applying knowledge and understanding:**
   The student can apply her or his knowledge and understanding, and problem-solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to the field of study.
3. **Making judgments:**
   The student has the ability to integrate knowledge and handle complexity, and formulate judgments with incomplete or limited information, but that include reflecting on social and ethical responsibilities linked to the application of her or his knowledge and judgments.
4. **Communication:**
   The student can communicate her or his conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously.
5. **Learning skills:**
   The student has the learning skills to allow her or him to continue to study in a manner that may be largely self-directed or autonomous.

1.5 Academic context

The Master of Science in Molecular Medicine is a two-year, 120 EC, research master's program. Students are trained to become junior scientists, who upon graduation are instantly ready for a PhD position within any national or international biomedical research laboratory.

From the very beginning, students will be absorbed into the scientific environment of the biomedical research laboratories at Erasmus MC. In all courses of the program, students are guided, instructed and taught by MSc faculty members who are internationally recognized scientists and educators.

Affiliations with departments and postgraduate schools

Teachers, course directors and chairpersons of the MSc Molecular Medicine program are affiliated with the postgraduate schools MGC and MolMed, both recognized by the KNAW (ECOS). Our MSc faculty members work in 20 different research departments within Erasmus MC: *see pages 56-57-58 for details on our faculty.*

Comparison with other Erasmus MC research masters

Apart from the MSc Molecular Medicine, Erasmus MC has four other research master's programs:

MSc Clinical Research
MSc Health Sciences
MSc Neuroscience
MSc Infection and Immunity

The MSc Health Sciences and the MSc Clinical Research offer programs with a strong clinical perspective, especially attractive to students of medicine. The MSc programs in Neuroscience and Infection & Immunity, like us, focus on basic biomedical research, but have a more specialized curriculum confined to the fields of neuroscience, and microbiology and immunology. MSc Molecular Medicine students are given a broad view of possible lines of investigation, and are able to perform their research projects in many different labs of their choice, including labs at Erasmus MC departments that are generally associated with other MSc programs.

1.6 Collaborations

The MSc Molecular Medicine courses possess a theoretical and practical level of training that is comparable to the curricula of national and international MSc programs in the biomedical field. We have established partnerships with some of them:

Wageningen University and Research Center:	MSc Biotechnology
Radboud University Nijmegen:	MSc Molecular Mechanisms of Disease
University of Barcelona, Spain:	MSc Biology / Neurosciences
Université Pierre et Marie Curie, Paris, France:	MSc Molecular and Cellular Biology
Friedrich-Alexander-Universität, Nürnberg, Germany :	MSc Molecular Medicine
Georg-August-Universität, Göttingen, Germany:	MSc Biology

The collaborative agreement with **Wageningen University and Research Center** (WUR) gives students from the Wageningen MSc in Biotechnology the possibility to specialize in 'Molecular Medicine'. This specialization fills a gap in the Wageningen curriculum, where medicine-related research projects are not available to the students.

In co-operation with the MSc program in Molecular Mechanisms of Disease, at **Radboud University Nijmegen**, MSc Molecular Medicine students can take a selection of classes and courses in Nijmegen, and vice versa, in year 2 of the curriculum. Topics may vary from a course on science and society, to a course on epigenetics.

With **Paris**, **Barcelona**, **Nürnberg and Göttingen**, we have set up student exchange agreements. *See detailed info on page 52.*

1.7 Career prospects

After having completed the MSc program, the majority of students with a background in medicine (mostly from within Erasmus MC) will further specialize in medicine, while maintaining an interest in biomedical science. Several medical students who received the MSc Molecular Medicine degree are now continuing, or have completed, advanced research training as PhDs, at both basic and clinical research levels.

MSc Molecular Medicine students with a BSc in biochemistry, biotechnology, or biology, or a BASc in biomedical laboratory techniques, upon graduation appear to be preferred and qualified candidates for PhD positions within Erasmus MC, and other high-ranking and international research institutions.

Curriculum

2.1 Course overview

The 120 EC points of the MSc Molecular Medicine program represent a total study load of 3,360 hours. An outline of the curriculum is given below:

Course Code	Name	EC points	Hours
MM-IW	Introduction Weeks	2	56
MM-DB	Developmental Biology	2	56
	DB - Review Presentation	1	28
MM-MBC-A	Molecular Biology of the Cell part A	5	140
MM-MBC-B	Molecular Biology of the Cell part B	5	140
MM-BOD	Biology of Disease	3	84
MM-GEN	Genetics	4	112
MM-CRT-F	Contemporary Research Topics - Faculty sessions	4	112
MM-RES1	Lab Research Project Year 1	24	672
MM-PS	Presentation Skills	2	56
MM-P1	Research Progress Presentation - Year 1	2	56
MM-RW	Report Writing	2	56
	Research Report	4	112
	Total Year 1	**60**	**1680**
MM-CS	Courses and Seminars	4	112
MM-LR	Literature Review	4	112
MM-PP	Writing a Project Proposal	2	56
MM-P2	Research Progress Presentation - Year 2	2	56
MM-RES2	Lab Research Project Year 2	38	1064
MM-MSTH	Master Thesis	8	224
	Master Thesis – Presentation	2	56
	Total Year 2	**60**	**1680**

2.2 Program summary

Year 1

At the start of the program (1st of September 2020), students will be introduced to a number of MSc faculty members, scientific group leaders, and MSc course directors and coordinators. During these *Introduction Weeks* students will have the opportunity to visit several of our research laboratories, to get a broader view of possible lines of investigation, and to get (further) acquainted with various research techniques. This will enable students to make an informed choice for the research projects ahead.

From mid of September till mid October onwards, the *Molecular Biology of the Cell course* is given. We will start this course with *part A (MM-MBC-A)* in the period September. Part A explores the basic aspects of biology. Students will have lectures four times a week. The course requires thorough and continuous reading of the textbook. Students are stimulated to actively take part in discussions. The *MM-MBC-A course* is followed by the *Molecular Biology of the Cell part B (MM-MBC-B course)* in the period October. Both exams aim to test insight and scientific ability.

In November till December the *Genetics course* is given to obtain a deeper theoretical understanding of genetic processes. This course will highlight some of the developments in modern genetics research. Building upon the knowledge of classical (Mendelian) genetics, we will discuss several aspects of molecular genetic research on model organisms as well as patients. Topics discussed include bacterial genetics, genomes of higher eukaryotes, recombinant DNA technology, epigenetics, genomic imprinting, genomics and bioinformatics, molecular genetic technology in the clinic. The course consists of 9 lectures. The exam immediately follows the lecture series.

The Biology of Disease course aims to give you a deeper insight into current problems in translational research, narrowing the gap between clinical and biological science and scientists. We will discuss several examples of translational research as it is running at Erasmus MC at this moment. This is meant as template for further discussion on demands/needs to set up a good translational research project.
After an introductory discussion on clinical needs ('a patient visits the doctor and what's next..''), we will discuss several examples of translational research from the fields of oncology and immunology. The session on the road from finding a target in the lab to clinical trials and introduction of a new drug in clinical practice offers insight in the long process of validation and implementation in a clinical setting.

In groups of 3 students, you will work on, and finally present, a possible translational research project in which you investigate the biological cause of an illness and how your data will be valorised (i.e. gets back to the patient again).

During the *Developmental Biology course*, in December-January, students will learn about developmental biology from an evolutionary perspective. The evolution of complex multicellular organisms is based on genetic changes, which are translated into changes in embryonic and postnatal development. Students will learn about molecular and cellular mechanisms of embryonic development, and dysregulation of development, in animals and humans, in an evolutionary context. The written exam immediately follows the lecture series. Students will also prepare presentations on selected topics.

The *Contemporary Research Topics - Faculty sessions (CRT-F) course* is given in weekly sessions throughout February to April (twice a week on average). The *CRT-F course* is setup as a journal club; a literature reading course.
Besides the research articles, some pages of the Molecular Biology of the Cell textbook should be studied, highlighting a technique or approach that is of importance to the paper. Furthermore, there will be excursions to a number of labs, to get familiar with specific technical equipment and, in small groups, students prepare short presentations about particular techniques. Writing an article abstract is practiced during class. The course is concluded with a written examination with open questions on a research article that was not discussed previously.

Based on faculty presentations, lab rotations, and discussions with research supervisors and course directors, students will choose a topic and research group for a research project *(Lab Research Project Year 1)*. At the end of this project (average duration will be 8 months) the results are written up in a report (see *course MM-RW*).

The aim of *the course Presentation Skills* (MM-PS) is to practice organizing information for a concise and informative presentation and to practice oral presentations skills. In March you will have at least 3 MM-PS sessions.

Research Progress Presentation - Year 1 (MM-P1): In May students will present a 15 to 20 minute talk on the progress of their research project, accompanied by PowerPoint slides.

Finally, in June-July students will write a scientific report: course *Report Writing (MM-RW)*. Based on the experiments conducted and results obtained during the first year research project in the lab, you will write a scientific report. You will write up the results of your work in the form of a research article (manuscript) with the style used in PLOS Biology. This will include: Title, Abstract, Introduction, Methods (for this purpose in more detail than is currently standard in publications), Results, Discussion and References, accompanied by figures. The completed report will be about 20-30 pages long. Prior to the writing of the report, you will have two class sessions to receive instructions and make preparations.

The theory courses of year 1 are designed to help students acquire the basic knowledge and capacities that they need to start the research projects they will be conducting as they proceed through the program. Most importantly, the courses aim to develop a sense of urgency to stay informed of new developments, and to acquire a life-long learning attitude. Without exception, theory courses are led by scientific MSc faculty. The laboratory visits and the larger research projects, which together take up almost 19 months of the total two-year study program, are usually performed within the many basic and/or translational research laboratories that participate in the MSc program. When working and learning in the lab, students will be continuously guided and supported by the scientific group leader who acts as their direct supervisor.

Year 2

Year 2 of the program is almost entirely taken up by a second *Lab Research Project*. The laboratory, topic and research supervisor of the year 2 project will be different from those of the year 1 project. A new project proposal will have to be written, based on the interests of the student and the laboratory. Students will be trained in additional specific methods, and will carry responsibility on successful implementation of their research plan. Students should start looking for a new lab, new supervisor, and new topic in July of the preceding semester. The average duration of the research project for second year MSc students is 11 months.

In regular course meetings October and November, you are educated on how to *write a scientific proposal*. You will develop a first draft of your own research proposal, describing the plan of work for the one-year period leading to the MSc thesis. The written research proposal will be prepared together with, and approved by, your research supervisor. This plan, agreed upon by both student and faculty, will be the basis for your research work leading to the MSc Molecular Medicine degree.
The research proposal should describe the plan of work for a full-year period of research.

This will include: Title, Summary, Description of the proposed research, Knowledge utilisation, and Reference list (including figures as appropriate). These parts will be written in a step-wise manner. At each stage, the written parts will be evaluated by faculty on specific elements of scientific writing, as well as content, and revised accordingly. Students will also review and evaluate the completed proposals of two of their peers to provide comments, during a discussion session, before the final revision.

Students are encouraged to participate in *several courses, seminars, lectures, and symposia* available at Erasmus MC or elsewhere. In consultation with their research supervisor and course directors, they may compose a program according to their individual needs and interests. Participation in an international meeting is to be considered.

Individually, students will write an insightful *literature review* on a specific topic within the wide field of biomedical science. We will provide students with an list of topics and will give literature suggestions to start reading. An experienced faculty member will be available to offer guidance and support.

In March, halfway of the full-year research project, students will give a 15-20 minute *research progress presentation*, accompanied by a slideshow. The students from the first MSc year are invited to these presentations. The presentation should include a brief introduction to the project, information on specific experiments and methods, actual data and controls and a conclusion.

The second, full-year, research project is concluded by submission and defence of the *MSc thesis*. The thesis will take the form of a full-length research article, suitable for publication in an international journal. In contrast to a regular article manuscript, the MSc thesis will include a more elaborate Introduction, describing the scientific background of the study: the Materials and Methods section will be expanded to include a complete and detailed description of all methods that have been applied; also, a List of Abbreviations will be added. The defence of the thesis will take about 20 minutes, and will be preceded by an oral half hour presentation of aim, results and conclusions of the thesis work.

Once the MSc thesis is written, approved, and defended, students are awarded the Master of Science in Molecular Medicine degree. The *MSc graduation ceremony* is held at the end of every academic year, in the first week of September. Faculty, undergraduate students, and alumni, are invited to this festive event.

2.3 Course descriptions

General information for all courses:

Target group	MSc Molecular Medicine students
Organization	Erasmus MC – Biomedical Sciences
Language	English
Number of participants	15 – 20 students [1]
Register	Courses are part of the MSc Molecular Medicine curriculum. Separate registration is not necessary for admitted students.
Absence	If you are unable to attend class, you are kindly requested to report your absence in advance, via mscmolmed@erasmusmc.nl
Accountability	Erasmus MC – Biomedical Sciences
Contact	Marjoleine van Berckel Bik E-mail: mscmolmed@erasmusmc.nl Phone: +31-10-7044844
Alumni	LinkedIn Group http://www.linkedin.com/groups?gid=1821478

[1] For the Lab Research Project Year 1 and Year 2: individual placement in lab of choice.

Detailed descriptions of each course module in the curriculum are given below. The applicable Dublin descriptors and end goals of the MSc program (*as listed on pages 11 and 9, respectively*) are indicated by number.

Name	**Introduction Weeks**
Form	Faculty presentations, introductory talks, lectures, lab visits.
Code	**MM-IW**
Aim	To get acquainted with each other and MSc faculty members, research groups, and group leaders. To assign tutors. To give a broader view of possible lines of investigation, to help the students to make a choice for the 1st year research project.
Content	The Introduction Weeks serve as a general introduction to the whole MSc program. You will get to know a number of MSc faculty members, scientific group leaders, as well as the MSc course directors and coordinator. You will have the opportunity to visit several basic and/or translational research laboratories, to get a broader view of possible lines of investigation, and get (further) acquainted with various research techniques. This will enable you to make an informed choice for the research projects ahead.
Literature	Literature relevant to the topics presented in the lectures.
Faculty	Various MSc faculty members.
Level EC points Course load	1st year MSc student 2 56 hours
Exam	Attendance and active participation. Evaluated by MSc faculty member. Grade appeal is subject to the rules laid out in the Teaching and Examinations Regulations of Erasmus MC.
Period Coordination	1st two weeks of September, 2020 Dik van Gent, Gert Jansen
Evaluation	The Introduction Weeks organizers and MSc program coordinators are open for suggestions from course participants on possible improvements. Course contents and setup are re-evaluated periodically, at least once a year, by the course directors and MSc program board members.
Dublin descriptors End goals	1, 2, 5 1, 2, 4, 5

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Name	**Molecular Biology of the Cell - part A**
Form	Textbook course.
Code	**MM-MBC-A**
Aim	To lay foundations of knowledge, and to deepen knowledge of molecular and cell biology.
Content	The textbook course Molecular Biology of the Cell delves into the basic aspects of biology. Students will have lectures by various faculty members, twice a week. Students are expected to thoroughly study the textbook, and to actively take part in discussions. In broad outlines, the MM-MBC part A and B courses together will move from DNA and proteins to regulation of gene expression and control of cellular functions, finally leading to consideration of more complex systems and problems. MM-MBC-part A will focus on Alberts chapters 1, 2, 3, 5, 6, 10, 12, 13, 16 and 17. The course is followed by the continued course part B.
Literature	Alberts et al., Molecular Biology of the Cell (6th edition 2015).
Faculty	Thamar van Dijk, Pim Pijnappel, Titia Sixma, Arnab Ray Chaudhuri, Niels Galjart, Willy Baarends, Maarten Fornerod.
Level	1st year MSc students
EC points	5
Course load	140 hours
Exam	Written exam. The exam will contain open essay questions. You will not be allowed to use the textbook during the exam. The exam aims to test your insight and scientific inventiveness. The exam will be assessed by at least two MSc faculty members. You will receive a grade on a scale from 1 (worst) to 10 (best). Upon completion of this course, if you have attended and actively participated in at least 80% of the classes, and when you have passed the written exam, you are awarded 5 EC points. Grade appeal is subject to the rules laid out in the Teaching and Examinations Regulations of Erasmus MC.
Period	Mid September to October, 2020
Coordination	Thamar van Dijk, Pim Pijnappel

Evaluation	The MBC part A course and MSc program coordinators are open for suggestions from course participants on possible improvements. At the end of the semester, students will receive an invitation for an online survey on the contents and setup of the course. Course contents and setup are re-evaluated periodically, at least once a year, by the course directors and MSc program board members.
Dublin descriptors End goals	1, 2, 5 2, 7

▪

Name	**Molecular Biology of the Cell part B**
Form	Textbook course.
Code	**MM-MBC-B**
Aim	Deepening knowledge in molecular and cell biology.
Content	The textbook course Molecular Biology of the Cell delves into the basic aspects of biology. Students will have two lectures per week, in total 11 lectures. Students are expected to thoroughly study the textbook, and to actively take part in discussions. In broad outlines, the MM-MBC part A and B course together will move from DNA and proteins to regulation of gene expression and control of cellular functions, finally leading to consideration of more complex systems and problems. This course part B focuses on Alberts chapters 4, 7, 12, 13, 14, 15, 16, 18, 20 and 22. The course is preceded by the MBC course part A.
Literature	Alberts et al., Molecular Biology of the Cell (6th edition 2015).
Faculty	Thamar van Dijk, Pim Pijnappel, Derk ten Berge, Riccardo Fodde, Jeffrey van Haren, Gert Jansen, Ana Ruiz Saenz, Kerstin Wendt, Raymond Poot.
Level	1st year MSc students
EC points	5
Course load	140 hours
Exam	Written exam. The exam will contain open essay questions. You will not be allowed to use the textbook during the exam. The exam aims to test your insight and scientific inventiveness. The exam will be assessed by at least two MSc faculty members. You will receive a grade on a scale from 1 (worst) to 10 (best).

Upon completion of this course, if you have attended and actively participated in at least 80% of the classes, and when you have passed the written exam, you are awarded 5 EC points.

Grade appeal is subject to the rules laid out in the Teaching and Examinations Regulations of Erasmus MC.

Period: October to November, 2020

Coordination: Thamar van Dijk, Pim Pijnappel

Evaluation: The MBC part B course and MSc program coordinators are open for suggestions from course participants on possible improvements.

At the end of the semester, students will receive an invitation for an online survey on the contents and setup of the course. Course contents and setup are re-evaluated periodically, at least once a year, by the course directors and MSc program board members.

Dublin descriptors: 1, 2, 5
End goals: 2, 7

▪

Name: **Genetics**

Form: Textbook course lectures, workgroup sessions, and self-study.

Code: **MM-GEN**

Aim: Obtain a deeper theoretical understanding of genetic processes.

Content: This course will highlight some of the developments in modern genetics research. Building upon the knowledge of classical (Mendelian) genetics, we will discuss several aspects of molecular genetic research on model organisms as well as patients. Topics discussed include bacterial genetics, genomes of higher eukaryotes, DNA recombination in meiosis, transposable elements and site specific recombination, recombinant DNA technology, forward and reverse genetics, epigenetics, mouse genetics, genomic imprinting, non-coding RNA, genomics and bioinformatics, molecular genetic technology in the clinic.

Literature: Introduction to Genetics: A Molecular Approach. Terry Brown. Additional reviews and other course materials will be made available during the course.

Faculty: Dik van Gent, Eskeatnaf Mulugeta, Sreya Basu, Joost Gribnau, Manfred Kayser, Joris Pothof, and others.

Level: 1st year MSc students
EC points: 4
Course load: 112 hours

Exam: Written exam. The exam will contain open essay questions. You will not be allowed to use the textbook during the exam. The exam aims to test your insight and scientific inventiveness. The exam will be assessed by at least two MSc faculty members. You will receive a grade on a scale from 1 (worst) to 10 (best).

Upon completion of this course, if you have attended and actively participated in at least 80% of the classes, and when you have passed the written exam, you are awarded 4 EC points.

Grade appeal is subject to the rules laid out in the Teaching and Examinations Regulations of Erasmus MC.

Period: November to December, 2020

Coordination: Dik van Gent, Eskeatnaf Mulugeta

Evaluation: The Genetics course and MSc program coordinators are open for suggestions from course participants on possible improvements. At the end of the semester, students will receive an invitation for an online survey on the contents and setup of the course. Course contents and setup are re-evaluated periodically, at least once a year, by the course directors and MSc program board members.

Dublin descriptors: 1, 2, 5
End goals: 2, 7

▪

Name: **Developmental Biology**

Form: Lectures, presentation assignment, workshops, excursion.

Code: **MM-DB**

Aim: To learn about the molecular and cellular mechanisms of embryonic and postnatal development, and the experimental methods that can be used to obtain more information about (dys)regulation of (human) development.

Content: The evolutionary biologist Theodosius Dobzhansky emphasized that “nothing in biology makes sense except in the light of evolution”. This is particularly true for embryonic development. In this course, we will study evolutionary developmental biology.

The students will learn how different species, from worms to flies and vertebrates, provide complementary 'model systems' with specific advantages and disadvantages for experimental analysis of developmental pathways and mechanisms. Indeed, research within Erasmus MC targets animal species at diverged branches of the evolutionary tree. In this course, the students will also gain an understanding of developmental aspects of cellular pluripotency and differentiation, in the context of stem cell research. It goes without saying that this approach also provides an illuminating picture of our own development.

Literature: Principles of Development, Wolpert and Tickle, sixth Edition. Molecular Biology of the Cell, Alberts et al. (6th edition 2015).

Faculty: Robbert Rottier, Hegias Mira Bontenbal, Joost Gribnau, Tjakko van Ham, Gert Jansen, Erwin Kompanje, and others.

Level: 1st year MSc student
EC points: 3
Course load: 84 hours

Exam: Written exam (2 EC points) with closed and open questions on the topics discussed during the lectures and in the textbook. The written exam will be assessed by two MSc faculty members. You will receive a grade on a scale from 1 (worst) to 10 (best). After the assessment, the written examination is discussed with the students as a group.
Presentation (1 EC points): Teams of 4 Students will prepare a presentation about a specific topic within the field of evolutionary developmental biology. A list of candidate topics will be provided. The presentation will be graded by three MSc faculty members.

Upon completion of this course, if you have attended and actively participated in at least 80% of the classes, and when you have passed the written exam and successfully given a presentation, you are awarded 3 EC points.

Grade appeal is subject to the rules laid out in the Teaching and Examinations Regulations of Erasmus MC.

Period: December 2020 – January 2021

Coordination: Robbert Rottier, Hegias Mira Bontenbal

Evaluation: The Developmental Biology course organizers and MSc program coordinators are open for suggestions from course participants on possible improvements. At the end of the semester, students will receive an invitation for an online survey on the contents and setup of the course.

Course contents and setup are re-evaluated periodically, at least once a year, by the course directors and MSc program board members.

Dublin descriptors 1, 4, 5
End goals: 1, 2, 7, 8

▪

Name: **Biology of Disease**

Form: Lectures, discussion/brainstorm, presentation assignment.

Code: **MM-BOD**

Aim: Gain insight into current problems in translational research, seen from the perspective of the life scientist as well as the clinician. Course is aimed to discuss the demands/needs to perform successful translational bench research that really gets back to the patients. Establish a deeper understanding between the viewpoints of students with a biology background and those of students with a medical background. Offers an overview of experimental design and clinical needs to students with a non-medical background.

Content: The Biology of Disease course aims to give you a deeper insight into current problems in translational research, narrowing the gap between clinical and biological science and scientists. We will discuss several examples of translational research as it is running at Erasmus MC at this moment. This is meant as template for further discussion on demands/needs to set up a good translational research project.
After an introductory discussion on clinical needs ('a patient visits the doctor and what's next..''), we will discuss several examples of translational research from the fields of oncology and immunology. The session on the road from finding a target in the lab to clinical trials and introduction of a new drug in clinical practice offers insight in the long process of validation and implementation in a clinical setting.

In groups of 3 students, you will work on, and finally present, a possible translational research project in which you investigate the biological cause of an illness and how your data will be valorised (i.e. gets back to the patient again).

To achieve the goal of making a successful translation of a problem 'from bench to bed-side', and vice versa, the students with a medical degree will team up with students who have an educational background in life sciences.

	At the end of each session, you will meet your fellow students in a small group to discuss how the new insights that were presented during that day's course session can be implemented in your research project. For the final course session, each of the groups will present a possible investigation strategy for a current clinical problem. These small projects will be presented to your fellow students and will stimulate you to think out of the box (and your own comfort zone).
Literature	Literature on various topics to be distributed during the course.
Faculty	Dik van Gent, Martin van Royen, Agnes Jager, Ralph Stadhouders, Luc van der Laan, Ferry Eskens, Gert Jansen, Gerjo van Osch, and others.
Level	1st year MSc students
EC points	3
Course load	84 hours
Exam	Presentation: in teams of 3 students, you will prepare a presentation about a current translational research question. The presentation will be graded by the MSc faculty members and the individual contribution to the presentation and discussion will be graded. Upon completion of this course, if you have attended and actively participated in the classes, and when you have successfully given a presentation, you are awarded 3 EC points. Grade appeal is subject to the rules laid out in the Teaching and Examinations Regulations of Erasmus MC.
Period	January, 2021
Coordination	Dik van Gent, Martin van Royen
Evaluation	The Biology of Disease course organizers and MSc program coordinators are open for suggestions from course participants on possible improvements. At the end of the semester, you will receive an invitation for an online survey on the contents and setup of the course. Course contents and setup are re-evaluated periodically, at least once a year, by the course directors and MSc program board members.
Dublin descriptors	1, 2, 3, 4, 5
End goals	1, 2, 7, 8, 9

▪

Name	**Contemporary Research Topics - Faculty sessions**
Form	Journal Club – literature reading course.
Code	**MM-CRT-F**
Aim	You will learn to critically read scientific publications within a restricted time frame, and identify strengths and weaknesses of the research presented in these articles. You will gain insight into strategies, complications, and new developments in life sciences research, and the connection of the research to molecular medicine.
Content	The Contemporary Research Topics course is setup as a journal club; a literature reading course. A number of research papers will be discussed by faculty members. Besides the research articles, some pages of the Molecular Biology of the Cell textbook should be studied, highlighting a technique or approach that is of importance to the paper. For some techniques, an excursion to the technical equipment is included. In small groups, you prepare short technique presentations. Writing an article abstract is practiced during class. You will have course sessions twice a week.
Literature	A selection of approx. 12 relevant research articles. Alberts et al., Molecular Biology of the Cell (6th edition 2015): selected chapters.
Faculty	Raymond Poot, Derk ten Berge, Dik van Gent, Willy Baarends, Niels Galjart, Maarten Fornerod, Gert Jansen, Guido Jenster, Jurgen Marteijn, Gerben Schaaf, and others.
Level	1st year MSc students
EC points	4
Course load	112 hours.
Exam	Written examination. The course is concluded with a written examination with open questions on a research article that was not discussed previously. The original title and abstract of the article are not given: you are asked to propose a title and write the abstract. Apart from this, the exam will contain specific questions on the design of the study and the interpretation of the results, as described in the article. The written exam will be assessed by at least two MSc faculty members. You will receive a grade on a scale from 1 (worst) to 10 (best).

After the assessment, the written examination is discussed with the students as a group. Grade appeal is subject to the rules laid out in the Teaching and Examinations Regulations of Erasmus MC.

Upon completion of this course, if you have attended and actively participated in at least 80% of the classes, and when you have passed the written exam, you are awarded 4 EC points.

Period	February to April, 2021
Coordination	Raymond Poot, Derk ten Berge
Evaluation	The CRT-F course and MSc program coordinators are open for suggestions from course participants on possible improvements. At the end of the semester, you will receive an invitation for an online survey on the contents and setup of the course. Course contents and setup are re-evaluated periodically, at least once a year, by the course directors and MSc program board members.
Dublin descriptors	1, 3, 4, 5
End goals	1, 2, 7, 8, 9

▪

	Name **Lab Research Project Year 1**
Form	Practical training; research project in lab of choice.
Code	**MM-RES1**
Aim	To obtain practical experience in laboratory research, to collect scientific data, to practice communication skills, master research techniques, and further develop scientific thinking and reasoning.
Content	Your first year research project will take approximately eight months, and is conducted in a host research laboratory of your choice, within any Erasmus MC department involved in basic (biomedical) science. The laboratory scientific group leader functions as your direct supervisor. While in the lab, you will obtain practical experience in laboratory research, collect scientific data, practice communication skills, master research techniques, and further develop scientific thinking and reasoning.
Literature	Literature relevant to the research topic.
Faculty	Various MSc faculty members.
Level	1st year MSc students
EC points	24
Course load	672 hours
Exam	Assessment by research lab supervisor. Evaluations are made as written performance assessments, by the involved lab supervisors. If you have successfully completed your lab project, you will be awarded 24 EC points. Grade appeal is subject to the rules laid out in the Teaching and Examinations Regulations of Erasmus MC.
Period	November, 2020 to July, 2021
Coordination	Dik van Gent, Willy Baarends
Evaluation	The MSc program coordinators are open for suggestions from course participants on possible improvements. Course contents and setup are re-evaluated periodically, at least once a year, by the course directors and MSc program board members.
Dublin descriptors	1, 2, 3, 4, 5
End goals	1, 2, 4, 5, 7, 8, 9

▪

Name	**Presentation Skills**
Form	Workgroup sessions, presentation practice.
Code	**MM-PS**
Aim	To practice organizing information for a concise and informative presentation. To practice oral presentation skills.
Content	To start off the course, two or more volunteers will give a short oral presentation of one of the lab rotations they have done in the past months, or a research project done before. The presentation is not graded. The students will receive comments from the instructors on aspects that can be improved, but also on aspects that were good. Attention will be paid to clarity, organization, content, presentation, the use of visual aids, preparation, and the use of English. In the next sessions, the course directors will further discuss: • the structure of your talk • figures • PowerPoint tips • common mistakes in English • style, attitude, voice • keeping the attention of your audience
Literature	W. Strunk Jr. and E.B. White (2000), The Elements of Style, 4th Ed, *Longman Publishers.* Less is more (2007), *Nature Cell Biology 9:1217.* Mary Ann Ahart and Carolyn Ash, The SURF Talk Book, *Summer Undergraduate Research Fellowship.* PowerPoint Tips (*.ppt)
Faculty	Willy Baarends, Debbie van den Berg.
Level	1st Year MSc Student
EC points	2
Course load	56 hours
Exam	Mandatory attendance and active participation. Evaluated by MSc faculty member. Grade appeal is subject to the rules laid out in the Teaching and Examinations Regulations of Erasmus MC.
Period	3 workgroup sessions in March, 2021
Coordination	Willy Baarends, Debbie van den Berg

Evaluation	The Presentation Skills course and MSc program coordinators are open for suggestions from course participants on possible improvements. Course adjustments can be made on the basis of your direct feedback. Course contents and setup are re-evaluated periodically, at least once a year, by the course directors and MSc program board members.
Dublin descriptors End goals	4 1, 6

▪

Name	**Research Progress Presentation - Year 1**
Form	Oral presentation
Code	**MM-P1**
Aim	To practice organizing experimental data for a concise and informative presentation. To practice communicating experimental results and their interpretation. To present information on background and methods appropriate to time and audience. To provide an update on what you are doing in your research project.
Content	You should prepare an oral presentation in a work discussion style, sharing in some detail the methods used, the controls applied, and actual data obtained so far in your research project. The oral presentation will be evaluated on the basis of clarity, organization, content, presentation, the use of visual aids, and preparation. Special attention is given to the use of spoken English. You will not be evaluated on the degree to which you have achieved the experimental goals set out in your proposal. This is a chance to work on giving a presentation to scientists outside of your research group and to get some constructive feedback.
Literature	Strunk and White: The Elements of Style (4th edition 2000).
Faculty	Willy Baarends, Thamar van Dijk, Dik van Gent, Debbie van den Berg, Hegias Mira Bontenbal, Kerstin Wendt.
Level	1st year MSc student
EC points	2
Course load	56 hours
Exam	You should give a 15 to 20 minute talk on the progress of your 1st year research project, accompanied by PowerPoint slides.

The evaluation will be based on clarity, organization and presentation aspects. Separate numerical grades are for the oral presentation and the slides (or other visual aids) with attention to clarity, organization and content. These two scores are averaged for an overall grade.

The oral presentation will be assessed by at least two MSc faculty members. You will receive a grade on a scale from 1 (worst) to 10 (best).

Once you have given your presentation with sufficient results, and if you have attended at least 80% of the presentations of your peers, you are awarded 2 EC points.

Grade appeal is subject to the rules laid out in the Teaching and Examinations Regulations of Erasmus MC.

Period	Individual presentations in May, 2021
Coordination	Willy Baarends, Debbie van den Berg
Evaluation	Course contents and setup are re-evaluated periodically, at least once a year, by the course directors and MSc program board members.
Dublin descriptors End goals	1, 2, 4 1, 2, 3, 4, 5, 6

▪

Name	**Report Writing**
Form	Workgroup sessions, written report assignment.
Code	**MM-RW**
Aim	To organize your work as you would for publication. To understand the parts of a written research article and present your work in this way. To develop skills in scientific writing; including technical aspects of preparing figures and referencing and dividing the relevant information into Abstract, Introduction, Results and Discussion sections. To produce a final written summary of the research work you have done.
Content	Based on the experiments conducted and results obtained during the first year research project in the lab, you will write a scientific report. You will write up the results of your work in the form of a research article (manuscript) with the style used in PLOS Biology.

This will include: Title, Abstract, Introduction, Methods (for this purpose in more detail than is currently standard in publications), Results, Discussion and References, accompanied by figures. The completed report will be about 20-30 pages long. Prior to the writing of the report, you will have two class sessions to receive instructions and make preparations.

Literature

The Elements of Style, 4th Ed
W. Strunk Jr. and E.B. White, Longman Publishers, 2000

How to Publish in Biomedicine
Jane Fraser, Radcliffe Medical Press, 1997, (optional)

How to Write & Publish a Scientific Paper, 5th Ed
Robert A. Day, Oryx Press, 1998, (selected chapters)

The Netherlands Code of Conduct for Scientific Practice
General Board of the Association of Universities
(Algemeen Bestuur van de Vereniging van Universiteiten) January 1, 2005

On Being a Scientist, Responsible Conduct in Research
Committee on Science, Engineering, and Public Policy; National Academy Press, 1995

Faculty

Willy Baarends, Debbie van den Berg, Thamar van Dijk, Dik van Gent, Tjakko van Ham, Ana Ruiz Saenz, Jeffrey van Haren, Kerstin Wendt, and others.

Level
EC points
Course load

1st year MSc student
6
168 hours

Exam

The writing assignment will be guided by your supervisor and then, after approval, evaluated by faculty. The comments of the faculty should be implemented in your final version, which should be accompanied with a rebuttal, stating the response to the comments received.

The final report is formally graded by one of the faculty based on scores in different categories such as: academic writing skills, theoretical knowledge and understanding, application of theory. Also the quality of the rebuttal will be graded.
The final grade is adjusted if needed based on consensus among all faculty who have reviewed the proposal. Points are deducted for submitting assignments late. You will receive a grade on a scale from 1 (worst) to 10 (best).

Grade appeal is subject to the rules laid out in the Teaching and Examinations Regulations of Erasmus MC.

Period

June/July, 2021
(in April 2021, two class sessions with Willy Baarends)
Deadlines Report Writing:

Monday, June 28, 2021	hand in report version approved by your supervisor
Monday, July 5, 2021	receive comments from faculty
Monday, July 12, 2021	submit Final Report and Rebuttal for grading

Coordination

Willy Baarends, Debbie van den Berg

Evaluation

The Report Writing course and MSc program coordinators are open for suggestions from course participants on possible improvements. Course adjustments can be made on the basis of your direct feedback. Additionally, at the end of the semester, you will receive an invitation for an online survey on the contents and setup of the course.
Course contents and setup are re-evaluated periodically, at least once a year, by the course directors and MSc program board members.

Dublin descriptors
End goals

1, 2, 3, 4, 5
1, 2, 3, 4, 5, 6, 7, 8, 9

▪

Name	**Courses and Seminars**
Form	Selection of courses, seminars, lectures, and symposia available within and outside the Erasmus MC. Participation in weekly lab meetings and journal clubs.
Code	**MM-CS**
Aim	To develop skills in gathering information and knowledge from the attendance of scientific seminars and related events.
Content	You are encouraged to participate in several courses, seminars, lectures, and symposia available at or outside the Erasmus MC (specific courses, seminars and symposia are organized by the postgraduate schools MGC and/or MolMed). In consultation with your research supervisor, you will compose a program according to your individual needs and interests. Participation in an international meeting is to be considered. Following lectures on topics outside the field of your project but with the Molecular Medicine program is recommended.
Literature	Various
Faculty	Various
Level	2nd year MSc student
EC points	4
Course load	112
Exam	Toward the end of the academic year, you will compile a list of all followed courses, seminars, lectures and symposiums. The list is examined and approved by MSc faculty. Your compiled list of attended courses and seminars will be reviewed by Gert Jansen and Gerben Schaaf. If you have attended and actively participated in the required number of courses and seminars, you are awarded 4 EC points. Grade appeal is subject to the rules laid out in the Teaching and Examinations Regulations of Erasmus MC.
Period	throughout the year
Coordination	Gert Jansen Gerben Schaaf
Evaluation	Course contents and setup are re-evaluated periodically, at least once a year, by the course directors and MSc program board members.

Dublin descriptors	1, 2, 4, 5
End goals	1, 2, 7, 8, 9

Overview

Lab and departmental meetings (max 1 EC)
You will attend weekly meetings of your lab and department and actively contribute to these meetings by asking questions and presenting your own work. Weekly participation at these meetings accounts for 1 EC.

Journal clubs (max 1 EC)
You will attend journal club sessions of your lab group or department and actively contribute to these meetings by reading the articles, asking questions and, importantly, by discussing a scientific article yourself. Participation in at least 10 journal club sessions, including discussing an article yourself accounts for 1 EC.

Courses (max 1 EC)
You can attend one or more courses, e.g. offered by one of the PhD programs of the Erasmus MC or the Radboud University. A maximum of 1 EC of the EC obtained at the course(s) can be used for the MM-CS course.

General PhD courses offered by Erasmus MC include:
- Biomedical English Writing and Communication
- Biostatistics
- Integrity in Science: https://www.erasmusmc.nl/en/education/education-opportunities/wetenschappelijke-integriteit-cursus
- Safe Laboratory Techniques
- Working with Test Animals

The Erasmus Optical Imaging Centre will organize in the Fall 2020, the Master course Optical Imaging (Live cell microscopy). **Participation in this course is highly recommended.**

Postgraduate Courses
The MSc students may participate in consultation with Gert Jansen and Gerben Schaaf in the specialized courses organized by the *Postgraduate schools Medical Genetics South-West Netherlands (MGC) and Molecular Medicine (MolMed)*. A few examples:
- Image Analysis Course
- Ensemble workshop
- Translational Imaging Workshop by AMIE: From mouse to man
- Basic and translational oncology
- Course on Interpretation of expression profiling data using R/BioC and web tools

Further information on the courses and online registration is available at:
http://www.medgencentre.com/
http://www.molmed.nl/
Registration for these courses is not free of charge, there is a fee involved (on discount basis). Before registering, please discuss your plans with the coordinators of the MM-CS course.

Due to the Covid-19 crisis, we think there will be less 'live' courses given. For possible interesting courses online, you may search on https://www.coursera.org/
Before registering, please discuss your plans with the coordinators of the MM-CS course.

Courses at Radboud University Nijmegen
The students may take part in selected classes and courses from the MSc program in Molecular Mechanisms of Disease, at the Radboud University Nijmegen:
- Master Classes
- Translational Research Courses
- Course on Science and Society

More information on these courses can be found at the website http://www.ru.nl/master/ncmls-mmd/. Interested students can send their application to Prof.dr. Roland Brock, program director of the MSc Molecular Mechanisms of Disease, via email: r.brock@ncmls.ru.nl, with cc to mscmolmed@erasmusmc.nl.

Seminars and Meetings (max 2 EC)
You will attend lectures at or outside the Erasmus MC on topics that fit within the scope of the MSc Molecular Medicine program. A maximum of 2 EC gathered by following lectures and/or meetings can be used for the MM-CS course.
Throughout the year, various departments arrange regular seminars with well-known scientists speaking on topics concerning biomedical research and advances. These include different lecture series within the Biomedical Sciences (Erasmus MC Lecture Series on Biomedical Science, Lectures on Molecular Genetics), as well as the Hematology Lectures, JNI Oncology Lectures, Clinical Genetics Lectures and Erasmus MC Lecture Series on Endocrinology. You are free to choose from any of these lectures. In addition, the MGC, other postgraduate schools and other organizations organize one or more-days scientific meetings that you can attend. Some of these meetings may involve fees.

List of Courses and Seminars
The MSc-Molecular Medicine program has a small budget for students who want to participate in particular courses or seminars. Before registering, please discuss your plans with the coordinators of the MM-CS course.
Toward the end of the academic year, you will compile a list of all followed courses, seminars, and lectures. The list is examined and approved by faculty.

Name	**Literature Review**
Form	Self study, written report.
Code	**MM-LR**
Aim	Students learn how to gather literature on a chosen topic and how to report on their findings in a written mini-review.
Content	Individually, you will write an insightful essay on a specific topic within the wide field of biomedical science. We will provide you with an list of topics and will give you literature suggestions to start reading. An experienced faculty member will be available to offer guidance and support.
Literature	Literature on a chosen topic.
Faculty	Stefan Barakat, Arnab Ray Chaudhuri, Dik van Gent, Bram van der Eerden, Joost Gribnau, Tjakko van Ham, Bert van der Horst, Wim Mandemakers, Pim Pijnappel, Gerben Schaaf, Christopher Schliehe, Ralph Stadhouders, Heleen Vroman, Kerstin Wendt, Monique Verstegen, and others.
Level	2nd year MSc student
EC points	4
Course load	112 hours
Exam	You are to write a comparative review on a research topic within the broad area of biomedical science. Specific instructions for content and form are given. The review will be assessed by at least two MSc faculty members. You will receive a grade on a scale from 1 (worst) to 10 (best). Upon completion of this course, if you have successfully written your review and obtained a passing grade, you are awarded 4 EC points. Grade appeal is subject to the rules laid out in the Teaching and Examinations Regulations of Erasmus MC.
Period	This assignment has to be completed in April 2021. Deadlines: Thursday, March 4, 2021 hand in Draft Literature Review Thursday, March 25 2021 receive comments from Literature Review supervisor Thursday, April 15, 2021 hand in Final Literature Review for grading
Coordination	Dik van Gent

Evaluation	The Literature Review course and MSc program coordinators are open for suggestions from course participants on possible improvements. Course adjustments can be made on the basis of your direct feedback. Course contents and setup are re-evaluated periodically, at least once a year, by the course directors and MSc program board members.
Dublin descriptors End goals	1, 2, 3, 4, 5 1, 2, 5, 7, 8, 9

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Name	**Writing a Project Proposal**
Form	Workgroup sessions and writing assignment.
Code	**MM-PP**
Aim	To develop skills in scientific writing in English. To understand the content and purpose of different parts of a research proposal such as those prepared in order to obtain funds from granting agencies. To obtain the necessary background information on the topic to be studied as a year-long project, and demonstrate this knowledge in written form. To create a formal plan for the year-long research project. To clearly state scientific questions and present a realistic experimental plan to answer them in written form. To develop skills in evaluating scientific writing. To allow the MSc faculty a chance to review and approve your plans.
Content	In regular course meetings Sept/October and November, you are educated on how to write a scientific proposal. You will develop a first draft of your own research proposal, describing the plan of work for the one-year period leading to the MSc thesis. The written research proposal will be prepared together with, and approved by, your research supervisor. This plan, agreed upon by both student and faculty, will be the basis for your research work leading to the MSc Molecular Medicine degree. The research proposal should describe the plan of work for a full-year period of research. This will include: Title, Summary, Description of the proposed research, Knowledge utilisation, and Reference list (including figures as appropriate). These parts will be written in a step-wise manner.

At each stage, the written parts will be evaluated by faculty on specific elements of scientific writing, as well as content, and revised accordingly. Students will also review and evaluate the completed proposals of two of their peers to provide comments, during a discussion session, before the final revision.

Special attention is given to the use of spoken and written English.
The research proposal should be submitted by begin December.

Literature

The Elements of Style, 4th Ed
W. Strunk Jr. and E.B. White, Longman Publishers, 2000

How to Publish in Biomedicine
Jane Fraser, Radcliffe Medical Press, 1997, (optional)

How to Write & Publish a Scientific Paper, 5th Ed
Robert A. Day, Oryx Press, 1998, (selected chapters)

The Netherlands Code of Conduct for Scientific Practice
General Board of the Association of Universities
(Algemeen Bestuur van de Vereniging van Universiteiten) January 1, 2005

On Being a Scientist, Responsible Conduct in Research
Committee on Science, Engineering, and Public Policy; National Academy Press, 1995

Faculty

Willy Baarends, Esther Baart, Debbie van den Berg, Thamar van Dijk, Maarten Fornerod, Jeffrey van Haren, Gert Jansen, Hannes Lans, Ana Ruiz Saenz, Gerben Schaaf, Kerstin Wendt and others.

Level
EC points
Course load

2^{nd} year MSc student
2
56 hours

Exam

The evaluation of the written research proposal assignment will be based the NWO criteria for evaluating the scientific content of this type of proposal:

1. quality, innovation and scientific impact of the research proposal
2. knowledge utilization

These criteria weigh 40% and 20% of the total score judgment. Taking the following considerations into account

1. Quality, innovative character and scientific impact of the research proposal
- Challenging content;
- Originality of the topic;
- Innovative elements;
- Potential to make important contributions to science;

- Effectiveness of proposed method.
Special attention will be paid to research questions posed, the appropriateness of the experimental approach, feasibility of the work for a one-year project, and suitability of the work for completion of the MSc thesis.

2. Knowledge utilisation;
- Contribution to society and / or to other disciplines;
- Disciplines and organizations to which the results can benefit.

In addition, Organization, clarity, and grammar will be evaluated and form 40% of the score judgement.

The writing assignment will be evaluated by faculty at each stage to provide comments for correcting, revising and improving the proposal. The final proposal will be reviewed by 2 other students in the class to provide additional comments for revision.

The final proposal is formally graded by one of the faculty based on the following 7 categories for assessment: 1;organization, 2;clarity, 3;grammar (1-3 together 40%), 4;originality and challenging and innovative aspects, 4;effectiveness of methodology, 6;feasibility and likelihood of making a significant contribution to the field (4-6 together 40%), 7;knowledge utilisation (20%). The final grade is adjusted if needed based on consensus of all faculty who have reviewed the proposal and may additionally be adjusted based on class participation. Points are deducted for submitting assignments late.

You will receive a grade on a scale from 1 (worst) to 10 (best).

Grade appeal is subject to the rules laid out in the Teaching and Examinations Regulations of Erasmus MC.

Period

End of September to begin of December, 2020

Coordination

Willy Baarends

Evaluation

The Project Proposal course and MSc program coordinators are open for suggestions from course participants on possible improvements. Course adjustments can be made on the basis of your direct feedback.
Course contents and setup are re-evaluated periodically, at least once a year, by the course directors and MSc program board members.

Dublin descriptors
End goals

1, 2, 3, 4, 5
1, 2, 3, 4

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Name	**Research Progress Presentation - Year 2**
Form	Oral presentation
Code	**MM-P2**
Aim	To practice organizing experimental data for a concise and informative presentation. To practice communicating experimental results and their interpretation. To present information on background and methods appropriate to time and audience. To provide an update on what you are doing in your research project.
Content	At the halfway point of the full-year research project, you will present a 15-20 minute talk on your research progress, accompanied by a slideshow. The students from the first MSc year are invited to these presentations. The presentation should include a brief introduction to the project, some information on specific experiments, details on methods, controls, and actual data, and a conclusion with a brief statement on the results obtained.
Literature	Instructions
Faculty	Gert Jansen, Gerben Schaaf.
Level	2nd year MSc student
EC points	2
Course load	56 hours
Exam	You should give a 15 to 20 minute talk on the progress of your full-year research project, accompanied by Powerpoint slides. The evaluation will be based on clarity, organization and presentation aspects. The oral presentation will be assessed by at least two MSc faculty members. You will receive a grade on a scale from 1 (worst) to 10 (best). Once you have given your presentation with sufficient results, and if you have attended at least 80% of the presentations of your peers, you are awarded 2 EC points. Grade appeal is subject to the rules laid out in the Teaching and Examinations Regulations of Erasmus MC.
Period	Individual presentations in March, 2021

Coordination	Gert Jansen, Gerben Schaaf
Evaluation	Course contents and setup are re-evaluated periodically, at least once a year, by the course directors and MSc program board members.
Dublin descriptors	2, 4
End goals	1, 2, 5, 7, 8, 9

▪

Name	**Lab Research Project Year 2**
Form	Practical training; 12-month research project in lab of choice.
Code	**MM-RES2**
Aim	To obtain practical experience in laboratory research, to collect scientific data, to practice communication skills, to master a variety of research techniques, and further develop scientific thinking and reasoning.
Content	Your second year research project will take approximately 10 to 12 months, and is conducted in a host research laboratory of your choice, within any Erasmus MC department involved in basic (biomedical) science, or a comparable research lab elsewhere. The laboratory scientific group leader functions as your direct supervisor. While in the lab, you will obtain practical experience in laboratory research, collect scientific data, practice communication skills, master research techniques, and further develop scientific thinking and reasoning.
Literature	Literature relevant to the topic of choice.
Faculty	Individual scientific group leaders.
Level	2nd year MSc student
EC points	38
Course load	1064 hours
Exam	Performance of the student during the full-year research project will be assessed in written form by the research supervisor. An extra mid-term moment of evaluation for both the supervisor and the student is recommended. This mid-term evaluation is not graded. Every student will also have an individual mid-term meeting with the course directors of the second year (Gert Jansen and Gerben Schaaf). This assessment is not graded.

Evaluations are made as written performance assessments, by the involved lab supervisors.

For the total amount of lab work, upon completion, you will be awarded 38 EC points.

Grade appeal is subject to the rules laid out in the Teaching and Examinations Regulations of Erasmus MC.

Period: September, 2020 to August, 2021

Coordination: Gert Jansen, Gerben Schaaf

Evaluation: The MSc program coordinators are open for suggestions from course participants on possible improvements.
Course adjustments can be made on the basis of your direct feedback. Course contents and setup are re-evaluated periodically, at least once a year, by the course directors and MSc program board members.

Dublin descriptors: 1, 2, 3, 4, 5
End goals: 1, 2, 3, 4, 5, 6, 7, 8, 9

▪

Name: **Master Thesis**

Form: Written report and oral presentation.

Code: **MM-MSTH**
Aim: The MSc thesis should demonstrate the ability of the student to organize and present results and knowledge in a form required for publication of a scientific article. Submission of the manuscript for publication is not a prerequisite, but is aimed at.

The MSc thesis should provide a record of the research work the student has done, a written presentation of knowledge and results, and a useful resource of information for others.

Content: The second, full-year, research project is concluded by submission and defence of the MSc thesis. The thesis will take the form of a full-length research article, suitable for publication in an international journal. In contrast to a regular article manuscript, the MSc thesis will include a more elaborate Introduction, describing the scientific background of the study: the Materials and Methods section will be expanded to include a complete and detailed description of all methods that have been applied; also, a List of Abbreviations will be added.

The thesis is typically 20-50 total pages of 1.5 lines spacing, 10pt text, including figures, references, et cetera. and will contain separate 'chapters': List of Abbreviations, Summary, Introduction, Materials and Methods, Results, Discussion / Conclusions, and in some cases appendices or supplemental material.

The final version of the thesis will have to be accompanied by a 1-2 page summary of the specific improvements that were implemented in the final version, based on the comments the student has received by faculty on the draft version. This should be in the form of a rebuttal letter, as would accompany a manuscript resubmitted after review.

The defence of the thesis will take about 20 minutes, and will be preceded by an oral half hour presentation of aim, results and conclusions of the thesis work.

Literature: MSc theses of previous students

The Elements of Style, 4th Ed
W. Strunk Jr. and E.B. White, Longman Publishers, 2000

How to Publish in Biomedicine
Jane Fraser, Radcliffe Medical Press, 1997, (optional)

How to Write & Publish a Scientific Paper, 5th Ed
Robert A. Day, Oryx Press, 1998, (selected chapters)

The Netherlands Code of Conduct for Scientific Practice
General Board of the Association of Universities
(Algemeen Bestuur van de Vereniging van Universiteiten) January 1, 2005

On Being a Scientist, Responsible Conduct in Research
Committee on Science, Engineering, and Public Policy; National Academy Press, 1995

Faculty: Gert Jansen, Gerben Schaaf, individual scientific group leaders.

Level: 2nd year MSc student
EC points: 8 (MSc thesis) + 2 (thesis defence)
Course load: 280 hours

Exam: The MSc thesis manuscript will be evaluated by the research supervisor and an independent faculty member.

The student's research supervisor and at least two independent MSc faculty members will assess the MSc thesis presentation and defence. Together, they will come up with a final grade both the MSc thesis and the thesis presentation.

	You will receive grades on a scale from 1 (worst) to 10 (best), for the manuscript and the defence presentation. A weighted average will be calculated for the final score. Upon completion of this course, if you have successfully written and defended your MSc thesis, you are awarded 10 EC points. Grade appeal is subject to the rules laid out in the Teaching and Examinations Regulations of Erasmus MC.
Period	Writing the MSc thesis will start during the full-year research project, while the large part is done in June/July 2021. In the middle/end of August 2021, the MSc thesis defence presentations are held.
Coordination	Gert Jansen, Gerben Schaaf
Evaluation	The MSc Thesis course and MSc program coordinators are open for suggestions from course participants on possible improvements. Course adjustments can be made on the basis of your direct feedback. Course contents and setup are re-evaluated periodically, at least once a year, by the course directors and MSc program board members.
Dublin descriptors End goals	1, 2, 3, 4, 5 1, 2, 3, 4, 5, 6, 7, 8

2.4 Course evaluations

After finishing the main theory courses of the MSc program, you will be asked to fill out an online evaluation form for each course. The online surveys allow you to give comments and/or suggestions for improvement.

When renewing the curriculum at the beginning of the academic year, the results of these evaluations are considered. Where deemed appropriate, changes in course contents are made by the course directors and/or the program director.

2.5 Workload, duration

The MSc Molecular Medicine program is a two-year research master's program of 120 EC, representing a total study load of 3,360 hours. The workload for the students is evenly distributed over the course years. Textbook courses are predominantly scheduled for year 1. In year 2, the emphasis is on performing a full-year research project, leading up to the MSc thesis.

Erasmus MC students of Medicine

Selected Erasmus MC students of medicine have the opportunity to follow the MSc Molecular Medicine program by starting with the whole year 1 of the MSc Molecular Medicine program, followed by the medical master 'new style'. After finishing medicine, students will come back to follow the second year of the MSc program (*see page 15 for an outline of the curriculum*).

Wageningen University – MSc Biotechnology students

WUR – MBT students have the possibility to specialize in 'Molecular Medicine' (WUR course modules *XEU-80336 Thesis Molecular Medicine part A* and *XEU-80324 Thesis Molecular Medicine part B* / 60 EC). These students follow the complete Year 2 of the MSc Molecular Medicine curriculum, conducting a full-year research project and writing and defending the MSc thesis in Rotterdam. Subsequently, WUR – MBT students will graduate in Wageningen. While at Erasmus MC, they can take part in additional courses and seminars (*also see page 62*).

2.6 Student exchanges – internships abroad

For a limited number of students, internships abroad are possible within the framework of our collaborative agreements with 3 universities:

Friedrich-Alexander-Universität, Nürnberg, Germany :	MSc Molecular Medicine
Georg-August-Universität, Göttingen, Germany:	MSc Biology
University of Barcelona, Spain:	MSc Biology / Neurosciences
Université Pierre et Marie Curie, Paris, France:	MSc Molecular and Cellular Biology

A typical student exchange will take the form of a clearly defined six-month research project, and will preferably be done while in year 2 of the program. When performing a research project in Nürnberg, Paris or Barcelona, students will receive supervision and guidance in accordance with the requirements in Rotterdam. The MSc thesis will always have to be defended in Rotterdam.

When visiting Rotterdam, exchange students from Nürnberg, Göttingen, Barcelona and Paris will be able to perform a six-month research project, with optional additional courses.

Incidentally, students are allowed to conduct their 2nd year research project in a research lab abroad (other than the labs at FAU, UPMC or UB). This can only happen on the conditions that collaborations already exist between the involved research groups, and that our requirements regarding course work, supervision, and assessment are met.

The Erasmus MC offers internships on a wide variety of topics. Students may consider internships at institutes outside the Erasmus MC or even abroad. To ensure optimal guidance and training for the student as well as participation of the student in the 2nd year course Writing a Project Proposal, a few additional requirements apply to these “extra-Erasmus MC” internships, in particular to those in institutes abroad. Excellence of the candidate and the hosting institute are major factors for support from the Molecular Medicine MSc program. In addition, the internship requires a mentor from within the Erasmus MC and should preferably be part of a collaboration with an Erasmus MC research group. Contact the year 2 coordinators (Dr. Gert Jansen and Dr. Gerben Schaaf) in time to discuss your plans and for more information.

An internship abroad can only be arranged and carried out in full agreement with the involved MSc faculty members: the lab supervisor, the course director(s), and the program director.

Staff

MSc Molecular Medicine faculty members are directly involved in basic biomedical research and training, within at least 20 different departments of Erasmus MC. This reflects the multi-disciplinary nature of our MSc program.

Faculty members are internationally recognized scientists and educators, with an excellent record of publications in peer-reviewed top international life science journals. Several faculty are members of the Royal Netherlands Academy of Arts and Sciences (*KNAW*), and many are elected members of the European Molecular Biology Organization, or are involved in other international organizations such as the World Health Organization.

Members of our staff have won many awards and prizes, such as the: Louis-Jeantet Prize for Medicine (1993 and 1995), Spinoza Prize (1995 and 1998), Laqueur Lecture Award (1999), Mulder-Masurel Award (2000), Descartes-Huygens Prize (2000), Van Gogh Award (2000), EC-Descartes Award (2000), Josephine Nefkens Award (2001), and the ESCV Gardner Lecture Award (2002). MSc faculty consistently obtain research funding from NWO, KNAW, NKB-KWF, NIH, EC, ERC, and many other funding bodies. Since 2002, they have been awarded around 25 NWO – VIDI and NWO – VICI grants. As a lifetime achievement award, four of our faculty members were appointed KNAW Academy Professor.

The MSc faculty is experienced in training students and postdoctoral fellows for university faculty, medical school faculty, clinical laboratory and industrial biomedical research positions, both nationally and internationally. To date, more than 550 students have successfully finished their PhD under the supervision of one or more of our faculty members.

3.1 Chair and course directors

Chair

Dr. Dik van Gent, program director	d.vangent@erasmusmc.nl
Dr. Gert Jansen	g.jansen@erasmusmc.nl
Prof.dr. Gerjo van Osch	g.vanosch@erasmusmc.nl
Dr. Gerben Schaaf	g.schaaf@erasmusmc.nl

Course directors

Dr. Willy Baarends	w.baarends@erasmusmc.nl
Dr. Debbie van den Berg	d.vandenberg@erasmusmc.nl
Dr. Derk ten Berge	d.tenberge@erasmusmc.nl
Dr. Thamar van Dijk	t.vandijk@erasmusmc.nl
Dr. Dik van Gent	d.vangent@erasmusmc.nl
Prof.dr. Joost Gribnau	j.gribnau@erasmusmc.nl
Dr. Gert Jansen	g.jansen@erasmusmc.nl
Dr. Hegias Mira Bontenbal	h.mirabontenbal@erasmusmc.nl
Dr. Eskeatnaf Mulugeta	e.mulugeta@erasmusmc.nl
Dr. Pim Pijnappel	w.pijnappel@erasmusmc.nl
Prof.dr. Gerjo van Osch	g.vanosch@erasmusmc.nl
Dr. Raymond Poot	r.poot@erasmusmc.nl
Dr. Robbert Rottier	r.rottier@erasmusmc.nl
Dr. Martin van Royen	m.vanroyen@erasmusmc.nl
Dr. Gerben Schaaf	g.schaaf@erasmusmc.nl

Course coordinator

Marjoleine van Berckel Bik	mscmolmed@erasmusmc.nl

3.2 Faculty members

Name	Erasmus MC department	Research field / keywords
Reuven Aghami	Netherlands Cancer Institute	Cancer, RNAi, microRNAs, Long noncoding RNAs, enhancer RNAs, Alternative polyadenylation, and protein translation
Willy Baarends	Developmental Biology	meiosis, chromatin dynamics
Esther Baart	Gynaecology and Obstetrics	human IVF, embryo development, aneuploidy, chromosome segregation
Debbie van den Berg	Cell Biology	transcription regulation, brain development, organoids, neurodevelopmental disorders
Derk ten Berge	Cell Biology	hematopoietic and embryonic stem cells, Wnt signaling
Vincenzo Bonifati	Clinical Genetics	brain and movement disorders, neurodegeneration, Parkinson's disease
Gert van Cappellen	Pathology	live cell imaging Confocal microscopy FCS Multi-photon 4Pi
Arnab Ray Chaudhuri	Molecular Genetics	DNA replication stress, DNA damage response, cancer, chemoresistance
Reno Debets	Medical Oncology	tumor or virus-specific receptor gene transfer to retarget T cells; cancer and inflammation; novel immune technologies.
Ruud Delwel	Hematology	leukemia disease genes
Jeroen Demmers	Biochemistry	Proteomics
Thamar van Dijk	Cell Biology	arginine methylation, signal transduction, transcription factors, lentiviral knockdown
Bram van der Eerden	Internal Medicine	regulatory mechanisms in bone, steroid hormone action, bone
Jeroen Essers	Radiotherapy	DNA duplication and genome maintenance
Eric Farrell	Oral and Maxillofacial Surgery	mimicking the biological process of endochondral ossification to tissue engineer new bone for the treatment of bone defects
Riccardo Fodde	Pathology	colon cancer, breast cancer, Wnt/ß-catenin signalling, cancer stem cells
Maarten Fornerod	Cell Biology	genome based intervention of pediatric acute myeloid leukemia
Ron Fouchier	Viroscience	influenza, SARS
Pim French	Neurology	glioma, omics
Niels Galjart	Cell Biology	cell structure and dynamics, microtubules, cytoskeleton
Dik van Gent	Molecular Genetics	DNA repair, V(D)J recombination, immuno-deficiency
Joost Gribnau	Developmental Biology	X inactivation, genomic imprinting
Frank Grosveld	Cell Biology	gene regulation, erythroid differentiation
Tjakko van Ham	Clinical Genetics	zebrafish and modelling human disease
Jeffrey van Haren	Cell Biology	Neuronal migration and directional guidance / neuronal guidance, cell biology, synthetic biology, optogenetics, live cell microscopy, cytoskeleton, micropatterning, iPSc
Rudi Hendriks	Pulmonary Medicine	immunodeficiencies, signal transduction, transcription factors, mouse models
Jan Hoeijmakers	Molecular Genetics	DNA repair, ageing
Robert Hofstra	Clinical Genetics	genes and mutations of genes contributing to inherited diseases and cancer

Bert van der Horst	Molecular Genetics	DNA repair, biological clock
Adriaan Houtsmuller	Pathology	in vivo dynamics of nuclear processes, androgen receptor
Danny Huylebroeck	Cell Biology	Smad/SIP signalling
Wilfred van IJcken	Cell Biology (Genomics)	genomics, next generation sequencing, bioinformatics, microarrays
Gert Jansen	Cell Biology	*C. elegans*, behavior, cilia, G protein signaling, signal transduction, intraflagellar transport, salt taste
Guido Jenster	Urology	androgen receptor, bioinformatics, biomarkers, microarrays, prostate cancer, proteomics, next generation sequencing
Roland Kanaar	Molecular Genetics / Radiation Oncology	genome maintenance, DNA repair, DNA recombination, genome transactions
Manfred Kayser	Genetic Identification	forensic genetics and molecular biology, genetics and physical traits, human population and evolutionary genetics
Annelies de Klein	Clinical Genetics	molecular (cyto) genetics
Steven Kushner	Neurobiological Psychiatry	defining the cellular and molecular basis of a memory network
Luc van der Laan	Laboratory of Experimental Transplantation and Intestinal Surgery	organ injury and repair
Hannes Lans	Molecular Genetics	mechanism and regulation of nucleotide exicision repair
Joyce Lebbink	Molecular Genetics	DNA mismatch repair
Eric Lubberts	Rheumatology	Rheumatology, dermatology, arthritis, inflammation, immune-mediated inflammatory diseases
Wim Mandemakers	Clinical Genetics	brain and movement disorders, neurodegeneration, Parkinson's disease
Tokameh Mahmoudi	Biochemistry	Gene Regulatory Mechanisms
Jurgen Marteijn	Molecular Genetics	DNA damage response, DNA-repair
Eskeatnaf Mulugeta	Cell Biology	Systems Biology, Computational Biology / Bioinformatics, Stem cells, Transcription factors, Cell Signalling, Genomics Epigenomics
Julie Nonnekens	Radiology and Nuclear Medicine / Molecular Genetics	prostate cancer / in vitro models, in vivo and ex vivo experiments
Gerjo van Osch	Orthopaedics	cartilage, cell therapy, growth factors, osteoarthritis, regenerative medicine, tissue engineering
Emma de Pater	Hematology	Blood cancer (MDS / AML) RNA sequencing, CRISPR/Cas9
Sjaak Philipsen	Cell Biology	erythropoiesis, transcription factors
Pim Pijnappel	Clinical Genetics	Pompe disease, Lysosomal storage disease, reprogramming, iPS cell, muscle stem cell, gene correction, TAL effector nuclease, pre-mRNA splicing, pathology
Raymond Poot	Cell Biology	embryonic and neural stem cells, transcription factors, chromatin, neurological disease
Joris Pothof	Molecular Genetics	DNA damage response, aging, cancer, cancer therapy resistance, genomics, next generation sequencing, microRNA
Robbert Rottier	Pediatric Surgery	molecular basis of lung development
Martin van Royen	Pathology / OIC	Non-coding RNA and extracellular vesicles, prostate cancer
Ana Ruiz Saenz	Cell Biology	Drug resistance and cancer progression / breast cancer, targeted therapies, glycosylation
Gerben Schaaf	Pediatrics	Muscle Stem Cells, Stem cell-based therapies, Muscle-degenerative disease

Christopher Schliehe	Immunology	antigen presentation and immune regulation
Martijn Schonewille	Neuroscience	Cerebellum, Purkinje cells, hereditary ataxia
Titia Sixma	Netherlands Cancer Institute	DNA repair, structural biology, SUMO, ubiquitin conjugation
Peter van der Spek	Bioinformatics	bioinformatics, normal and abnormal brain development
Ralph Stadhouders	Pulmonary Medicine / Cell Biology	lymphocyte differentiation lung inflammation, chromatin profiling, gene regulation, transcription factors
Bas van Steensel	Netherlands Cancer Institute	chromatin profiling, gene expression, bioinformatics
Georges Verjans	Viroscience	herpes simplex virus, varicella zoster virus, virus-host interactions
Wim Vermeulen	Molecular Genetics	DNA damage response, transcription
Peter Verrijzer	Biochemistry	chromatin remodeling, transcription, *Drosophila*, cancer
Kerstin Wendt	Cell Biology	cohesins and developmental defects, chromatin structure and regulators, CTCF
Rob Willemsen	Clinical Genetics	fragile X syndrome, mouse models, zebrafish, neuroscience
Geeske van Woerden	Neuroscience	the role of CAMK2 in neurodevelopment and neurodevelopmental disorders
Claire Wyman	Radiation Oncology	homologous recombination, DNA double-strand break repair, scanning force microscopy, single molecule dynamics

Assessments

4.1 Exams

The combined Master of Science programs at Erasmus MC have developed a shared set of Teaching and Examination Regulations (*Onderwijs- en Examenreglement, OER*). Students can obtain a copy of the full text of the Teaching and Examination Regulations Research Master Programs (in English) online, from the SIN online.
The main rules for course assessments are:

Examinations (*OER* annex – paragraph 2.1.3)
All course modules within the MSc Molecular Medicine program are assessed as stated in the course descriptions of this student manual (*pages 20-50*).
Full attendance is mandatory for some courses or course sessions. For other courses, students are allowed to be absent a maximum of 20% of classes, but only when reporting their absence in advance to the MSc coordinator and/or the course director.
EC points will only be awarded if the above requirements are met and if a test is passed with sufficient results.

Re-exams (*OER* annex – paragraph 2.2.3)
Students are entitled to take one re-exam for each test, per year.

Exemptions (*OER* rules and guidelines – paragraph 3.2)
All course modules in the program are mandatory. Requests for exemptions will be evaluated by the examination board (see below), which to this purpose needs to receive a written request from the student.

4.2 Examination board and program board

The combined research master's programs at Erasmus MC have an examination board (*examencommissie*) as well as a program board (*opleidingscommissie*).

MSc examination board
The MSc examination board carries formal responsibility for the outcome of all exams of the program. There is one board for all bachelor and master programs (including medicine). There is a separate chamber of the examination board for the combined five

Erasmus MC research master programs[1]. The MSc examination board chair reports to the dean of Erasmus MC. The board will delegate specific responsibilities to the MSc Molecular Medicine admissions committee.

Members of the chamber research masters of the Erasmus MC examination board

Dr. F. Petrij, chairman
Dr. A.J.M. Verhoeven, vice-chairman
Ms M.M. Jaegle
Ms G.M. van Woerden
Secretariat: examinationboard@erasmusmc.nl

MSc program board

The MSc program board acts as an advisory board for matters concerning the existing five research master programs[1] within Erasmus MC, according to the Dutch Law on Higher Education (*WHW*, article 9.18). The committee is entitled to advise on and yearly evaluate the 'education and exam regulations' (*onderwijs- en examenregeling, OER*), and to advise the program director and the dean on all matters concerning the educational program, either on request or on its own authority.
The program board consists of five MSc faculty members (including the committee chair) and five MSc students: one for each Erasmus MC research master program. Chairpersons and program directors are excluded from this committee.

MSc program board members

Dr. J.P. Hays (chair, teacher MSc Infection and Immunity)
Dr. R.J. Rottier (teacher MSc Molecular Medicine)
Dr. P.A. Forbes (teacher MSc Neuroscience)
Dr. D. Rizopoulos (teacher MSc Health Sciences)
Dr. M.K. Ikram (teacher MSc Clinical Research)
Ms. M. Jokic (student MSc Infection and Immunity)
Ms. F. Karkala (student MSc Molecular Medicine)
Mr. T.A.O. Beck (student MSc Neuroscience)
Mr. C.F. Khan (student MSc. Health Sciences)
Mr. V.J.M. Zeijen (student MSc Clinical Research)
Ms. S.B. Manusama-Lachman (secretary, s.manusama@erasmusmc.nl)

[1]MSc Molecular Medicine, MSc Neuroscience, MSc Health Sciences, MSc Clinical Research, and MSc Infection and Immunity

Admissions

5.1 Selection criteria

The admissions committee is responsible for the admission of candidate students. Members of the admissions committee are the chairpersons, the program director, and occasionally, one of the course directors.

Candidate students are asked to submit their application on-line via the MSc Molecular Medicine website https://www.eur.nl/en/erasmusmc/research-master/molecular-medicine, and face the following selection criteria:

- BSc in any of the biomedical sciences (e.g. biology, biochemistry, medicine), *or* BASc from a Dutch vocational training program in biomedical laboratory techniques (*HBO-BML*)
- personal motivation, assessed by written statement and/or interview
- letters of reference
- TOEFL 575 / 232 / 90 or IELTS 6.5, or comparable English proficiency
- overall performance in previous educational programs
- in some cases: a written entrance examination

The academic records of prospective students are always examined. For foreign candidates we perform a detailed analysis of grades, bearing in mind the various grading systems of different countries. Generally speaking, we wish to see a minimum grade point average of 80%. You will be further evaluated on the basis of your personal motivation, and the ability to express this motivation in written form and/or during an (internet) interview.

5.2 Biomedical BSc students

Prospective international or Dutch students with a background in life sciences are advised to contact us before submitting an application on-line, preferably via email: mscmolmed@erasmusc.nl.

Application deadline for the academic year 2021-2022:
March 1, 2021 (non-EU students)
May 1, 2021 (EU students)

5.3 Erasmus MC – BSc students of medicine

Selected Erasmus MC students of medicine have the opportunity to follow the MSc Molecular Medicine program by starting with the whole year 1 of the MSc Molecular Medicine program, followed by the medical master 'new style'. After finishing medicine, students will come back to follow the second year of the MSc program (*see page 15 for an outline of the curriculum*).

Application deadline: May 1st, 2021 (for the academic year 2021-2022)

5.4 HBO – BML students

BASc students in Biomedical Lab Techniques from the Hogeschool Rotterdam, or any relevant higher vocational training program (HBO) within the Netherlands, may apply. Please contact us (mscmolmed@erasmusmc.nl) before submitting an application.

Application deadline: May 1st, 2021 (for the academic year 2021-2022)

5.5 WUR – MBT students

MSc students in Biotechnology from Wageningen University can choose to specialize in 'Molecular Medicine' (WUR course modules *XEU-80336 Thesis Molecular Medicine part A* and *XEU-80324 Thesis Molecular Medicine part B* / 60 EC). These students follow the complete year 2 of the MSc Molecular Medicine curriculum, conducting a full-year research project and writing and defending the MSc thesis in Rotterdam. Subsequently, WUR - MBT students will graduate in Wageningen. While at Erasmus MC, they can take part in additional courses and seminars.

Interested students may contact the MSc Biotechnology coordinator, Dr. Sonja Isken (mbt.msc@wur.nl), or turn to the Wageningen University study handbook for further details.

5.6 MSc students from elsewhere

In special cases, students from equivalent MSc research master's programs (within the Netherlands or abroad) may wish to enter at the year 2 level. Such an admission will require evaluation by the admissions committee, based upon academic scores, an interview, and the submission of a research proposal.

Money

6.1 Tuition fees, cost of living

Tuition fees per year, fixed amounts for 2020-2021

EU/EEA/Swiss/Surinamese students	€	**2,143**
Students from non-EU countries	€	**18,900**

Tuition fees per year, fixed amounts for 2021-2022

EU/EEA/Swiss/Surinamese students € **2.168**

Students from non-EU countries (around) € 19,400

Prospective **students from abroad** should be aware that for accommodation and the daily cost of living approximately € 950 per month is needed, in addition to the tuition fees mentioned above.

For a realistic cost estimate and advice on your financial situation, please visit https://www.eur.nl/en/education/practical-matters/financial-matters/financial-aid/scholarships-grants

6.2 Possible scholarships and grants

In recent years, some of our MSc Molecular Medicine students proved to be eligible for a scholarship, grant, or award:

A few scholarship links

- https://www.eur.nl/en/education/practical-matters/financial-matters/financial-aid/scholarships-grants
- http://www.studyinholland.nl
- http://www.grantfinder.nl/content/index.asp
- http://ec.europa.eu/ploteus/
- http://www.study-in-europe.org
- http://www.aiesec.org
- https://duo.nl/particulier/international-student/

Study funding for EU/EEA citizens

EU/EEA citizens who work in the Netherlands for at least 32 hours a month may be eligible for study funding (Dutch: *studiefinanciering*) by the Dutch government: see https://duo.nl/particulier/international-student/student-finance/applying-for-student-finance.jsp for more information.

6.3 Working in the Netherlands

During your stay in Rotterdam as a MSc Molecular Medicine student, we strongly advise **against** taking on an extra job, alongside your studies. You will need your valuable time to study, prepare for classes, write reports, and perform your research projects in the lab. Nevertheless, we list the current rules here.

- Students from EU/EEA countries, including Switzerland

Students from most countries of the European Union, and students from the European Economic Area including Switzerland, are allowed to work in the Netherlands without restrictions. Your employer does not need to apply for a work permit and you may work as many hours as you wish. However, you must pay income tax, so you will need a tax registration number (Dutch: *Burger Service Nummer*, *BSN*).
Exception: if you are a national of Croatia, that entered the EU on July 1, 2013, your employer will still need to apply for a work permit.

- Students from outside the EU/EEA

Students from outside the EU/EEA with a valid residence permit are allowed to work for a salary 10 hours a week on average per year. Your employer will need to apply for a work permit.

Dutch Tax Office website	http://www.belastingdienst.nl/english/
Dutch Immigration Office website	https://ind.nl/en
Expat recruitment agency	http://www.undutchables.nl/

Services

7.1 Facilities

Registration as a student

Existing and new students are required to (re-)register for the MSc program yearly, at http://eur.studielink.nl .

Registration as a guest employee / accident insurance

Students will additionally be registered as a 'guest employee', before the start of the laboratory practices in the program. This registration will allow you easy access to the faculty building. As a guest employee, you are insured against accidents in the workplace.

Introductory activities for new students

- MScMM introductions in September

Apart from the mandatory introductory courses of the MSc program (MM-IW, *see pages 20-21*), *newly admitted students are invited to attend the Thesis defences of our graduating students, in the 4th and 5th week of August. Our yearly MSc Graduation Ceremony is held in the first week of September. Students, faculty, and alumni, are invited to this event.* → due to the Covid-19 measures these two events have been skipped for new students.

- *EUR introduction activities for new students – The so called 'Blended Eurekaweek 2020' will consist of two parts; 3 offline days in Rotterdam followed by 1 "online" day.*

  → due to new Covid-19 measures this event has been skipped has well.

Every year in August, Erasmus University hosts Eureka Week, a week-long event for all new students. 'Eureka' stands for *Erasmus University Rotterdam Eerstejaars*
For more information please see https://www.eur.nl/en/about-eur/eurekaweek
Kennismakings Activiteiten (Erasmus University Rotterdam First-year's Orientation Program).

Student Service Center, International Office

The Erasmus University Student Service Center and the university International Office have clear and up-to-date online information for students:
https://www.eur.nl/en/education/practical-matters/contact

You can call them during office hours (Central European Time) at +31-10-4082323.
Visiting address: the hall of the E building, at the university *Woudestein* campus, Burgemeester Oudlaan 50, Rotterdam.

University services at the Woudestein campus

Erasmus University Rotterdam has two main locations: the Woudestein campus and Erasmus MC (or 'Hoboken'). Most student facilities are situated at the Woudestein campus. University facilities and services include:

- the **sports center**. Two sports halls, five squash courts, a fitness gym, and six open-air tennis courts are at your disposal. You may choose from a wide variety of sports, including basketball, boxing, aerobics, athletics, and football (soccer), and you can also take courses in tennis or squash. Or learn to dive or play golf at a reduced price. Buy your affordable sports card at the reception of the S-building. More info: https://erasmussport.nl/home/
- **professional help**. During your time as a student, you may need to see a physiotherapist, a student psychologist, study counsellors, or religious counsellors. See https://www.eur.nl/en/education/practical-matters for details.
- **student organizations**, such as student unions, student associations (including associations specifically for international students), student cultural organizations, student sports clubs, political organizations, and many more. Again, visit https://www.eur.nl/en/education/practical-matters for details.

MSc Molecular Medicine coordinator

Any questions regarding your study program can be addressed directly to the MSc Molecular Medicine coordinator, Marjoleine van Berckel Bik. You can reach her by phone: +31-10-7044844, by email: mscmolmed@erasmusmc.nl, or you can stop by at the office in room Ee-971 (on the 9th floor of the Erasmus MC faculty building).
In the absence of Marjoleine, and in case of emergency only, you may contact Loes Nijs-de Langen, the coordinator of the MSc program in Neuroscience: l.nijs-delangen@erasmusmc.nl or +31-10-7043560 or the director of the MScMM program, Dik van Gent, or the vice-director, Gert Jansen.

MScMM program links

Students will receive regular updates by email and via the online student information channel: http://emc.sin-online.nl/. Use your ERNA account to login to SIN-Online.
The program website https://www.eur.nl/en/erasmusmc/research-master/molecular-medicine gives you general course information.

Erasmus MC links

Employee login to Erasmus MC intranet from home, with library and PubMed access:
https://www.erasmusmc.nl/nl-nl/onderwijs/medische-bibliotheek

LinkedIn

A LinkedIn (http://www.linkedin.com) network group was created to connect students, faculty members, and alumni. Current and former students are invited to join the group.

Classrooms

Weekly classes are held in the university Education Center colloquium rooms, or one of the meeting rooms of the Biomedical Sciences departments at Erasmus MC (Ee-1024, Ee-822, Ee-1473).

Course materials

Textbooks courses: students are offered the loan of some of these books. Course schedules, course documents, selected articles and presentations slides are handed out online http://emc.sin-online.nl/

Timetable online

The timetable for a part of the program can be viewed online via
https://asklepios.eur.nl/iris/definitief/
(below Graduate School click the 'MScMM' link).

Test results

Test results are registered in OSIRIS, the Erasmus University student registration system. Students can check their results on OSIRIS Online: http://osirisstudent.eur.nl.

Libraries

- Erasmus MC Medical Library

Students have access to the Erasmus MC Medical Library and the various institutional libraries. The Medical Library is located in the Education Center of Erasmus MC, phone +31-10-7043783. The Medical Library can be visited online at:
https://www.erasmusmc.nl/nl-nl/onderwijs/medische-bibliotheek

- EUR University Library

The EUR University Library collection includes approximately one million volumes, over 10,000 periodicals and access to more than 300 digital databases in all scientific areas that are taught and studied at EUR. To borrow, a student card or library card is necessary. Publications not available in the University Library can be requested from another library for a small charge. The University Library is situated at the *Woudestein* university campus, in the B building, Burgemeester Oudlaan 50, Rotterdam.

- Rotterdam Central Library – *Bibliotheek Rotterdam*

The Rotterdam Central Library in the city center, near the subway station *Blaak*, has six floors and over one million books. The central library is a social and cultural information center where you can read (international) newspapers and magazines, see exhibitions and listen to music. You can borrow books, projection-slide series, films, and DVDs. Studying at and obtaining information from the library is free of charge, but you will need a subscription card if you want to borrow books or other materials.

Computers, communications, and the web

In the Education Center of Erasmus on the 2nd floor computers are available to the students. To make use of computer facilities within Erasmus MC and to login to the university websites from home or any other location, the students are given an Erasmus Remote Network Access (ERNA) account. More information on this account can be found at http://www.erna.nl.

For copying, you can go to the Medical Library on the 2nd floor in the Education Center. There are commercial printing facilities at the Canon shop, 3rd floor Faculty building.

Software

Cheap software for registered students and/or employees can be obtained from: http://www.surfspot.nl

Language courses

At the university's Language & Training Center (LTC), you can take beginner, intermediate and advanced courses in English, Spanish, German, French, Italian, Japanese, Chinese, Russian, and Dutch.
An intensive Dutch course is organized twice a year in August and January. This course takes place during the day and focuses on grammar, vocabulary and conversation, and includes a few excursions. See https://www.eur.nl/en/education/language-training-centre

Student councils

According to the Dutch 'Modernizing University Administration' act (*wet Modernisering Universitaire Bestuursorganisatie - MUB*), students have a say in the administration and policies of the university. Besides the EUR university council, with 2 employee members and 2 student members coming from the medical faculty, Erasmus MC has a student council, consisting of 8 student members.
The MSc program board (*see page 60*) is specifically involved in the policies and educational programs of the five research master's programs at Erasmus MC.

EUR university council:	universiteitsraad@abd.eur.nl
Erasmus MC student council:	studentenraad@erasmusmc.nl
MSc program board:	s.manusama@erasmusmc.nl

7.2 Tutors, guidance

Because of relatively small student numbers, contacts between students and staff are informal and plentiful. As a student, you can come and see the program director, the course directors, and/or the coordinator whenever necessary.

In year 1 of the program, you can choose a tutor for personal guidance and counseling. The tutor may play an important role when you make a choice for your first research project.
As soon as you start the year 1 laboratory research project, you will be absorbed in the pertaining research group, with a group leader acting as your direct supervisor.

Before the start of year 2, you are required to draft a research proposal, in preparation for your engagement in the full-year research project. In January, the year 2 course director will have a personal talk with each individual student in year 2 on her or his study progress. If needed, the research supervisor is consulted as well.

The MSc chairpersons, program director, and course directors continually monitor the progress and performance of the students within the program. They can seek advice from tutors and supervisors.

7.3 Alumni

The first group of MSc Molecular Medicine students graduated in 2003. We try to stay in touch with our alumni on a basic level, by yearly monitoring their whereabouts and experiences. Via a LinkedIn (http://www.linkedin.com) network group we maintain contacts between current students, MSc Faculty members, and alumni.

Preparing your stay

when coming from abroad

8.1 Student Service Center, International Office

The Erasmus University Student Service Center (ESSC) and the university International Office have clear and up-to-date online information for prospective international students, on visa, student registration, finances, and various other services: https://www.eur.nl/en/education/practical-matters. You can call them during office hours (Central European Time) at +31-10-4082323. Visiting address: the hall of the E building, at the university *Woudestein* campus, Burgemeester Oudlaan 50, Rotterdam.

8.2 Practical matters

Introductory activities for new students

- MScMM introductions in September

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Kennismakings Activiteiten (Erasmus University Rotterdam First-year's Orientation Program).

Accommodation

The Erasmus University International Office will make sure that you are offered a suitable student room or apartment in Rotterdam.

Visa and residence permit
If applicable, your visa and residence permit must be arranged before your arrival. The Erasmus University International Office will guide you through the process.

Passport
Your passport should be valid for at least six months after your intended arrival date in the Netherlands. If this is not the case, renew your passport prior to your departure, otherwise you will run the risk of not being admitted to the country.

Registration at the City Hall, including tax registration number - *BSN*
To officially register as a resident of Rotterdam with the Municipal Primary Administration (Dutch: *Gemeentelijke Basis Administratie, GBA*), you will need the following documents:

- Valid passport or valid identity card
- Original birth certificate (authenticated or legalized)
- Rent agreement or, for those who do not live in accommodation provided by Stadswonen, a declaration by the main occupant (Dutch: *verklaring van inwoning*), or a housing permit

Make sure you have these documents on arrival, or in case of the rent agreement, shortly after. You will register at the City Hall when you have actually arrived.

Within approximately four weeks after you have been successfully registered, you will receive a unique tax registration number (Dutch: *Burger Service Number*, *BSN*), in a confirmation letter from the Municipal Administration (*GBA*). Certain agencies may ask you for your *BSN* number, for example an employer, your benefit provider, your bank or your insurance company.

Health insurance, third party liability insurance
Before you come to the Netherlands, check that you are properly insured against the costs of medical treatment and third party liabilities. Perhaps there is an insurance company in your home country that will cover medical costs and liabilities in the Netherlands. If so, bring international declaration forms or a European Insurance Card with you. If your current insurance is not sufficient, you will need to take out an insurance policy for the duration of your stay in the Netherlands.

We recommend Aon Students Insurance: http://www.students-insurance.eu.
While a student and working on your projects in any of the labs of Erasmus MC, you are insured against accidents in the workplace.

The doctor
For medical assistance, it is common in the Netherlands to go see a general practitioner (Dutch: *huisarts*) first, before visiting any specialist in the hospital. Find a GP in your neighbourhood. Google 'huisarts Rotterdam' for a map and list.

After office hours and during weekends, the Rotterdam GPs have a collective emergency post at the Sint Franciscus Gasthuis, Kleiweg 500, Rotterdam, phone 010 - 461 6720.

The Erasmus MC Emergency Ward (Dutch: *Spoedeisende Hulp*, *SEH*) is located at the Wytemaweg 80, phone (010 - 70)40145.

Pharmacy and chemist
Most medications are only available on prescription. You will be given the prescription by the general practitioner and can collect your medication at a pharmacy (Dutch: *apotheek*). the chemist (Dutch: *drogist*) and some supermarkets sell medications that do not require a prescription, such as aspirin and cough medicine. For night and weekend emergencies, one of the Rotterdam pharmacies will always be open. Call any pharmacy to find out which one is on duty, or check the notice in the window.

Opening a bank account
As you will be living in the Netherlands for an extended period of time, we recommend opening a Dutch bank account. You will for instance need a Dutch bank account if you want to pay your tuition fee in instalments. All banks can charge for products and services, but they must inform you of the charges levied. There are several major banks in the Netherlands.
The ABN AMRO Bank, ING Bank and Rabobank offer online banking facilities that are completely in English. To open a bank account, visit https://www.eur.nl/en/education/practical-matters/financial-matters/dutch-bank-account .

Postal services

You can buy stamps for letters and postcards, or send larger packages, from post offices at various locations in Rotterdam. Mail can be posted at these post offices (bearing the sign *TNT Post*) or at any of the orange mailboxes you find in the street. Some TNT Post offices have banking services from ING. It is possible to pay bills through the TNT Post office, even if you don't have an account with them, but you may have to pay a small charge. See website http://www.tntpost.nl for locations (only in Dutch).

Telephone

When calling **within** the Netherlands, all land lines will have an area code starting with a zero (010 for Rotterdam), followed by the actual phone number. When calling **to** the Netherlands from abroad, after the country code +31, the initial zero of the area code is left out (thus: +31-10 for Rotterdam). Similarly, mobile phone numbers start with 06 (or +31-6). Numbers beginning with 0800 are toll free but cannot be called from abroad; 0900 numbers are charged (per call or per minute).
Erasmus MC has a telephone exchange. Internal phone calls are toll free: dial the last 5 digits of the number (example: 44844 instead of +31-10-7044844).

Mobile phones

You may want to find a Dutch mobile phone service with a contract (in Dutch: *abonnement*), or perhaps you would prefer a prepaid card. Compare the latest rates at https://www.bellen.com (in Dutch only). Be aware that for a contract, you will need a Dutch bank account, a document that gives proof of your address and income (such as a bank statement), and a passport.

Power - electricity and gas

The Netherlands' energy market is privatized. Utility companies offer integrated services, providing gas (for cooking and heating) and electricity. You may choose your own energy provider (but NOT if you are a tenant of Stadswonen property). Electricity is 230 Volts, alternating at 50 Hertz. If your device does not accept this, you will need a voltage converter.

Water

Clean drinking water is available straight from the tap all over the country. The water companies, the national government, and the 'Water Control Board' (Dutch: *waterschap* or *hoogheemraadschap*) together take care of the supply of clean water, the discharge of wastewater, and the groundwater level. Tax is charged for these water works. You will most likely receive a separate, yearly water bill.

Climate

The Netherlands have a typical 'marine' climate. In summer, fine, hot weather may last for weeks, but the weather may just as well be cool and unsettled. In winter, spells of cold weather lasting from a week to two months or more may cause rivers and canals to freeze, but in mild winters this may not occur at all. Rainfall is well distributed over the year. The average daily temperature in January is around 5°C, and in June around 20°C. Check for approaching showers real-time at http://www.buienradar.nl.

Public transport

The Rotterdam Transportation Authority (Dutch: *Rotterdamse Electrische Tramweg maatschappij*, *RET*) provides mass transit services in the greater Rotterdam area by tram, bus, and subway (metro). You need a public transport chipcard (Dutch: *Openbaar Vervoer chipkaart*, *OV-chipkaart*) to travel. Personalized, anonymous, and/or disposable cards can be purchased online at http://www.ret.nl/?sc_lang=en, from *RET* ticket offices, and from *RET* vending machines at metro stations.
Dutch railway services are widespread across the country, in most cases maintained by the National Railways (Dutch: *Nederlandse Spoorwegen*, *NS*). Paper railway tickets are no longer available in The Netherlands, you have to use the *OV-chipkaart or single-use chipcard*, see for more information https://www.ns.nl/en
If you have a personalized or anonymous *OV-chipkaart*, you will have to load credit onto the card before travelling. This can be done at the vending machines, or online, via https://www.ov-chipkaart.nl/home-1.htm . When using the *OV-chipkaart*, make sure to always check in and check out at the station (or in the bus or tram).
If you plan on travelling by train and/or metro a lot, it might be a good idea to buy an off-peak discount pass. For both local and national public transport, 40% discount cards are available. For more information, visit the *NS* or *RET* website, or go to the *NS* or *RET* counter, for example at Rotterdam Central Station.

National public transport itinerary planner: http://journeyplanner.9292.nl

The bicycle

To get around quickly, easily and cheaply, buy a bicycle (Dutch: *fiets*). A used bike in reasonable shape will cost you between € 75 and € 150. Find them at second-hand bike shops or advertised in the small ads on the notice boards of supermarkets. Always use a good quality bicycle lock. If you're interested in buying an affordable new bicycle, that you have to assemble yourself, visit http://urlm.nl/www.opdiefiets.nl .
Erasmus MC has a bike repair man in the basement / bicycle shed below the Hospital building, open on Monday, Tuesday, and Wednesday mornings.

Or rent a bike: https://swapfiets.nl/en/

"For a fixed monthly fee you get a Swapfiets bicycle. We make sure your Swapfiets bicycle always works".

Cheap and free stuff

http://www.marktplaats.nl/ - the Dutch equivalent of Ebay

http://www.gratisoptehalen.nl/aangeboden - free electronics, home appliances, and furniture.

NL news

If you are interested in Dutch society, mentality, and current issues, the preferred public news source is Radio Netherlands Worldwide: https://www.rnw.org/ .

Supermarkets and markets

The larger supermarkets in Rotterdam are open 7 days a week. Albert Heijn and Jumbo supermarkets are considered as one of the best, ALDI and LIDL supermarkets are the cheapest. Besides groceries, most supermarkets sell stamps and mobile phone prepaid credit. Weekly open air markets for affordable fresh food, flowers, and clothing are held on Saturdays at the *Binnenrotte* square in the city center, and in other locations, for instance the *Visserijplein* in the west of Rotterdam.

Out and about in Rotterdam

The 'Rotterdam Pass' will give you lots of discounts on cultural events, travelling, restaurants, et cetera, within Rotterdam. As a student, you can buy it at the Rotterdam Central Library. You will need a passport photo, your student ID card and a valid ID. More info: http://www.rotterdampas.nl/ (only in Dutch).

8.3 Checklist

Before you go

- Application and admission MSc Molecular Medicine
- Sufficient financial resources to cover tuition fees and cost of living
- *Studielink* – student registration
- Fast track *MVV* entry visa or residence permit application (if applicable, via Erasmus University International Office)
- Registration for housing at or elsewhere (via Erasmus University International Office)
- Health insurance (and third party liability insurance)
- Travel arrangements
- ID card valid for use in the Netherlands, or passport
- Original birth certificate (authenticated or legalized).

Upon arrival

- Bring some cash money to cover first travel expenses within the Netherlands
- Sign your rent agreement, pay the rent for the first month and possibly: a deposit
- If applicable, report to the ESSC – Erasmus Student Service Center within three days of arrival, in the main hall of the E-building, *Woudestein* campus, Burgemeester Oudlaan 50, Rotterdam, to complete the residence permit application. Bring all your papers.
- If applicable, take the tuberculosis check at the Municipal Public Health Authority *GGD*, Schiedamsedijk 95, Rotterdam.
- Register at the City Hall, Coolsingel 40, as a resident of Rotterdam. Bring all your papers.
- If applicable, pick up your residence permit from the City Hall.
- With help of the MSc coordinators, complete your registration as a guest employee of Erasmus MC.

8.4 National Holidays

December 5, 2020 (Saturday)	Sinterklaas (not an official holiday) *Sinterklaas*, the original version of Santa Claus, is celebrated in Flanders and the Netherlands. Loosely based on Saint Nicholas, this fictional character arrives yearly from Spain to hand out presents and sweets to children.
December 25, 2020 (Friday)	Christmas Day
December 26, 2020 (Saturday)	Second Christmas Day – Boxing Day
December 31, 2020 (Thursday)	Old Year's Day
January 1, 2021 (Friday)	New Year's Day
April 2, 2021 (Friday)	Good Friday (not an official holiday) Religious holiday for christians, commemorating the crucifixion of Jesus Christ.
April 4, 2021 (Sunday)	Easter Religious holiday for christians, commemorating the resurrection of Jesus Christ.
April 5, 2021 (Monday)	Easter Monday
April 27, 2021 (Tuesday)	King's Day Celebration of the birthday of King Willem - Alexander, as a day of national unity. People wear orange, wave flags and drink beer. Others will hold or visit rummage sales in the streets.
May 4, 2021 (Tuesday)	Memorial Day (not an official holiday) The *Dodenherdenking* is held for those who fought and died during World War II, or in later combat or peacekeeping operations. Throughout the country, two minutes of silence are observed at 20:00 hrs.
May 5, 2021 (Tuesday)	Liberation Day (not an official holiday) Celebrated to mark the end of the occupation by Nazi Germany during World War II.
May 13, 2021 (Thursday)	Ascension Day Religious holiday for christians, commemorating the ascension of Jesus Christ into heaven.
May 23, 2021 (Sunday)	Pentecost Religious holiday for christians, 50 days after Easter, celebrating the descent of the Holy Spirit upon the disciples of Christ.
May 24, 2021 (Monday)	Pentecost Monday

8.5 Useful addresses and phone numbers

Emergency telephone number: **112**

Local police, non-emergency: **0900-8844**

***Studielink* Student Help Desk**
Tel: +31 (0)88 424 7600
@: helpdesk@studielink.nl
web: www.studielink.nl

City Hall - *Stadhuis*
Coolsingel 40 (*Dienst Burgerzaken*)
3011 AD Rotterdam
Open: 09:00 – 16:00 hrs
Tel: **14 010** or +31 (0)10 267 16 25
web: www.rotterdam.nl

Municipal Public Health Authority *GGD*
Schiedamsedijk 95
3011 EN Rotterdam
Tel: +31 (0)10 433 9933
@: info@ggd.rotterdam.nl
web: www.ggd.rotterdam.nl

Erasmus MC - hospital
Wytemaweg 80
3015 CN Rotterdam
Tel: +31 (0)10 704 0704
web: www.erasmusmc.nl

Stayokay Rotterdam Hostel
Overblaak 85-87
3011 MH Rotterdam
Tel: +31 (0)10 436 5763
@: rotterdam@stayokay.com
Web: www.stayokay.com/en/hostel/rotterdam

Hostel ROOM
Van Vollenhovenstraat 62
3016 BK Rotterdam
Tel: +31 (0)10 282 7277
@: info@roomrotterdam.nl
web: www.roomrotterdam.nl

Stadswonen Rotterdam
Rochussenstraat 21
3015 EA Rotterdam
Tel: +31 (0)10 245 67 00
@: info@stadswonenrotterdam.nl
www.stadswonenrotterdam.nl/en/About-us/Contact

Tax Office - *Belastingdienst* Rotterdam
Laan op Zuid 45
3072 DB Rotterdam
Tel: 0800 0543
web: www.belastingdienst.nl

Rotterdam Central Library
Hoogstraat 110
3011 PV Rotterdam
Tel: +31 (0)10 281 6100
web: www.bibliotheek.rotterdam.nl/EN

Rotterdam Tourist Information
Coolsingel 114
3011 AG Rotterdam
Tel: +31 (0)10 790 01 85
@: info@rotterdamtouristinformation.nl
web: https://en.rotterdam.info/

Aon Students Insurance
web: www.students-insurance.eu

Dutch Immigration Office *IND*
Tel: 0900 123 4561
web: www.ind.nl

Nuffic - Netherlands Organization for International Cooperation in Higher Education
PO Box 29777
2502 LT The Hague
Tel: +31 (0)70 426 0260
web: www.nuffic.nl

Contact details

Institution:	Erasmus MC – University Medical Center Rotterdam Wytemaweg 80 3015 CN Rotterdam The Netherlands
Web:	http://www.erasmusmc.nl http://www.eur.nl
Course:	**Master of Science in Molecular Medicine** Erasmus MC – University Medical Center Rotterdam
Program director:	Dr. Dik van Gent
Vice-director:	Dr. Gert Jansen
Program coordination:	Marjoleine van Berckel Bik
Type of education:	two-year research master's program (120 EC points)
Degree:	Master of Science, MSc
CROHO registration:	60279
NVAO-accreditation:	26-FEB-2004 - 25-FEB-2022
Contact:	Erasmus MC – MSc Molecular Medicine Room Ee-971 (postal address) / Ee-971 (visiting address) PO Box 2040 / Wytemaweg 80 3000 CA Rotterdam / 3015 CN Rotterdam The Netherlands
Tel:	+31-10-7044844
Email:	mscmolmed@erasmusmc.nl

Web: https://www.eur.nl/en/erasmusmc/research-master/molecular-medicine

Erasmus University Rotterdam

Erasmus MC **MSc Molecular Medicine**

www.eur.nl/en/erasmusmc/research-master/molecular-medicine

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