



UiT The Arctic University of Norway

Program description

Master of Science in Biology

120 ECTS/Campus Tromsø

The program description has been approved by the board of Faculty of Biosciences, Fisheries and Economics on 15.09.2021



Study programme name	Biology – master
Degree obtained	Master of Science in Biology
Target group	The Master's program in biology is aimed at students holding a bachelor's degree in biology or similar who are interested in pursuing a career in a wide range of jobs, both public and private sectors; research, administration, consulting and the teaching profession.
Admission requirements, required prerequisite, recommended prerequisite knowledge	<p>Admission to the master's program in Biology requires a bachelor's degree (180 ECTS) or equivalent qualification, including a specialization in biological topics [i.e., biodiversity (zoology/botany), ecology, cell- and molecular biology, microbiology, physiology (animal/plant), biochemistry and bioinformatics] corresponding to a minimum of 80 ECTS.</p> <p>Applicants with a degree in Agricultural, Fisheries and Aquaculture studies, Biomedical laboratory sciences ("Bioingeniør"), or Bachelor of Pharmacy, Medicine or Dentistry do not fulfil the admission requirements.</p> <p>Applicants who hold a bachelor's degree or equivalent issued in Europe, Canada, USA, Australia and New Zealand: An average grade of C (3,0) is the minimum requirement (see the link for information on the grading system).</p> <p>Applicants who hold a bachelor's degree or equivalent issued in countries other than the above-mentioned region/countries: An average grade of B is the minimum requirement.</p> <p>The average grade is calculated for the entire bachelor's degree.</p> <p>Certain disciplines in our Master's program require specific qualification requirement:</p> <p>Arctic Animal Physiology: Applicants must meet the general admission requirements for the Master of Science in Biology program. Additionally, applicants must have completed a basic course in animal physiology corresponding to a minimum of 10 ECTS (BIO-2002 or equivalent).</p> <p>Molecular Environmental Biology: Applicants must meet the general admission requirements for the Master of Science in Biology program. Additionally, applicants must have completed courses in basic and practical molecular biology corresponding to a minimum of 10 ECTS (BIO-2018 or equivalent) or can document hands-on molecular lab experience through a bachelor thesis.</p> <p>Please contact the student adviser for more information about this</p> <p>More information on admission requirements: General admission requirements- Master</p> <p>Applicants from Norway or Nordic countries: Application deadline: April 15th for admission to the autumn semester Online application is via Søknadsweb, study codes: 6020 Arctic animal physiology 6021 Freshwater ecology 6022 Arctic marine ecology 6023 Molecular environmental biology 6024 Northern populations and ecosystem</p>

	<p>6025 Arctic marine ecotoxicology 6026 Ecology and sustainability</p> <p>International applicants/ Applicants from outside the Nordic countries: Application deadline: December 1st for admission to the autumn semester. Online application, study codes: 2076 Arctic animal physiology 2077 Freshwater ecology 2078 Arctic marine ecology 2079 Molecular environmental biology 2080 Northern populations and ecosystem 2081 Arctic marine ecotoxicology 2082 Ecology and sustainability</p> <p>How to apply for admission to UiT? Read more here</p>
Certificate of good conduct	<i>Not relevant</i>
Suitability assessment	<i>Not relevant</i>
The study programme's Learning Outcome	<p>A Master's candidate is expected to gain advanced and comprehensive knowledge of biological methodology, theories, concepts and scientific approaches. The candidates who complete the program are expected to have achieved the following learning outcomes:</p> <p>Knowledge The candidate will, through one of the seven disciplines offered, acquire advanced scientific understanding of key concepts and theories at the forefront of research and development in biological sciences. For discipline-specific knowledge outcomes, please go to the specific discipline description.</p> <p>The program's obligatory course in Study design and Data analysis II (BIO3012) will provide advanced knowledge of quantitative approaches useful for evaluation of questions relevant to science and management. The candidate will learn about both study designs, including the critical differences between experimental and observational studies, and how to choose an appropriate statistical analysis approach. The candidate will also be able to apply different statistical modelling approaches adapted to different study designs and data types and to interpret results in terms of quantitative effect sizes. Finally, the candidate will be able to understand and evaluate study design, statistical analyses and interpretation as presented in scientific papers.</p> <p>Through the program's obligatory course in Academic skills (BIO-3529), the candidate will acquire advanced knowledge about the different forms and structure of written and oral scientific communication taking into consideration the objectives and the audience. The candidate will also learn how to search scientific material, use reference tools and use sources in a critical and ethical manner. Finally, the student will learn about academic fraud.</p> <p>Skills The candidate can:</p>

	<ul style="list-style-type: none"> • Conduct rigorous scientific research using the following stepwise approach: <ul style="list-style-type: none"> ○ Read up on background theories and knowledge (information literacy – the skill of knowing how to locate, evaluate and use information), ○ Formulate research questions and hypotheses (critical thinking skills – including evaluation, analysis and synthesis), ○ Identify and use scientific methods to answer research questions and test hypotheses (innovative problem solving), ○ Collect, visualize, analyze and synthesize qualitative and quantitative data (data fluency), ○ Interpret and discuss data considering current advances in the research area and study designs. • Apply theories, concepts and methods relevant to the scientific and ethical standards in the field, • Critical and constructive evaluation of your own and others’ academic work, • Acquire technical and methodological competence in your field of specialization, • Communicate effectively, both orally and in writing, by giving both spoken and written presentations of scientific topics and research results. <p>General competence</p> <p>The candidate can:</p> <ul style="list-style-type: none"> • Conduct independent work in the field or in a laboratory in accordance with general and work-type specific safety regulations • Communicate biological knowledge and concepts to the scientific community, policy makers and the general public, • Understand the foundations of the scientific process, critical reflection of research ethics, including ethics in animal research, integrity, and transparency. • Work cooperatively, professionally, and ethically with others towards a common goal.
<p>Academic content and description of the study programme</p>	<p>Our Master’s program provides opportunities to explore an array of pressing questions within modern biology and emphasize some of society’s challenges with regard to management of natural resources and biodiversity. Each of the disciplines is strongly linked to ongoing research in our research groups, providing the relevant theoretical background, training in state-of-the-art laboratory and field methods, innovative and critical thinking for problem solving, thesis and publication writing as well as training of presentation and knowledge transfer proficiency.</p> <p>The program has six disciplines:</p> <ul style="list-style-type: none"> • Arctic animal physiology • Arctic marine ecology • Arctic marine ecotoxicology • Ecology and sustainability • Freshwater ecology • Molecular environmental biology • Northern populations and ecosystems <p>A detailed description of each discipline is found below.</p> <p>Some of the opportunities provided by the program are the following:</p>

	<ul style="list-style-type: none"> • Access to laboratories, field stations and research vessels providing great facilities for field and experimental work in northern and Arctic regions for your master project and courses. • Knowledge acquisition and training in cutting-edge modern technologies and scientific methods. • Participation in on-going research projects with the possibility to study a wide range of species spanning from single cell organisms to polar bears. • Support from highly qualified and enthusiastic supervisors to solve research questions using either field observations, field or laboratory experimentation, theoretical biology and quantitative models or any combination of these and other methods. • Learn to work according to the principles of scientific integrity and best practices from planning the project to publication. • Comprehensive training in writing skills and scientific presentation. • Possibility to acquire a wide collaboration network across the institute and beyond faculty borders, including institutions involved in nature management, consultancy services and biotechnological research. • Supervision from teachers and researchers that are experienced and established nationally and internationally within their research specializations. 								
<p>Table: programme structure</p>	<p>Course component</p> <p>The program has a number of compulsory courses for all students (safety courses HMS-050X, academic skills BIO-3529, data analysis BIO-3012) as well as discipline-specific compulsory components (see the specific discipline for details). For all students undertaking experiments on live animals (vertebrates and decapods), BIO-3503 or HEL-6320 is compulsory. There is the opportunity to apply for courses at the University Centre in Svalbard (UNIS) during the second and third semesters (see a list of relevant courses under each discipline description).</p> <p>The number of compulsory and elective courses varies depending on the master's discipline and the sum of courses taken by the student must be at least worth 60 ECTS. The course portfolio taken by individual students will be decided upon consultation with thesis supervisors (see below for details related to the master thesis).</p> <p>Master students are allowed to take up to 20 ECTS of 2000 level courses. In particular cases, also 10 ECTS of 1000 level courses. Contact the study administration for further information.</p> <p>It is recommended for students to consider an individual special curriculum (BIO-3805/3810 - 5/10 ECTS) with their supervisor on a relevant topic to their master thesis project. It is also recommended for students to consider the course BED-2054 Innovasjon i praksis (10 ECTS, in Norwegian only).</p> <p>The table below summarizes the compulsory courses for all students (red color), elective courses (grey) and course compulsory for some students depending on the Master project (blue). The sum of all courses taken must be at least 60 ECTS.</p> <table border="1"> <tr> <td></td> <td>10 ECTS</td> <td>10 ECTS</td> <td>10 ECTS</td> </tr> <tr> <td></td> <td colspan="3">Compulsory safety courses at semester start (no ECTS)^a</td> </tr> </table>		10 ECTS	10 ECTS	10 ECTS		Compulsory safety courses at semester start (no ECTS) ^a		
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First semester (autumn)	BIO-3529 Academic skills (5 ECTS) ^b	Elective courses		
Second semester (spring) ^e		Animal exp. (5/6 ECTS) ^c	BIO-3012 Study design and data analysis in Biology II (10 ECTS) ^d	Elective course
Third semester (autumn) ^f	BIO-3950 Master's Thesis Biology			
Fourth semester (spring)	BIO-3950 Master's Thesis Biology			

^a [HMS-0501](#) Safety in the laboratory, workshop and on sea and land expeditions, [HMS-0502](#) First aid in the laboratory, workshop and on sea and land expeditions, [HMS-0503](#) UiT's regulations for field work and sea-going expeditions, [HMS-0504](#) Biological material.

^b BIO-3529 is 5 ECTS spread over the two first semesters and conducted partly digitally to accommodate students going to UNIS.

^c [BIO-3503 Aquatic Animal Welfare](#) (only for projects that require use of live aquatic organisms) or [HEL-6320 Animal Experimentation for Researchers](#) (only for projects that require use of live birds or mammals). Please note that there is an own application deadline for HEL-6320.

^d Intensive teaching in class (January – March).

^e Possibilities to take single (intensive) courses at UNIS from mid-March.

^f Possibilities to take single (intensive) courses at UNIS.

Obligatory Master Thesis component (BIO-3950)

The selection of a master project is done during the first or second semester. You are encouraged to contact teachers and research group members within your discipline as soon as possible to discuss available projects and opportunities and find a master project and supervisor during the first two semesters of the MSc. Information on available MSc projects can also be found through internal communication channels for program students once admitted to the program. You may start working on a 60 ECTS thesis already in the first, second or (latest) third semester, depending on your own availability and the character of the project.

It is possible to conduct part or the entire master project work in collaboration with external organizations such as [Fram Centre](#) Institutes, the [University Centre In Svalbard](#) (UNIS), or other organizations in Norway and abroad. In this case, you will need to have an external supervisor at the host Institution, as well as an internal supervisor at our department of Arctic and Marine Biology. For stays abroad, please contact the study administration.

	<p>Many master's students in Biology are connected to research projects at the Department of Arctic and Marine Biology (AMB) and other institutes in Tromsø that carry out biological research and consultation work. You are welcome to contact potential external supervisors at these institutions to discuss potential master projects. For instance at the Norwegian Polar Institute, Institute of Marine Research, Norwegian Institute for Nature Research (NINA), Norwegian Institute of Bioeconomy Research (NIBIO), Akvaplan-niva and Nofima.</p>																													
<p>Learning activities, examination and assessment</p>	<p>Several teaching methods are employed, including lectures, seminars, laboratory work, computer lab and field courses. These will vary from course to course.</p> <p>Course examinations may be oral or written, including semester theses, assessments of project work/ lab reports/field reports, often in combination.</p> <p>Supervision of the project work that leads to the writing of the master's thesis will be given by faculty staff, sometimes in co-operation with an external supervisor.</p>																													
<p>Table: Summary of coursework requirements and assessment</p>	<p>See specific discipline below for specific course requirements.</p> <table border="1"> <thead> <tr> <th>Subject</th> <th>Coursework requirements</th> <th>Assessment</th> <th>Term</th> <th>Assessment scale</th> <th>ECTS</th> </tr> </thead> <tbody> <tr> <td>BIO-3012 Study design and data analysis in Biology II</td> <td></td> <td>Oral exam and project work</td> <td>2. term</td> <td>Pass/Fail</td> <td><u>10</u></td> </tr> <tr> <td>Academic skills BIO-3529</td> <td>Obligatory attendance on 80% of lectures. 2) Obligatory attendance in group-work assignments and submit your (tentative) project description. 3) Give a 10 minute presentation of your (tentative) master-project.</td> <td></td> <td>2. term</td> <td>Pass/Fail</td> <td><u>5</u></td> </tr> <tr> <td>BIO-3950 Master's thesis in biology</td> <td>Participation to Master student seminars. Every student is required to give 1 talk and be part of the organizing committee. In addition, every student has to participate to a</td> <td>master's thesis, a public presentation of the scientific work and an oral exam.</td> <td>4. term</td> <td>A-F</td> <td><u>60</u></td> </tr> </tbody> </table>						Subject	Coursework requirements	Assessment	Term	Assessment scale	ECTS	BIO-3012 Study design and data analysis in Biology II		Oral exam and project work	2. term	Pass/Fail	<u>10</u>	Academic skills BIO-3529	Obligatory attendance on 80% of lectures. 2) Obligatory attendance in group-work assignments and submit your (tentative) project description. 3) Give a 10 minute presentation of your (tentative) master-project.		2. term	Pass/Fail	<u>5</u>	BIO-3950 Master's thesis in biology	Participation to Master student seminars. Every student is required to give 1 talk and be part of the organizing committee. In addition, every student has to participate to a	master's thesis, a public presentation of the scientific work and an oral exam.	4. term	A-F	<u>60</u>
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	minimum of 6 seminars per year.				
The study programme's relevance	<p>The Master's degree in Biology will allow you to qualify for different career paths and prepare you to step into a professional role or to apply for a PhD.</p> <p>A Master of Science degree in Biology will prepare you for a wide range of jobs, in both public and private sectors, including research, resource and nature management, administration, consulting and the teaching profession. The master thesis can play an important role to establish your domain of expertise and to showcase acquired technical and soft skills. Also, it can be very important in building scientific and professional network, that will be a support in your future job search.</p>				
Work scope	<p>The program consists of 120 ECTS. Full-time students are expected to work 40 hours per week, corresponding to 1500 - 1800 hours per year.</p>				
For master's theses/independent work in master's degrees	<p>The master thesis is an independent scientific work (60 ECTS) under the guidance by one or several supervisors. The thesis is written within one of the following disciplines:</p> <ul style="list-style-type: none"> • Arctic animal physiology • Arctic marine ecology • Arctic marine ecotoxicology • Ecology and sustainability • Freshwater ecology • Molecular environmental biology • Northern populations and ecosystems <p>The number of pages required for a master's thesis, may vary depending on the type of project and has to be discussed with the supervisor. The general work effort in a master's project is 1500-1800 hours (including field and lab work).</p> <p>Students who are admitted to the master's degree normally select a project during the first or second semester, and no later than one month before the end of the second semester. A contract of supervision and a project description approved by the Department are required from each student.</p> <p>Deadline for handing in the contract is 1st of September during the third semester.</p> <p>Deadline for submission of thesis is May 15th in the final semester.</p> <p>After the master's thesis is submitted, there is an oral master's examination. This examination consists of a public presentation of minimum 30 minutes where the student provides an overview of the project. Then follows an oral examination with the examination commission. The final oral exam is normally within 2-3 weeks after the submission, and not later than six weeks.</p>				
Language of instruction and examination	<p>Language of instruction is English, and all of the syllabus material is in English. Examination questions are given in English but may be answered either in English or a Scandinavian language.</p> <p><u>The Master's thesis must be written in English.</u></p>				

Internationalisation	<p>It is possible to conduct part or the entire master project work in collaboration with external institutions in Norway or abroad. In this case, the student will need to have both an external supervisor at the host Institution, as well as an internal supervisor at our department of Arctic and Marine Biology. The student should contact the study administration for stays abroad.</p> <p>Students can have the opportunity to participate to national and international conferences during or after their thesis completion. These provide an arena for networking, but also represents an arena where the student's research can be assessed by peers.</p>
Student exchange	<p>Students can undertake periods of studying at The University Centre at Svalbard (UNIS), especially during their third and fourth semester. Each discipline highlights relevant courses at UNIS.</p> <p>International exchange during an entire semester is not possible in the first year of studies due to obligatory courses in all disciplines.</p> <p>Stays abroad can take place as part of a master project in the third and fourth semester. Please consult the program study adviser for more information.</p>
Supervised professional training	<i>Not relevant</i>
Administrative responsibility and academic responsibility	Department of Arctic and Marine Biology, Faculty of Biosciences, Fisheries and Economics. Institute leader, study administration and Master study program leader.
Quality assurance	The study program is continuously evaluated according to the university's quality assurance system by the Department's leader team and study program leader with help of the study program council. An internal evaluation is conducted every semester. An evaluation by an external and international committee is conducted every third year. In addition, courses are evaluated every third time they are given, as a minimum.
Other regulations	

Discipline: [Arctic Animal Physiology](#)

Program description

The master's discipline in Arctic Animal Physiology (AAP) focuses on physiological adaptations to life at high latitudes in fish, birds and mammals. Particular emphasis is placed on how animals cope with climatic variability, extreme light-dark cycles and large seasonal fluctuations in food availability and how they keep track of time in order to be appropriately prepared for seasonal events. Physiological adaptations of diving birds and mammals, which are abundant at high-latitudes, also represents an important research topic.

Master's projects will normally form a part of ongoing projects, which encompass both curiosity-driven basic research projects and projects important for production and management of natural resources in aquatic and terrestrial environments. Students will be expected to participate actively in seminars that are given within the research group, as well as at the department.

For more information about the research group Arctic Chronobiology and Physiology, see our [blog-spot](#) and our [facebook page](#).

Learning outcomes

Candidates that have completed a master's degree in biology in the discipline Arctic Animal Physiology will have advanced knowledge within many aspects of animal physiology (e.g., chronobiology, endocrinology, reproductive physiology, thermoregulation, nutrition/digestion, cardiovascular physiology), with approaches spanning from studies of molecular and cellular/subcellular mechanisms, to integrative, whole-animal studies that may be conducted in the field or as experimental studies in the laboratory - or as a combination of these. For these purposes, field stations, research cruise vessels, specialized laboratories and approved research animal facilities for relevant species of fish, birds and mammals, are all available.

Program Structure

The Table below summarized the compulsory courses for all students (red color), elective courses (grey) and courses compulsory for students working with live animals (blue). The sum of all courses taken must be at least 60 ECTS.

	10 ECTS	10 ECTS	10 ECTS
	compulsory safety courses at semester start (no ECTS) ^a		
First semester (autumn)	BIO-3529 Academic skills (5 ECTS) ^b	Elective course (up to 10 ECTS)	Elective course (10 ECTS)
Second semester (spring) ^e		Animal exp. (5/6 ECTS) ^c	BIO-3012 Studydesign and data analysis in Biology II (10 ECTS) ^d
	Elective course (up to 10 ECTS)	Bio-3030 Extreme animal physiology (20 ECTS)	
Third semester (autumn) ^f	BIO-3950 Master's Thesis Biology		
Fourth semester (spring)	BIO-3950 Master's Thesis Biology		

^a [HMS-0501](#) Safety in the laboratory, workshop and on sea and land expeditions, [HMS-0502](#) First aid in the laboratory, workshop and on sea and land expeditions, [HMS-0503](#) UiT's regulations for field work and sea-going expeditions, [HMS-0504](#) Biological material.

^b BIO-3529 is 5 ECTS spread over the two first semesters and conducted partly digitally to accommodate students going to UNIS.

^c [BIO-3503 Aquatic Animal Welfare](#) (only for projects that require use of live aquatic organisms) or [HEL-6320 Animal Experimentation for Researchers](#) (only for projects that require use of live birds or mammals). Please note that there is an own application deadline for HEL-6320.

^d Intensive teaching in class (January – March).

^e Possibilities to take single (intensive) courses at UNIS from mid-March.

^f Possibilities to take single (intensive) courses at UNIS.

In addition to the compulsory courses above, it is recommended you choose from of the following elective courses, depending on your research interest/project topic:

Recommended elective courses in the autumn

Recommended elective courses which timeplans are coordinated with the compulsory courses BIO-3030 are the following:

- BIO-3014 Biological Rhythms - 10 ECTS (Chronobiology and Physiology)
- BIO-3009 Arctic Marine Pollution - 10 ECTS (Physiology and ecotoxicology)
- BIO-3020 Fundamentals of Ecotoxicology - 10 ECTS (Physiology and ecotoxicology)
- BIO-3013 Northern Food Web Ecology - 10 ECTS (Ecophysiology)
- BIO-3505 Ecological interactions - 10 ECTS (Ecophysiology)

Other relevant elective courses in the autumn:

- BIO-3019 Arctic Biodiversity and Systematics - 10 ECTS
- BIO-3805/3810 Individual Special Curriculum - 5/10 ECTS
- BIO-3506 Top predators - 10 ECTS (every other year)

Recommended elective courses in the spring

- BIO-3004 Ecosystem-based management - 10 ECTS (Ecophysiology)
- BIO-3118 Microscopical Imaging Techniques - 10 ECTS
- BIO-3029 Sea ice habitats and biology - 5 ECTS
- BIO-3805/3810 Individual Special Curriculum - 5/10/ ECTS

Relevant courses offered at UNIS

- AB-325 Biotelemetric Methods – 10 ECTS (every other year in June/July)
- AB-338 Life History Adaptations to Seasonality – 10 ECTS (every other year in May/June).

DISCIPLINE: [Arctic Marine Ecology](#)

Program description

This discipline concerns the ecology of high-latitude coastal and oceanic systems. You will learn about polar marine ecosystems, what makes them special and how they function. You will discover how food webs in different Arctic marine habitats are structured, what it takes to use them sustainably, and how the physical environment influences species and their ecology.

Through a master in Arctic Marine Ecology, you will be introduced to a large variety of organisms, ranging from bacteria and plankton to benthos and top predators, such as fish and marine mammals. You can compare Arctic marine food webs across the entire Arctic, and you can study how organisms and ecosystems respond to climate change and environmental variation.

In this discipline, you will gain hands-on experience through sampling and data collection during research expeditions, as well as laboratory experiments and analyses. You will learn to use a suite of methods, which may include numerical modeling, novel observation and sampling technology or biochemical and molecular methods. You may design experiments to study behavior or physiology in the field or in temperature-controlled laboratories.

We collaborate extensively with UNIS and with other research institutions in Tromsø, such as the Norwegian Polar Institute, the Institute of Marine Research and Akvaplan-niva. You may carry out parts of your thesis at these institutions.

For more information about the research Arctic Marine System Ecology (AMSE) group see:

[AMSE research group](#)

Learning outcomes

Candidates that have completed a master's degree in biology in the discipline Arctic Marine Ecology will have advanced knowledge within a range of topics in Arctic marine system ecology (e.g. polar night ecology, biophysical interactions, sea ice ecology and biogeochemistry, coastal ecology). This entails a thorough understanding of how organisms respond to various biotic and abiotic factors, about primary and secondary production in marine, high-latitude ecosystems, how trophic interactions regulate the community and determine the functioning of marine food webs, or how biogeochemical cycles such as the carbon cycle, is closely interlinked with the ecosystem.

In addition to the [overall skills](#) acquired as Master of Science in biology and depending on the master's degree project, the candidate may have the possibility to design scientific experiments, prepare and conduct ship-based expeditions and work with marine ecosystem models, critically reflecting on their benefits and limitations.

Students will also be able to critically evaluate information from a variety of sources and to transpose acquired knowledge and competency to issues relevant for society e.g., management of marine resources and pollution in marine systems.

Program Structure

The Table below summarized the compulsory courses for all students (red color), elective courses (grey) and course compulsory for students working with live animals (blue). The sum of all courses taken must be at least 60 ECTS.

	10 ECTS	10 ECTS	10 ECTS
	compulsory safety courses at semester start (no ECTS) ^a		
First semester (autumn)	BIO-3529 Academic skills (5 ECTS) ^b	Elective course (up to 10 ECTS)	BIO-3015 Arctic Marine System Ecology and Climate Change (10 ECTS)
Second semester (spring) ^e	BIO-3529 Academic skills (5 ECTS) ^b	Animal exp. (5/6 ECTS) ^c	BIO-3012 Studydesign and data analysis in Biology II (10 ECTS) ^d
		Elective course (up to 10 ECTS)	
Third semester (autumn) ^f	BIO-3950 Master's Thesis Biology		
Fourth semester (spring)	BIO-3950 Master's Thesis Biology		

^a [HMS-0501](#) Safety in the laboratory, workshop and on sea and land expeditions, [HMS-0502](#) First aid in the laboratory, workshop and on sea and land expeditions, [HMS-0503](#) UiT's regulations for field work and sea-going expeditions, [HMS-0504](#) Biological material.

^b BIO-3529 is 5 ECTS spread over the two first semesters and conducted partly digitally to accommodate students going to UNIS.

^c [BIO-3503 Aquatic Animal Welfare](#) (only for projects that require use of live aquatic organisms) or [HEL-6320 Animal Experimentation for Researchers](#) (only for projects that require use of live birds or mammals). Please note that there is an own application deadline for HEL-6320.

^d Intensive teaching in class (January – March).

^e Possibilities to take single (intensive) courses at UNIS from mid-March.

^f Possibilities to take single (intensive) courses at UNIS.

In addition to the compulsory courses above, it is recommended you choose one of the following course combinations, where courses will not overlap in time. Students are encouraged to discuss the ideal set of courses with supervisors.

Recommended elective courses in the autumn

Recommended elective courses which timeplans are coordinated with the compulsory courses BIO-3015 are the following:

- BIO-3505 Ecological Interactions - 10 ECTS (*Marine ecological interactions*)
- BIO-3516 Food-webs and Fisheries – 10 ECTS (*Marine ecological interactions*)
- BIO-3810 Individual Special Curriculum – 10 ECTS with a focus on sea ice habitats and biogeochemistry (*Sea ice habitats & biogeochemistry*)
- BIO-3009 Arctic Marine Pollution – 10 ECTS (*Ecosystem disturbances*)
- BIO-3020 Fundamentals of Ecotoxicology – 10 ECTS (*Ecosystem disturbances*)

Other relevant elective courses in the autumn:

- FSK-3012 Geographical Information Systems for Coastal and Marine Resource Management – 10 ECTS
- BIO-3506 Top predators – 10 ECTS (every other year, *Higher trophic levels*)

Recommended elective courses in the spring

- BIO-3029 Sea Ice Habitats and Biology – 5 ECTS (*Sea ice habitats & biogeochemistry*)
- BIO-3518 From catchment to coast: Northern inland waters and global change – 10 ECTS

Other relevant elective courses in the spring:

- BIO-3512 Early life history of marine fishes (spring) – 10 ECTS
- BIO-3805/3810 Individual Special Curriculum - 5/10 ECTS

Relevant courses offered at UNIS

- AB-320 Arctic Marine Zooplankton (every other year) – 10 ECTS (*Marine ecological interactions*)
- AB-321 Ecology of Arctic Marine Benthos (every other year) – 10 ECTS (*Marine ecological interactions*)
- AB-330 Ecosystems in Ice Covered Waters (every other year) – 10 ECTS (*Sea ice habitats & biogeochemistry*)
- AB-323 Light Climate and Primary Productivity in the Arctic (May/June, every other year – 10 ECTS)
- AB-332 Arctic Marine Molecular Ecology – 10 ECTS

DISCIPLINE: Arctic Marine Ecotoxicology

Program description

Ecotoxicology is the study of how man-made pollution affects organisms at all levels of biological organization, from cells to ecosystems. The subject is multidisciplinary, and primarily integrates ecology and toxicology with advanced knowledge of one or several of the following field of sciences: cell and molecular biology, physiology, environmental chemistry and ecology.

This discipline will give you a fundamental introduction to ecotoxicological principles and approaches and contemporary research topics. Our broad choice of elective courses, also at UNIS, will allow you to deepen your knowledge on Arctic ecosystems from a molecular, physiological or ecological perspective.

Master projects will be carried out as part of ongoing research projects, which encompass both fundamental research and more applied topics related to contemporary environmental issues. For instance, a master project can cover fields of science related to the release, transport and toxicity of legacy and emerging persistent organic pollutants, petroleum related pollution, littering in the marine environment (e.g. microplastics) and more. The research approaches may span from molecular and cellular mechanisms, to integrative whole animal or population studies and through experimental or field-based research. Many projects are offered in collaboration with external institutions, especially within the Fram Centre in Tromsø, e.g. Akvaplan-niva, Norwegian Polar Institute (NPI), Norwegian Institute for air research (NILU), Institute of Marine Research (IMR) and Norwegian Institute for Nature Research (NINA).

Students from this discipline may be relevant candidates to research institutions in both the public and private sectors, management at the regional, national and international levels as well as consultancy firms.

Learning outcomes

Candidates that have completed a master's degree in biology in the discipline Arctic marine ecotoxicology will have advanced knowledge of how arctic marine organisms, populations and communities are impacted by anthropogenic stressors. The discipline will provide a thorough knowledge of all classes of contaminants (persistent organic pollutants, microplastics, heavy metals, hydrocarbons, etc.) including their sources, physico-chemical properties, fate and biological effects on living organisms from molecular mechanisms of toxicity to adverse outcomes at higher levels of biological organization. Also, a range of ecotoxicological approaches and methods used for instance in toxicity testing (e.g. *in vivo*, *in vitro*, *in vivo*, *in silico*) are introduced as part of the course portfolio and master project.

Program Structure

The Table below summarized the compulsory courses for all students (red color), elective courses (grey) and course compulsory for some students depending on Master project or discipline (blue). The sum of all courses taken must be at least 60 ECTS.

	10 ECTS	10 ECTS	10 ECTS	
First semester (autumn)	compulsory safety courses at semester start (no ECTS) ^a			
	BIO-3529 Academic skills (5 ECTS) ^b	Elective course (up to 10 ECTS)	BIO-3020 Fundamentals of Ecotoxicology (10 ECTS)	BIO-3009 Arctic Marine Pollution (10 ECTS)
Second semester (spring) ^e	BIO-3529 Academic skills (5 ECTS) ^b	Animal exp. (5/6 ECTS) ^c	BIO-3012 Studydesign and dataanalysis in Biology II (10 ECTS) ^d	Elective course (10 ECTS)
		Elective course (up to 10 ECTS)		
Third semester (autumn) ^f	BIO-3950 Master's Thesis Biology			
Fourth semester (spring)	BIO-3950 Master's Thesis Biology			

^a [HMS-0501](#) Safety in the laboratory, workshop and on sea and land expeditions, [HMS-0502](#) First aid in the laboratory, workshop and on sea and land expeditions, [HMS-0503](#) UiT's regulations for field work and sea-going expeditions, [HMS-0504](#) Biological material.

^b BIO-3529 is 5 ECTS spread over the two first semesters and conducted partly digitally to accommodate students going to UNIS.

^c [BIO-3503 Aquatic Animal Welfare](#) (only for projects that require use of live aquatic organisms) or [HEL-6320 Animal Experimentation for Researchers](#) (only for projects that require use of live birds or mammals). Please note that there is an own application deadline for HEL-6320.

^d Intensive teaching in class (January – March).

^e Possibilities to take single (intensive) courses at UNIS from mid-March.

^f Possibilities to take single (intensive) courses at UNIS.

Recommended elective courses in the autumn

Recommended elective courses which timeplans are coordinated with BIO-3009 and BIO-3020 are the following:

- BIO-3015 Arctic Marine System Ecology and Climate Change - 10 ECTS (Marine ecology)
- BIO-3030 Extreme Animal Physiology - 20 ECTS (physiology)
- BIO-3018 Environmental Molecular Genetics - 20 ECTS (molecular biology)

Other relevant elective courses in the autumn:

- BIO-3013 Northern food web ecology - 10 ECTS (terrestrial ecology)
- BIO-3505 Ecological Interactions -10 ECTS (aquatic ecology)
- MBI-2005 General pharmacology and toxicology - 10 ECTS (toxicology)
- BIO-3506 Top predators - 10 ECTS (every other year)

Recommended elective courses in the spring

- BIO-3004 Ecosystem-based management - 10 ECTS
- BIO-3518 From catchment to coast: Northern inland waters and global change - 10 ECTS
- BIO-3512 Early life of marine fish - 10 ECTS
- KJE-1006 Miljø- og analytisk kjemi - 10 ECTS (in norwegian)
- BIO-3805/3810 Individual Special Curriculum - 5/10 ECTS

Relevant courses offered at UNIS

- AT330 Arctic Environmental Toxicology - 10 ECTS (March-April)
- AT324 Techniques for the Detection of Organo-Chemical Pollutants in the Arctic Environment - 10 ECTS (April/May)
- AT333 Arctic Petroleum: Challenges for Society, Technology, and Environment - 10 ECTS (July/August)
- AB338 Life History Adaptations to Seasonality - 10 ECTS (May/June)
- AB322 Fluxes of Nutrients, Energy and Contaminants from Sea to Land – 10 ECTS (every other year, July)

DISCIPLINE: Ecology & Sustainability

Program description

Students will learn theories and practices underpinning sustainability science and ecosystem-based management. To solve complex sustainability challenges, students will learn how to understand and analyze the interactions between natural and social systems to find solutions and support decisions that can meet the needs of present and future generations while conserving the planet's life supporting systems. Students will get insights in sustainability theories, principles, models and indicators, including those of relevance for the UN's Sustainable Development Goals, the Paris Agreement, the post-2020 global biodiversity framework, the European Green Deal, IPCC, IPBES and the climate- and environmental assessments produced by the Arctic Council. Ecosystem-based approaches to research, management and adaptations are generally regarded as the key for addressing complex sustainability challenges, and this program will train students in system thinking by working with ecosystem ecology, spatial ecology, resilience, socio-ecological systems, regime shifts, tipping points, biodiversity and ecosystem services assessment, and adaptive management and governance. Students will also be trained in equitable engagement of citizens, stakeholders and indigenous – and local communities science and management. Skills and tools that students learn in our group depend on the topic chosen for the MSc thesis. We also encourage students to do their MSc project together with external partners at the FRAM center or to link their tasks closely to needs of business or management agencies.

Learning outcomes

Candidates that have completed a master's degree in biology in the discipline Environment & Sustainability will have the skills necessary for understanding and analyzing causes and possible solutions to sustainability challenges. They have the capacity to critically reflect upon the different sustainability theories, principles and models that prevails in contemporary environmental policies and in global environmental assessments (e.g. IPCC, IPBES and the Arctic Council's working groups). Ecological sciences are the fundament for sustainability, and our program will focus on three fields of research that are central for sustainability sciences: ecosystem ecology, landscape ecology and global ecology. Translational skills and system thinking is also important for understanding causal interactions between social- and ecological systems and to identifying solutions and measures that can be implemented by management agencies and businesses. Depending on their MSc topic, students can acquire in-depth knowledge about specific tools used in sustainability science, such as sustainability analytics using big data analysis, carbon – or ecological footprint analysis, environmental impact analysis, spatial ecology & GIS analysis, socio-ecological systems analysis, ecosystem services assessment, climate risk assessment, or different methodologies and approaches for engaging citizens and stakeholders in sustainability science and ecosystem-based management.

Program Structure

The Table below summarized the compulsory courses for all students (red color), elective courses (grey) and course compulsory for students working with live animals (blue). The sum of all courses taken must be at least 60 ECTS.

	10 ECTS		10 ECTS		10 ECTS
	compulsory safety courses at semester start (no ECTS) ^a				
First semester (autumn)	BIO-3529 Academic skills (5 ECTS) ^b	Elective courses to reach a total of 60 ECTS of courses ^c		10 ECTS obligatory courses (BIO-3111 or BIO-3015 or BIO-3013 or BIO-3518) ^c	BIO-3021 Sustainability Science (10 ECTS)
Second semester (spring)		Animal exp. (5/6 ECTS) ^e		BIO-3004 Ecosystem-based management (10 ECTS)	BIO-3012 Study design and data analysis in Biology II (10 ECTS) ^d
Third semester (autumn)	BIO-3950 Master's Thesis Biology				
Fourth semester (spring)	BIO-3950 Master's Thesis Biology				

^a [HMS-0501](#) Safety in the laboratory, workshop and on sea and land expeditions, [HMS-0502](#) First aid in the laboratory, workshop and on sea and land expeditions, [HMS-0503](#) UiT's regulations for field work and sea-going expeditions, [HMS-0504](#) Biological material.

^b BIO-3529 is 5 ECTS spread over the two first semesters and conducted partly digitally to accommodate students going to UNIS.

^c Students must select one of four courses during their discipline (Autumn: BIO-3013 Northern Food Web Ecology, BIO-3015 Arctic Marine System Ecology and Climate Change, BIO-3111 Geographical Information Systems (GIS) and Earth Observation. Spring: BIO-3518 From catchment to coast: Northern inland waters and global change) and take an additional elective course of up to 10 ECTS.

^d Intensive teaching in class (January – March).

^e [BIO-3503 Aquatic Animal Welfare](#) (only for projects that require use of live aquatic organisms) or [HEL-6320 Animal Experimentation for Researchers](#) (only for projects that require use of live birds or mammals). Please note that there is an own application deadline for HEL-6320.

In addition to the compulsory courses above, it is recommended you choose from the following elective courses and are encouraged to discuss what will be the optimal set with the supervisors.

Selection of one of the following courses is obligatory:

Autumn

BIO-3111 Geographical Information Systems (GIS) and Earth Observation – 10 ECTS

BIO-3013 Northern food web ecology – 10 ECTS

BIO-3015 Arctic Marine System Ecology and Climate Change – 10 ECTS

Spring

BIO-3518 From catchment to coast: Northern inland waters and global change – 10ECTS

Recommended elective courses

Autumn

BIO-3019 Arctic biodiversity and systematics - 10 ECTS

BIO-3505 Ecological interaction – 10 ECTS

BIO-3024 Northern Biodiversity Hotspots: taxonomy field courses - 5 ECTS

BIO-3516 Food-webs and Fisheries – 10 ECTS

BIO-3009 Arctic Marine Pollution – 10 ECTS

BIO-3805/3810 Individual Special Curriculum - 5/10 ECTS

Spring

BIO-3805/3810 Individual Special Curriculum - 5/10 ECTS

DISCIPLINE [Freshwater Ecology](#)

Program description

Master's projects are usually related to topical activities within freshwater ecology, which include research in lakes, rivers and coastal areas related to landlocked and anadromous populations of fish (in particular salmonids) as well as invertebrates. Research activities comprise basic aspects of ecology and more applied topics related to nature and resource management. Important keywords are population and community ecology, predation, competition, parasitism, trophic ecology, ecological speciation, invasion biology, anadromy, life history and migration.

For more information about the research group see: [Freshwater ecology research group](#)

Learning outcomes

Candidates that have completed a master's degree in biology in the discipline Freshwater ecology will have advanced knowledge in ecological and evolutionary theory, management-related knowledge and key methodologies for research in freshwater habitats and fish ecology. Furthermore, the students will have an overview over physical and chemical factors and processes in freshwater environments as an important foundation for understanding the significant seasonal changes in ecological patterns.

Students will be able to critically evaluate information from a variety of sources and to transpose acquired knowledge and competency to issues relevant for society, like e.g., freshwater and fish resource management and conservation.

Program Structure

The Table below summarized the compulsory courses for all students (red color), elective courses (grey) and course compulsory for students working with live animals (blue). The sum of all courses taken must be at least 60 ECTS.

	10 ECTS	10 ECTS	10 ECTS
	compulsory safety courses at semester start (no ECTS) ^a		
First semester (autumn)	BIO-3529 Academic skills (5 ECTS) ^b	BIO-3521 Seminar in freshwater ecology (5 ECTS)	BIO-3505 Ecological Interactions (10 ECTS)
			Elective course (10 ECTS)
Second semester (spring)		Animal exp. (5/6 ECTS) ^c	BIO-3012 Studydesign and data analysis in Biology II (10 ECTS) ^d
		Elective course (up to 10 ECTS)	BIO-3518 From catchment to coast: Northern inland waters and global change (10 ECTS)
Third semester (autumn) ^e	BIO-3950 Master's Thesis Biology		
Fourth semester (spring)	BIO-3950 Master's Thesis Biology		

^a [HMS-0501](#) Safety in the laboratory, workshop and on sea and land expeditions, [HMS-0502](#) First aid in the laboratory, workshop and on sea and land expeditions, [HMS-0503](#) UiT's regulations for field work and sea-going expeditions, [HMS-0504](#) Biological material.

^b BIO-3529 is 5 ECTS spread over the two first semesters and conducted partly digitally to accommodate students going to UNIS.

^c [BIO-3503 Aquatic Animal Welfare](#) (only for projects that require use of live aquatic organisms) or [HEL-6320 Animal Experimentation for Researchers](#) (only for projects that require use of live birds or mammals). Please note that there is an own application deadline for HEL-6320.

^d Intensive teaching in class (January – March).

^e Possibilities to take single (intensive) courses at UNIS.

In addition to the compulsory courses above, it is recommended you choose from the following elective courses and are encouraged to discuss what will be the optimal set with the supervisors.

Recommended elective courses in the autumn

Recommended elective courses which timeplans are coordinated with the compulsory courses BIO-3505 and BIO-3521 are the following:

BIO-3519 Parasites and epidemiology- 10 ECTS

BIO-3111 Geographical Information Systems (GIS) and Earth Observation - 10 ECTS

BIO-3013 Northern food web ecology - 10 ECTS

Recommended elective courses in the spring

Recommended elective courses which timeplans are coordinated with the compulsory course

BIO-3518 are the following:

BIO-3028 Evolutionary and ecological interactions - 10 ECTS (every other year)

BIO-3003 Fish migration: Theory and technology - 10 ECTS

BIO-3004 Ecosystem-based management - 10 ECTS

BIO-3805/3810 Individual Special Curriculum - 5/10 ECTS

DISCIPLINE: [Molecular Environmental Biology](#)

Program description

The MSc in Molecular environmental biology focuses on the molecular analysis of plants and microorganisms. Research areas cover a broad range of contemporary research topics ranging from functional plant and microbial molecular biology and plant/microbe interactions to bioinformatic analysis and modelling. The common theme of our discipline is understanding interactions within and between cells and between organisms and their environment at a molecular level. The Master students will be offered an opportunity for a molecular study within one selected field of research and the participation in an ongoing research project among the following focal areas:

- Analysis of molecular signalling and transport processes within and between individual plant and bacterial cells
- Biochemistry and cell biology of parasitic plants and the interaction with their hosts
- Environmental and developmental regulation of secondary metabolism in plants
- Communication and interaction of plants and microorganisms with each other and with the environment.
- Diversity and function of microbial communities involved in biodegradation of environmental pollutants
- Production and enzymatic degradation of plant biomass for bioenergy
- Implementation of bioinformatic approaches for the topics above and beyond

During the master study the students will be given the opportunity to choose from a variety of different courses applying modern methods of experimental molecular biology and bioinformatics for the study of plant and microbe systems. All courses are designed specifically to prepare the candidates for their master's thesis. Also, the active participation in common seminars and courses are expected as an important part of scientific training.

For more information about the research group see: [Microorganisms and Plants research group](#)

Admission requirements

Applicants must meet the general admission requirements for the Master of Science in Biology program. Additionally, applicants must have completed courses in basic and practical molecular biology corresponding to a minimum of 10 ECTS (BIO-2018 or equivalent) or can document hands-on molecular lab experience through a bachelor thesis.

Learning outcomes

Candidates that completed a master's degree in biology in the discipline Molecular Environmental Biology will have advanced knowledge in biology and in the following topics:

- Intra and interspecies communications and molecular interactions.
- Functioning and dynamics of microbial communities in challenging environmental situations.
- secondary metabolites in microbes and plants, their biological functions and applied aspect.
- modelling of metabolic pathways and other biological processes.

Program Structure

The Table below summarized the compulsory courses for all students (red color), elective courses (grey) and course compulsory for students working with live animals (blue). The sum of all courses taken must be at least 60 ECTS.

	10 ECTS	10 ECTS	10 ECTS
	compulsory safety courses at semester start (no ECTS) ^a		
First semester (autumn)	BIO-3529 Academic skills (5 ECTS) ^b	BIO-3005 Seminar: Molecular Environmental Biology in Microbs and Plants (5 ECTS)	Elective course (10 ECTS)
Second semester (spring) ^e		Animal exp. (5/6 ECTS) ^c	BIO-3012 Studydesign and data analysis in Biology II (10 ECTS) ^d
		Elective course (up to 10 ECTS)	Elective course (10 ECTS)
Third semester (autumn) ^f	BIO-3950 Master's Thesis Biology		
Fourth semester (spring)	BIO-3950 Master's Thesis Biology		

^a [HMS-0501](#) Safety in the laboratory, workshop and on sea and land expeditions, [HMS-0502](#) First aid in the laboratory, workshop and on sea and land expeditions, [HMS-0503](#) UiT's regulations for field work and sea-going expeditions, [HMS-0504](#) Biological material.

^b BIO-3529 is 5 ECTS spread over the two first semesters and conducted partly digitally to accommodate students going to UNIS.

^c [BIO-3503 Aquatic Animal Welfare](#) (only for projects that require use of live aquatic organisms) or [HEL-6320 Animal Experimentation for Researchers](#) (only for projects that require use of live birds or mammals). Please note that there is an own application deadline for HEL-6320.

^d Intensive teaching in class (January – March).

^e Possibilities to take single (intensive) courses at UNIS from mid-March.

^f Possibilities to take single (intensive) courses at UNIS.

Students should discuss optimal course composition, including elective courses with their supervisors.

BIO-3018 or an equivalent laboratory-based course is strongly recommended for all students taking the Molecular Environmental Biology discipline. In the second semester, an individual curriculum course (BIO-3805/3810) preferably designed by a future supervisor, is recommended.

Recommended elective courses in the autumn

Recommended elective courses which timeplans are coordinated with BIO-3005 are the following:

BIO-3018 Environmental Molecular Genetics - 20 ECTS

BIO-3805/3810 Individual Special Curriculum - 5/10 ECTS

Other relevant elective courses in the autumn:

KJE-3402 Protein Structure - 10 ECTS

Recommended elective courses in the spring

BIO-3022 Biological membranes and their proteins - 5 ECTS (every other year)

BIO-3118 Microscopical imaging Techniques - 10 ECTS

BIO-3027 Scientific Programming with Python in the life sciences - 10 ECTS

BIO-3805/3810 Individual Special Curriculum - 5/10 ECTS

Relevant courses offered at UNIS

AB-332 Arctic Marine Molecular Ecology - 10 ECTS (September/October)

AB-327 Arctic Microbiology - 10 ECTS (June/July)

DISCIPLINE: [Northern populations and ecosystems](#)

Program description

A MSc discipline with us provides insight in general ecological theories, analytical approaches and tools for understanding, analyzing and managing populations, food webs, ecosystems or socio-ecological systems. Students in our group work with empirical data collected in the field, use novel technologies, modelling and advanced data analyses, or combine ecology with climate data, citizen science, didactics, or social science for ecosystem-based monitoring and/or management. We offer MSc projects in a broad range of topics, including in animal behavior, health and diseases, wildlife ecology, plant ecology, theoretical ecology and evolution, and in ecosystem science & management. The MSc discipline supports inter- and transdisciplinary projects relevant for climate research, sustainable harvest of wildlife and livestock ecology, primary production, conservation or sustainability science. Our main focus is on arctic-alpine tundra, boreal forests and northern coastal ecosystems. Projects are often conducted as a part of larger research projects and in teamwork. We collaborate extensively with partners within the [Fram Centre](#) such as the Norwegian Institute for Nature Research (NINA), the Norwegian Polar Institute and the Marine Research Institute as well as management agencies and other stakeholders.

Students belonging to our group will work with their supervisors to conceptualize and design their own project work. Students need to contact their supervisor at an early stage to plan their thesis work and to acquire the necessary scientific literature and training to implement the project. Students in our group will learn:

- The theoretical and conceptual frameworks relevant to their topic
- To develop study designs or models reflecting their hypotheses or questions
- To use state-of-the-art methods for acquiring and analyzing data
- To write a research paper
- To communicate and present their work

For more information about the research group see: [Northern populations and ecosystems research group](#)

Learning outcomes

Candidates that have completed a master's degree in biology in the discipline Northern populations and ecosystems will have advanced knowledge within many aspects of terrestrial ecosystem ecology, environmental monitoring and management (e.g., plant ecology, animal ecology, ecosystem ecology, environmental monitoring designs and analysis, ecosystem-based management). Study and working approaches span from single populations to integrative ecosystem-based studies, and data collection comprising from detailed field studies on the ground to the use of satellite imagery. The candidate will be able to use relevant analytical methods including both theoretical and statistical approaches.

Program Structure

The Table below summarized the compulsory courses for all students (red color), elective courses (grey) and course compulsory for students working with live animals (blue). The sum of all courses taken must be at least 60 ECTS.

	10 ECTS	10 ECTS	10 ECTS
	compulsory safety courses at semester start (no ECTS) ^a		
First semester (autumn)	BIO-3529 Academic skills (5 ECTS) ^b	Elective course (up to 10 ECTS)	BIO-3013 Northern food web ecology (10 ECTS)
Second semester (spring) ^e		Animal exp.(5/6 ECTS) ^c	BIO-3012 Study design and data analysis in Biology II (10 ECTS) ^d
		Elective course (up to 10 ECTS)	
Third semester (autumn) ^f	BIO-3950 Master's Thesis Biology		
Fourth semester (spring)	BIO-3950 Master's Thesis Biology		

^a [HMS-0501](#) Safety in the laboratory, workshop and on sea and land expeditions, [HMS-0502](#) First aid in the laboratory, workshop and on sea and land expeditions, [HMS-0503](#) UiT's regulations for field work and sea-going expeditions, [HMS-0504](#) Biological material.

^b BIO-3529 is 5 ECTS spread over the two first semesters and conducted partly digitally to accommodate students going to UNIS.

^c [BIO-3503 Aquatic Animal Welfare](#) (only for projects that require use of live aquatic organisms) or [HEL-6320 Animal Experimentation for Researchers](#) (only for projects that require use of live birds or mammals). Please note that there is an own application deadline for HEL-6320.

^d Intensive teaching in class (January – March).

^e Possibilities to take single (intensive) courses at UNIS from mid-March.

^f Possibilities to take single (intensive) courses at UNIS.

In addition to the compulsory courses above, it is recommended you choose from the following elective courses and are encouraged to discuss what will be the optimal set with the supervisors.

Recommended elective courses in the autumn

Recommended elective courses which timeplans are coordinated with BIO-3013 are the following:

- BIO-3111 Geographical Information Systems (GIS) and Earth Observation - 10 ECTS
- BIO-2103 Evolusjon og Adferd (in norwegian) – 10 ECTS
- BIO-3015 Arctic Marine System Ecology and Climate Change – 10 ECTS
- BIO-3019 Quantitative methods for molecular systematics and biodiversity analyses - 10 ECTS
- BIO-3505 Ecological interaction – 10 ECTS
- BIO-3519 Parasites and epidemiology – 10 ECTS
- BIO-3024 Northern Biodiversity Hotspots: taxonomy field courses - 5 ECTS
- BIO-3805/3810 Individual Special Curriculum - 5/10 ECTS

Recommended elective courses in the spring

- BIO-3004 Ecosystem-based management – 10 ECTS
- BIO-3028 Evolutionary and ecological interactions - 10 ECTS (every other year)
- BIO-3118 Microscopical imaging Techniques – 10 ECTS
- BIO-3518 From catchment to coast: Northern inland waters and global change – 10 ECTS
- BIO-3805/3810 Individual Special Curriculum - 5/10 ECTS

Relevant courses offered at UNIS

- AB-326 Arctic Plant Ecology - 10 ECTS (June/July)
- AB-327 Arctic Microbiology - 10 ECTS (June/July)
- AB-329 Arctic Winter Ecology - 10 ECTS (March/May)
- AB-340 Climate Change Biology - 10 ECTS (January/February)

