Programme syllabus for

Master's Programme in Biostatistics and Data Science, 120 credits

Masterprogrammet i biostatistik och datavetenskap, 120 hp

Basic programme information

Programme code	5BD24
Name of the programme	Master's Programme in Biostatistics and Data Science
Number of credits	120.0 credits (120.0 ECTS credits)
Starting date	The syllabus applies to students who commence their studies in or after autumn 2024. Approved revisions of the syllabus are described under the heading Transitional Provisions.
Decision date	2023-05-09
Decided by	Committee for Higher Education
Last revision	2024-10-14
Revised by	Committee for Higher Education
Reference number	3-4633/2024
Specific eligibility requirements	A Bachelor's degree or professional degree of at least 180 credits or the equivalent. The applicant must have completed a total of at least 60 credits in mathematics, statistics, and programming, of which univariate calculus, multivariate calculus, numerical methods, probability theory and statistics, and programming in a general-purpose programming language such as C++, Python, or Java. Proficiency in English equivalent to the Swedish upper secondary school course English 6/English B.
Main field of study	Biostatistics and Data Science
Qualification	Degree of Master of Medical Science (120 credits) with a Major in Biostatistics and Data Science (Medicine masterexamen med huvudområdet biostatistik och datavetenskap). The programme leads to a joint degree between Karolinska Institutet, KTH Royal Institute of Technology, and Stockholm University. A student who fulfills the requirement for the degree shall, upon request, receive a degree certificate.

Outcomes

Outcomes of second cycle education according to the Higher Education Act

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

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

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

Knowledge and understanding

For a Degree of Master (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 (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 clearly report 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.

Judgement and approach

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

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

Content and structure

The education aims to train specialists in analyzing and evaluating data as scientific evidence in medicine and life sciences. This includes an understanding of the principles of data collection and construction, methods of data analysis and their limitations, critical interpretation of results, and the mathematical framework that transcends the scientific context to generalize the results. These skills can be used to improve biomedical science and bridge the gap between theory and practice, requiring both an interest in and knowledge of the application area and proficiency in mathematical and statistical models and computational tools.

To achieve these skills, students are trained in designing and conducting experiments and studies in life sciences, statistical modelling, and methods of statistical inference as well as data-driven methods of reasoning derived from machine learning and artificial intelligence. Students acquire such knowledge, skills, and abilities through the compulsory courses, which are distributed across all three universities.

Semester 1 begins with courses that provide a solid theoretical foundation that provides prior knowledge for the upcoming courses. The second part of the first semester consists of courses in the main field of study, which also includes parts on ethics and scientific methodology. Semesters 2 and 3 include more in-depth courses in the main field of study, elective courses, as well as a course in computer-intensive statistical methods. Semester 3 also includes deepening in scientific methodology and ethics. In semester 4, a degree project is carried out.

Scientific knowledge, competence and approach

The student is provided with the opportunity to gain in-depth knowledge within the main field of study and advanced methodological knowledge, as well as training in independence in the courses *Survival Analysis with Applications in Medicine* and *Degree Project in Biostatistics and Data Science*.

Skills and abilities to communicate effectively in both oral and written form, and to approach a scientific question with a correct methodological and ethical approach are trained in the courses *Biostatistics 1: Introduction to Biostatistics*, *Biostatistics 2: Methods and Applications*, as well as *Degree Project in Biostatistics and Data Science.*

Internationalisation

An international perspective characterizes all courses in the programme. All teaching is done in English by the teachers who do research in an international environment.

Elective courses

In addition to the compulsory courses that make up the structured study paths, there are also flexible study paths where students can choose 30 credits from a selection of elective courses. There is an opportunity for individual profiling, where the student deepens or broadens their knowledge based on their interests and the course offerings, by taking theoretical courses in statistics and machine learning, applied courses in statistics and machine learning, or by delving into different biological applications. During the elective periods, students must choose one (and only one) of the following elective courses: *Modern Methods for Statistical Learning* (7.5 credits), *Machine Learning* (7.5 credits), *Statistical Learning* (7.5 credits). Of the elective courses, a total of up to 15 credits can be at the undergraduate level.

Transitional provisions

For those admitted in Autumn Term 2024, the following prerequisites applied: A Bachelor's degree or

professional degree of at least 180 credits or the equivalent. The applicant must have completed a total of at least 60 credits in mathematics, statistics, and programming, of which univariate calculus, multivariate calculus, linear algebra, numerical methods, probability theory and statistics, and programming with a high-level language must be included. Proficiency in English equivalent to the Swedish upper secondary school course English 6/English B.

The prerequisites were revised for Autumn Term 2025 to clarify the requirements.

Other guidelines

Grading scale

Grades are set according to the respective university's guidelines. The grading scale for each course is shown in the course syllabus.

Language of instruction

The language of instruction is English.

Specific eligibility requirements within the programme

There are specific eligibility requirements for the courses within the programme. The eligibility requirements can be found in the course syllabi.

Study plan with constituent courses

Semester	Course namne	Credits	Main field of study	Cycle	University
1	Theory of statistical inference	7,5		First	SU
1	Probability theory	7,5		Second	KTH
1	Categorical data analysis	7,5		First	SU
1	Biostatistics 1: Introduction to biostatistics	7,5	Biostatistics and Data Science	Second	KI
2	Survival analysis with applications in medicine	7,5	Biostatistics and Data Science	Second	KI
2	Conditionally elective course	7,5		First or Second	KI, KTH, SU
2	Computer intensive methods in mathematical statistics	7,5		Second	KTH
2	Conditionally elective course	7,5		First or Second	KI, KTH, SU
3	Biostatistics 2: Methods and applications	7,5	Biostatistics and Data Science	Second	KI
3	Conditionally elective course	7,5		First or Second	KI, KTH, SU
3	Study design and analysis in medical research	7,5	Biostatistics and Data Science	Second	KI
3	Conditionally elective course	7,5		First or Second	KI, KTH, SU
4	Degree project in Biostatistics and Data science	30	Biostatistics and Data Science	Second	KI