MSC PROGRAMME IN MARINE COASTAL DEVELOPMENT

This Master of Science degree program in Marine Coastal Development is an integrated, two year study program for Norwegian and foreign students. The program is designed according to the current framework for engineering and science graduate studies at NTNU. The normal workload for a full-time student for one academic year is 60 credits.

The program is especially designed to give the students a broad understanding of the complex interactions in the coastal zone and how human activity affects this environment.

Admission

Entry requirement to this MSc program is a Bachelor degree (or equivalent) in Science or Engineering with an academic profile in marine science. Norwegian students can enter the full M.Sc. programme, or select individual courses from the program in their study curriculum. Foreign students can be admitted through the Quota Program, with participants from developing countries and from Central and Eastern Europe. Students with other sources of financing may also be admitted to the full MSc program. Foreign exchange students can select individual courses from the program, provided they have the necessary qualifications for the courses.

Learning objective

Objective of the Master's program in MSc in Marine Coastal Development

MSc in Marine Coastal Development provides students with knowledge, analytical skills and general knowledge at an advanced level, with the aim of working in universities, independent institutes, industry, consultancy, manufacturing, equipment, school sector and public administration, or for the purpose of further education in a doctoral degree program.

The Master of Science degree program provides an interdisciplinary, broad understanding of complex interactions in the marine environment. The oceans have large marine living and non-living resources that are becoming increasingly important, and that we will be more dependent of in the future. In order to utilize and conserve resources and develop coastal resources in a sustainable manner, there is a need for in-depth knowledge, interdisciplinarity, in both economy, environment, technology, marine biological resources, and other social developments.

The thesis provides special expertise in the areas of research: 1. Aquaculture, 2. Marine Harvesting 3. Marine Biology and Biochemistry

Knowledge

The candidate has

- Solid knowledge of marine technology, marine biology or aquaculture and advanced knowledge in a variety of topics, some of which support the thesis
- Depth knowledge in the form of research experience in their field, through a supervised master's project
- Knowledge of the breadth of research conducted in the marine sciences today
- Interdisciplinary, broad understanding of complex interactions in the marine environment.
- Knowledge of different working and analytical methods used in the field.

Skills

The candidate

- has background and experience to formulate and analyze complex bioscience research or technological problems
- Manages a variety of advanced theoretical and experimental methods in their fields.
- Can make critical and independent assessments of methods and results

- Can design, implement and report a scientific project both through teamwork and independent in the thesis
- Can communicate technical material and the results both to specialists and to a wider audience
- Can combine insights from several disciplines

General competence
The candidate
- Knows how the marine sector and its operations have evolved as a discipline / science, also internationally.
- Is able to acquire, evaluate and use relevant and reliable new information, and thus renew and further develop their professional skills
- Has knowledge of the marine sector's role in society and is the basis for assessing the ethical issues
- Has expertise in handling chemical substances and biological materials and understand environmental problems, focusing on health, safety and environment (HSE)

Specializations

The following three lines of specializations are offered: The students have to choose one of them. Deadline 15th October 1st semester.

□□□Aquaculture

Marine Juvenile Technology –60 credits thesis possible
Contact: Professor Elin Kjørsvik

Marine Aquaculture system - Both 30 and 60 credits thesis possible
Contact: Professor Yngvar Olsen – 60 credits thesis
Professor Harald Ellingsen – 30 credits thesis

Recycling Aquaculture and Environmental Analysis -30 credits thesis possible
Contact: Professor Tor Ove Leiknes

□□□ Marine Harvesting

Processing of Marine Resources - Both 30 and 60 credits thesis possible
Contact: Professor Turid Rustad – Both 30 and 60 credits thesis

Sustainable Marine Harvesting - 30 credits thesis possible
Contact: Professor Harald Ellingsen

□□□Marine Biology and Biochemistry

Marine Biology and Ecology - 60 credits thesis possible
Contact: Professor Yngvar Olsen

Marine Biochemistry and Biotechnology - Both 30 and 60 credits thesis possible
Contact: Professor Kjell Morten Vaarum – Both 30 and 60 credits thesis

Contacts:
Professor Elin Kjørsvik, Department of Biology
Elin.Kjorsvik@bio.ntnu.no

Professor Yngvar Olsen, Department of Biology
Yngvar.Olsen@bio.ntnu.no

Professor Tor Ove Leiknes, Department of of Hydraulic and Environmental Engineering
torove.Leiknes@ntnu.no
Professor Harald Ellingsen, Department of Marine Technology
Harald.Ellingsen@ntnu.no
Professor Turid Rustad, Department of Biotechnology
Turid.Rustad@biotech.ntnu.no
Professor Kjell Morten Vaarum, Department of Biotechnology
Kjell.Morten.Vaarum@biotech.ntnu.no

Compulsory courses

All students have two compulsory courses in common; TMR 4137 *Sustainable Utilization of Marine Resource, and* BI3061 *Biological Oceanography* in addition to *"Experts in Teamwork"(see below).* Every specialization has strongly recommended courses, see tables below.

Experts in Teamwork

Experts in Teamwork is compulsory.

Thesis

The thesis consists of 60 credits or 30 credits. This depends of the student's education and the chosen field of study. For instance, all students taking their thesis at the Department of Biology choose the 60 credits thesis. These students will start their work on the thesis in the 2.nd semester. Students with a former technology education taking their thesis at Department of Marine Technology or Department of Hydraulic and Environmental Engineering choose the 30 credit thesis, starting in their 4.th semester. Students at Department of Biotechnology may choose either a 30 or a 60 credits thesis.

A) Information about the Master's Study (Thesis 60 credits)

Workload and Structure

The programme requires two years of full-time study, beginning with the autumn term (medio August). The normal work load for a full-time student for one academic year is 60 ECTS credits.

The Master's study consists of two parts:

5. A written thesis of the project (Master's thesis). The extent of the assignment should correspond to a work load of 60 credits. The work on the thesis is time limited. The thesis has to be handed in within May 15th of the 2nd year.
6. An approved selection of courses, of a minimum of total of 60 credits, from what (at least) 30 credits must be courses at 3000-level (master level) (UTF§14.1).

Master's agreement

Every master student has to make a Master's agreement. This agreement comprises your syllabus and master project together with regulations for the counseling given during the master's study. The subjects, compulsory or elective, stated as syllabus in your Masters Agreement cannot be changed. If there for serious reason develops a need for change, the Masters Agreement must be revised. The supervisor, the responsible institute and the student must agree upon the revision and the new Agreement filed.

The Master's thesis

The Master thesis should be developed as your own original work (with some support from your adviser). Any quotation, use of data, information etc. from other sources (including the

scientifically literature and your fellow students) should therefore be carefully listed and included in the reference list of your thesis, according to best practice within your field of study.

Submission and Examination

The student has to:

- Register for the final master's degree exam (through STUDWEB) within February the 15th of the 2nd academic year
- Apply for approval of your individual special syllabus if your Masters Agreement demands a special syllabus. It is important that this is done well in advance of the examination. A study committee will evaluate the syllabus, and if it is not accepted, you must change it. Your supervisor must approve and sign the form. The syllabus should be a minimum of 50 pages per credit.
- Hand in the thesis (within the deadline given, see below) for print through DAIM .The Department will give you 5 copies of the thesis.

In addition to the judgment of thesis, the candidate will have an oral exam consisting of:

- A conversation on/presentation ("defense") of the research assignment (the master's thesis)

Examination on the theoretic syllabus of the advanced subjects which has previously not been evaluated during the study (at least 7,5 credits, preferentially individual special syllabus). All exams, except the Individual Special Syllabus (if any) have to be passed before the date of the final Master's Degree exam, unless otherwise stated in your Masters Agreement.

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A grade is given for every course / special syllabus that constitutes a part of the exam.

Important deadlines

- **15th of October (1st year)**: Decide on a Master's project in cooperation with a supervisor.
- **1st of November** (1st year) Register your Master's Agreement in DAIM and hand in the project description.
- **15th of February (2nd year):**Deadline for the signing up of the final Master's Degree exam (through STUDWEB)
- **15th of May (2nd year)**. Deadline for the submission of the master thesis. If the thesis is not submitted within this date the grade "not passed" will be awarded, unless there is an application for extension of the deadline in reasonable time before the deadline. The reasons given in the application must be in accordance with Supplementary Regulations for the Natural Sciences (UTF) § 20.3 and the Examination Regulations at NTNU, § 20. The Supplementary Regulations for the Natural Sciences (UTF) § 7 and the Examination Regulations at NTNU, § 7. See below for further information regarding §7 and §23.3.
- **15th of June (**approximately**, 2nd year)**: The date for the final Master's Degree exam. (Individual agreement with the respective Department, approximately four weeks after the thesis is submitted).

Leave of absence from the Master Study (UTF § 7) (extract):

e) Leave of absence from the master studies of two years of duration and from the two last year of master studies of five years of duration is normally not granted.

f) Leaves of absence may nevertheless be granted when applied for and compelling circumstances are present. Such circumstances might be illness (yourself or among close family member) etc.

Prolongation of the study (UTF § 20.3) (extract):

The master's thesis is time limited. In case of illness, the deadline for handing in the thesis can be postponed equivalent to the time of absence due to illness. The illness must be documented by medical certificate.

If there is a valid reason for not handing in the thesis in time, one can apply for up to three months prolongation of the deadline. If the thesis is not handed in within the extended deadline, a new extension must be applied for, or else the candidate is regarded failed. Delay of deadline can only be applied for twice.

Valid reasons for postponement (in addition to illness) is teaching, organized student activity, social work and unmerited problems concerning the thesis. Written documentation or statement is required, in addition to a new plan of completion. The Faculty, or Department when given the assignment by the Faculty, determines the application. When the reason for delay is teaching, organized student activity or social work, the extended time given is according to the time spent on these activities.

The agreed delay has no influence on the evaluation of the thesis.

B) Programme Specific Regulations

Department of Biology

“BI3091 Special syllabus exam (and similar special curriculum courses) can be held together with the final master exam or at an earlier stage in the master programme.”

More information
www.ntnu.no/macodev

MSc in Marine Coastal Development (MACODEV)
1st and 2nd year Specialization 60 credits

Ex	Subject no	Subject title	Note	Cr	Specialization		
					1	2	3
		Compulsory courses					
1st sem	TMR4137	SUST UTIL OF MARINE RESOURCES		7,5	C	C	C
autumn	BI3061	BIOL OCEANOGRAPHY		7,5	C	C	C
	BI3062	SCIENTIFIC SEMINARS, MARINE		0	C	C	C
		Optional courses A-list	a				
	BI3060	EXPERIMENTAL MARINE ECOL METHODS	1,3,d	7,5	O	O	O
	BI3063	BIOLOGICAL AND GENETIC STOCK MANAGE	2,3	7,5	O	O	O
	KJ3051	OCEAN SPACE: MARINE BIOGEOCHEMICAL PROC	1,2,3	7,5	O	O	O
	TBT4135	BIOPOLYMERS	3	7,5	O	O	O
	TBT4145	MOLECULAR GENETICS	3	7,5	O	O	O
	TMR4115	DESIGN METHODS	1,2	7,5	O	O	O
	TMR4130	RISK ANALYSES AND SAFETY MANAGEMENT	1,2	7,5	O	O	O
	TMR4135	FISHING VESSEL AND WORK BOAT DESIGN	2	7,5	O	O	O
		Optional courses B-list	b				
	BI3010	POPULATION GENETICS		7,5	O	O	O
	TBT4140	BIOCHEMICAL ENGINEERING		7,5	O	O	O
	BT3110	AQUATIC FOOD PROCESSING AND TECHNOLOGY	1,2,3	7,5	O	O	O
	TIØ4120	OPERATION RESEARCH, INTRO		7,5		O	
	TMR4215	SEA LOADS	2	7,5	O	O	O
	TTT4175	MARINE ACOUSTICS		7,5	O	O	O
	TVM4145	UNIT PROC IN WATER AND WASTEWAT TREATM		7,5	O	O	O
	TEP4223	LIFE CYCLE ASSESSMENT		7,5	O	O	O
	BT3115	PRIMARY PRODUCTION – AQUACULTURE FISH	1,2,3	7,5	O	O	O
	BT3125	AQFOODSAFETY	1,2,3	7,5	O	O	O
	BT3120	AQFOOD SUPPLY CHAIN	1,2,3	7,5	O	O	O
2nd sem		**Compulsory courses**					
spring	-	EXPERTS IN TEAMWORK		7,5	C	C	C
	BI3062	SCIENTIFIC SEMINARS, MARINE		0	C	C	C
	BI3905/BT3905	MASTER THESIS IN MaCoDev		15	C	C	C
		Optional courses A-list	a				
	BI3066	MARINE JUVENILE PRODUCTION	1,d,e	7,5	O	O	O
	BI3083	EVOLUTIONARY AND ECOLOGICAL GENETICS	1,2,3	7,5	O	O	O
	TEP4265	THERMAL AND PROCESS ENGINE FOR BIOMAT	2	7,5	O	O	
	TMR4140	DESIGN OF MARINE PRODUCTIONS PLANTS	1	7,5	O	O	O
	TMR4120	UNDERWATER ENGINEERING, BC	2	7,5	O	O	
	TMR4230	OCEANOGRAHY	2	7,5	O	O	O
	TMR4225	MARINE OPERATIONS		7,5	O		O
		Optional courses B-list	b				
	SØK2004	INDUSTRIAL ECONOMICS		7,5		O	
	TBT4125	FOOD CHEMISTRY	2,3	7,5	O	O	O
	TMR4240	MARINE CONTROL SYSTEMS		7,5		O	
	TTK4170	MOD AND IDENTIFIC BIOLOGICAL SYST	1	7,5	O		
3rd sem		**Compulsory courses**					
autumn	BI3062	SCIENTIFIC SEMINARS, MARINE		7,5	C	C	C
	BI3905/BT3905	MASTER THESIS IN MaCoDev		22,5	C	C	C
4th sem		**Compulsory courses**					
spring	BI3091	SPECIAL SYLLABUS FOR MASTER DEGREE		7,5	C	C	C
	BT3092	SPECIAL SYLLABUS FOR MASTER DEGREE		7,5	C	C	C
	BI3905/BT3905	MASTER THESIS IN MaCoDev		22,5	C	C	C

Specialization 60 credits:
1. Aquaculture
2. Marine Harvesting
3. Marine Biology and Biotechnology

1) Aquaculture:
The following courses are recommended in specialization
Marine Juvenile Technology
Autumn: KJ3051, BI3060, TMR4115 Spring: BI3066, TMR4140
Marine Aquaculture Systems
Autumn: KJ3051, TMR4115 Spring: BI3066, TMR4140, TTK4170

2) Marine Harvesting
The following courses are recommended in specialization
Processing of Marine Resources
Autumn: BI3063, KJ3051 TMR4115, TMR4130, TMR4135, TMR4215, Spring: TBT4125, TEP4265, TMR4120,TMR4230

3) Marine Biology and Biotechnology:
The following courses are recommended in specialization
Marine Biology and Ecology
Autumn: BI3060, BI3063, KJ3051, BI3084, TBT4135, TBT4145 Spring: TBT4125
Marine Biochemistry and Biotechnology
Autumn: BI3060, BI3063, KJ3051, TBT4135, TBT4145, Spring: TBT4125, TEP4265

d) This course is taught intensively
e) This course is taught every second year, 2015, 2017
a) A-list
Courses are considered when planning the teaching and examination schedule
b) B-list
Courses are NOT considered when planning the teaching and examination schedule

Other courses can be chosen
C=Compulsory
O= Optional

MSc in Marine Coastal Development (MACODEV)
1st and 2nd year Specialization 30 credits

Ex	Subject no	Subject title	Note	Cr	Specialization		
					1	2	3
1st sem		**Compulsory courses**					
autumn	TMR4137	SUST UTIL OF MARINE RESOURCES		7,5	C	C	C
	BI3061	BIOL OCEANOGRAPHY		7,5	C	C	C
		Optional courses A-list	a				
	KJ3051	OCEAN SPACE: MARINE BIOGEOCHEMICAL PROC	1,2,3	7,5	O	O	O
	TBT4135	BIOPOLYMERS	3	7,5	O	O	O
	TBT4145	MOLECULAR GENETICS	3	7,5	O	O	O
	TMR4115	DESIGN METHODS	1,2	7,5	O	O	O
	TMR4130	RISK ANALYSES AND SAFETY MANAGEMENT	1,2	7,5	O	O	O
	TMR4135	FISHING VESSEL AND WORK BOAT DESIGN	2	7,5	O	O	O
		Optional courses B-list	b				
	BI3060	EXPERIMENTAL MARINE BIOLOGICAL METHODS	3,d	7,5	O	O	O
	BI3063	BIOLOGICAL AND GENETIC STOCK MANAGEMENT	2,3	7,5	O	O	O
	BT3110	AQUATIC FOOD PROCESSING AND TECHNOLOGY	1,2,3	7,5	O	O	O
	TBT4140	BIOCHEMICAL ENGINEERING		7,5	O	O	O
	KJ3050	MARINE ORGANIC ENVIRONMENTAL CHEMISTRY	3	7,5			O
	KJ3072	ADVANCED AQUATIC CHEMISTRY	3	7,5			O
	TIØ4120	OPERATION RESEARCH, INTRO		7,5		O	
	TMR4215	SEA LOADS	2	7,5	O	O	O
	BT3115	PRIMARY PRODUCTION – AQUACULTURE FISH	1,2,3	7,5	O	O	O
	BT3120	AQFOOD SUPPLY CHAIN	1,2,3	7,5	O	O	O
	BT3125	AQFOODSAFETY	1,2,3	7,5	O	O	O
	TTT4175	MARINE ACOUSTICS		7,5	O	O	O
	TVM4145	UNIT PROC IN WATER AND WASTEWAT TREATM		7,5	O	O	O
	TEP4223	LIFE CYCLE ASSESSMENT		7,5	O	O	O
2nd sem		**Compulsory courses**					
spring		EXPERTS IN TEAMWORK		7,5	C	C	C
		Optional courses A-list	a				
	TBT4125	FOOD CHEMISTRY	2,3	7,5	O	O	
	TEP4265	THERMAL AND PROCESS ENGINEERING FOR BIOMATER.	2	7,5	O	O	
	TMR4120	UNDERWATER ENGINEERING, BC	2	7,5	O	O	
	TMR4140	DESIGN OF MARINE PRODUCTIONS PLANTS	1	7,5	O	O	O
	TMR4230	OCEANOGRAHY	2	7,5	O	O	O
	TMR4225	MARINE OPERATIONS		7,5	O		O
		Optional courses B-list	b				
	BI3066	MARINE JUVENILE PRODUCTION	1,d,	7,5	O	O	O
	BI3073	GENETICS TOXICOLOGY	1,d	7,5	O		O
	SØK2004	INDUSTRIAL ECONOMICS		7,5		O	
	TMR4240	MARINE CONTROL SYSTEMS		7,5		O	

Ex	Subject no	Subject title	Note	Cr	1	2	3
3rd sem		**Compulsory courses**					
autumn		**Specialization courses**					
	TBT4505	BIOTECHNOLOGY, SPEC COURSE	3	7,5	C	C	C
	TMR4575	FISHERIES AND MARINE RESOURCES, SPEC COURSE	2	7,5	C	C	C
		Specialization projects					
	TBT4505	BIOTECHNOLOGY, SPEC PROJ	3	7,5	C	C	C
	TMR4570	FISHERIES AND MARINE RESOURCES, SPEC PROJ	2	7,5	C	C	C
		Optional courses					
	BI3060	EXPERIMENTAL MARINE ECOL METHODS	2	7,5	O	O	O
	BI3063	BIOLOGICAL AND GENETICAL STOCK MANAGEMENT	3	7,5	O	O	O
	BI3071	ADV ECOTOXICOLOGY	1	7,5	O		
	TBA4265	ARCTIC AND MARINE CIVIL ENGINEERING		7,5		O	
	TBT4135	BIOPOLYMERS	2	7,5	O	O	O
	TBT4140	BIOCHEMICAL ENGINEERING	1	7,5	O	O	
	TBT4145	MOLECULAR GENETICS		7,5	O	O	O
	TBT4175	AQUATIC FOOD PROCESSING AND TECHNOLOGY	1,2,3	7,5	O	O	O
	BT3120	AQFOOD SUPPLY CHAIN	1,2,3	7,5	O	O	O
	BT3125	AQFOODSAFETY	1,2,3	7,5	O	O	O
	TMR4115	DESIGN METHODS		7,5	O	O	
	TMR4135	FISHING VESSEL AND WORK BOAT DESIGN	2	7,5	O	O	O
	TMR4190	FINITE ELEMENT METHODS IN STRUCTURAL ANALYSES	2	7,5	O	O	O
	TMR4215	SEA LOADS		7,5	O	O	O
	TTT4175	MARINE ACOUSTICS		7,5	O	O	
	TEP4223	LIFE CYCLE ASSESSMENT		7,5	O	O	
	TVM4145	UNIT PROC IN WATER AND WASTEWAT TREATM		7,5	O	O	
4th sem		**Compulsory courses**					
spring	BT3910	BIOTECHNOLOGY, MASTER THESIS		30	C	C	C
	TMR4930	MARINE TECHNOLOGY, MASTER THESIS		30	C	C	C

1. Aquaculture
2. Marine Harvesting
3. Marine biology and Biotechnology

1) Aquaculture:
The following courses are recommended in specialization:
Marine Aquaculture Systems
Autumn: BI3064, TMR4115, TMR4130 Spring:BI3065, TMR4140, TTK4170
Recycling Aquaculture and Environmental Analysis
Autumn: BI3064, BI3071, TBT4130, TMR4115, TMR4130 Spring :BI3065, BI3073, TBT4140, TMR4140, TTK4170

2) Marine Harvesting
The following courses are recommended in specialization:
Processing of Marine Resources
Autumn: BI3060, BI3063, TEP4265, TMR4115, TMR4135, Spring: TBT4125, TBT4135, TMR4215
Sustainable Marine Harvesting
Autumn: TEP4265, TMR4115, TMR4130, TMR4135 Spring: TBT4125, TMR4190, TMR4215, TMR4120, TMR4230

3) Marine Biology and Biotechnology:
The following courses are recommended in specialization:
Marine Biochemistry and Biotechnology
Autumn: BI3060, BI3063, TBT4135, TBT4145 Spring: TBT4125, TTT4195

d) This course is taught intensively
a) **A-list** Courses are considered when planning the teaching and examination schedule
b) **B-list** Courses are NOT considered when planning the teaching and examination schedule

Other courses can be chosen
C=Compulsory
O= Optional