Programme syllabus for

Master's Programme in Biomedicine, 120 credits

Masterprogrammet i biomedicin, 120 hp

Basic programme information

Programme code	4BI21
Name of the programme	Master's Programme in Biomedicine
Number of credits	120.0 credits (120.0 ECTS credits)
Starting date	The syllabus applies to students who commence their studies in or after autumn 2021. Approved revisions of the syllabus are described under the heading Transitional Provisions.
Decision date	2020-05-05
Decided by	Committee for Higher Education
Reference number	3-1414/2020
Specific eligibility requirements	A Bachelor's degree or a professional degree worth at least 180 credits in biomedicine, biotechnology, cellular and molecular biology, medicine, or the equivalent. Proficiency in English equivalent to the Swedish upper secondary school course English 6/English B.
Main field of study	Biomedicine
Qualification	Degree of Master of Medical Science (120 credits) with a Major in Biomedicine *Medicine masterexamen med huvudområdet biomedicin* Upon request, a student who meets the requirements for a qualification is to receive a diploma.

Outcomes

Outcomes of second cycle education according to the Higher Education Act

Second-cycle courses and study programmes shall be based fundamentally on the knowledge acquired by students during first-cycle courses and study programmes, or its equivalent.
Second-cycle courses and study programmes shall involve the acquisition of specialist knowledge, competence and skills in relation to first-cycle courses and study programmes, and in addition to the requirements for first-cycle courses and study programmes shall:

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

Outcomes of the Degree of Master (120 credits) according to the Higher Education Ordinance
Knowledge and understanding
For a Degree of Master of Science (120 credits) the student shall

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

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

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

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

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

Outcomes of the study programme at Karolinska Institutet

The overall purpose of the Master's Programme in Biomedicine is to investigate the functioning of the human body in health and disease at the molecular level and to consider individual variation. This

provides a basis for understanding the course of disease and for developing new treatment strategies.

In addition to the national outcomes for the Degree of Master (120 credits), the following outcomes apply for the Master's Programme in Biomedicine at Karolinska Institutet.

On completion of the Programme, the student shall be able to:

- independently identify and address scientific problems in biomedicine and provide theoretical, practical and ethical solutions in relation to local, national and global biomedical challenges;
- actively contribute to a biomedical research team;
- understand biomedical research project management and reflect on its value from perspectives of science, sustainable development, innovation and/or entrepreneurship; and
- demonstrate proficiency in critical analysis and peer review.

Content and structure

The programme focuses on practical and theoretical aspects of biomedical research with the aim of improving human health. A number of subject-specific topics form the basis of several of the courses in the programme, with the remainder of the courses being individual research projects. In addition, the following overarching themes are integrated throughout the programme with progression in the learning outcomes at course level:

- global perspective;
- ethics and equal treatment; and
- critical thinking and scientific reasoning.

The first semester of the programme provides a course in advanced translational medicine with a focus on molecular mechanisms in relation to common diseases. This is complemented by courses that provide training in key biomedical competences, namely applied biostatistics and bioinformatics. Both these methods are central to modern biomedicine and are cornerstones of the entire programme. The first semester also includes elective courses that offer in depth training in different biomedical methodologies.

The second semester continues with advanced courses in bioethics and laboratory animal science, and in biomedical communication and professional development thereby broadening the training in key biomedical competences. This semester also offers the first individual project course enabling the student to gain further depth in their chosen field of biomedical research. The student will therefore return to overarching research topics introduced in the course in advanced translational medicine (semester one), for more in depth study.

During the third semester, a course in biomedical research literacy further develops skills essential to the future professional role of a biomedicine graduate. Furthermore, an introduction to bioentrepreneurship provides insight into business aspects of the life science sector. A second individual research project provides additional opportunities for further specialisation, combined with training in formulating scientific hypotheses, methodology and project planning. Alongside this, the programme offers advanced research-related elective courses in areas that were introduced in the first semester. The field of the research project chosen by a student is preferably linked to that of their elective course.

The programme ends with a degree project that runs throughout the fourth semester. Students have the option of performing a final research project over a period of longer than one semester through the performance of the individual research project in semester three in the same laboratory as the degree project in semester four. This provides students with the option of a truly in depth specialisation in a chosen field, alternatively enabling them to gain a broader methodological and theoretical knowledge if they prefer to perform the research projects in semesters three and four in different laboratories. However, the individual research projects performed during semesters two and three must be carried out

within different research groups to ensure that in depth training is obtained in more than one area. Training in independent evaluation and the presentation of research will be given throughout the programme, not least within the individual project courses as part of the analysis and presentation of the student's own research data.

Scientific knowledge, competence and approach

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

Practice Integrated Learning

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

Within the Master's Programme in Biomedicine, the practice integrated learning takes place through the engaging in research projects in laboratories in the academic or life science sectors and through active engagement with research teams. Students will spend half of their time on the programme conducting research related activities in laboratory and research team settings.

Internationalisation

The Programme is international in its entirety and all courses have an international perspective. The field of biomedicine seeks to explain physiological and pathophysiological processes at the molecular and individual levels and addresses these issues from a global perspective. International exchange takes place primarily through the performance of research projects in semesters 3 or 4 at partner universities within the framework of formal exchange agreements. In semester 3, the research project is combined with elective courses at the host university. Students are also invited to take elective courses in the first semester together with students at partner universities in the Nordic region, as a way to offer elements of internationalisation-at-home.

Elective courses

The Programme offers students the possibility of performing research-related advanced elective courses. During the first semester the students can choose from several elective courses of 4.5 credits each. These courses offer in depth training in different biomedical methodologies and are based around online learning combined with local examination. The courses are offered through collaboration with partner universities in the Nordic region. During the third semester advanced elective courses of 6 credits are offered, in collaboration with doctoral education programmes at Karolinska Institutet, that allow students to specialise and gain further depth in a field of biomedical research. The broad research area of each elective course is introduced earlier in the programme. Through a combination of the field of elective courses with the area of research in the programme's individual research projects, students can specialise in a research field of their choice.

Other guidelines

Grading scale

The grades used are Fail, Pass or Pass with Distinction. Alternative grading scales may apply to modules

within courses and to elective courses. The grading scale is described in the syllabus for each course.

Language of instruction

The language of instruction is English.

Specific eligibility requirements within the programme

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

Study plan with constituent courses

Term	Course name	Credits	Main field of study	Cycle
1	Frontiers in Biomedicine	10.5	Biomedicine	Second
1	Applied Biostatistics	7.5	Biomedicine	Second
1	Bioinformatics	7.5	Biomedicine	Second
1	Elective courses	4.5	Biomedicine	Second
2	Bioethics and Laboratory Animal Science	7.5	Biomedicine	Second
2	Applied Biomedical Communication and Professional Development	7.5	Biomedicine	Second
2	Frontiers in Biomedicine: Research Project 1	15	Biomedicine	Second
3	Biomedical Research Literacy	6	Biomedicine	Second
3	Bioentrepreneurship	3	Biomedicine	Second
3	Elective courses	6	Biomedicine	Second
3	Frontiers in Biomedicine: Research Project 2	15	Biomedicine	Second
4	Degree Project in Biomedicine	30	Biomedicine	Second