NTNU

INTERNATIONAL MASTER´S PROGRAMMES 2012 - 2013

MASTER OF SCIENCE IN ENGINEERING
MASTER OF SCIENCE IN NATURAL SCIENCES
MASTER OF PHILOSOPHY

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For course descriptions see: http://www.ntnu.no/studies/courses

INTRODUCTION

This is a guide for students who are enrolled in one of the International Master's Degree Programmes at NTNU, and who are in the process of planning or completing their degree.
It contains an updated outline of the programmes for each of the individual International Master's Degrees.

As this catalogue is revised annually, only the latest edition is valid. This edition is valid until the end of the academic year 2012/2013.

Good luck with your studies,

Student and Academic Division

NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY (NTNU)

NTNU consists of 7 faculties. The University has over 20 000 students, and approximately 5 000 employees.

Although the University has a main profile in technological and the natural sciences it also has a full range of degrees in the social sciences, arts, humanities, medicine, and psychology. NTNU has a number of non-degree courses, such as those for practising musicians and teachers, as well as for artists in the visual arts.

NTNU is concerned with creativity and innovation. A University where its students can meet the challenges of a new era. NTNU is concerned with interrelations at the macro- and micro-levels, and contributes to developing society that is in harmony with our natural resources in interplay with traditional and new knowledge.

GUIDE TO THE INTERNATIONAL MASTER´S PROGRAMMES

Tables
The tables show the courses in relation to the overall degree programme. Here is a guide to the specific boxes:

Ex (Course year and time of examination)
This box states which course year and examination period this examination can be taken for the first time.
The examination period is marked “h” for the autumn examination and “v” for the spring examination.

Subject no.
The course code comprises 6 or 7 digits.

Subject title
This box gives the course title in abbreviated form.

Note
This box includes any references to footnotes.

Cr (credits)
The credits give the weighting of each course in the degree programme. Credits are given according to the European Credit Transfer System (ECTS).

FACULTY OF NATURAL SCIENCES AND TECHNOLOGY

MSC-PROGRAMME IN CHEMICAL ENGINEERING
(MSCHEMENG)

Term 1 and 2

Ex	Subject no.	Subject title	Note	Cr	Comp./ Opt.
		Compulsory and optional courses	1		
1h	TKP4140	PROCESS CONTROL		7,5	v1
1h	TKP4155	REACTION KIN/CATALYS		7,5	v1
1h	TKP4160	TRANSPORT PHENOMENA		7,5	v1
1h	TKP4170	PROCESS DESIGN PROJ	2	7,5	v
1v	-	EXP IN TEAM INT PROJ		7,5	o
1v	TKP4115	SURFACE/COLLOID CHEM		7,5	v1
1v	TKP4130	POLYMER CHEMISTRY		7,5	v2
1v	TKP4135	CHEM PROC SYST ENG		7,5	v2
1v	TKP4145	REACTOR TECHNOLOGY		7,5	v2
1v	TKP4150	PETROCH/OIL REFINING		7,5	v2
1v	TKP4171	PROCESS DESIGN PROJ	2	7,5	v
1v	TKP4180	BIOENERG FIBER TECH	3	7,5	v2
		Supplementary courses	1		
1h	TBT4140	BIOCHEM ENGINEERING		7,5	v
1h	TMA4195	MATHEMATIC MODELLING		7,5	v
1h	TMA4215	NUMERIC MATHEMATICS		7,5	v
1h	TPG4105	PETROLEUM ENG BC		7,5	v
1h	TPG4140	NATURAL GAS		7,5	v
1h	TPK4120	SAFETY/RELIAB ANALYS		7,5	v
1v	KJ2053	CHROMATOGRAPHY		7,5	v
1v	TBT4125	FOOD CHEMISTRY		7,5	v
1v	TBT4130	ENVIRONM BIOTECH		7,5	v
1v	TEP4215	ENERGY AND PROCESS		7,5	v
1v	TEP4250	MULTIPHASE TRANSPORT		7,5	v
1v	TEP4265	FOOD ENGINEERING		7,5	v
1v	TKJ4175	CHEMOMETRICS		7,5	v
1v	TKP4185	NUCLEAR POWER INTRO		7,5	v
1v	TKP4190	FABR/APPL NANOMAT		7,5	v
1v	TKT4140	NUM METH COMP LAB		7,5	v
1v	TMM4175	POLYMERS/COMPOSITES		7,5	v
1v	TPG4230	FIELD DEV/OPERATIONS		7,5	v
1v	TTK4135	OPTIMISATION/CONTROL		7,5	v
1V	TVM4145	WATER/WASTEW TREATM		7,5	v

o - compulsory courses
v - optional courses

v1 - at least 3 of these 4 courses must be selected
v2 - at least 1 of these courses must be selected

Ex 1h = Term 1, Exam Autumn
Ex 1v = Term 2, Exam Spring

1) The courses must be selected to obtain a total of 30 credits in each semester. Supplementary courses are not considered when planning the teaching and examination schedules.
2) The course must be chosen either in autumn (TKP4170) or in spring (TKP4171).
3) The course is not considered when planning the teaching and examination schedules.

FACULTY OF NATURAL SCIENCES AND TECHNOLOGY

MSC-PROGRAMME IN CHEMICAL ENGINEERING
(MSCHEMENG)

Term 3 and 4

Ex	Subject no.	Subject title	Note	Cr
		Specialization courses	1	
2h	TKP4515	CATALYS/PETROCHEM SC		7,5
2h	TKP4525	COLL/POLYMER CHEM SC		7,5
2h	TKP4535	ENVIRONM/REACT TECH SC		7,5
2h	TKP4555	PROCESS SYST ENG SC		7,5
2h	TKP4565	PULP/PAPER BIOREFIN SC		7,5
		Specialization projects	1	
2h	TKP4510	CATALYS/PETROCHEM SP		15,0
2h	TKP4511	CATALYS/PETROCHEM SP		7,5
2h	TKP4520	COLL/POLYMER CHEM SP		15,0
2h	TKP4521	COLL/POLYMER CHEM SP		7,5
2h	TKP4530	ENVIRONM/REACT TECH SP		15,0
2h	TKP4531	ENVIRONM/REACT TECH SP		7,5
2h	TKP4550	PROCESS SYST ENG SP		15,0
2h	TKP4551	PROCESS SYST ENG SP		7,5
2h	TKP4560	PULP/PAPER BIOREFIN SP		15,0
2h	TKP4561	PULP/PAPER BIOREFIN SP		7,5
		Supplementary courses	2	
2h	TBT4140	BIOCHEM ENGINEERING		7,5
2h	TKP4140	PROCESS CONTROL		7,5
2h	TKP4155	REACT KIN/CATALYSIS		7,5
2h	TKP4160	TRANSPORT PHENOMENA		7,5
2h	TMA4195	MATHEMATIC MODELLING		7,5
2h	TMA4215	NUMERIC MATHEMATICS		7,5
2h	TPG4105	PETROLEUM ENG BC		7,5
2h	TPG4140	NATURAL GAS		7,5
2h	TPK4120	SAFETY/RELIAB ANALYS		7,5
2h	TVM4145	WATER/WASTEW TREATM		7,5
		Master Thesis		
2v	TKP4900	CHEM PROCESS TECHN		30,0

Ex 2h = Term 3, Exam Autumn
Ex 2v = Term 4, Master Thesis Spring

1) One specialization course and one specialization project must be selected. The specializations are within the following five main profiles:
   Catalysis and Petrochemistry
   Colloid and Polymer Chemistry
   Process Systems Engineering
   Environmental Technology and Reactor Technology
   Pulp & Paper and Biorefinery
2) Supplementary courses must be selected to obtain a total of 30 credits per semester. The courses are not considered when planning the teaching and examination schedules.

FACULTY OF ENGINEERING SCIENCE AND TECHNOLOGY

MSC-PROGRAMME IN COASTAL AND MARINE CIVIL ENGINEERING (MSCOASTMAR)

Term 1, 2, 3 and 4

No admittance 2012/13

Ex	Subject no	Subject title	Note	Cr
		Compulsory courses		
1h	TBA4145	PORT/COAST FACILITI		7,5
1h	TBA4265	MARINE PHYS ENV		7,5
1v	-	EXP IN TEAM INT PROJ		7,5
1v	TBA4270	COASTAL ENGINEERING		7,5
		Optional courses	1	
1h	TBA4275	DYNAMIC RESPONSE		7,5
1h	TBA4325	SPREAD OF POLLUTION		7,5
1h	TBA5100	THEORETICAL SOIL MEC		7,5
1h	TKT4220	CONCRETE STRUC 2 AC		7,5
1h	TPK4120	SAFETY/RELIAB ANALYS		7,5
1h	AT327	ARCTIC OFFSHORE	2	10,0
1v	TBA5155	FOUNDATIONS/SLOPES		7,5
1v	TKT4135	MEC OF MATERIALS		7,5
1v	TKT4201	STRUCTURAL DYNAMICS		7,5
1v	TKT4215	CONCRETE TECHNOLOGY		7,5
1v	TMR4225	MARINE OPERATIONS		7,5
1v	AT205	FROZEN GROUND ENG	3	15,0
1v	AT208	THERM MECH PROP MAT	3	15,0
		Specialization	4	
2h	TBA4116	GEOTECHN ENG AC	5	7,5
2h	TBA4292	MARINE CIV ENG AC		7,5
2h	TBA4510	GEOTECHN ENG SP	5	7,5
2h	TBA4550	MARINE CIV ENG SP		7,5
2h	TBA4551	MARINE CIV ENG SP	6	15,0
		Supplementary courses	7	
2h	TBA4110	GEOTECH FIELD/LAB IN		7,5
2h	TBA4116	GEOTECH ENG AC		7,5
2h	TBA4292	MARINE CIV ENG AC		7,5
2h	TKT4108	DYNAMICS AC		7,5
2h	TMR4130	RISK SAFETY MAR TRAN		7,5
2h	AT301	INFRA CHANGING CLIM	3	10,0
2h	AT323	THERM MECH ICE SNOW	3	10,0
2h	AT327	ARCTIC OFFSHORE	2	10,0
	-	**Non-technical courses**	8	7,5
		Master Thesis	9	
2v	TBA4900	GEOTECH ENGINEERING	5	30,0
2v	TBA4920	MARINE CIVIL ENG		30,0

Ex 1h = Term 1, Exam Autumn
Ex 1v = Term 2, Exam Spring
Ex 2h = Term 3, Exam Autumn
Ex 2v = Term 4, Master Thesis Spring

cont.

1) Select two of the courses each term.
2) Two-week intensive course at UNIS, Svalbard. In agreement with the supervising professor. Check date of exam. Number of participants might be restricted.
3) These subjects requires that the student is at UNIS the whole semester. Special agreement with professor in charge is required.
4) A specialization course with the associated specialization project must be chosen. Generally specialization Marine Civil Engineering should be selected.
5) Specialization Geotechnics is an option for those who aim to specialize in Marine Geotechnics.
6) Specialization project of 15 credits is a special need for studentes aiming at a specialization in Arctic Marine Engineering in cooperation with UNIS and who are not at NTNU during the specialization semester.
7) One supplementary course must be chosen so that the total load for the semester is at least 30 credits. It shall be chosen from the list or among the optional courses listed for term 1 (1h). Check dates of exam. The courses are not considered when planning the teaching and examination schedules.
8) A non-technical course shall be chosen. Check language of teaching and date of exam.
9) Master thesis must be chosen. Students aiming a specialization in Arctic Marine Civil Engineering might in agreement with the supervising professor take the Master thesis at UNIS, Svalbard. Parts of the studies can be taken at UNIS, Svalbard. Check supplementary regulations. Studies at UNIS must be approved by the faculty.

FACULTY OF INFORMATION TECHNOLOGY, MATHEMATICS AND ELECTRICAL ENGINEERING

MSC-PROGRAMME IN ELECTRIC POWER ENGINEERING (MSELPOWER)

Term 1, 2, 3 and 4

Ex	Subject no.	Subject title	Note	Cr	Comp/ Opt.
		Compulsory and optional courses	1		
1h	TET4115	POWER SYST ANALYSIS		7,5	o
1h	TET4160	INSULATING MATERIALS		7,5	o
1h	TET4190	POWER ELECTRONICS RE		7,5	o
1h	TET5100	POWER ENG UPDATES		7,5	o
1v	-	EXP IN TEAM INT PROJ		7,5	o
1v	TEP4220	ENERGY/ENV CONSEQUEN	2	7,5	v
1v	TET4120	ELECTR DRIVES		7,5	v1
1v	TET4135	ENERGY PLANNING		7,5	v1
1v	TET4170	EL INSTALLATIONS	2	7,5	v1
1v	TET4175	POWER CONT SMART NET		7,5	v1
1v	TET4180	EL POW SYST STAB		7,5	v1
1v	TET4185	POWER MARKETS	2	7,5	v1
1v	TET4195	HIGH VOLTAGE EQUIPM		7,5	v1
1v	TET4200	MAR OFFSH POW SYST		7,5	v1
2h	TET4165	LIGHT AND LIGHTING		7,5	v
2h	TET5500	EL POWER ENG SP		15,0	o
2h	TET5505	EL POWER ENG SC		7,5	o
2h	TPK4120	SAFETY/REL ANALYSIS		7,5	v
2h	TPK5100	PROJ PLAN/CONTR		7,5	v
		Master Thesis			
2v	TET4910	ELEC POW ENG		30,0	o

o - compulsory courses
v - optional courses

v1 - at least two of these courses must be chosen

Ex 1h = Term 1, Exam Autumn
Ex 1v = Term 2, Exam Spring
Ex 2h = Term 3, Exam Autumn
Ex 2v = Term 4, Master Thesis Spring

1) In addition to the compulsory courses, the student must select courses so that the requirement of 60 credits pr year is met. Available courses are listed in the table. Other relevant courses may be accepted after application.
2) The course is not considered when planning the teaching and examination schedules.

FACULTY OF ENGINEERING SCIENCE AND TECHNOLOGY

MSC-PROGRAMME IN GEOTECHNICS AND GEOHAZARDS (MSGEOTECH)

Term 1, 2, 3 and 4

Ex	Subject no.	Subject title	Note	Cr
		Compulsory courses		
1h	TBA4110	GEOTECH FIELD/LAB IN		7,5
1h	TBA4231	APPLIED GEOMATICS		7,5
1h	TBA5100	THEORETICAL SOIL MEC		7,5
1h	TBA5150	GEOHAZARDS/RISK AN		7,5
1v	-	EXP IN TEAM INT PROJ		7,5
1v	TBA5155	FOUNDATIONS/SLOPES		7,5
1v	TGB5110	GEOLOGY TUNNELL BC		7,5
1v	TKT4201	STRUCTURAL DYNAMICS		7,5
2h	TBA4116	GEOTECH ENG AC		7,5
2h	TBA4510	GEOTECH ENG SP	1	7,5
2h	TGB5100	ROCK ENGINEERING AC		7,5
2h	-	ELECTIVE COURSE	2	7,5
		Master Thesis		
2v	TBA4900	GEOTECH ENGINEERING		30,0

Ex 1h = Term 1, Exam Autumn
Ex 1v = Term 2, Exam Spring
Ex 2h = Term 3, Exam Autumn
Ex 2v = Term 4, Master Thesis Spring

1) The primary choice is the combination TBA4510 (7,5 cr) together with an elective course (7,5 cr). In some case, when an appropriate elective course is hard to find, the combination may be exchanged with the 15 cr course TBA4511 Geotechnical Engineering, Specialization Project. This must be done in agreement with the project supervisor.
2) A technical or project-related course must be chosen.

FACULTY OF ENGINEERING SCIENCE AND TECHNOLOGY

MSC-PROGRAMME IN HYDROPOWER DEVELOPMENT
(MSB1)

Term 1, 2, 3 and 4

Ex	Subject no.	Subject title	Note	Cr
		Compulsory courses		
1h	TVM4105	HYDROLOGY		7,5
1h	TVM5115	DAM ENGINEERING		7,5
1h	TVM5125	HYDRAULIC DESIGN		7,5
1h	TVM5135	PLANNING HYDROPOWER		7,5
1v	-	EXP IN TEAM INT PROJ		7,5
1v	TGB5110	GEOLOGY TUNNELL BC		7,5
1v	TVM5132	PREF STUDY HYDRO DEV		7,5
1v	TVM5140	ECON ASSESM HYDROPOW		7,5
2h	TGB5100	ROCK ENGINEERING AC		7,5
2h	TVM4106	HYDRO MODELLING		7,5
2h	TVM5160	HEADWORKS/SEDIMENT		7,5
2h	TVM5171	ENV IMP HYDROPOWER		7,5
		Master Thesis	1	
2v	TBA4910	PROJ MANAGEMENT		30,0
2v	TGB4910	ROCK ENGINEERING		30,0
2v	TVM4915	HYDROPOWER DEVELOPMENT		30,0

Ex 1h = Term 1, Exam Autumn
Ex 1v = Term 2, Exam Spring
Ex 2h = Term 3, Exam Autumn
Ex 2v = Term 4, Master Thesis Spring

1) Choose one of the thesis.

FACULTY OF ENGINEERING SCIENCE AND TECHNOLOGY

MSC-PROGRAMME IN INDUSTRIAL ECOLOGY (MSINDECOL)

Term 1, 2, 3 and 4

Ex	Subject no	Subject title	Note	Cr	Specialization 1	Specialization 2
		Compulsory and optional courses	1			
1h	TEP4223	LIFE CYCLE ASSESS		7,5	o	o
1h	TFY4300	ENERGY ENVIR PHYSICS		7,5	v	v
1h	TIØ4195	ENV MAN CORP SOC RES	2	7,5	o	o
1h	TVM4162	INDUSTRIAL ECOLOGY		7,5	o	o
1h	SOS1002	RESEARCH METHODS	3	15,0	v	v
1v	-	EXP IN TEAM INT PROJ		7,5	o	o
1v	TEP4220	ENERGY/ENV CONSEQUEN		7,5	v	v
1v	TPD5100	SUS PROD DES AC		7,5	v	v
1v	TVM4160	MATERIAL FLOW ANALYS		7,5	o	v
1v	POL1003	POLITICS ENVIRONMENT		7,5	v	o
1v	POL3004	RESEARCH DESIGN	4	7,5	v	v
		Supplementary courses	5			
1h	TIØ4300	ENV SC ECOSYS SUST		7,5	v	v
1h	TPD4505	DESIGN THEORY SC		7,5	v	v
1v	KULT3304	TECHN INOV/SOC CH	6	15,0	v	v
1v	SØK1101	ENVIRONM RESOURCE		7,5	v	v
		Compulsory and optional courses	1			
2h	TEP4222	INPUT-OUTPUT ANALYS		7,5	o	v
2h	TIØ4525	SAFE HEALTH/ENV SC	7	7,5	v	v
2h	TPK4160	VALUE CHAIN CONTR		7,5	v	v
2h	POL3507	POLICY ANALYSIS	5,8	15,0	v	v
		Supplementary courses	1,5			
2h	TIØ4300	ENV SC ECOSYS SUST		7,5	v	v
2h	TPD4505	DESIGN THEORY SC		7,5	v	v
		Project and thesis preparation course	9			
2h	TBA4580	INDECOL PROJECT		15,0	v	-
2h	TEP5100	INDECOL PROJECT		15,0	v	-
2h	TIØ5235	INDECOL PROJECT	7	15,0	-	v
2h	TPD4190	DESIGN PROJECT	10	15,0	v	-
2h	TVM5175	INDECOL PROJECT		15,0	v	-
2h	POL3520	INDECOL PROJECT	4	15,0	-	v
		Master Thesis	9			
2v	TBA4950	INDUSTRIAL ECOLOGY		30,0	v	-
2v	TEP4930	INDUSTRIAL ECOLOGY		30,0	v	-
2v	TIØ4955	INDUSTRIAL ECOLOGY	7	30,0	-	v
2v	TPD4910	INDUSTRIAL ECOLOGY		30,0	v	-
2v	TVM4900	INDUSTRIAL ECOLOGY		30,0	v	-
2v	POL3920	INDUSTRIAL ECOLOGY	4	30,0	-	v

o = Compulsory courses
v = Optional courses

Ex 1h = Term 1, Exam Autumn
Ex 1v = Term 2, Exam Spring
Ex 2h = Term 3, Exam Autumn
Ex 2v = Term 4, Master Thesis Spring

cont.

1) Other optional/supplementary courses may be chosen from the NTNU course catalogue. The combination of optional/supplementary courses must be approved by the programme. The courses are selected so that the total weighting each term amounts to 30 credits (Cr).
2) May be taken in the second autumn semester, 2h.
3) If a student in Specialization 2, with a supervisor from the Dep. of Sociology and Political Science, does not already have this course in his bachelor degree, he must take it during the first semester. Exemptions may be granted when the student has a similar course from another institution.
4) This course is compulsory for students in Specialization 2 who want to write a project and a thesis with a supervisor from the Dep. of Sociology and Political Science.
5) The courses are not considered when planning the teaching and examination schedules.
6) Course given in Norwegian only.
7) This course is compulsory for students in Specialization 2 who want to write a project and a thesis with a supervisor from the Dep. of Industrial Economics and Technology Management.
8) The course is taught upon availability.
9) Students in Specialization 1 choose one of the options depending on which department their supervisor belongs to.
10) Can also be taken in the spring semester, 1v.

Specialization:
1 Environmental Systems Analysis
2 Environmental Politics and Management

For Specialization 2, in the second or third semester students must choose different compulsory courses depending on from which department they want to have a supervisor; from the Dep. of Industrial Economics and Technology Management or the Dep. of Sociology and Political Science. In order to have a supervisor from the Dep. of Sociology and Political Science the student must have at least 60 ECTS credits of Political Science courses in his bachelor degree.

FACULTY OF INFORMATION TECHNOLOGY, MATHEMATICS AND ELECTRICAL ENGINEERING

MSC-PROGRAMME IN INFORMATION SYSTEMS
(MSINFOSYST)

Term 1, 2, 3 and 4

Ex	Subject no.	Subject title	Note	Cr	Specialization 1	Specialization 2
		Compulosory and optional courses	1			
1h	TDT4235	SOFTWARE QUALITY		7,5	v	v
1h	TDT4237	SOFTWARE SECURITY		7,5	v	-
1h	TDT4245	COOPERATION TECHN		7,5	v	v
1h	TDT4250	MODEL-DRIVEN DEV IS		7,5	o	o
1h	TDT4290	CUSTOMER DRIVEN PROJ		15,0	o	o
1h	TPK5100	PROJ PLAN/CONTR		7,5	v	v
1v	-	EXP IN TEAM INT PROJ		7,5	o	o
1v	TDT4215	WEB INTELLIGENCE		7,5	o	o
1v	TDT4240	SOFTWARE ARCHITECT		7,5	v	v
1v	TDT4242	REQUIREMENT TEST		7,5	v	v
1v	TDT4252	MOD INFOSYST AC		7,5	v	o
1v	TTM4115	ENG DIST REAL SYST		7,5	v	-
2h	TDT4501	COMPUTER SCIENCE SP		15,0	o	o
2h	TDT4506	COMPUTER SCIENCE SC		7,5	o	o
2h	TBA5200	PROJ PLAN/ANALYSIS		7,5	v	v
2h	TDT4210	HEALTHCARE INFORM		7,5	v	v
2h	TIØ4180	INNOV MANAGEM		7,5	v	-
2h	IT3010	RESEARCH METHODOLOGY		7,5	v	-
2h	IT3604	ORGANIZATION/ICT		7,5	v	v
		Master Thesis				
2v	TDT4900	COMPU INFO SCIENCE		30,0	o	o

o - compulsory courses
v - optional courses

1) Optional courses must be selected to obtain a total of 30 credits in each semester.

Specialization:
1 Information Systems
2 Information Systems Engineering*

*Possible for students accepted for this specialization to have the 3rd semester at one of the order EUROMISE universities (NTNU, KTH, UPValencia, Politechnico Milano, UnivDelft, Twente, Sorbonne, Tech Univ Catalonia).

FACULTY OF NATURAL SCIENCES AND TECHNOLOGY

MSC-PROGRAMME IN LIGHT METALS PRODUCTION
(MSLIMETAL)

Term 3 and 4

Ex	Subject no.	Subject title	Note	Cr
		Compulsory courses		
2h	TMT4325	REFIN/RECYL METALS		7,5
2h	TMT4330	RES ENERGY ENVIRONM		7,5
2h	TMT5500	PROC MET ELECTR SP		15,0
		Master Thesis		
2v	TMT4905	MATR TECHN		30,0

Ex 2h = Term 3, Exam Autumn
Ex 2v = Term 4, Master Thesis Spring

FACULTY OF NATURAL SCIENCES AND TECHNOLOGY

MSC-PROGRAMME IN LIGHT METALS, SILICON AND FERROALLOY PRODUCTION (MSLISIFER)

Term 1, 2, 3 and 4

Ex	Subject no.	Subject title	Note	Cr
		Compulsory courses		
1h	TMT4155	HETEROGEN EQUILIBRIA		7,5
1h	TMT4253	ELECTROCHEM/ENERGY		7,5
1h	TMT4280	EXTRACT METALLURGY		7,5
1v	TMT4166	EXP MATR/ELECTR CHEM		7,5
1v	TMT4208	FLUID/HEAT TRANSF AC		7,5
1v	TMT4850	EXP IN TEAM INT PROJ		7,5
		Optional courses	1	
1h	TMT4145	CERAMIC ENGINEERING		7,5
1h	TMT4305	ELECTROMETALLURGY		7,5
1v	MT8301	CARBON MAT TECHN		7,5
1v	TMT5102	ELECTR LIGHT METALS		7,5
		Compulsory courses		
2h	TMT4325	REFIN/RECYL METALS		7,5
2h	TMT4330	RES ENERGY ENVIRONM		7,5
2h	TMT5500	PROC MET ELECTR SP		15,0
		Master Thesis		
2v	TMT4905	MATR TECHN		30,0

Ex 1h = Term 1, Exam Autumn
Ex 1v = Term 2, Exam Spring
Ex 2h = Term 3, Exam Autumn
Ex 2v = Term 4, Master Thesis Spring

1) Select one of the courses.

FACULTY OF ENGINEERING SCIENCE AND TECHNOLOGY

MSC-PROGRAMME IN MARINE TECHNOLOGY (MSN1)

Term 1, 2, 3 and 4

MARINE STRUCTURES

Ex	Subject no.	Subject title	Note	Cr	Specialization 1	2	3
		Compulsory and optional courses					
1h	TMR4115	DESIGN METHODS		7,5	v	v	-
1h	TMR4125	BUILD SHIPS/PLATF		7,5	v	v	-
1h	TMR4130	RISK ANALYSIS		7,5	v	-	-
1h	TMR4170	MARINE STRUCTURES BC	1	7,5	o	o	o
1h	TMR4190	FINITE ELEM METH		7,5	o	o	-
1h	TMR4200	FATIGUE/FRACTURE	2	7,5	v	v	-
1h	TMR4215	SEA LOADS		7,5	o	o	o
1h	TMR4235	STOCH THEORY SEALOAD		7,5	v	v	-
1h	TMR4275	MOD/SIM/AN DYN SYS		7,5	-	v	o
1h	TMR4290	MAR ELECTR PROP SYST		7,5	-	-	v
1h	TTK4115	LINEAR SYST THEORY		7,5	-	-	v
1h	TTK4150	NONLINEAR CONTR SYST		7,5	-	-	v
1v	-	EXP IN TEAM INT PRO		7,5	o	o	o
1v	TKT4145	FIN ELEM METH		7,5	v	-	-
1v	TMR4182	MARINE DYNAMICS	1	7,5	o	o	o
1v	TMR4195	DESIGN OFFSHOR STRUC		7,5	o	v	-
1v	TMR4205	BUCKLING/COLLAPS STR	2	7,5	v	-	-
1v	TMR4217	HYDRO HIGH-SPEED VEH		7,5	-	v	v
1v	TMR4220	NAVAL HYDRODYNAMICS		7,5	v	v	-
1v	TMR4225	MARINE OPERATIONS		7,5	v	v	v
1v	TMR4240	MARINE CONTROL SYST		7,5	-	-	o
1v	TTK4135	OPTIMISATION/CONTROL		7,5	-	-	v
1v	TTK4190	GUIDANCE/CONTROL		7,5	-	-	v
		Supplementary courses	3				
1h	TMR4135	FISH VESSEL/WORK DES		7,5	v	v	-
1v	TKT4145	FIN ELEM METH		7,5	-	-	v
1v	TMR4140	DES MAR PROD PLANTS		7,5	v	-	-
1v	TMR4195	DESIGN OFFSHORE STRUC		7,5	-	-	v
1v	TMR4217	HYDRO HIGH-SPEED VEH		7,5	v	-	-
1v	TMR4220	NAVAL HYDRODYNAMICS		7,5	-	-	v
1v	TMR4230	OCEANOGRAPHY		7,5	v	-	v
		Specialization courses					
2h	TMR4505	MARINE STRUCTURE SC		7,5	o	-	-
2h	TMR4515	MAR CONTR SYST SC		7,5	-	-	o
2h	TMR4525	MARINE HYDRODYN SC		7,5	-	o	-
		Specialization projects					
2h	TMR4500	MARINE STRUCTURE SP		7,5	o	-	-
2h	TMR4510	MAR CONTR SYST SP		7,5	-	-	o
2h	TMR4520	MARINE HYDRODYN SP		7,5	-	o	-

cont.

FACULTY OF ENGINEERING SCIENCE AND TECHNOLOGY

MSC-PROGRAMME IN MARINE TECHNOLOGY (MSN1)

Term 1, 2, 3 and 4

MARINE STRUCTURES

Ex	Subject no.	Subject title	Note	Cr	Specialization		
					1	2	3
		Supplementary courses	4				
2h	TMA4145	LINEAR METHODS		7,5	-	-	v
2h	TMR4115	DESIGN METHODS		7,5	v	v	-
2h	TMR4130	RISK ANALYSIS		7,5	v	-	-
2h	TMR4135	FISH VESSEL/WORK DES		7,5	v	-	-
2h	TMR4200	FATIGUE/FRACTURE		7,5	v	v	-
2h	TMR4235	STOCH THEORY SEALOAD		7,5	v	v	-
2h	TMR4275	MOD/SIM/AN DYN SYS		7,5	-	v	-
2h	TMR4290	MAR ELECTR PROP SYST		7,5	-	-	v
2h	TMR4300	EXP/NUM HYDRODYN		7,5	-	v	-
2h	TMR4305	ADV ANALY MAR STRUCT		7,5	v	-	-
2h	TTK4115	LINEAR SYST THEORY		7,5	-	-	v
2h	TTK4150	NONLINEAR CONTR SYST		7,5	-	-	v
		Master Thesis					
2v	TMR4900	MARINE STRUCTURES		30,0	o	o	o

o = compulsory course
v = optional course

Ex 1h = Term 1, Exam Autumn
Ex 1v = Term 2, Exam Spring
Ex 2h = Term 3, Exam Autumn
Ex 2v = Term 4, Master Thesis Spring

1) Compulsory course for students without the equivalent background.
2) Select at least one subject for the specialization Marine structures.
3) Supplementary courses are not considered when planning the teaching and examination schedules.
4) Select two supplementary courses. Courses are not considered when planning the teaching and examination schedules.

Specialization:
1 Marine structures
2 Marine hydrodynamics
3 Marine cybernetics

FACULTY OF ENGINEERING SCIENCE AND TECHNOLOGY

MSC-PROGRAMME IN MARINE TECHNOLOGY (MSN1)

Term 1 and 2

MARINE SYSTEMS ENGINEERING

Ex	Subject no.	Subject title	Note	Cr	Specialization 1	Specialization 4
		Compulsory and optional courses				
1h	TEP4185	NATURAL GAS TECHN	1	7,5	-	v
1h	TIØ4120	OP RESEARCH INTRO		7,5	o	-
1h	TMM4150	MAC DES/MECHATRON	1	7,5	-	v
1h	TMR4115	DESIGN METHODS		7,5	-	v
1h	TMR4125	SHIPBUILDING		7,5	-	v
1h	TMR4130	RISK ANALYSIS		7,5	o	v
1h	TMR4135	FISH VESSEL WORK DES		7,5	-	o
1h	TMR4137	SUST UTIL MAR RES		7,5	-	o
1h	TMR4290	MAR ELECTR PROP SYST		7,5	-	v
1h	TMR4295	DES OF MECH SYST		7,5	o	-
1h	TPK4120	SAFETY/REALIA ANALYS		7,5	o	-
1v	-	EXP IN TEAM INT PROJ		7,5	o	o
1v	TMR4120	UNDERWATER ENG BC		7,5	v	v
1v	TMR4140	DES MAR PROD PLANTS		7,5	-	o
1v	TMR4182	MARINE DYNAMICS		7,5	v	v
1v	TMR4260	SAFE OPER/MAINTEN		7,5	o	v
1v	TMR4280	INTERNAL COMB ENGINE		7,5	v	v
		Supplementary courses	2			
1h	BI3061	BIOL OCEAN		7,5	-	v
1h	TIØ4120	OP RESEARCH INTRO		7,5	-	v
1h	TMR4215	SEA LOADS		7,5	-	v
1h	TMR4275	MOD/SIM/AN DYN SYST		7,5	-	v
1h	TMR4295	DES OF MECH SYST		7,5	-	v
1h	TPK4160	VALUE CHAIN CONTROL		7,5	-	v
1h	TPK5100	PROJ PLAN/CONTR		7,5	-	v
1h	TTT4175	MARINE ACOUSTICS		7,5	-	v
1h	TVM4162	INDUSTRIAL ECOLOGY		7,5	-	v

o = compulsory course
v = optional course

Ex 1h = Term 1, Exam Autumn
Ex 1v = Term 2, Exam Spring

According to their specialization the students will be assigned to an academic supervisor in the first or beginning of the second semester. The combination of courses must be approved by the programme. The courses are selected so that the total weighting each term amounts to 30 credits (Cr).

1) Optional courses need to be approved by the responsible professor for the spesialization.
2) Courses are not considered when planning the teaching and examination schedules.

Specialization:
1 Technical Operation of Marine Systems
4 Fisheries and Marine Resources

FACULTY OF ENGINEERING SCIENCE AND TECHNOLOGY

MSC-PROGRAMME IN MARINE TECHNOLOGY (MSN1)

Term 1 and 2

MARINE SYSTEMS ENGINEERING - for students to TU Delft*

Ex	Subject no.	Subject title	Note	Cr	Specialization 2	Specialization 3
		Compulsory and optional courses				
1h	TEP4185	NATURAL GAS TECHN	1	7,5	v	v
1h	TMM4150	MACH DES/MECHATRON	1	7,5	v	v
1h	TMR4115	DESIGN METHODS		7,5	-	o
1h	TMR4135	FISH VESSEL WORK DES		7,5	-	v
1h	TMR4137	SUST UTIL MAR RES		7,5	-	v
1h	TMR4170	MARINE STRUCTURES BC		7,5	-	v
1h	TMR4275	MOD/SIM/AN DYN SYST		7,5	o	v
1h	TMR4290	MAR ELECTR PROP SYST		7,5	o	v
1h	TMR4295	DES OF MECH SYST		7,5	o	-
		Supplementary courses	2			
1h	TIØ4120	OP RESEARCH INTRO		7,5	-	v
1h	TMR4125	SHIPBUILDING		7,5	-	v
1h	TMR4130	RISK ANALYSIS		7,5	-	v
1h	TMR4215	SEA LOADS		7,5	-	v
1h	TPK4160	VALUE CHAIN CONTROL		7,5	-	v
		Compulsory courses at Delft	3			
1v	MT044	NAVAL SHIP DESIGN		3,0	-	o
1v	MT113	DESIGN ADV VEHICLES		3,0	v	o
1v	MT218	MECHATRONIC MAR TECH		5,0	o	v
1v	MT313	SHIPPING MANAGEMENT		3,0	-	o
1v	MT525	MARINE PROP SYSTEMS		2,0	o	v
1v	MT713	MARINE ENGINEERING C		2,0	o	o
1v	WB4408A	DIESEL ENGINES A		4,0	o	-
1v	WB4408B	DIESEL ENGINES B		4,0	o	-
		Optional courses at Delft	3			

o = compulsory course
v = optional course

Ex 1h = Term 1, Exam Autumn
Ex 1v = Term 2, Exam Spring

According to their specialization the students will be assigned to an academic supervisor in the first or beginning of the second semester. The combination of courses must be approved by the programme. The courses are selected so that the total weighting each term amounts to 30 credits (Cr). The Department will give a list of optional subjects.

1) Optional courses need to be approved by the responsible professor for the specialization.
2) Courses are not considered when planning the teaching and examination schedules.
3) Information on the subjects, see http://blackboard.tudelft.nl. Altogether 30 ECTS pr. semester.

Specialization:
2 Marine Engineering
3 Marine Systems Design and Logistics

*For students who choose the option Marine Systems Engineering and the main profiles Marine Engineering or Marine Systems Design and Logistics, there is an obligatory 6-months stay at TU Delft in the Netherlands in the second semester of the first year.

FACULTY OF ENGINEERING SCIENCE AND TECHNOLOGY

MSC-PROGRAMME IN MARINE TECHNOLOGY (MSN1)

Term 3 and 4

MARINE SYSTEMS ENGINEERING

Ex	Subject no.	Subject title	Note	Cr	Specialization			
					1	2	3	4
		Specialization courses						
2h	TMR4535	MARINE MACHINERY SC		7,5	-	o	-	-
2h	TMR4555	OPER TECHN SC		7,5	o	-	-	-
2h	TMR4565	MAR SYST DESIGN SC		7,5	-	-	o	-
2h	TMR4575	FISH/MAR RES SC		7,5	-	-	-	o
		Specialization projects						
2h	TMR4530	MARINE MACHINERY SP		7,5	-	o	-	-
2h	TMR4550	OPER TECHN SP		7,5	o	-	-	-
2h	TMR4560	MAR SYST DESIGN SP		7,5	-	-	o	-
2h	TMR4570	FISH/MAR RES SP		7,5	-	-	-	o
		Supplementary courses	1					
2h	TEP4212	GAS CLEAN/EMISS CONT		7,5	-	v	-	-
2h	TIØ4120	OP RESEARCH INTRO		7,5	v	-	-	v
2h	TIØ4130	OPT METHODS		7,5	-	-	v	-
2h	TMM4135	ANALYS/ASSESMENT		7,5	-	v	-	-
2h	TMM4220	INNOV-WITHOUT LIMITS		7,5	v	-	-	-
2h	TMR4115	DESIGN METHODS		7,5	v	v	-	v
2h	TMR4125	SHIPBUILDING		7,5	v	v	v	v
2h	TMR4130	RISK ANALYSIS		7,5	-	-	v	-
2h	TMR4135	FISH VESSEL WORK DES		7,5	v	-	-	-
2h	TMR4137	SUST UTIL MAR RES		7,5	v	-	v	-
2h	TMR4190	FINITE ELEM METH		7,5	v	-	v	v
2h	TMR4200	FATIGUE/FRACTURE		7,5	v	-	v	-
2h	TMR4215	SEA LOADS		7,5	-	v	v	v
2h	TMR4275	MOD/SIM/AN DYN SYST		7,5	-	v	v	v
2h	TMR4290	MAR ELECTR PROP SYST		7,5	-	v	v	v
2h	TPK4160	VALUE CHAIN CONTROL		7,5	-	-	v	v
2h	TPK5100	PROJ PLAN/CONTR		7,5	v	-	v	v
2h	TTK4115	LIN SYST THEORY		7,5	-	v	-	-
2h	TTT4175	MARINE ACOUSTICS		7,5	-	-	-	v
2h	TVM4162	INDUSTRIAL ECOLOGY		7,5	-	-	-	v
		Master Thesis						
2v	TMR4905	MARINE SYST		30,0	o	o	o	o

o = compulsory course
v = optional course

Ex 2h = Term 3, Exam Autumn
Ex 2v = Term 4, Master Thesis Spring

According to their specialization the students will be assigned to an academic supervisor in the first or beginning of the second semester. The combination of courses must be approved by the programme. The courses are selected so that the total weighting each term amounts to 30 credits (Cr).

1) Select two supplementary courses. Courses are not considered when planning the teaching and examination schedules.

Specialization:
1 Technical Operation of Marine Systems
2 Marine Engineering
3 Marine Systems Design and Logistics
4 Fisheries and Marine Resources

FACULTY OF ENGINEERING SCIENCE AND TECHNOLOGY

MSC-PROGRAMME IN MARINE TECHNOLOGY (MSN1)

Term 1, 2, 3 and 4

NAUTICAL SCIENCE

No admittance 2012/13

Ex	Subject no.	Subject title	Note	Cr
		Compulsory courses		
1h	TMA4120	CALCULUS 4K	1	7,5
1h	TMR4215	SEA LOADS		7,5
1h	TMR5230	NAUTICAL SCIENCE BC		7,5
1h	TTT4175	MAR ACOUSTICS		7,5
1v	-	EXP IN TEAM INT PROJ		7,5
1v	TMR4182	MARINE DYNAMICS	1	7,5
1v	TTT4150	NAVIGATION SYSTEMS		7,5
		Optional courses		
1v	TMR4217	HYDRO HIGH-SPEED VEH	2	7,5
1v	TMR4220	NAVAL HYDRODYNAMICS	2	7,5
1v	TMR4225	MARINE OPERATIONS		7,5
1v	TMR4230	OCEANOGRAPHY		7,5
1v	TMR4240	MARINE CONTROL SYST	3	7,5
1v	TTK4105	CONTROL SYSTEMS	4	7,5
1v	TTK4190	GUIDANCE AND CONTROL	2	7,5
		Compulsory courses		
2h	TMR5240	NAUTICAL SCIENCE AC		7,5
2h	TMR5250	NAUTICAL SCIENCE PRO		7,5
2h	TMR5260	NAUTICAL SCIENCE SC		7,5
		Optional courses		
2h	TMR4130	RISK ANALYSIS		7,5
2h	TMR4235	STOCH THEORY SEALOAD		7,5
		Master Thesis		
2v	TMR4925	NAUTICAL SCIENCE		30,0

o = Compulsory course
v = Optional course

Ex 1h = Term 1, Exam Autumn
Ex 1v = Term 2, Exam Spring
Ex 2h = Term 3, Exam Autumn
Ex 2v = Term 4, Master Thesis Spring

The courses have to be selected so that the total weighting each term amounts to 30 credtis (Cr).

1) Compulsory course for students without the equivalent background.
2) The course is not considered when planning the teaching and examination schedules.
3) TTK4105 or equivalent is necessary background for TMR4240.
4) It is recommended to study this course in parallel to TMR4240.

FACULTY OF NATURAL SCIENCES AND TECHNOLOGY

MSC-PROGRAMME IN MEDICAL TECHNOLOGY (MSMEDTEK)

Term 1, 2, 3 and 4

Ex	Subject no.	Subject title	Note	Cr	Specialization 1	2	3	4
		Compulsory and optional courses						
1h	FY2302	BIOPHYSICS I		7,5	-	-	-	v
1h	IT3604	ORGANIZATION/ICT		7,5	-	v	-	-
1h	MFEL3010	MED FOR STUD OF NAT		7,5	o	o	o	o
1h	TDT4173	MACH LEAR/CASE REAS		7,5	-	-	v	-
1h	TDT4200	PARALLEL COMPUTING		7,5	-	-	v	-
1h	TDT4210	HEALTHCARE INFORM		7,5	-	o	v	-
1h	TDT4245	COOPERATION TECHN		7,5	-	v	-	-
1h	TDT4250	MODEL DRIVEN DEV IS		7,5	-	v	-	-
1h	TFY4225	NUCLEAR/RAD PHYS		7,5	-	-	-	o
1h	TFY4265	BIOPHYSICAL MICROMET		7,5	-	-	-	v
1h	TFY4310	MOLECULAR BIOPHYSICS		7,5	-	-	-	v
1h	TTK4160	MEDICAL IMAGING		7,5	o	-	v	-
1h	TTK4170	MOD/IDENT BIOL SYS		7,5	-	-	-	v
1h	TTT4130	DIGITAL COMMUN		7,5	v	-	-	-
1h	TTT4155	REMOTE SENSING		7,5	v	-	-	-
1h	TTT4175	MARINE ACOUSTICS		7,5	v	-	-	-
1v	-	EXP IN TEAM INT PROJ		7,5	o	o	o	o
1v	DT8112	RES TOP HEALTH INFO		7,5	-	v	-	-
1v	MOL4010	MOL BIOL FOR TECH	1	7,5	-	-	o	-
1v	MTEK3001	APPL BIOINFORMATICS		7,5	-	-	o	-
1v	TBT4165	SYST BIOL/BIOL NETW		7,5	-	-	v	-
1v	TDT4215	WEB INTELLIGENCE		7,5	-	v	-	-
1v	TDT4240	SOFTWARE ARCHITECT		7,5	-	v	-	-
1v	TDT4242	REQUIREMENTS/TESTING		7,5	-	o	-	-
1v	TFY4280	SIGNAL PROCESSING		7,5	-	-	-	o
1v	TFY4315	BIOPHYS IONIZ RADIAT		7,5	-	-	-	o
1v	TFY4320	MEDICAL PHYSICS		7,5	v	-	v	o
1v	TMA4300	COMP STAT METHODS		7,5	-	-	v	-
1v	TTK4165	SIGNAL PROC MED IMAG		7,5	o	-	-	-
1v	TTT4125	INFO THEORY COD/COMP		7,5	o	-	-	-
1v	TTT4240	STAT SIGNAL THEORY		7,5	v	-	-	-
1v	TTT4245	MARINE ACOUSTICS II		7,5	v	-	-	-

cont.

FACULTY OF NATURAL SCIENCES AND TECHNOLOGY

MSC-PROGRAMME IN MEDICAL TECHNOLOGY (MSMEDTEK)

Ex	Subject no.	Subject title	Note	Cr	Specialization				
					1	2	3	4	5*
2h	BI3016	MOLECULAR CELL BIOL		7,5	-	-	-	-	o
2h	DT8119	CLIN DEC SUPPORT		7,5	-	v	-	-	-
2h	TDT4173	MACH LEAR/CASE REAS		7,5	-	v	-	-	-
2h	TDT4287	ALGORITHMS BIOINFO		7,5	-	-	o	-	-
2h	TKT4150	BIOMECHANICS		7,5	-	-	-	v	-
2h	TTK4160	MEDICAL IMAGING		7,5	-	-	-	v	-
2h	TTT4135	MULTIMEDIA SIGNAL PRO		7,5	o	-	-	-	-
		Specialization courses	2						
2h	TBI4505	BIOTECHNOLOGY SC	3	7,5	-	-	-	-	v
2h	TBT4505	BIOTECHNOLOGY SC	3	7,5	-	-	-	-	v
2h	TDT4535	BIOINFORMATICS SC		7,5	-	-	o	-	-
2h	TDT4545	HEALTHCARE INFO SC		7,5	-	o	-	-	-
2h	TFY4505	BIOPHYSICS SC		7,5	-	-	-	o	-
2h	TTK4555	ENG CYBERNETICS SC	4	7,5	v	-	-	-	-
2h	TTT4525	SIGNAL PROC SC	4	7,5	v	-	-	-	-
		Specialization projects							
2h	TBI4500	BIOTECHNOLOGY SP	3	15,0	-	-	-	-	v
2h	TBT4500	BIOTECHNOLOGY SP	3	15,0	-	-	-	-	v
2h	TDT4530	BIOINFORMATICS SP		15,0	-	-	o	-	-
2h	TDT4540	HEALTHCARE INFO SP		15,0	-	o	-	-	-
2h	TFY4500	BIOPHYSICS SP		15,0	-	-	-	o	-
2h	TTK4550	ENG CYBERNETICS SP	4	15,0	v	-	-	-	-
2h	TTT4520	SIGNAL PROC SP	4	15,0	v	-	-	-	-
		Master Thesis							
2v	TBI4900	BIOTECHNOLOGY	3	30,0	-	-	-	-	v
2v	TBT4900	BIOTECHNOLOGY	3	30,0	-	-	-	-	v
2v	TDT4900	COMP INFORM SCIENCE		30,0	-	o	o	-	-
2v	TFY4910	BIOPHYSICS		30,0	-	-	-	o	-
2v	TTK4900	ENGINEERING CYBERN	4	30,0	v	-	-	-	-
2v	TTT4900	SIGN PROC/COM	4	30,0	v	-	-	-	-

* Follows the Examination regulations for the Natural Sciences studies.

o = compulsory courses
v - optional courses

Ex 1h = Term 1, Exam Autumn
Ex 1v = Term 2, Exam Spring
Ex 2h = Term 3, Exam Autumn
Ex 2v = Term 4, Master Thesis Spring

Specialization:
1 Medical Signal Processing and Imaging
2 Healthcare Informatics
3 Bioinformatics
4 Biophysics and Medical Physics
5 Medical Biotechnology

1) Lectures are held in Norwegian, but PBL exercises and presentations are given in English.
2) Other relevant ordinary subjects may be chosen, if taught in english.
3) Students at specialization Medical Biotechnology should choose one of the combinations TBI4500/TBI4505/TBI4900 or TBT4500/TBT4505/TBT4900.
4) Students at specialization Medical Signal Processing and Imaging should choose one of the combinations TTK4550/TTK4555/TTK4900 or TTT4520/TTT4525/TTT4900.

FACULTY OF ENGINEERING SCIENCE AND TECHNOLOGY

MSC-PROGRAMME IN NATURAL GAS TECHNOLOGY (MSGASTECH)

Term 1, 2, 3 and 4

Ex	Subject no.	Subject title	Note	Cr
		Compulsory courses		
1h	TEP4185	NATURAL GAS TECHN		7,5
1h	TPG4140	NATURAL GAS		7,5
1v	-	EXP IN TEAM INT PROJ		7,5
		Optional courses	1	
1h	TEP4135	ENG FLUID MECH 1		7,5
1h	TEP4156	VISC FLOW/BOUND LAYER		7,5
1h	TEP4165	COMP HEAT/FLUID FLOW		7,5
1h	TEP4180	EXP METH PROC ENG		7,5
1h	TEP4240	SYSTEM SIMULATION		7,5
1h	TKP4170	PROCESS DESIGN PROJ		7,5
1h	TPK4120	SAFETY/RELIABILITY	2	7,5
1v	TEP4150	ENERGY MANAGEM/TECH	2,3	7,5
1v	TEP4170	HEAT/COMBUST TECH		7,5
1v	TEP4195	TURBO MACHINERY		7,5
1v	TEP4215	ENERG UTIL/PROC INT		7,5
1v	TEP4250	MULTIPHASE TRANSPORT		7,5
1v	TEP4255	HEAT PUMP PROC SYST	2	7,5
1v	TKP4150	PETROCH/OIL REFINING		7,5
1v	TMT4285	HYDROGEN TECHN	2	7,5
1v	TPG4135	PROC OF PETR		7,5
1v	TPG5110	PETROLEUM ECONOMICS	2	7,5
		Specialization courses	4	
2h	TEP4515	THERMAL ENERGY SC		7,5
2h	TEP4525	INDUS PROC TECHN SC		7,5
2h	TEP4545	ENG FLUID MECH SC		7,5
		Specialization projects	5	
2h	TEP4510	THERMAL ENERGY SP		15,0
2h	TEP4520	INDUS PROC TECHN SP		15,0
2h	TEP4540	ENG FLUID MECH SP		15,0
		Supplementary courses	6	
2h	TEP4135	ENG FLUID MECH		7,5
2h	TEP4165	COMP HEAT/FLUID FLOW		7,5
2h	TEP4180	EXP METH PROC ENG		7,5
2h	TEP4240	SYSTEM SIMULATION		7,5
2h	TKP4170	PROCESS DESIGN PROJ		7,5
2h	TPK4120	SAFETY RELIABILITY		7,5
		Master Thesis	7	
2v	TEP4905	INDUS PROC TECHN		30,0
2v	TEP4915	THERMAL ENERGY		30,0
2v	TEP4925	ENG FLUID MECH		30,0

Ex 1h = Term 1, Exam Autumn
Ex 1v = Term 2, Exam Spring

1) Optional courses must be selected to obtain a total of 30 credits in each semester.
2) The course is not considered when planning the teaching and examination schedules.
3) The course will not be taught in 2012/13.
4) One specialization course must be chosen.
5) One specialization project must be chosen according to the selected specialization course.
6) Supplementary courses must be selected to obtain a total of 30 credits per semester. The courses are not considered when planning the teaching and examination schedules.
7) The master thesis must be chosen according to the selected specialization.

FACULTY OF ENGINEERING SCIENCE AND TECHNOLOGY

MSC-PROGRAMME IN PETROLEUM ENGINEERING (MSG1)

Term 1, 2, 3 and 4

Ex	Subject no.	Subject title	Note	Cr	Specialization 1	2	3
		Compulsory and optional courses	1				
1h	TPG4117	UNCONVENT RESERVOIRS		7,5	v	-	-
1h	TPG4145	RESERVOIR FLUIDS		7,5	o	v	o
1h	TPG4150	RESERVOIR REC TECHN		7,5	o	o	o
1h	TPG4151	UNDERGROUND DECISION	2	7,5	v	v	v
1h	TPG4162	3D VISUAL PETR DATA	3	7,5	v	v	v
1h	TPG4175	PETROPHYSICS FUND		7,5	v	v	v
1h	TPG4177	CARB RESERVOIR CHAR		7,5	v	v	v
1h	TPG4215	HIGH DEV DRILLING		7,5	v	o	v
1h	TPG4235	WELL TESTING AC		7,5	v	v	v
1h	TPG5100	MATH/COMPUTER METHOD		7,5	o	o	o
1h	TPG5140	SPEC SUB SURF MAN	3	7,5	v	v	v
1v	-	EXP IN TEAM INT PROJ		7,5	o	o	o
1v	TPG4115	RES PROP DETERMIN		7,5	v	-	-
1v	TPG4160	RESERVOIR SIMULATION		7,5	o	v	v
1v	TPG4180	PETR PHYS INTERPR AC	2	7,5	v	v	v
1v	TPG4205	DRILL TECH PR CONTR		7,5	v	v	v
1v	TPG4220	DRILLING FLUID		7,5	v	o	v
1v	TPG4225	FRACTURED RESERVOIRS	3	7,5	v	-	-
1v	TPG4230	FIELD DEVELOPMENT		7,5	v	v	o
1v	TPG5110	PETROLEUM ECONOMICS	3	7,5	v	v	v
2h	TPG4140	NATURAL GAS		7,5	v	v	v
2h	TPG4177	CARB RESERVOIR CHAR		7,5	v	v	v
2h	TPG4185	FORMATION MECHANICS		7,5	v	v	v
2h	TPG4235	WELL TESTING AC		7,5	v	v	v
		Specialization courses					
2h	TPG4515	PETR PROD SC		7,5	-	-	o
2h	TPG4525	DRILLING ENG SC		7,5	-	o	-
2h	TPG4535	RESERVOIR ENG SC		7,5	o	-	-
		Specialization project					
2h	TPG4510	PETR PROD SP		15,0	-	-	o
2h	TPG4520	DRILLING ENG SP		15,0	-	o	-
2h	TPG4530	RESERVOIR ENG SP		15,0	o	-	-
		Master Thesis					
2v	TPG4920	PETROL ENGINEERING		30,0	o	o	o

o - compulsory courses
v - optional courses

Ex 1h = Term 1, Exam Autumn
Ex 1v = Term 2, Exam Spring
Ex 2h = Term 3, Exam Autumn
Ex 2v = Term 4, Master Thesis Spring

1) The courses must be selected to obtain a total of 30 credits in each semester. In addition to the subjects listed 2h students can choose from 1h Petroleum Engineering, 1h Petroleum Geosciences and PhD-courses.
2) The course will not be taught in 2012/13.
3) The course is not considered when planning the teaching and examination schedules.

Specialization:
1 Reservoir Engineering and Petrophysics
2 Drilling Engineering
3 Petroleum Production

FACULTY OF ENGINEERING SCIENCE AND TECHNOLOGY

MSC-PROGRAMME IN PETROLEUM GEOSCIENCES (MSG2)

Term 1, 2, 3 and 4

Ex	Subject no.	Subject title	Note	Cr	Specialization 1	Specialization 2
		Compulsory and optional courses	1			
1h	TGB4160	PETROLEUM GEOLOGY		7,5	v	o
1h	TGB4265	STRUCT GEOLOGY AC	2	7,5	v	v
1h	TPG4120	MIN ENG/ENV GEOPH	2	7,5	v	v
1h	TPG4125	SEISMIC WAVE PROP		7,5	o	o
1h	TPG4150	RESERVOIR REC TECHN		7,5	v	v
1h	TPG4162	3D VISUAL PETR DATA	2	7,5	v	v
1h	TPG4175	PETROPHYSICS BC		7,5	v	v
1h	TPG4177	CARB RESERVOIR CHAR		7,5	v	v
1h	TPG4185	FORMATION MECHANICS		7,5	v	v
1h	TPG4195	GRAVIMETR MAGNETOMET		7,5	v	v
1h	TPG5100	APPL COMPUTER METHODS		7,5	o	o
1h	TPG5130	SEISMIC PROCESSING	2	7,5	v	v
1v	-	EXP IN TEAM INT PROJ		7,5	o	o
1v	TGB4135	BASIN ANALYSIS		7,5	v	v
1v	TGB4170	DIAGENESIS/RES QUAL		7,5	v	v
1v	TGB4275	GEOL RES MOD		7,5	v	v
1v	TPG4130	SEISMIC INTERPRET		7,5	o	o
1v	TPG4170	RESERVOIR SEISMICS		7,5	v	v
1v	TPG4180	PETR PHYS INTERPR AC	3	7,5	v	v
1v	TPG5110	PETROLEUM ECONOMICS		7,5	v	v
2h	TPG4151	UNDERGROUND DECISION	3	7,5	-	v
2h	TPG4177	CARB RESERVOIR CHAR		7,5	-	v
2h	TPG4190	SEISMIC DATA		7,5	o	v
		Specialization courses				
2h	TGB4565	PETR GEOLOGY SC		7,5	-	o
2h	TPG4545	PETR GEOPHYS SC		7,5	o	-
		Specialization project				
2h	TGB4560	PETR GEOLOGY SP		15,0	-	o
2h	TPG4540	PETR GEOPHYS SP		15,0	o	-
		Master Thesis				
2v	TGB4915	PETROLEUM GEOSCIENCE		30,0	-	o
2v	TPG4925	PETROLEUM GEOSCIENCE		30,0	o	-

o - compulsory courses
v - optional courses

Ex 1h = Term 1, Exam Autumn
Ex 1v = Term 2, Exam Spring
Ex 2h = Term 3, Exam Autumn
Ex 2v = Term 4, Master Thesis Spring

1) The courses must be selected to obtain a total of 30 credits in each semester. In addition to the subject listed 2h (TPG4190) students in specialization 2 can choose from 1h Petroleum Engineering, 1h Petroleum Geosciences and PhD-courses.
2) The course is not considered when planning the teaching and examination schedules.
3) The course will not be taught in 2012/13.

Specialization:
1 Petroleum Geophysics
2 Petroleum Geology

FACULTY OF SOCIAL SCIENCES AND TECHNOLOGY MANAGEMENT

MSC-PROGRAMME IN PROJECT MANAGEMENT (MSPROMAN)

Term 1, 2, 3 and 4

Ex	Subject no.	Subject title	Note	Cr	Specialization		
					1	2	3
		Compulsory courses	1				
1h	TBA5200	PROJ PLAN/ANALYSIS		7,5	o	o	o
1h	TIØ5200	PROJ ORG		7,5	o	o	o
1h	TPK5100	PROJ PLAN/CONTR		7,5	o	o	o
1v	-	EXP IN TEAM INT PROJ		7,5	o	o	o
1v	TIØ5210	PROGRAM MGMT		7,5	o	o	o
1v	TIØ5215	GLOB GOV OF SUPPLY		7,5	o	o	o
		Optional courses	1,2				
1h	TBA4315	ECONOM/TRANSP INFRA		7,5	v	-	-
1h	TBA5150	GEOHAZARDS/RISK AN		7,5	v	-	-
1h	TIØ4265	STRATEGIC MANAGEMENT		7,5	-	v	-
1h	TIØ4345	MAN BUS RELAT/NETW		7,5	-	v	-
1h	TPK4140	MAINTEN MANAGEMENT		7,5	-	-	v
1h	TPK4160	VALUE CHAIN CONTR		7,5	-	-	v
1h	TPK5160	RISK ANALYSIS		7,5	-	-	v
1v	TGB5110	ENG GEO/TUNNEL BC		7,5	v	-	-
1v	TIØ4175	PURCH LOG MGMT		7,5	-	v	-
1v	TPK4110	QUAL/PERFORMANCE		7,5	-	-	v
		Supplementary courses	1				
1v	TIØ4140	PROJ EVAL FINANCING		7,5	-	v	-
1v	TIØ4235	IND MARK		7,5	-	v	-
1v	TPK4135	LOG/PROD MANAGEMENT		7,5	-	-	v
1v	TPK4185	IND SYST ENG		7,5	-	-	v
1v	TPK5165	RAMS ENG/MANAGEMENT		7,5	-	-	v
		Specialization courses					
2h	TBA4128	PRO MAN AC		7,5	o	-	-
2h	TIØ5225	PRO MAN SC		7,5	-	o	-
2h	TPK4505	PRO MAN SC		7,5	-	-	o
		Specialization projects					
2h	TBA4530	PRO MAN SP		15,0	o	-	-
2h	TIØ5230	PRO MAN SP		15,0	-	o	-
2h	TPK4500	PRO MAN SP		15,0	-	-	o
2h	TPK5115	RISK MANAGEM PROJ		7,5	o	o	o
		Master Thesis					
2v	TBA4910	PROJ MANAGEMENT		30,0	o	-	-
2v	TIØ4920	PROJ MANAGEMENT		30,0	-	o	-
2v	TPK4905	PROJ MANAGEMENT		30,0	-	-	o

o - compulsory courses v - optional courses

Ex 1h = Term 1, Exam Autumn Ex 2h = Term 3, Exam Autumn
Ex 1v = Term 2, Exam Spring Ex 2v = Term 4, Master Thesis Spring

1) The courses must be selected to obtain a total of 30 credits per semester. The supplementary courses are not considered when planning the teaching and examination schedules.
2) Other courses within your field of technology may be chosen with Faculty permission.

Specialization:
1. Civil Engineering
2. Industrial Engineering
3. Production and Quality Engineering

FACULTY OF ENGINEERING SCIENCE AND TECHNOLOGY

MSC-PROGRAMME IN RELIABILITY, AVAILABILITY, MAINTAINABILITY AND SAFETY (MSRAMS)

Term 1, 2, 3 and 4

Ex	Subject no.	Subject title	Note	Cr
		Compulsory courses		
1h	TPK4120	SAFETY/RELIABILITY		7,5
1h	TPK4140	MAIN MANAGEMENT		7,5
1h	TPK5115	RISK MANAGEM PROJ		7,5
1h	TPK5160	RISK ANALYSIS		7,5
1v	-	EXP IN TEAM INT PROJ		7,5
1v	TIØ4205	SHE-METH/TOOLS SHE	1	7,5
1v	TMA4255	APPLIED STATISTICS	1	7,5
1v	TMA4275	LIFETIME ANALYSIS	1	7,5
1v	TPK5165	RAMS ENG/MANAGEMENT		7,5
2h	SPRÅK3501	SCIENTIFIC COM	2	7,5
2h	TIØ4201	RISK GOVERNANCE	2	7,5
2h	TPK4510	PROD QUALITY ENG SP		15,0
2h	TPK5170	RAMS OPTIMISATION		7,5
		Master Thesis		
2v	TPK4900	PROD QUALITY ENG		30,0

Ex 1h = Term 1, Exam Autumn
Ex 1v = Term 2, Exam Spring
Ex 2h = Term 3, Exam Autumn
Ex 2v = Term 4, Master Thesis Spring

1) Select two of the courses.
2) Select one of the courses.

FACULTY OF NATURAL SCIENCES AND TECHNOLOGY

MSC-PROGRAMME IN SILICON AND FERROALLOY PRODUCTION (MSSILFER)

Term 3 and 4

Ex	Subject no.	Subject title	Note	Cr
		Compulsory courses		
2h	TMT4222	MECH PROP OF METALS		7,5
2h	TMT4330	RES ENERGY ENVIRONM		7,5
2h	TMT5500	PROC MET ELECTR SP		15,0
		Master Thesis		
2v	TMT4905	MATR TECHN		30,0

Ex 2h = Term 3, Exam Autumn
Ex 2v = Term 4, Master Thesis Spring

FACULTY OF INFORMATION TECHNOLOGY, MATHEMATICS AND ELECTRICAL ENGINEERING

MSC-PROGRAMME IN TELEMATICS - COMMUNICATION NETWORKS AND NETWORKED SERVICES (MSTCNNS)

Term 1, 2, 3 and 4

Ex	Subject no.	Subject title	Note	Cr	Specialization 1	2	3
		Compulsory courses					
1h	TTM4105	ACCESS TRANS NETW		7,5	o	o	o
1h	TTM4110	DEP AND PER WITH SIM		7,5	o	o	o
1h	TTM4150	INTERNET NETW ARCH		7,5	o	o	o
1v	-	EXP IN TEAM INT PROJ		7,5	o	o	o
1v	TTM4115	ENG DIST REAL SYS		7,5	o	o	o
1v	TTM4135	INFORMATION SEC		7,5	o	o	o
		Optional courses	1				
1h	TDT4235	SOFTWARE QUALITY		7,5	v	v	v
1h	TDT4237	SOFTWARE SECURITY		7,5	v	v	v
1v	TTM4120	DEPENDABLE SYSTEMS		7,5	v	v	v
1v	TTM4128	NETW AND SERV MAN		7,5	v	v	v
1v	TTM4130	SERV INT AND MOB		7,5	v	v	v
		Specialization courses					
2h	TTM4516	NETWORKS/QUALITY SC		7,5	o	-	-
2h	TTM4526	SERV AND SYST ENG SC		7,5	-	o	-
2h	TTM4536	INFO SECURITY SC		7,5	-	-	o
		Specialization projects					
2h	TTM4511	NETWORKS/QUALITY SP		15,0	o	-	-
2h	TTM4521	SERV AND SYST ENG SP		15,0	-	o	-
2h	TTM4531	INFO SECURITY SP		15,0	-	-	o
2h	TTM4137	WIRELESS SECURITY		7,5	-	-	o
2h	TTM4155	TELETRAFFIC THEORY		7,5	o	-	-
2h	TTM4160	SOFTWARE DESIGN		7,5	-	o	-
		Master Thesis					
2v	TTM4905	NETWORKS/SERVICES		30,0	o	o	o

o = compulsory courses
v = optional courses

Ex 1h = Term 1, Exam Autumn
Ex 1v = Term 2, Exam Spring
Ex 2h = Term 3, Exam Autumn
Ex 2v = Term 4, Master Thesis Spring

1) Select one of the courses each semester.

Specialization:
1 Networks and Quality of Service
2 Services and Systems Engineering
3 Information Security

FACULTY OF ENGINEERING SCIENCE AND TECHNOLOGY

MSC-PROGRAMME IN INNOVATIVE SUSTAINABLE ENERGY ENGINEERING (MSISEE)

Term 2 *
Term 3 and 4

CARBON DIOXIDE CAPTURE

Ex	Subject no.	Subject title	Note	Cr
		Optional courses	1	
1v	-	EXP IN TEAM INT PROJ		7,5
1v	TEP4150	ENERGY MANAGEM/TECH	2,3	7,5
1v	TEP4170	HEAT/COMBUST TECH		7,5
1v	TEP4195	TURBO MACHINERY		7,5
1v	TEP4215	ENERG UTIL/PROC INT		7,5
1v	TEP4250	MULTIPHASE TRANSPORT		7,5
1v	TEP4255	HEAT PUMP PROC SYST	2	7,5
1v	TKP4150	PETROCH/OIL REFINING		7,5
1v	TMT4285	HYDROGEN TECHN	2	7,5
1v	TPG4135	PROC OF PETR		7,5
		Specialization courses	4	
2h	TEP4515	THERMAL ENERGY SC		7,5
2h	TEP4525	INDUS PROC TECHN SC		7,5
		Specialization projects	5	
2h	TEP4510	THERMAL ENERGY SP		15,0
2h	TEP4520	INDUS PROC TECHN SP		15,0
		Supplementary courses	6	
2h	TEP4135	ENG FLUID MECH 1		7,5
2h	TEP4165	COMP HEAT/FLUID FLOW		7,5
2h	TEP4180	EXP METH PROC ENG		7,5
2h	TEP4240	SYSTEM SIMULATION		7,5
2h	TKP4105	SEPARATION TECHN		7,5
2h	TKP4170	PROCESS DESIGN PROJ		7,5
2h	TPK4120	SAFETY RELIABILITY		7,5
		Master Thesis	7	
2v	TEP4905	INDUS PROC TECHN		30,0
2v	TEP4915	THERMAL ENERGY		30,0

Ex 1v = Term 2, Exam Spring
Ex 2h = Term 3, Exam Autumn
Ex 2v = Term 4, Master Thesis Spring

1) Optional courses must be selected to obtain a total of 30 credits in each semester.
2) The course is not considered when planning the teaching and examination schedules.
3) The course will not be taught in 2012/13.
4) One specialization course must be chosen.
5) One specialization project must be chosen according to the selected specialization course.
6) Supplementary courses must be selected to obtain a total of 30 credits per semester. The courses are not considered when planning the teaching and examination schedules.
7) The master thesis must be chosen according to the selected specialization.

The Innovative and Sustainable Energy Engineering (ISEE) programme is a joint Nordic master programme between six Nordic Universities in five Nordic Countries.

* All students will start the first semester at KTH, Stockholm.

For further information see
http://www.ntnu.no/studies/msc-sustainable-energy-engineering
http://www.nordicmaster.eu/

FACULTY OF ENGINEERING SCIENCE AND TECHNOLOGY

MSC-PROGRAMME IN INNOVATIVE SUSTAINABLE ENERGY ENGINEERING (MSISEE)

Term 2*
Term 3 and 4

INDUSTRIAL ECOLOGY

Ex	Subject no	Subject title	Note	Cr
		Compulsory courses		
1v	TEP4220	ENERGY/ENV CONSEQUEN		7,5
1v	TVM4160	MATERIAL FLOW ANALYS		7,5
		Optional courses	1	
1v	-	EXP IN TEAM INT PROJ		7,5
1v	TPD5100	SUSTAINABLE PD AC		7,5
1v	KULT3304	TECHN INOV/SOC CH	2	15,0
1v	POL1003	POLITICS ENVIRONM		7,5
1v	SØK1101	ENVIRONM RESOURCE		7,5
		Optional courses	1	
2h	TEP4222	INPUT-OUTPUT ANALYS		7,5
2h	TEP4223	LIFE CYCLE ASSESSM		7,5
2h	TPD4505	DESIGN THEORY SC	3	7,5
2h	TPK4160	VALUE CHAIN CONTR		7,5
2h	TVM4162	INDUSTRIAL ECOLOGY		7,5
2h	POL3507	POLICY ANALYSIS	3	15,0
		Project and thesis preparation course	4	
2h	TEP5100	INDECOL PROJECT		15,0
2h	TPD4500	PRODUCT DESIGN 9 SP	3	15,0
2h	TVM5175	INDECOL PROJECT		15,0
		Master Thesis	5	
2v	TEP4930	INDUSTRIAL ECOLOGY		30,0
2v	TPD4910	INDUSTRIAL ECOLOGY		30,0
2v	TVM4900	INDUSTRIAL ECOLOGY		30,0

Ex 1v = Term 2, Exam Spring
Ex 2h = Term 3, Exam Autumn
Ex 2v = Term 4, Master Thesis Spring

1) According to their disciplinary background, students choose optional courses from both the list of Industrial Ecology courses and from the list of Master and PhD level courses. The combination of courses must be approved by the programme. The courses are selected so that the total weighting each term amounts to 30 credits (Cr).
2) Course given in Norwegian only.
3) The courses are co-requisites.
4) In the first semester, students will be assigned to an academic supervisor. This supervisor guides the student through the programme. The students choose optional courses, project and thesis preparation courses according to their specialization and in agreement with their supervisors. Students choose one of the listed project courses. The courses are not considered when planning the teaching and examination schedules.
5) The master thesis must be chosen according to the selected specialization.

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* All students will start the first semester at KTH, Stockholm.

For further information see
http://www.ntnu.no/studies/msc-sustainable-energy-engineering
http://www.nordicmaster.eu/

MASTER OF ARTS IN DANCE STUDIES

Knowledge

Master graduates in dance studies
• have specialised knowledge about application and development of dance studies
• have knowledge about theory and methods in the fields such as analysis, history, anthropology and theory of dance
• have knowledge about the central and the most actual research topics in the field

Skills

Master graduates in dance studies
• can use the knowledge and methods to implement analytical projects on a high level
• can use knowledge to develop an in-depth project in a particular field of dance
• can run independent projects based on research

General competences

Master graduates in dance studies
• can approach phenomena from different perspectives
• can present or perform arguments in oral and written form using an appropriate terminology
• can develop ideas and formulate problems in the field of studies; can collect, use and present subject matter, give advice and make professional evaluations

Admission requirements

The programme is open to both international and Norwegian students. Admittance to the programme requires a bachelor's degree in dance studies or another relevant discipline combined with good background in dance, or other equivalent education. Possible admission to the programme of study requires a minimum of an average grade of C or the equivalent. C is however, not a guarantee for admission.

Course overview

Codes	Course	Credits	Semester	Restricted admission
DANS3003	Dance Analysis	15	Autumn	
DANS3002	Individual project	7,5	Autumn and Spring	
DANS3004	Individual project	15	Autumn and Spring	
DANS3010	Master Thesis	30	Autumn and Spring	Yes 1)
DANS3011	Ethnochoreology (IPEDAM)	7,5	Spring	Yes 2)

1) Requires admission to Nordic Master in Dance Studies
2) EU-financed course in collaboration with nine other European universities and teachers from all over the world. Admission is limited depending on the resources and where the students come from. See the department's webpage for more information.

The Table of Structure

Below follows an overview of the structure of the Nordic master in Dance Studies:

Semester	7,5 ECTS Credits	7,5 ECTS Credits	7,5 ECTS Credits	7,5 ECTS Credits
4th semester Spring	DANS3010 *Master's Thesis in Dance Studies* (NTNU)		Dance Anthropology (University of Tampere)	
3rd semester Autumn	DANS3010 *Master's Thesis in Dance Studies* (NTNU)		Dance History (University of Copenhagen)	
2nd semester Spring	Dance and Cultural Theory (University of Stockholm)		Elective course (NTNU or University of Stockholm)	Elective course (NTNU or University of Stockholm)
1st semester Autumn	DANS3003 *Dance Analysis* (NTNU intensive course early september)		*Elective course (NTNU or University of Stockholm)*	

Regulations of accreditation

When it comes to the accreditation of external training / education abroad, each case must be assessed individually. See general rules for equivalency. Application for transfer of Norwegian degrees is to be sent to the department. Application for recognition of foreign degrees is to be sent to the faculty. Those who are admitted to the Nordic Master's program in Dance studies have the opportunity to fulfil these requirements until the submission of master's thesis as stated in the individual master agreement.

Development and structure

The master programme in dance studies includes four joint courses: *Dance analysis* taught at NTNU (15 ECTS), *Dance and cultural theory* taught at University of Stockholm (15 ECTS), *Dance history* taught at University of Copenhagen (15 ECTS) and *Dance anthropology* taught at University of Tampere (15 ECTS). The master thesis is 30 ECTS.

Additionally each partner university has to provide at least one freely chosen course of minimum 7, 5 ECTS. These courses are first of all meant for university's own students, but are open to all students as well. These study plans are considered in the agreement among universities and automatically recognized as part of the master study.

NTNU suggest six courses to choose freely from. Aesthetic is provided under the codes FI2101 *Spesialemne I i filosofi* (15 ECTS) or FI2103 *Spesialemne III i filosofi* (7, 5 ECTS), (NTNU). For more information, please, contact the Department of Philosophy, NTNU. Additionally, Department of Music provides DANS3002 *Individual project* (7, 5 ECTS), DANS3004 *Individual project* (15 ECTS) and DANS3011 *Etnochoreology* (7, 5 ECTS).

University of Stockholm provides following free-chosen courses: TVARKI *Arkivuppgift* (7,5 ECTS), TVKIAN *Kulturelle Iscensättningar* (15 ECTS), TVFLPR *Fältarbete/praktik* (7,5 ECTS).
University of Copenhagen provides following free-chosen courses: *Studieelement 307 – Det frie emne II* (15 ECTS), *Studieelement 308 – Det frie emne III* (7,5 ECTS), *Studieelement 309 – Det frie emne IV* (7,5 ECTS) and *Studielement 310 – Teknikk II: Teknikk, improvisation, komposition og formidling* (15 ECTS)
It is possible to apply for recognition of other free-chosen courses, if they are useful for the master thesis.

MASTER OF ARTS IN DANCE KNOWLEDGE, PRACTICE AND HERITAGE (CHOREOMUNDUS)

Learning outcomes

Choreomundus is a two-year full time programme taught over four semesters at the four partner universities: Norwegian University of Science and Technology (NTNU), Blaise Pascal University (UBP), Scientific University of Szeged (SZTE), and University of Roehampton (URL). Students who successfully complete the programme gain 120 ECTS (European Credit Transfer System). They will be awarded a Joint Master's degree carrying the Erasmus Mundus label with diploma supplement. Every successful participant graduates simultaneously from the four European universities of the Choreomundus consortium.
During the course of study, students are introduced to theoretical, epistemological and methodological issues concerning the concept of Dance Heritage, with a focus on ethnographic material. This includes examples from the Nordic countries, from Eastern and Western Europe, from South Asia, Africa and Aboriginal Australia. Further examples will be provided by visiting scholars. The programme is committed to both movement and contextual analyses and has been designed to provide all students with a common scientific training to equip them with the intellectual tools necessary to analyse dance cross-culturally and to deal with dance as Intangible Cultural Heritage in diverse professional contexts. Fieldwork is an important feature, and brief field trips are undertaken in all four countries to allow students to engage fully with a number of european cultures. Moreover, an intensive period of fieldwork during the summer between the first and the second year, in a country of the student's choice is a prelude to the dissertation/thesis and a prerequisite to the successful completion of the Master's degree.

Knowledge

Master graduates in Choreomundus

- have specialised knowledge about development of dance studies
- have knowledge about theory and methods in the fields such as analysis, anthropology and theory of dance
- have knowledge about the central and the most actual research topics in the field
- have in-depth knowledge about Intangible Cultural Heritage

Skills

Master graduates in Choreomundus

- can use the knowledge and various methods to analyse dance on a high level
- can run independent fieldwork projects and do corresponding research
- can read and write dances notated in advanced Labanotation

General competences

Master graduates in Choreomundus

- can approach phenomena from different perspectives
- can present or perform arguments in oral and written form using an appropriate terminology
- can develop ideas and formulate problems in the field of studies; can collect, use and present subject matter, give advice and make professional evaluations

Admission requirements

Applications are invited from individuals who have:

- A first degree (equivalent to 180 ECTS) from a recognised higher education institution (university, college, conservatoire) preferably in dance studies, anthropology, folklore, heritage studies or in related subjects (drama and/or theatre, music, sports and human movement studies, sociology, cultural studies) or equivalent professional experience.
- English Language qualification equivalent to the International English Language Testing System (IELTS) Level 6.5 in each band (Listening, Reading, Writing and Speaking).
- Two letters of recommendation supporting their application.
- Expertise in or understanding of dance or related movement practices (rituals, games, martial arts and physical theatre) which can be demonstrated through one or more of the following:

1) A DVD or online film/video clip of no more than three minutes duration, showing their own dancing, choreography or other relevant performances or productions, or their teaching
2) An essay of no more than three pages long, focusing either on the contextual and/or movement aspects of a dance or other related practice
3) A relevant publication.

Programme map and mobility of students

Year 1- Semesters 1 & 2: Students spend their first year of study either at NTNU Trondheim (Group A) or at UBP Clermont-Ferrand (Group B). They are divided between the two universities according to the desired supervision focus for their master's dissertation/thesis. This will be more practically oriented with a focus on dance practice and movement analysis at NTNU or more theoretically oriented with a focus on contextual analysis at UBP. All students will, however, be trained in both perspectives through the two first year intensive courses (see below Programme content), one held in each of the two universities.

Year 1 – Semester 2: By the beginning of the second semester students will have chosen the topic for their dissertation/thesis. They will undertake the necessary fieldwork during the period at the end of semester 2 and beginning of semester 3.

Year 2 – Semester 3: In the second academic year, all students go to SZTE Szeged for their third semester of the study. The focus here will be on the documentation and archiving of dance and other movement structures, with further training in movement analysis. Students will begin analysing their fieldwork data for their dissertation.

Year 2 – Semester 4: For the fourth and final semester of the programme, students will go to URL London. Courses will focus on anthropological analyses of dance in the contemporary context of post-colonialism, globalisation, transnationalism, and multiculturalism. Students will finalise the process of writing up their dissertation, which they shall submit by the end of July.

Development and structure: Semester Breakdown

Below follows a semester breakdown of the structure of the Choreomundus Master's Programme for both study tracks:

Study option/Study track: Ethnochoreology:

Semester	30 ECTS Credits per semester

4th semester Spring: ***Roehampton*** *(joint courses across the two study tracks)*	• *The Performance of Heritage: Dance in Museums, Galleries and Historic Sites* (10 ECTS)
	• *Extended Essay* (Dissertation 3) (10 ECTS)
	• One of following elective courses:
	  ○ *Dance in Culturally Diverse Societies* (10 ECTS)
	  ○ *Boundaries of the Body: Ritual, Dance and Performance* (10 ECTS)

3rd semester Autumn: ***Szeged*** *(joint courses across the two study tracks)*	• *Dance Heritage, Individual Creativity* (5 ECTS) • *From Field to Archive* (5 ECTS) • *Research Methods* (Dissertation 2) (10 ECTS) • 10 ECTS elective courses *)
2nd semester Spring ***Blaise Pascal and NTNU***	• *Critical Perspectives on Intangible Cultural Heritage* (Intensiv Programme 2 at UBP) (15 ECTS) • DANS3004 *Individual Project* (15 ECTS) on the topics Dance as Knowledge (equivalent to a workload of 5 ECTS) and Analysing Dance – Dissertation 1 (equivalent to a workload of 10 ECTS)
1st semester Autumn ***NTNU***	• DANS3003 *Dance Analysis* (Intensive Programme 1 at NTNU) (15 ECTS) • DANS3002 *Individual Project* (7,5 ECTS) *on the topic Field and archiving techniques in dance and music* • DANS3014 *Labanotation* (7,5 ECTS)
*) A list of courses will be announced prior to the beginning of the semester.	
Joint courses across the two study tracks are highlighted in blue.	

Study option/Study track: Anthropology:

Semester	30 ECTS Credits per semester

4th semester Spring: ***Roehampton*** *(joint courses across the two study tracks)*	• *The Performance of Heritage: Dance in Museums, Galleries and Historic Sites* (10 ECTS)
	• *Extended Essay (Dissertation 3)* (10 ECTS)
	• One of following elective courses:
	  ○ *Dance in Culturally Diverse Societies* (10 ECTS)
	  ○ *Boundaries of the Body: Ritual, Dance and Performance* (10 ECTS)

3rd semester Autumn: ***Szeged*** *(joint courses across the two study tracks)*	• *Dance Heritage, Individual Creativity* (5 ECTS) • *From Field to Archive* (5 ECTS) • *Research Methods* (Dissertation 2) (10 ECTS) • 10 ECTS elective courses *)
2nd semester Spring ***Blaise Pascal***	• *Critical Perspectives on Intangible Cultural Heritage* (Intensive Programme 2 at UBP) (15 ECTS) • *Transmitting Dance as Embodied Culture, Knowledge and Experience* (5 ECTS) • *Conceptual and Methodological Issues for Fieldwork (Dissertation 1)* (10 ECTS)
1st semester Autumn ***NTNU and Blaise Pascal***	• DANS3003 *Dance Analysis* (Intensive Programme 1 at NTNU) (15 ECTS) • *Anthropological analyses of dance (10 ECTS)* • *Ethnographic research methods: Fieldwork, interview and other techniques (5 ECTS)*
*) A list of courses will be announced prior to the beginning of the semester.	
Joint courses across the two study tracks are highlighted in blue.	

More information

More information is available on the web page of the programme: www.choreomundus.org

MASTER OF PHILOSOPHY (M.PHIL.) IN ENGLISH LINGUISTICS AND LANGUAGE ACQUISITION

The Department of Modern Foreign Languages offers an international Master's programme: Master of Philosophy (abbreviated 'M. Phil.') in English Linguistics and Language Acquisition.

Learning Outcome

This programme provides the basis for a career in public and private sector organisations where there is a demand for a high level of competence in the fields of English language and linguistics, language acquisition, or language and cognition, for example, expertise in how humans comprehend and use language in speech and writing.

The programme also provides the basis for further postgraduate education / doctoral research with a specialisation in language acquisition, language processing and/or English linguistics; or any career where analysis, development, text production and communication play an essential role.

Knowledge

The candidate

- is familiar with theoretical concepts and frameworks, and methods involved in the study of language acquisition, language and cognition, language processing and English linguistics,
- is acquainted with central questions and past and current debates in the subject area, and can compare, contrast and evaluate different approaches,
- has acquired in-depth specialist knowledge from the writing of his/her masters thesis on a self-chosen topic within the fields of language acquisition, language processing, language and cognition and/or English language and linguistics.

Skills

The candidate

- is able, using English, to apply an array of precise theoretical linguistic concepts in approaching and analysing a variety of different questions,
- is able to communicate in English, both orally and in writing, in formal and academic contexts using forms appropriate to the subject area,
- is able to identify relevant topics and questions within the subject area,
- knows how to identify and locate source materials within the subject area, and is able to make critical use of these.

General competence

The candidate

- is able to formulate productive research questions and to assess the suitability and validity of different methodologies,
- is able to plan and carry out a research project of substantial scope under supervision,
- is able to make use of a range of research tools in a research investigation,
- knows how to apply ethical standards in research, for example standards concerning the use and citation of sources and the handling of data that has been collected,
- is able to work with, to create an overview of, and to identify the main points in, large amounts of text,
- is able to create and organise an extensive written document in accordance with specific guidelines and requirements.

Admission/Entry requirements

The programme is open to Quota Programme applicants and to applicants with other sources of financing. Applicants should hold a B.A. or an equivalent degree in English or Linguistics with a sufficient background in topics related to English language or linguistics. Only candidates with a minimum of 20 ECTS in English language/linguistics courses will be considered for acceptance.

Successful applicants to the Master's programme must meet the minimum average grade requirement for admission, which is the grade C by the Norwegian grading scale, or equivalent approved minimum grade.

Officially certified copies of all educational certificates, including transcripts and diplomas from secondary school and university education, must be submitted.

An English proficiency test must be included. Applicants must pass either the TOEFL with a minimum paper score of 550 (230 computer) or the IELTS with 6.0 or better. Citizens of Ireland, the UK, the US, Canada, Australia and New Zealand do not have to submit TOEFL/IELTS test results. This is also the case for applicants who have spent at least one year in any of these countries, attending higher secondary school or university. Applicants from African countries with a B.A./B.Sc./B.Eng. degree where the language of instruction has been English and those who have passed English as a subject at GCE A-level with grade C or better are also exempted. Applicants with a university degree in English language (B.A. in English) are also exempted from the English language proficiency test requirement. Please be aware that applicants from Asian countries (for example Bangladesh, India, Nepal, Pakistan, Sri Lanka, Thailand, and Vietnam) with a B.A./ B.Sc./ B.Eng. degree where the language of instruction has been English are not exempted from the English language requirements, except for candidates holding a B.A. degree in English.

Courses

Course code	Course title	ECTS credits	Semester	Restricted admission
ENG2153	First and Second Language Acquisition	7.5	Spring	
ENG2155	Theoretical Approaches to English Language	7.5	Autumn	
ENG3122	Cognitive and Theoretical Aspects of Language	15	Spring	
ENG3123	Translation	7.5	Spring	
ENG3510	Topics in Semantics	7.5	Autumn	
ENG3920	Master's Thesis in English Linguistics and Language Acquisition	60	Autumn and spring	Yes[1]
SPRÅK3000	Theories and Methods in Linguistics	15	Autumn	

[1]Admission to the course requires admission to the M. Phil.-programme.

Programme components

The table below shows how a Master of Philosophy in English Linguistics and Language Acquisition is usually built up.

Semester	7.5 credits	7.5 credits	7.5 credits	7.5 credits
Spring 4th semester	ENG3920 Master's Thesis in English Linguistics and Language Acquisition			
Autumn 3rd semester				
Spring 2nd semester	ENG3122 Cognitive and Theoretical Aspects of Language		ENG3123 Translation	ENG2153 First and Second Language Acquisition
Autumn 1st semester	SPRÅK3000 Theories and Methods in Linguistics		ENG3510 Topics in Semantics	ENG2155 Theoretical Approaches to English Language

The range of topics that could be offered in the programme includes advanced topics in modern English syntax, studies of the lexicon, first language acquisition and second language acquisition studies, translation theory and communication studies.

Students who wish to include other courses offered by The Department of Modern Foreign Languages, or from the list of courses offered at the Department of Language and Communication Studies, should contact the Department of Modern Foreign Languages for further information regarding the possibilities for an individual curriculum.

The department offers supervision in the syntax/semantics of modern English, first and second language acquisition, the syntax/semantics interface and theories on contemporary information structure.

In their second semester in the programme, students should choose a topic for their Master's thesis. A supervisor will be appointed for each student based on his or her choice of topic. By the end of the second semester, students have to submit a project proposal for their Master's thesis. The project proposal must be approved by the Department of Modern Foreign Languages.

After the first year of studies, during the period mid-June to mid-August, candidates are given the opportunity to go back to their home countries to do field-work if this is necessary for the completion of their thesis. Students who are supported by the Quota Programme are awarded an extra grant to cover field-trip expenses.

MASTER OF PHILOSOPHY (M. PHIL.) IN LINGUISTICS: THEORETICAL, DESCRIPTIVE AND DIGITAL APPROACHES

This degree is also known as the 'International M. Phil in Linguistics'.

Admission requirements

Applicants should hold a B.A. or equivalent degree in Linguistics or an equivalent degree with a sufficient emphasis on topics related to Linguistics. Only candidates with a minimum of three Linguistics courses will be considered.

Applicants to the Master's programme must meet the minimum average grade requirement for admission, which is the grade C by the Norwegian grading scale, or equivalent approved minimum grade

Officially certified copies of all educational certificates, including transcripts and diplomas from secondary school and university education, must be submitted.
An English proficiency test result must be included. Applicants must pass either the TOEFL with a minimum paper score of 550 (230 computer) or the IELTS with a mark of 6.0 or better. Citizens of Ireland, the UK, the US, Canada, Australia and New Zealand do not have to submit TOEFL/IELTS test results. This is also the case for applicants who have spent at least one year in one of these countries, and who have attended higher secondary school or university there. Applicants from African countries with a BA/BSc/BEng degree for which the language of instruction has been English, and those who have passed English as a subject at GCE A-level with grade C or better, are also exempted from the language requirement. Applicants with a university degree in English language (BA in English) are also exempted from the language requirement. Please be aware that applicants from Asian countries (for example Bangladesh, India, Nepal, Pakistan, Sri Lanka, Thailand, and Vietnam) with a BA/BSc/BEng degree for which the language of instruction has been English are not exempted from the English language requirement, except for candidates holding a BA degree in English.

NB! The Programme is also open to non-quota programme applicants.

Course outline

The M.Phil. Programme requires two years of full-time study, and starts in the autumn term. The ECTS credits are divided between courses comprising of a total of 75 ECTS credits, and a thesis of 45 ECTS credits. 60 ECTS credits represent the normal workload for a full-time student for one academic year. LING2211 and LING3301 are compulsory courses. The other courses may include both intermediate courses (LING2xxx courses) and master's courses (LING3xxx courses) of the candidate’s choice from the first table below, in addition to maximum one of the interdisciplinary topics listed in the second table below. At least 45 ECTS credits must have a course code LING3xxx (master's level). The courses are selected from those offered to regular students in the department. It is expected that the second semester of the second year shall be devoted exclusively to work on the master’s thesis.

Topics offered in the programme

The range of topics that may be offered represents a subset of the topics offered in the regular Bachelor's and Master's Programmes in Linguistics, namely:

Course code	Course title	ECTS credits	Semester	Restricted admission
LING2208	Digital methods for speech and text processing	15	Spring	
LING2211	Semantics and Syntax	15	Autumn 1)	
LING3000	Chosen Topic	7,5	Spring	
LING3304	Phonology	7,5	Autumn 1)	
LING3305	Pragmatics	7,5	Autumn 1)	
LING3302	Master's Course II in Syntax and Semantics	15	Autumn	
LING3308	Master's Course in Phonology	7,5	Spring	
LING3309	Master's Course in Pragmatics	7,5	Spring	
LING3392	M. Phil. Thesis in Linguistics	45	Autumn and Spring	Yes 2)
1) Compulsory courses in the M. Phil in Linguistics. 2) LING3392: Requires admission to the study programme Master of Philosophy in Linguistics.				

Interdisciplinary topics

The following courses are approved in an M.Phil. in Linguistics. Maximum one of the following courses may be admitted in the degree. More information about the courses is to be found in the course descriptions in the respective curricula.

Course code	Course title	ECTS credits	Semester	Restricted admission
FON1101	Introduction to Phonetics	15	Autumn	
ENG2153	First and Second Language Acquisition	7,5	Spring	
ENG3122	Cognitive and Theoretical Aspects of Language 1)	15	Spring	
TDT4275	Natural Language Interface	7,5	Spring	
1) Students who choose ENG3122 are exempted from LING2206 and LING3000				

M.Phil. in Linguistics:

The table below shows how an M. Phil. in Linguistics can be built up:

Semester	**7,5 credits**	**7,5 credits**	**7,5 credits**	**7,5 credits**
Spring 4th semester	LING3392 M. Phil. Thesis			
Autumn 3rd semester	LING3392 M. Phil. Thesis		LING3302 Master's Course in Syntax and Semantics	
Spring 2nd semester	LING2208 Digital Methods for speech and text processing *)		LING3308 Master's Course in Phonology	and LING3309 Master's Course in Pragmatics
Autumn 1st semester	LING2211 Semantics and Syntax		LING3304 Phonology	LING3305 Pragmatics
*) LING2208 can be replaced by LING3000 and TDT4275.				

MASTER OF PHILOSOPHY IN CHILDHOOD STUDIES

Approved by the Board at NTNU 30.08.2005, with changes made by the Faculty of Social Sciences and Technology Management 20.12.2011.

INTRODUCTION

The Norwegian Centre for Child Research (NOSEB) offers an interdisciplinary, international master's programme in Childhood Studies. The degree is awarded by the Faculty of Social Sciences and Technology Management at NTNU and administered by NOSEB. The master's programme offers an advanced education in interdisciplinary social studies of children and childhood.

Aim of the programme

The programme aims at providing the student with:

- Knowledge and perspectives regarding contemporary debates in childhood studies.
- Knowledge on how childhoods and children's lives vary and are shaped by historical, social, cultural, political, economic and everyday life contexts.
- Knowledge on international and regional conventions on children's rights and how they might be used to improve children's wellbeing.
- Skills to carry out independent research on children's lives and on childhood as a social phenomenon.
- The skill of promoting children's views and perspectives in public services.

In addition, the programme aims at providing the student with the following general competencies:

- Practical training in planning and carrying out project work and research on children's lives in different settings and contexts.
- Skills in working in national and international organizations where multicultural work environment is a norm.
- Academic communication skills (writing and verbal) and reflexivity in contexts in which several parties are involved.

Furthermore, a main focus of the programme is to generate knowledge about childhood, children's life-worlds, and the politics of childhood in changing societies. The programme will give a broad introduction to different theoretical and methodological perspectives and key concepts in contemporary social and historical research on children and childhood. The central issue is childhood and related themes such as generation, gender, class, identity and ethnicity, as these take form through varying processes like globalisation, institutionalisation, consumption and commercialisation.

The master's programme is theoretically and methodologically related to interdisciplinary social studies of childhood. A child perspective, including participatory approaches and conducting research with children, represents a main integrative approach. The UN Convention on the Rights of the Child (CRC) is discussed as a tool to promote children's well-being worldwide. Important topics are children as participants in play, education, child labour, community building, and the social, political and economic reproduction of society in general. CRC can be seen as part of globalisation processes, producing particular images of what it means to be a child. An important aim is to encourage comprehensive insights in and an understanding of how the globalised conditions under which children grow up affect 'local' and 'national' childhoods in both the global North and the global South. The ways in which children themselves explore and experience their everyday lives and childhoods are also explored.

Employment opportunities

The MPhil in Childhood Studies qualifies for work related to research, teaching, supervision and consultancy in the fields of children, welfare and social development. The master's programme will be relevant for building a career related to children and childhood in different public sectors in governmental organisations. This may include policy and planning for children's living conditions in ministries and institutions which concern children, both locally and internationally. Another important area is non-governmental organisations (NGOs), such as Save the Children and the Red Cross.

ADMISSION REQUIREMENTS

The master's programme accepts students financed by the Quota Programme, Norwegian/Nordic students, as well as international students with individual funding. The total number of admitted students is 20-25 per year.

Admittance to the programme requires a bachelor's degree in the social sciences or humanities, or other equivalent education. The average grade of the degree must be at least C by the Norwegian grading system, or equivalent, as decided by NTNU. A background in childhood studies, social anthropology, geography, sociology or history is recommended.

The language of instruction is English, and applicants must document their English proficiency by achieving a passing grade from a Norwegian upper secondary school (videregående skole) or through a standardized test (TOEFL 550/230/80 paper-based/computer-based/internet-based or IELTS with 6.0 or better). Applicants may document their English proficiency in other ways, and students from some countries may be exempted from documenting their competence in English as described above. For more information, please contact the Office of International Relations or consult the following website:

www.ntnu.edu/studies/imp/admissions.

OUTLINE OF THE MPHIL IN CHILDHOOD STUDIES

Semester	Course (7,5 cr)	Course (7,5 cr)	Course (7,5 cr)	Course (7,5 cr)
4th sem/spring	BARN3900 Master's Thesis (60 cr)			
3rd sem/autumn				
2nd sem/spring	BARN3102 Children's Rights (7,5 cr)	BARN3201 Methods and Techniques in Child and Childhood Research (7,5 cr)	Experts in Teamwork (7,5 cr)	BARN3400 Preparatory Course, Master's Thesis (7,5 cr)
1st sem/autumn	BARN3101 Social Studies of Children and Childhood (7,5 cr)	BARN3202 Methodological Perspectives on Child and Childhood Research (7,5 cr)	BARN3300 Children and Development in the Global South (7,5 cr)	Elective (7,5 cr)

The master's programme in Childhood Studies involves two years of full-time study. The normal workload for a full-time student for one academic year is 60 credits. The programme is structured around a combination of core courses (52.5 credits) and elective courses (7.5 credits), which provide a general introduction to theory and methodology, as well as giving students the opportunity to specialize in particular topics. In addition, the programme includes a master's thesis (60 credits).

Core courses

Code	Title	Credits	Term	Admission
BARN3101	Social Studies of Children and Childhood	7,5	Autumn	Open
BARN3102	Children's Rights	7,5	Spring	Open
BARN3201	Methods and Techniques in Child and Childhood Research	7,5	Spring	Open
BARN3202	Methodological Perspectives on Child and Childhood Research	7,5	Autumn	Open
BARN3300	Children and Development in the Global South	7,5	Autumn	Open
BARN3400*	Preparatory Course, Master's Thesis	7,5	Spring	Admission to programme
EiT	Experts in Teamwork	7,5	Spring	Restricted admission
BARN3900*	Master's Thesis	60	Autumn/ Spring	Admission to programme

* Requires admission to MPhil in Childhood Studies. Exception: BARN3400 is open for exchange students from the MA Children, Youth and International Development, Brunel University.

Elective courses

Code	Title	Credits	Term	Admission
BARN3610*	Anthropology of Early Childhood	7,5	Autumn	Open
GEOG3006*	Quantitative Methods	7,5	Spring	Open
GEOG3506*	Geography, Health and Development	7,5	Autumn	Open
GEOG3515*	Environment, Development and Changing Rural Livelihoods	7,5	Autumn	Open
GEOG3516*	Humanitarianism: Theory and Practice	7,5	Autumn	Open
GEOG3522*	Migration and Development	7,5	Spring	Open
PED3520*	Democracy and Education: Perspectives in Educational Sociology	7,5	Autumn	Open
SANT3507*	Globalization, Culture and Identity	7,5	Spring	Open

* For up-to-date information about which courses are running, please contact NOSEB, the Department of Geography (GEOG courses), the Department of Education (PED3520) and the Department of Social Anthropology (SANT3507).

Experts in Teamwork (EiT)

Experts in Teamwork will be taught as an intensive village in this master's programme.

Master's thesis agreement

All students must sign a master's thesis agreement that regulates the relationship between student and supervisor, among other things.

Social and academic arrangements for students

At the beginning of the first semester, a common ground between students and teachers will be established. Through social and academic arrangements everyone will have the

opportunity to get to know one another. Both students and teachers are encouraged to share experiences from their own childhoods and/or childhoods in their 'home country', and basic theoretical perspectives within Childhood Studies will be introduced and discussed.

PHD

MPhil in Childhood Studies qualifies for the PhD Programme in Interdisciplinary Child Research, as well as several other PhD Programmes within the social sciences.

CREDIT ADJUSTMENTS DUE TO OVERLAP IN CONTENT

Course	Course	Credits
BARN3100	BARN3101	7,5 credits
BARN3100	BARN3102	7,5 credits
BARN3101	BARN3001	7,5 credits
BARN3200	BARN3201	7,5 credits
BARN3200	BARN3202	7,5 credits
BARN3201	BARN3002	4 credits
BARN3202	BARN3002	4 credits
GEOG3006	GEOG3002	7,5 credits
GEOG3006	GEOG3052	7,5 credits
GEOG3006	GEOG3004	7,5 credits
GEOG3006	AFR3002	7,5 credits
GEOG3006	AFR3005	7,5 credits
GEOG3506	SVGEO331	7,5 credits

MASTER OF PHILOSOPHY IN DEVELOPMENT STUDIES, SPECIALISING IN GEOGRAPHY

Approved by the Board at NTNU 16.12.2002, with changes made by the Faculty of Social Sciences and Technology Management 3.2.2012.

INTRODUCTION

The Master in Development Studies, specialising in Geography, is a programme designed for students who want to specialise in development studies and social change. The degree is awarded by the Faculty of Social Sciences and Technology Management at NTNU and administered by the Department of Geography. It is an interdisciplinary degree that is relevant for students with backgrounds in different social sciences and development studies. The programme is relevant for a variety of jobs, including research, planning, resource management, and teaching. Through the M. Phil programme in Development studies, specialising in geography, students should:

- Gain a thorough understanding of key concepts and theories within the field of development studies and geography
- Acquire robust/suitable methodological and analytical skills
- Be able to identify and formulate relevant and feasible research objectives for a scientific study
- Be able to carry out an independent research project by:
- Identifying an appropriate research design, collecting and analysing data
- Applying relevant theories and when analysing empirical data
- Writing a scientific text and disseminating scientific knowledge
- Complying with established ethical norms for research and dissemination.
- Acquire skills relevant for employment in public and private sectors and in academic research.

The programme is open to both international and Norwegian students. The language of instruction is English for this study programme and we expect students to do all their compulsories and examinations in English. No exceptions will be made in this regard.

ADMISSION REQUIREMENTS

Admittance to this programme requires a Bachelor's degree in Social Sciences. The degree must include at least one year of studies within geography, planning or development studies.

The average grade of the degree must be at least C by the Norwegian grading system, or equivalent, as decided by NTNU.

The language of instruction is English. All lectures and seminars will be held in English, all reading material is in English and all term papers, assignments, exam papers and the thesis must be submitted in English.

The applicants must document their English proficiency by achieving one of the following:

A passing grade from a Norwegian upper secondary school (videregående skole), or through a standardized test:

- TOEFL (Test of English as a Foreign Language) with a minimum score of 550/230/80 paper based /computer based/internet based
- IELTS (International English Language Testing Service) with a minimum score of 6.0 points
- APIEL (Advanced Placement International English Language) examination with a minimum score of 3 points

Exceptions from this requirement can be given for certain groups of applicants. For more information about the admission requirements, please consult the following webpage:

www.ntnu.edu/studies/imp/admissions.

COURSE OUTLINE

The programme involves 2 years of full-time studies. The programme is structured around core courses (37,5 credits), electives (37,5 credits) and a Master's thesis (45 credits).

The core courses are: GEOG3053 Theories of Development and Globalization, GEOG3054 Thesis preparation course work, Experts in Teamwork (EiT), GEOG3003 Methodology and the Research Process, and either GEOG3005 Qualitative Methods or GEOG3006 Quantitative Methods.

Students can choose electives worth 37,5 credits from a number of courses offered by the Department of Geography or other departments. Most of the electives will be offered in the autumn term. Courses other than those listed below can be chosen as electives. Other courses may be chosen if approval is given by the Department of Geography.

CORE COURSES

Code	Title	Credits	Term	Admission
EiT	Experts in teamwork	7,5	Spring	Restricted admission
GEOG3003	Methodology and the Research Process	7,5	Autumn	Open
GEOG3005	Qualitative methods	7,5	Spring	Open
GEOG3006	Quantitative methods	7,5	Spring	Open
GEOG3053	Theories of Development and Globalization	7,5	Autumn	Open
GEOG3054*	Thesis preparation course work	7,5	Spring	Restricted admission
GEOG3920*	Master's Thesis	45	Autumn /Spring	Restricted admission

* Requires admission to the programme.

ELECTIVES

Code	Title	Credits	Term	Admission
GEOG3030	Natural Resources Management	7,5	Autumn	Open
GEOG3505	Landscape and Planning	15	Autumn	Open
GEOG3506	Geography, Health and Development	7,5	Autumn	Open
GEOG3515	Environment, Development and Changing Rural Livelihoods	7,5	Autumn	Open
GEOG3516	Humanitarianism: Theory and Practice	7,5	Autumn	Open
GEOG3518	Knowledge Management in a Global Economy	7,5	Autumn	Open
GEOG3519	Geographical Information Systems - I	7,5	Autumn	Open
GEOG3520	Geographical Information Systems - II	7,5	Spring	Open
GEOG3522	Migration and Development	7,5	Spring	Open
GEOG3523	GIS Data Capture and Mapping	7,5	Spring	Open
AAR4234**	Urban Planning for Sustainability and Development	7,5	Spring	Open
BARN3300	Children and Development in the	7,5	Spring	Open

Code	Title	Credits	Term	Admission
	South			
POL3517	International Development: the Effects of Politics, Institutions and International Economy	15	Spring	Open

Elective courses may be cancelled due to the teaching capacity at the Department of Geography or if less than 5 students register for the course.

Check www.ntnu.no/geografi/studentinformasjon for updated information about what courses are available.

Information about cancellations will be given no later than January 10th in spring term and August 10th in autumn term. For courses available outside the department of Geography, please contact the respective department.

**Please note deadline for registration.

MPhil in Development Studies, specialising in Geography, programme structure:

Term	Course (7,5 cr)	Course (7,5 cr)	Course (7,5 cr)	Course (7,5 cr)
4. sem/Spring	GEOG3920			
3. sem/Autumn	GEOG3920		Electives (15 credits)	
2. sem/Spring	GEOG3054	GEOG3005 or GEOG3006	EiT	Electives (7,5 credits)
1.sem/Autumn	GEOG3053	GEOG3003	Electives (15 credits)	

Candidates are expected to use the summer between the second and third term to collect data and conduct fieldwork for their thesis.

Experts in Teamwork (EIT)

The course is normally taught every Wednesday throughout the spring semester (regular village). It is not possible to take the course as an intensive village in this master's programme.

CREDIT REDUCTIONS DUE TO OVERLAP IN CONTENT

Course	Course	Credits
GEOG3053	GEOG3050	7,5 credits
GEOG3054	GEOG3050	7,5 credits
GEOG3053	GEOG3504	7,5 credits
GEOG3003	GEOG3002	7,5 credits
GEOG3005	GEOG3052	7,5 credits
GEOG3005	AFR3005	7,5 credits
GEOG3005	AFR3002	7,5 credits
GEOG3005	GEOG3004	7,5 credits
GEOG3005	GEOG3002	7,5 credits
GEOG3006	GEOG3002	7,5 credits
GEOG3006	GEOG3052	7,5 credits
GEOG3006	GEOG3004	7,5 credits
GEOG3006	AFR3002	7,5 credits
GEOG3006	AFR3005	7,5 credits
GEOG3510	GEOG3519	6 credits

Course	Course	Credits
GEOG3510	GEOG3520	3 credits
POL3503	POL8503	10 credits
GEOG3510	GEOG3521	6 credits

MASTER OF SCIENCE IN GLOBALIZATION

Approved by the Board at NTNU 12.10.2006, with changes made by the Faculty of Social Sciences and Technology Management 30.3.2012.

A description of the Master's programme in Globalization

The Master's programme in Globalization is a unique inter-disciplinary cooperative programme involving the following faculties at NTNU:

- Humanities
- Social Sciences and Technology Management
- Engineering Science and Technology

The Master's programme is part of NTNU's university-wide Globalization Programme, which comprises nearly 200 researchers in departments across the university.

During this two-year international Master's programme in Globalization, students will explore the interrelations between the economic, technological, cultural, social and political dimensions of Globalization. The aim of the programme is to provide students with a general understanding of the forms and consequences of the processes of Globalization, combined with an in-depth knowledge of one of the two fields of Specializations:

- Global Production Management (abbreviated 'GPM')
- Global Politics and Culture (abbreviated 'GPC')

Learning objectives for the Master's programme in Globalization

- Through the master's programme the candidate:

Knowledge

- has advanced knowledge within the field of globalization studies and specialist knowledge within a given area (e.g. development and globalization, production management, knowledge management, economic restructuring).
- has thorough knowledge about the major theories and methods in globalization research, and hence can apply his/her knowledge on new scientific areas/fields as well as in real life situations.
- has obtained knowledge through work in real life situations through the internships and real work projects.

Specific skills

- can work independently with theoretical and practical problem solving.
- can apply relevant and appropriate methods for research and other knowledge production in an independent manner.
- can analyze and critically relate to different sources and types of information and to apply these to structure and formulating academic reasoning.
- can conduct a limited research project independently, but under supervision and in accordance with existing ethical norms and guidelines.

General competency

- has command over the particular discourse and analytical concepts of the globalization research field.
- can apply his/her knowledge and skills to new research areas to implement advanced work tasks and projects.

- can disseminate substantial independent work.
- can contribute to creative and innovative thinking.
- has gained work experience, which is relevant for International organizations and companies.

Study environment

The Master's programme is part of NTNU's highly interdisciplinary Globalization Programme, which comprises nearly 200 researchers and research fellows from across the university. Students will benefit from this NTNU-wide programme, which organizes regular seminars, as well as workshops and international conferences.

SPECIALIZATION IN GLOBAL POLITICS AND CULTURE

Globalization and the increased interconnectedness created by the rapid flow of capital, people, goods, images and ideologies across national boundaries require a new set of specialized educational tools. The specialization in Global Politics and Culture aims at making students understand the complex interactions between the political, economic, cultural and social trends which profoundly affect our daily lives in the contemporary world. The student will gain:

- an interdisciplinary perspective on the implications of globalization on civil society, state power, changing patterns of national culture and global markets and technologies
- a clear understanding of the effects of globalization on key actors in the global arena, such as NGOs, global corporations, international campaigning groups, states or multilateral institutions
- the ability to employ interdisciplinary approaches to the practical challenges posed by globalization through an internship undertaken in a global company or organization

Career opportunities

The Master's programme's specialization in Global Politics and Culture is designed to provide its students with the specialist knowledge and transferable skills to pursue careers in global corporations, non-governmental organizations (NGOs), and international campaigning groups, the civil and diplomatic services or in the media, research and information sectors. By the end of their degree, students will have proved their capacity to engage in team work, gained relevant work experience in a global corporation or organization and demonstrated their ability to employ interdisciplinary approaches at both theoretical and practical levels.

Admission requirements

- Successful applicants must have achieved a minimum of the equivalent of a C grade (Norwegian grading system) in their undergraduate degree to be accepted onto this Master's programme, in accordance with NTNU regulations.
- Students with a BA in the Humanities or Social Sciences with a specialization of minimum 80 ECTS credits in a discipline with relevance to the MSc in Globalization's academic components or equivalent from a university or college defined as:
- Political Science
- Sociology
- Social Anthropology
- History
- Geography
- European Studies
- Economics
- Development Studies
- Cultural Studies

- Cultural Heritage Studies
- Religious Studies
- International Relations

For the Global Politics and Culture Specialization, English language requirements for international students are TOEFL 550/230/80 paper based /computer based/internet based or IELTS with 6.0 or better.

STRUCTURE

The Master's programme in Globalization is a two year programme, which awards a total of 120 ECTS credits, 30 credits per semester over four semesters.

Core courses

Code	Title	Credits	Term	Admission
GEOG3518	Knowledge Management in a Global Economy	7.5	Autumn	Open
HIST3295	Contemporary International Economic History	7.5	Autumn	Open
KULT3320	Globalization Theory	7.5	Autumn	Open
GEOG3053	Theories of Development and Globalization	7.5	Autumn	Open
SOS3050*	Empirical Research Methods	7.5	Spring	Open
POL3005	Research Design and Methods for Interdisciplinary Studies	7.5	Spring	Open
**	Internship/Work Project	30	Autumn	***
**	Master's Thesis in Globalization	30	Spring	***

* Students who already have already passed SOS1002 Research Methods in the Social Sciences (15 cr.) must replace SOS3050 with SOS3004 Qualitative Research Methods (7.5 cr.).

** The course code depends on the student's departmental belonging.

*** Requires admission to the program of study (MSc in Globalization).

Electives

Code	Title	Credits	Term	Admission
SANT3507	Globalization, Culture and Identity*	7.5	Spring	Open
GEOG3522	Migration and Development*	7.5	Spring	Open
RVI2115	Religion, Politics and Science in Global Society	15	Spring	Open
POL3517	International Development: The effects of Politics, Institutions and International Economy *	15	Spring	Open
POL3512	The Soviet Union and Russia since 1917*	15	Spring	Open

* Choose 15 credits of electives.

MSc in Globalization, specializing in Global Politics and Culture, programme structure:

<table>
<tr><th>Term</th><th>7.5 credits</th><th>7.5 credits</th><th>7.5 credits</th><th>7.5 credits</th></tr>
<tr><td>4th sem. Spring</td><td colspan="4">Master’s Thesis in Globalization***</td></tr>
<tr><td>3rd sem. Autumn</td><td colspan="4">Internship***</td></tr>
<tr><td rowspan="4">2nd sem. Spring</td><td rowspan="4">SOS3050 Empirical Research Methods**</td><td rowspan="4">POL3005 Research Design and Methods for Interdisciplinary Studies</td><td colspan="2">SANT3507 Globalization, Culture and Identity (7.5 Credits)* and GEOG3522 Migration and Development (7.5 Credits)*, or</td></tr>
<tr><td colspan="2">RVI2115 Religion, Politics and Science in Global Society</td></tr>
<tr><td colspan="2">POL3517 International Development: The effects of Politics, Institutions and International Economy*, or</td></tr>
<tr><td colspan="2">POL3512 The Soviet Union and Russia since 1917*</td></tr>
<tr><td>1. sem. Autumn</td><td>GEOG3518 Knowledge Management in a Global Economy</td><td>HIST3295 Contemporary International Economic History</td><td>KULT3320 Globalization Theory</td><td>GEOG3053 Theories of Development and Globalization</td></tr>
</table>

* Choose 15 credits of electives.

** Students who already have already passed SOS1002 Research Methods in the Social Sciences (15 cr.) must replace SOS3050 with SOS3004 Qualitative Research Methods (7.5 cr.).

*** The course code depends on the student’s departmental belonging.

INTERNSHIP

The internship scheme related to the Global Politics and Culture specialization provides a unique opportunity for students to develop and build their personal, academic and professional capacities by managing an individual project. The internship project should contribute an interdisciplinary perspective and should be relevant to the needs and requirements of the company/organization. It should lead to the production of a written academic assignment, which will be undertaken under the supervision of a supervisor at NTNU, and a corporate or organizational supervisor.

Internship Courses

Course	Department	Credits	Term	Admission
RVI3012	Department of Archaeology and Religious Studies	30	Autumn	*
HIST3012	Department of History and Classical Studies	30	Autumn	*
GEOG3012	Department of Geography	30	Autumn	*
POL3012	Department of Sociology and Political Science	30	Autumn	*
KULT3012	Department of Interdisciplinary Studies of Culture	30	Autumn	*
SANT3012	Department of Social Anthropology	30	Autumn	*

* Requires admission to the programme of study (MSc in Globalization).

Students are supposed to choose a supervisor from one of the six departments at NTNU.

MASTER'S THESIS

The 30 ECTS credit Master's thesis should be between 50 and 70 pages in length (12 pt, 1.5 spacing). The contents of the thesis should fulfill an academic level appropriate to a Master's level course. Furthermore, it should relate to the interdisciplinary framework of the taught course element of the Master's programme. A project summary of 300 words should be written in the third semester followed by a more detailed proposal in the form of a written outline of the thesis (around 5 pages) at the beginning of the fourth semester. The thesis should be written over a 20-week period in the fourth semester. The deadline for submission of the thesis is normally May 1st. The students may apply for a two week extension. Students must have passed all the courses on the Masters programme before submitting the Master's thesis. Students must have passed their Master's thesis in order to present themselves for the 30-minute oral exam related to the Master's thesis. The grade for the Master's thesis may be adjusted after the oral exam. The Global Politics and Culture students will normally write their thesis at NTNU, and may relate its contents to the internship assignment.

Codes for the Master`s thesis

Course	Department	Credits	Term	Admission
RVI3910	Department of Archaeology and Religious Studies	30	Spring	*
HIST3910	Department of History and Classical Studies	30	Spring	*
GEOG3910	Department of Geography	30	Spring	*
POL3910	Department of Sociology and Political Science	30	Spring	*
KULT3910	Department of Interdisciplinary Studies of Culture	30	Spring	*
SANT3910	Department of Social Anthropology	30	Spring	*

* Requires admission to the program of study (MSc in Globalization).

Students are supposed to choose a supervisor from one of the six departments at NTNU.

SPECIALIZATION IN GLOBAL PRODUCTION MANAGEMENT

Global production and the intensifying competitive challenges in the world market calls for an understanding of how strategic improvements can be made at the supply chain, enterprise and operations level. Global Production Management aims at giving students a holistic theoretical foundation and analytical skills to effectively address these challenges. The students will gain a broad and integrated set of capabilities, combining engineering and management competences with a global perspective.

Learning objectives for the specialization

The candidate will obtain the following knowledge, skills and general competencies through the specialization:

Knowledge

- Advanced knowledge in global production management, and specialist knowledge in production strategy, production logistics, purchasing management, enterprise resource planning, or supply chain management in global enterprises
- Thorough knowledge about the strategic concepts and major models, technologies, methods and analysis techniques in global production research, and hence can apply his/her knowledge on new scientific areas and engineering challenges
- Knowledge on managing in a global economy

Skills

- Can work independently with theoretical and practical problem solving, and apply his/her knowledge to analyse, improve, and manage global production enterprises in such a way that the overall competiveness is improved

- Can apply theory to develop practical solutions based on a critical evaluation of relevant alternatives
- Can apply appropriate models, technologies, methods, and analysis techniques in an independent manner
- Can conduct a minor research or development project independently, but under supervision

General competency

- Has a understanding of the strategic, technological, ethical, and environmental challenges facing production enterprises that compete in a global market
- Can communicate production problems and solutions to specialists and the public. Can cooperate and contribute to multidisciplinary interaction.
- Can lead and motivate employees in global production enterprises
- Has obtained knowledge through group work, projects, and contact with industry that can be applied in real life management problems

Career opportunities

The specialization in Global Production Management is designed to give students the skills to establish, develop, and manage global production enterprises in order to improve overall competitiveness. Students will be able to understand and successfully handle processes and technology in production, and can pursue careers in global production enterprises, global logistics enterprises, and business consultancy.

Admission requirements

- Admission to the programme requires a BSc in a Technological or Engineering discipline or equivalent from a university or college. Successful applicants must have achieved a minimum of the equivalent of a C grade (Norwegian grading system) in their undergraduate degree to be accepted onto this Master's programme, in accordance with NTNU regulations. The English language requirements for international students are TOEFL 550/213/79 paper based /computer based/internet based or IELTS with 6.0 or better.
- Students at selected departments at NTNU who have finished the first 3 years of a 5-year Masters of Technology/Engineering programme, may opt into the programme by applying to the relevant Study Board(s) of their current programme.

STRUCTURE

The Specialization in Global Production Management is a two year programme, which awards a total of 120 ECTS credits, 30 credits per semester over four semesters.

Term	7.5 credits	7.5 credits	7.5 credits	7.5 credits
4th sem. Spring	TPK 4900 Master's Thesis (in Production and Quality Engineering) or IØ 3910 Master's Thesis in Globalization			
3rd sem. Autumn	TPK 4510 Production and Quality Engineering, Specialization Project or IØ30XX Specialization Project		TPK 4515 Production and Quality Engineering, Specialization Course or IØ30XX Specialization Project	TIØ4195 Environmental management and Corporate Governance
2nd sem. Spring	TPK4110 Quality and Performance Oriented Management	TPK4180 Manufacturing Strategy	TPK4135 Logistics and Production Management or TIØ4175 Purchasing and Logistics Management	SOS3050 Empirical Research Methods
1st sem. Autumn	TIØ4146 Finance for Science and Technology Students	TPK4165 ERP and PLM Systems	TPK4160 Value Chain Control and Applied Decision Support or TIØ4265 Strategic Management	GEOG3518 Knowledge Management in a Global Economy

Core courses

These courses are compulsory for all students at the specialization.

Code	Title	Credits	Term	Admission
GEOG3518	Knowledge Management in a Global Economy	7,5	Autumn	Open
TIØ4146	Finance for Science and Technology Students	7,5	Autumn	Open
TPK4165	ERP and PLM Systems	7,5	Autumn	Open
TPK4110	Quality and Performance Oriented Management	7,5	Spring	Open
TPK4180	Manufacturing Strategy	7,5	Spring	Open
SOS3050	Empirical Research Methods	7,5	Spring	Open
TIØ4195	Environmental management and Corporate Governance	7,5	Autumn	Open

Elective courses

The students must choose between two "strings" of courses:

String 1: Production Management

Code	Title	Credits	Term	Admission
TPK4160	Value Chain Control and Applied Decision Support	7,5	Autumn	Open
TPK4135	Logistics and Production Management	7,5	Spring	Open
TPK 4510	Production and Quality Engineering, Specialization Project	15	Autumn	Restricted admission
TPK 4515	Production and Quality Engineering, Specialization Course	7,5	Autumn	Restricted admission
TPK 4590	Master's Thesis (in Production and Quality Engineering)	30	Spring	Restricted admission

String 2: Purchasing Management

Code	Title	Credits	Term	Admission
TIØ4265	Strategic Management	7,5	Autumn	Open
TIØ4175	Purchasing and Logistics Management	7,5	Spring	Open
IØ 3011	Work Project	22,5	Autumn	Restricted admission
IØ 3910	Master's Thesis in Globalization	30	Spring	Restricted admission

Work project (TPK4510 and IØ30XX)

Students will spend their third semester undertaking a work project at NTNU, linked to the university's cooperation projects with industry, on a topic relevant for global operations. Education in Global Production Management is based on students experiencing and exploring real-life industrial challenges in global enterprises. Theoretical topics are exemplified and discussed based on cases from Norwegian and international companies and research projects. The work project will be geared at solving industrial challenges within areas such as production strategy, production logistics, purchasing management, enterprise resource planning, or supply chain management. Students will be required to produce a written academic assignment, relating to the internship/work project (between 30 and 40 pages; 12 pt, 1.5 spacing), which should be submitted to NTNU by the end of the second semester. The assignment should relate to the taught element of the programme and fulfill the academic requirements of a Master's level programme. The course requires admission to the Specialization in Global Production Management. Students are supposed to choose a supervisor from the Department of Production and Quality Engineering or the Department of Industrial Economics and Technology Management.

Master's thesis (TPK 4900 and IØ3910)

The 30 ECTS credit Master's thesis should be between 50 and 70 pages in length (12 pt, 1.5 spacing). The contents of the thesis should fulfill an academic level appropriate to a Master's level course. Furthermore, it should relate to the interdisciplinary framework of the taught course element of the Master's programme. A project summary of 300 words should be written in the third semester followed by a more detailed proposal in the form of a written outline of the thesis (around 5 pages) at the beginning of the fourth semester. The thesis should be written over a 20-week period in the fourth semester. The students may apply for a two week extension. Students must have passed all the courses on the Master's programme before submitting the Master's thesis.

The Global Production Management students will write their thesis for an international company. The course requires admission to the Specialization in Global Production Management. Students are supposed to choose a supervisor from the Department of Production and Quality Engineering or the Department of Industrial Economics and Technology Management, in accordance with the string chosen.

COURSE DESCRIPTIONS

To be found at NTNUs web pages: www.ntnu.edu/studies/allstudies

MASTER OF SCIENCE IN EXERCISE PHYSIOLOGY AND SPORT SCIENCES

2-year Master of Science (MSc)

Programme code: MSPORT
Webpage: www.ntnu.edu/studies/msport/

This programme description is valid for students admitted in the academic year 2012/2013.

Introduction

The Master of Science in Exercise Physiology and Sport Sciences is a research and thesis-based integrated programme of study at the Faculty of Medicine. It is exclusively concerned with basic research training and comprises compulsory courses together with specialization courses dependent upon the research interest of students.

The MSc programme is associated with the research group in Exercise and Extreme Environments at the Department of Circulation and Medical Imaging. One of the main research interests of this group is to examine basic mechanisms behind central and peripheral limitations to the supply and demand of oxygen transport, and to identify training responses. The group is also involved in examining the mechanisms behind muscular and neural limitations to strength and coordination, the prescription of effective endurance and strength training, and the effects on top sports performance.

Another aspect is based upon the fact that the fastest developing diseases within the population, such as obesity, atherosclerosis, diabetes II, osteoporosis and chronic obstructive pulmonary disease (COPD), are related to inactivity. Effective new training interventions based on basic biological adaptations have positive effects and are effective treatments with high socioeconomic as well as quality of life outcomes.

Learning Outcome

The graduated student should be able to:

- demonstrate in depth insight in Exercise Physiology and Sport Sciences reaching from the molecular to whole body level, and have practical skills relevant for the field;
- describe how physical activity and exercise influence the heart, arteries and skeletal muscles in our bodies, both for health and performance;
- identify and describe the limitations for the energy delivery and utilization, as well as the muscular and neural limitations for strength and coordination;
- understand and describe the beneficial effects of physical activity for successful aging and disease prevention, and prescribe effective training programmes for treatment;
- formulate a research question based on adequate insight into current knowledge within Exercise Physiology and Sport Sciences;
- apply and adopt experimental methods to gain new knowledge within Exercise Physiology and Sport Sciences;
- present, evaluate and discuss scientific results in English (orally and in writing).

Target Groups and Admission Requirements

Candidates should hold a bachelor’s degree (or 3-year equivalent), preferably within biochemistry, biology, exercise physiology/sport sciences, movement science, nursing, occupational therapy, physiotherapy, or similar fields. A firm foundation in human biology is required. The minimum average grade required is the Norwegian "C".

International applicants need to submit proof of English proficiency (TOEFL, IELTS, APIEL or University of Cambridge test). More details about the language requirements are available at www.ntnu.edu/studies/langcourses/languagerequirements

Applicants who are not citizens of the European Union (EU) or the European Economic Area (EEA) need to provide a financial guarantee to get a residence permit in Norway.

Teaching Methods and Learning Activities

In 2010 the new Hearth and Lung Centre opened at Øya campus in Trondheim. In this building students get to work in high-tech laboratory environments side by side with researchers both from NTNU and St. Olav's Hospital.

The teaching includes lectures, colloquiums, problem-based learning (PBL), seminars, demonstrations, practical training, self-tuition, and independent work. During the work with the master's thesis the student will do research in our well-equipped laboratories.

Programme Structure

The master's degree is a two-year, full-time programme starting in the autumn semester. There are two main components:

- Theoretical and methodological courses (totalling 60 credits)
- Master's thesis (60 credits)

The first semester is primarily based on theory and lectures. From the second semester most attention is directed towards preparing for carrying out an experiment representing work at the forefront of the research in exercise physiology in close co-operation with the professors in the research group. The quality of research is high, and the research project is expected to contain data of a quality that makes international publication possible.

<table>
<tr><th colspan="2">Year 1</th><th colspan="2">Year 2</th></tr>
<tr><td>1st semester
(autumn)</td><td>2nd semester
(spring)</td><td>3rd semester
(autumn)</td><td>4th semester
(spring)</td></tr>
<tr><td>KLH3100
Introduction to Medical Statistics
(7.5 credits)</td><td>EiT
Experts in Teamwork
(7.5 credits)</td><td colspan="2" rowspan="4">SPO3900
Thesis in Exercise Physiology
(60 credits)</td></tr>
<tr><td>SPO3020
Training Circulation and Oxygen Consumption
(7.5 credits)</td><td>SPO3040
Environmental Adaptations
(7.5 credits)</td></tr>
<tr><td>SPO3030
Training Muscle and Force Production
(7.5 credits)</td><td rowspan="2">SPO3060
Specialisation in Exercise Physiology
(15 credits)</td></tr>
<tr><td>SPO3055
Research Methods in Exercise Physiology
(7.5 credits)</td></tr>
</table>

Experts in Teamwork (EiT) is compulsory for all master's degree students at NTNU, and it is taught intensively in the weeks 2, 3 and 4 in the second semester. Read more about EiT here: www.ntnu.edu/dmf/studies/eit

By the end of the first semester, the student must choose a topic for the thesis. A master's thesis agreement (including a project description) is drawn up by the student and submitted to the programme board within the first academic year. More information is available at www.ntnu.edu/dmf/studies/master (in English) / www.ntnu.no/dmf/studier/master (in Norwegian).

The student must have passed all theoretical and methodological courses before he/she can submit the thesis.

MASTER OF SCIENCE IN MOLECULAR MEDICINE

2-year Master of Science (MSc)

Programme Code: MSMOLMED
Webpage: www.ntnu.edu/studies/msmolmed

This programme description is valid for students admitted in the academic year 2012/2013.

Introduction

The field of Molecular Medicine is often referred to as “tomorrow’s medicine”. It aims to provide a molecular understanding of how normal cellular processes change, fail or are destroyed by disease.

The mapping of the human genome in 2003 was a turning point, and our knowledge and understanding of molecules in living organisms are advancing at a fast rate. Modern technologies such as high-throughput analyses (microarray and proteomics) enable us to study thousands of genes and proteins simultaneously. This provides the foundation for a totally new understanding of biological systems and generates fresh hypotheses about the importance of genes and proteins for different diseases.

The MSc in Molecular Medicine is administered by the Department of Laboratory Medicine, Children’s and Women’s Health at the Faculty of Medicine.

Learning Outcome

The graduated student should be able to:

- demonstrate a strong background in molecular medicine (i.e. molecular/cell biology relevant to medical applications) and have practical skills relevant for the field;
- describe the organization of the human genome and its functional regulation (i.e. replication, gene expression, genome maintenance, and signal transduction principles);
- describe the impact of genes, inheritance and environment on disease, and understand how normal cellular processes change, fail or are destroyed by disease development, in particular for common diseases such as cancer, diabetes, and heart disease;
- explain principles of molecular diagnostics and advantages/limitations of its applications;
- recognize and explain current strategies and state-of-the-art approaches within functional genomics;
- collect relevant background information about topics within molecular medicine;
- present, evaluate and discuss scientific results in English (orally and in writing);
- reflect on the existence of ethical aspects, sound experimental approaches and scientific thinking.

Target Groups and Admission Requirements

Admission requirements to the MSc in Molecular Medicine is a bachelor’s degree (or an equivalent 3-year education) in biology, biomedical science, biotechnology, chemistry or similar, with an average grade of C or higher. A solid background in cell and molecular biology is highly recommended within the bachelor’s degree.

International applicants need to submit proof of English proficiency (TOEFL, IELTS, APIEL or University of Cambridge test). More details about the language requirements are available at

www.ntnu.edu/studies/langcourses/languagerequirements. Applicants who are not citizens of the European Union (EU) or the European Economic Area (EEA) need to provide a financial guarantee to get a residence permit in Norway.

Teaching Methods and Learning Activities

In 2005 the new Laboratory Centre opened at Øya campus in Trondheim. In this building students get to work in high-tech laboratory environments side by side with researchers both from NTNU, Sør-Trøndelag University College and St. Olav's Hospital.

The teaching methods and learning activities include lectures, colloquiums, problem-based learning (PBL), seminars, demonstrations, excursions, practical training, self-tuition, and independent work. During the work with the master's thesis the student will do research in our well-equipped laboratories.

Programme Structure

The MSc is a two-year, full-time programme of study starting in the autumn semester. There are two main components:

- **Master's thesis (60 credits)**
- **Theoretical and methodological courses (totalling 60 credits). Two courses, making up 15 credits, are compulsory. The remaining courses, adding up to 45 credits, are selected from lists of electives. Ideally, electives should be linked to the topic of the master's thesis.**

There are two lists of elective courses (see below). *Two courses* must be selected from 'Electives 1'. The remaining elective courses can be chosen from both 'Electives 1' *and* 'Electives 2'. Additional relevant courses may be taken at NTNU or other educational institutions subject to the approval of the Faculty of Medicine.

A master's thesis agreement, including a project description, must be submitted by 15 March in the second semester. Potential projects will be presented in advance.

Master's Thesis

MOL3901	Thesis in Molecular Medicine	60 credits

Compulsory Courses

MOL3000	Introduction to Molecular Medicine	7.5 credits (autumn)
Various codes[1]	Experts in Teamwork	7.5 credits (spring)

Electives 1

BI3016	Molecular Cell Biology	7.5 credits (autumn)
MOL3001	Medical Genetics	7.5 credits (spring)
MOL3005	Immunology	7.5 credits (autumn)
MOL3007	Functional Genomics	7.5 credits (spring)
MTEK3001	Applied Bioinformatics and Systems Biology	7.5 credits (spring)

Electives 2

BI3013[2]	Experimental Cell and Molecular Biology	7.5 credits (autumn)
BI3018	Patenting and Commercialization of Biotech and Medtech Inventions	7.5 credits (spring)
KLH3100	Introduction to Medical Statistics	7.5 credits (autumn)
MOL3003[3]	Molecular Medical Microbiology	7.5 credits (autumn)
MOL3009	Biobanking	7.5 credits (autumn)
MOL3010	Animal Cell Culture	7.5 credits (autumn)
MOL3014	Nanomedicine I – Bioanalysis	7.5 credits (autumn)
MOL3015	Nanomedicine II – Therapy	7.5 credits (spring)
MOL3018	Medical Toxicology	7.5 credits (spring)
MOL8002[4]	Molecular Mechanisms of Host Defence	9.0 credits (autumn)
MOL8003[4]	High-Throughput Genomics	7.5 credits (spring)
MOL8005[4]	Molecular Mechanisms of Host Defence – Essay	6.0 credits (autumn)
NEVR8014[4]	Laboratory Animal Science for Researchers	7.5 credits (autumn)

Some of the elective 2 courses may be cancelled if few students register for the examination.

[1] Experts in Teamwork (EiT) is taught intensively in the weeks 2, 3 and 4 in the second semester. Read more about EiT on this webpage: www.ntnu.edu/dmf/studies/eit

[2] The course has restricted admission, and will be open for master's students in Molecular Medicine only if there are any available seats. Please contact the Department of Biology if you are interested.

[3] The course has restricted admission. Two-thirds of the seats are reserved for the first-year master's students in Molecular Medicine. One-third of the seats are reserved for second-year master's students in Molecular Medicine and other master's students at NTNU.

[4] The course is at PhD level, but it is open for qualified and motivated master's students.

Model of the MSc Programme (Example)

<table>
<tr><th colspan="2">Year 1</th><th colspan="2">Year 2</th></tr>
<tr><th>1st semester (autumn)</th><th>2nd semester (spring)</th><th>3rd semester (autumn)</th><th>4th semester (spring)</th></tr>
<tr><td>Introduction to Molecular Medicine</td><td>Experts in Teamwork</td><td colspan="2" rowspan="4">Thesis in
Molecular Medicine</td></tr>
<tr><td>Elective course</td><td>Elective course</td></tr>
<tr><td>Elective course</td><td>Elective course</td></tr>
<tr><td>Elective course</td><td>Elective course</td></tr>
</table>

Please note that this is only a suggestion. The student can choose to start with the thesis already in the first year and postpone one or more of the elective courses to the second year.

The student must have passed all examinations in compulsory and elective courses before he/she can submit the thesis.

MASTER OF SCIENCE IN NEUROSCIENCE

2-year Master of Science (MSc)

Programme code: MSNEUR
Webpage: www.ntnu.edu/studies/msneur

This programme description is valid for students admitted in the academic year 2012/2013.

Introduction

The MSc in Neuroscience provides an in-depth study of brain structure and -function, reaching from the molecular to systems level. A central aim for students is to understand how neural systems may contribute to sensory experiences, thoughts, emotions and behaviour, and learn to adopt experimental methods to gain new knowledge in the field.

The MSc in Neuroscience is an interdisciplinary collaboration between the following faculties:

- Humanities
- Information Technology, Mathematics and Electrical Engineering
- Medicine
- Natural Sciences and Technology
- Social Sciences and Technology Management

The MSc is coordinated by the Programme Board of Neuroscience, with representatives from the students and the participating faculties. It is administered by the Department of Neuroscience at the Faculty of Medicine.

The degree awarded to students completing the programme will be *Master of Science in Neuroscience*. Completion of the master's degree is a qualification for studies at the PhD level.

Learning Outcome

General learning outcome

A solid knowledge about neuroscience, good experimental and theoretical skills, and competence to obtain and critically appraise own and already published experimental and theoretical data and to pursue a career in neuroscience.

Specific learning outcome

Knowledge

- The student has advanced knowledge of the research field of neuroscience including its subareas (Molecular and Cellular neuroscience, Systems Neuroscience (including comparative neuroscience), Computational Neuroscience and Cognitive Neuroscience) and disciplines (Anatomy, Physiology, Biochemistry, in vivo and in vitro Imaging techniques at cellular and network level, neurogenetics, neurophysics).
- The student has knowledge of relevant methodologies and techniques in neuroscience including both historical as well as more recent techniques.
- The student has knowledge about:

  - Sensory systems (somatosensory, visual, auditory, olfactory and taste, vestibular, pain, visual streams, barrel cortex, topographic organization, homunculus)
  - Motor systems (prim motor system, basal ganglia, cerebellum)
  - association cortex (definitions and different levels such as prefrontal, parietal, temporal cortex, etc.)
  - monosynaptic and complex reflex networks at spinal cord and brainstem levels.
- The student has specialized knowledge in at least one of the above mentioned disciplines.
- The student has knowledge about the main current theoretical concepts in Neuroscience, and can apply this to his/her own research: Chemical and electrical signaling, cellular integration, regulation of neuronal activity, excitatory and inhibitory transmission and the related cellular mechanisms (transmitter synthesis, packaging, release, receptor binding, location and regulation of receptor expression). Theorems include cortical networks, hierarchical processing, feedforward and feedback connectivity. Primary and higher order (association) cortex, oscillations and their functions, concepts of neuronal networks. Role of thalamocortical and cortico-basal ganglia networks, default networks, (monoaminergic/subcortical)modulation, and computational models including connectionists models (small world networks, spin glass models) and oscillatory models.
- The student has knowledge about mainstream concepts of neurophilosophy and ethics. The student is aware of and has knowledge of the relevant historical perspectives in neuroscience, its traditions and the position in the society. Is aware of debates in the field on neurophilosophy, theory of mind and discussions on consciousness.

Skills

- The student is capable of analyzing main outstanding issues in neurosciences, follow and analyze ongoing debates in the field, with special knowledge in at least one domain.
- The student knows how to find relevant methods and how to apply those to his/her project/question of interest.
- The student has competence to analyze experimental data, put them in a context of relevant available (published) data in neuroscience and directly adjacent fields such as psychology, and the ethical and societal issues related to neuroscience research and is able to communicate experimental results both orally and in a number of specific written formats.
- The student can analyze existing theories, methods and assumptions within the field of neuroscience.
- The student can recognize and validate problems; formulate and test hypotheses.
- The student can evaluate and formulate a theoretical concept. Evaluation includes originality, independence and applicability.
- The student can, with supervision, perform a research project independently, including the formulation of the research question based on good general insight in the field, experimental design and implementation, results analyses and reporting.
- The student is capable of adequate analysis of findings, including appropriate levels of statistics and integration with existing (published) information.
- The student can summarize, document, report, and reflect on own findings.

General competence

- The student knows how to analyse relevant general issues in neuroscience including field specific theorems and ethical issues, including how to decide on animal and human research, general insight in ways to diminish research that causes suffering to humans and animals and knows how to evaluate and weight the outcome to the inflicted suffering.
- The student is capable to apply his/her knowledge and capabilities to analyse and carry out complex experiments in neuroscience in not-familiar domains.
- The student has proven capability to apply his/her knowledge to new domains within neuroscience; has skills and knowledge to search for relevant data on his/her own scientific question, and can critically assess published data within the theoretical framework chosen for a particular project.
- The student can carry out research independently and knows how to formulate and express results and interpretations of the research outcomes.
- The student knows how to participate in discussions, put forward his/her results both in a constellation of peers as well as for lay-people.
- The student has proven capabilities to contribute to the generation of new idea/concepts/technical approaches to experimental research questions.
- The student can summarize, document, report, and reflect on own findings.

Learning outcome for Master of Science in Neuroscience

After completion of the programme the student	**Knowledge**	**Skill**	**General competence**
has in depth insight in basic brain structure and function reaching from the molecular to systems level.	3	1	3
understands how neural systems contribute to sensory experiences, thoughts, emotions, behaviour	2	2	3
can apply and adopt experimental methods to gain new knowledge	2	3	2
can formulate a research question based on adequate insight into current knowledge	3	3	2
is able to report outcomes of research in a coherent oral and written report	3	2	2

1 = elementary; 2 = average; 3 = advanced

Target Groups and Admission Requirements

The master's programme is suitable for students motivated towards research or teaching in Neuroscience in particular or the natural sciences in general. The introduction to experimental and analytical methods is relevant to other academic areas as well. The methodological introduction also provides a good background for positions in public health administration, academic journalism and medical publishing.

Admission to the MSc in Neuroscience requires a bachelor’s degree (or an equivalent 3-year education) in biochemistry, biophysics, biology, biomedical science, neuroscience or psychology. Other relevant disciplines (e.g. biotechnology, informatics, mathematics, medicine, movement science, philosophy, radiography) may be accepted after an individual evaluation of the applicant’s qualifications. The minimum average grade required is the Norwegian "C".

Applicants are encouraged to include the NTNU-based course NEVR2010 – *Introduction to Neuroscience* as a part of their bachelor's degree. Students who do not have NEVR2010 (or an equivalent background in Neuroscience) when admitted, may be required to follow the NEVR2010 lectures during their first semester of the master's programme.

International applicants need to submit proof of English proficiency (TOEFL, IELTS, APIEL or University of Cambridge test). More details about the language requirements are available at www.ntnu.edu/studies/langcourses/languagerequirements

Applicants who are not citizens of the European Union (EU) or the European Economic Area (EEA) need to provide a financial guarantee to get a residence permit in Norway.

Teaching Methods and Learning Activities

The MSc in Neuroscience is a two-year, full-time programme. The teaching includes lectures, laboratory work/demonstrations and supervised project work. The language of instruction is English.

The master's programme has small classes, which stimulates a good study environment. The students contribute to the interdisciplinary environment with their different educational and ethnical backgrounds. Master's thesis projects are offered in multidisciplinary research teams such that students are exposed to and encouraged to participate in collaborative projects. The language of instruction and examinations is English.

Students will get access to high-tech laboratory environments, and modern reading and lecture rooms, computer labs and library facilities at Øya campus in Trondheim. NTNU shares this campus with St. Olav's University Hospital and Sør-Trøndelag University College.

Soma is an academic and social organization for master's students at the Faculty of Medicine. Soma runs a buddy programme at the start of the semester, and various events through the academic year. For more information, visit http://somantnu.blogspot.com/

Programme Structure

The master program is made up of the following three components:

- Master's thesis (60 credits)
- Compulsory courses (37.5 credits)
- Elective courses (22.5 credits)

Master's Thesis

NEVR3901*	Thesis in Neuroscience	60 credits

* The course code FY3901 is used by students with a supervisor at the Department of Physics.

Compulsory Courses

NEVR3001	Basic Neuroscience	7.5 credits (autumn)
NEVR3002	Systems Neuroscience	7.5 credits (autumn)
NEVR3003	Behavioural and Cognitive Neuroscience	7.5 credits (spring)
NEVR3004	Neural Networks	7.5 credits (spring)
Various	Experts in Teamwork	7.5 credits (spring)

Elective Courses

A selection of suggested elective courses is presented below. Other courses at NTNU or other universities can be approved by the Programme Board on request.

Some of the courses have entry requirements and/or restricted admission. Be sure to check this before you register for a course.

Courses with a course code in the 8000-series are at PhD level, but are open for qualified and motivated master's degree students.

The elective courses should normally be at master's degree level (3000-series or higher). However, if the student lacks appropriate background in areas relevant for the master's thesis, undergraduate courses in biology, chemistry, informatics, mathematics, medicine, physics, psychology or statistics may be accepted as well.

Faculty of Humanities:

FI3107	Biotechnology and Ethics	7.5 credits (autumn)
NEVR3005	Philosophy of Neuroscience	15 credits (spring)

Faculty of Information Technology, Mathematics and Electrical Engineering:

IT3708	Sub-symbolic AI Methods	7.5 credits (spring)
TMA4255	Applied Statistics	7.5 credits (spring)

Faculty of Medicine:

KLH3101	Introduction to Medical Statistics	7.5 credits (autumn)
MOL3001	Medical Genetics	7.5 credits (spring)
MOL3005	Immunology	7.5 credits (autumn)
MOL3010	Animal Cell Culture	7.5 credits (autumn)
MOL3014	Nanomedicine I – Bioanalysis	7.5 credits (autumn)
MOL3015	Nanomedicine II – Therapy	7.5 credits (spring)
MOL3018	Medical Toxicology	7.5 credits (spring)
NEVR3040	Private Study of Neuroscience I	7.5 credits (both)
NEVR3050	Private Study of Neuroscience II	15 credits (both)
NEVR8001	Brain Metabolism Studied by 13C Nuclear Magnet Resonance Spectroscopy and Other Methods	7.5 credits (autumn)
NEVR8002	Aspects of Neurobiology	4.5 (both)
NEVR8014	Laboratory Animal Science for Researchers	7.5 credits (autumn)

Faculty of Natural Sciences and Technology:

BI3010	Population Genetics	7.5 credits (autumn)
BI3013	Experimental Cell and Molecular Biology	7.5 credits (autumn)
BI3016	Molecular Cell Biology	7.5 credits (autumn)
BI3017*	Bio Visualisation	7.5 credits (spring)
BI3018	Patenting and Commercialization of Biotech and Medtech Inventions	7.5 credits (spring)
TBT4145	Molecular Genetics	7.5 credits (autumn)
TFY4265	Biophysical Micromethods	7.5 credits (autumn)
TFY4280	Signal Processing	7.5 credits (spring)
TFY4310	Molecular Biophysics	7.5 credits (autumn)
TFY4320	Medical Physics	7.5 credits (spring)
TMT4300	Light and Electron Microscopy	7.5 credits (spring)

*Course not offered in the academic year 2012/13.

Progression

NEVR3001 and NEVR3002 should be taken during the first semester. NEVR3001 is taught in the first half of the semester, and the final written examination is held in October. NEVR3002 is taught in the second half of the semester and the final written examination is held in December.

NEVR3003 and NEVR3004 should be taken during the second semester. NEVR3003 is taught in the first half of the semester, and the final written examination is held in March. NEVR3004 is taught in the second half of the semester and the final written examination is held in May or June.

The modular course *Information Literacy* is embedded in the four compulsory courses NEVR3001, NEVR3002, NEVR3003 and NEVR3004.

The course *Experts in Teamwork* (EiT) is compulsory for all master's degree students at NTNU, and is taught intensively in the weeks 2, 3 and 4 in the second semester. Read more about EiT here: http://www.ntnu.edu/eit

The elective courses are to be taken when convenient for the work with the master's thesis. In the second semester, the student must choose a topic for the thesis. A contract for the master's thesis including a project description is drawn up by the student and his/her supervisor and submitted to the Department of Neuroscience within 15 March. Due to the nature of experimental projects in Neuroscience, it is recommended to work continuously with the master's thesis during the two years of the programme.

Model of the MSc in Neuroscience (example):

<table>
<tr><th colspan="2">Year 1</th><th colspan="2">Year 2</th></tr>
<tr><td>1st semester (autumn)</td><td>2nd semester (spring)</td><td>3rd semester (autumn)</td><td>4th semester (spring)</td></tr>
<tr><td>NEVR3001</td><td>NEVR3003</td><td colspan="2" rowspan="4">Thesis</td></tr>
<tr><td>NEVR3002</td><td>NEVR3004</td></tr>
<tr><td>Elective course</td><td>Experts in Teamwork</td></tr>
<tr><td>Elective course</td><td>Elective course</td></tr>
</table>

Please note that this is only a suggestion. As mentioned above, the student can choose to start with the thesis already in the first year and postpone one or more of the elective courses to the second year.

The student must have passed all examinations in compulsory and elective courses before the thesis can be submitted.

MASTER OF SCIENCE IN URBAN ECOLOGICAL PLANNING

ADDITIONAL REGULATIONS

Knowledge
• Knowledge of two specific, underprivileged neighbourhoods (one in a developing country, the other in a Nordic country), their territorial strength in terms of organisation, resources, skills and access to land, but also their struggle, and changing livelihood conditions. • Experience in how to address both non-planned and planned neighbourhoods in urban centres and fringe areas for the purpose of livelihood improvements, tenure security and urban upgrading in contexts of conflicts of objectives of equity, environmental sustainability and civil society interests. • Understanding of specific cases of building strategic responsibility and action at higher levels of urban governance and management in terms of 'scaling up' local development initiatives.
Skills
• Knowledge of integrated action planning and integrated local planning processes building both on local defined priorities and local ownership and higher levels strategic action. • Competence in applying, examining and analyzing participative tools. • Ability to use geographical information systems (GIS) as an important tool in urban mapping, planning and management.
General competence
• Awareness of the struggle of the urban poor in terms of entitlements to land, work, and participation in the civil society, and overall livelihood improvements. • Understanding of what are contextual and general issues in local and higher level urban transition in both developing and Nordic countries as well as their localised and interrelated nature. • Knowledge on the interface and the potential conflicts between targeted strategies addressing urban poverty and urban environmental strategies.

1. Learning Goal

The goal of the Masters course in Urban Ecological Planning is to enable the candidates to act as planners in urban settings based on an understanding of the dynamics of urban change in a global context.

The course is grounded in an ideology that focuses on exploring and utilizing contextual knowledge and localized resources while at the same time acknowledging the relational complexity that exist in the urban reality of the developing world. Through a practice oriented learning approach the course adheres to the principles of equity, sustainability and in promoting the interests of the marginalized.

2. Course Structure

This is a two year course where each of the four semesters comprises core modules and electives from the natural or social sciences depending on the candidate's interests or qualifications. There are also multidisciplinary courses, "Experts in Team" that may be chosen as electives.

Semester I: International 'Field Work and Project' taking place in a third country done in cooperation with students from other international universities and faculties of NTNU.

Semester II: Core courses (Urban Ecological Planning; Planning for Sustainability and Development; Research Methods; GIS for Urban Planning).
Semester III: Core courses (Planning Theory, Methods) + electives.
Semester IV: Master thesis; analyses and final write-up.

Individual study plans for each semester has to be agreed upon with the course coordinator and submitted by deadlines set by the university

3. Career Prospects

The course will give the candidate in insight into the dynamics of urban change, and prevalent development challenges of the developing world, and furthermore advise on possible ways of dealing with the constitutive problems and possibilities. The candidate is thus qualified to fill positions within public administration, private and public planning institutions, in private consulting businesses, NGOs, aside from positions in educational institutions. Our candidates have previously settled into all the mentioned positions.

4. Entry Qualifications

1: International Students (excluding students from Nordic countries) Students are required to have a B.Sc/ B. Engg/ BA university degree preferably in Urban Planning, Architecture or Civil Engineering. Candidates with a BA degree in Social Sciences that are relevant to the field of Planning such as Geography, Sociology, Cultural Studies etc in combination with 2 – 5 years work experience in Urban Planning will also be considered for admission.

2: Students from Nordic countries: Equivalent to those for international students. Nordic students may also apply on the basis of exams in relevant areas from the University Colleges (høyskolene).

English Language Requirements:

TOEFL Scroe 500/170

IELTS mark 5.0

5. Studies at other universities

Candidates may spend one of the four semesters as echange student at another university on the condition that the courses taken are equivalent ot those taught at our course.

6. Contacts

For further information on admission and administrative matters: studadm@ab.ntnu.no.
For information on academic matters: hans.skotte@ntnu.no or hans.c.bjonness@ntnu.no

MASTER OF SCIENCE IN URBAN ECOLOGICAL PLANNING 2012/2013

Compulsory core courses:

Semester:	Subject no.:	Title:	Note	Autumn	Spring
1.sem	AAR4525	Urban Ecological Planning in Developing Countries. Project work	1	15 Sp	
1.sem	AAR4816	Urban Ecological Planning. Method	1	7,5 Sp	
1.sem	AAR4820	Urban Ecological Planning. Theory	1	7,5 Sp	
2.sem		Electives (see list)			7,5 Sp
2.sem		Electives (see list)			7,5 Sp
2.sem	AAR5305	Urban Ecological Planning in Diverse Cultures			7,5 Sp
2. sem	AAR5250	Preparation for fieldwork			7,5 Sp
3.sem	AAR5200	Processing Field Study Data		15 Sp	
3.sem	FP4350	Planning theory and planning process skills		7,5 Sp	
3. sem		Electives (see list)		7,5 Sp	
4.sem	AAR5400	Master In Urban Ecological Planning			30 Sp

Electives:

Subject no.	Title:	Note	Autumn	Spring
AAR8100	Housing Theory and History	2	7,5 Sp	
GEOG3505	Landscape and Planning	2	15 Sp	
GEOG3506	Geography, Health and Development	2	7,5 Sp	
AAR4944	Planning for Sustainability and Development	3		7,5 Sp
AAR5270	Globalisation and Urban Development			7,5 Sp

1) The course will not be teached in 2012/2013

2) Autumn: Elective courses offered during the autumn can only be selected if a study plan tailored to the M.Sc. thesis subject is agreed with the Faculty, and recommended by the M.Sc. thesis supervisor and course responsible.

3) Spring: Elective courses amounting to 15 Sp shall be selected from the above list

The subject description can be found at http://www.ntnu.no/studier/sokemne

MASTER OF SCIENCE IN SUSTAINABLE ARCHITECTURE
– Towards a zero emission built environment

ADDITIONAL REGULATIONS

1. Learning Aims

Participants in the international MSc programme for Sustainable Architecture will learn to identify and apply the correct measures and resources to design high-quality, cost effective architecture that contributes towards achieving a zero emission built environment.

In a global and European perspective, buildings are accountable for about 40 % of all GHG emissions. IPCC reports point to measures in the building sector as being the most economical (when compared to other important sectors).

The MSc programme aims to educate and train building professionals in the use and development of competitive methods and solutions for existing and new buildings that will contribute to lowering GHG emissions related to the production, use, management, and demolition of architecture in a life-cycle perspective. The Master programme encompasses residential, commercial and public architecture as well as its effect on the urban and rural built environment.

2. Course Structure

The curriculum consists of 3 consecutive semesters with theory and project courses, and a fourth semester during which the participants write their MSc thesis. Throughout the two years of the MSc programme, a holistic perspective stresses the many architectural expressions and possibilities encompassed within a zero emission built environment. Within each of the theory and project courses, high demands are made towards integrated design strategies to ensure usability and synergy of the design with its surroundings and users. The students are continuously trained in interdisciplinary co-operation in order for them to integrate this integrated design method in their professional practice.

- Semester 1: Concepts and strategies related to energy efficient, sustainable and zero emission buildings and built environment (theory); Climate and Built Form (theory); Project course
- Semester 2: Energy systems and services and their integration in architectural design (theory); Sustainable building materials and components (theory); Project course
- Semester 3: Use and operation of zero emission buildings (theory); Elective Course (theory – to be agreed upon with supervisor and course coordinator); Project course
- Semester 4: Master thesis

3. Career Prospects

The MSc programme in Sustainable Architecture lies in the forefront of research, innovation and implementation related to reducing GHG emissions in architecture which the students will be able to transfer into their practice as building professionals. The

continuous focus on integrated design methodology will enable the students to perform in any building design team, both as co-worker and leader.

The programme's close link to the interdisciplinary Research Centre on Zero Emission Buildings ensures close contact with State-of-the-Art research and practice in Norway and abroad with whom the students will be in contact during their education: education and research institutions; producers of materials and products for the building industry; contractors, consultants, architects; trade organisations; public administration; public and private construction and property management; and users. Among the international partners of the Research Centre are VTT (Finland), Chalmers (Sweden), Fraunhofer (Germany), TNO (The Netherlands), LBL and MIT (USA), University of Strathclyde (Scotland), and Tsinghua University (China).

4. Entry Qualifications

A 3-year Bachelor Degree in Architecture, Engineering or Urban Planning. Students with a background in other relevant fields may be considered for admission as well, after discussion with the MSc coordinator and Advisory Board.

English Language Requirements: TOEFL Score 500/170; IELTS mark 5.0

5. Studies at other universities

Students may spend one of the four semesters as exchange student at another university on the condition that the courses taken are equivalent to the programme at NTNU.

6. Contacts

For further information on admission and administrative matters: studadm@ab.ntnu.no.

For information on academic matters: annemie.wyckmans@ntnu.no.

MASTER OF SCIENCE IN SUSTAINABLE ARCHITECTURE 2012/2013

Semester	Subject no.:	Title:	Note	Autumn	Spring
1st semester	AAR4532	Climate and Built Form Design Project	1	15 Sp	
1st semester	AAR4833	Concepts and Strategies in Sustainable Architecture	1	7,5 Sp	
1st semester	AAR4832	Climate and Built Form	1	7,5 Sp	
2st semester	AAR4616	Integrated Energy Design Project			15 Sp
2st semester	AAR 4926	Integrated Energy Desing			7,5 Sp
2st semester	AAR4907	Sustainable Building Materials and Components			7,5 Sp
3st semester	AAR4546	Design of Zero Emission Buildings		15 Sp	
3st semester	AAR4817	Use and Operation of Zero Emission Buildings		7,5 Sp	
3st semester		Elective Course		7,5 Sp	
4st semester	AAR4993	Master Thesis			30 Sp

Electives:

Subject no.	Title:	Note	Autumn	Spring
Subject may be thought in english				
BI2050	Biological Resources		7,5 Sp	
TVM4162	Industrial Ecology		7,5 Sp	
AAR4820	Urban Ecological Planning. Theory	1	7,5 Sp	
AAR4850	Principles in Lighting		7,5 Sp	
AAR4863	Off-site Fabrication and Building Info Modeling		7,5 Sp	7,5 Sp
AAR4816	Urban Ecological Planning. Method	1	7,5 Sp	
TMM4225	Engineering Collaboration in Distributed Teams		7,5 Sp	
AAR4873	Sections	1	7,5 Sp	
Thought in norwegian				
FP4100	Arkitektur og stedsforming		7,5 Sp	
EP0100	Energifremtider og miljøvisjoner		7,5 Sp	
TBA4155	Prosjektplanlegging og analyse		7,5 Sp	
TBA4160	Bygningsfysikk, grunnkurs		7,5 Sp	
TBA4135	Organisasjon og økonomi I BA-prosjekt		7,5 Sp	
GEOG1000	Menneske og sted I		7,5 Sp	
TMM4220	Innovasjon		7,5 Sp	
TIØ4258	Teknologiledelse		7,5 Sp	7,5 Sp
TPD4142	Designtenkning		7,5 Sp	
FI1105	Etikk		7,5 Sp	

The subject description can be found at http://www.ntnu.no/studier/sokemne

1) The course will not be teached in 2012/2013

MASTER IN SUSTAINABLE URBAN TRANSITIONS

Nordic master programme

1 Goals

The Nordic Master Programme in Sustainable Urban Transitions (NMP SUT) is a Nordic double degree master programme which has been developed by the Nordic Five Tech (N5T) collaboration. N5T is an alliance of the five leading technical universities: Aalto University (Aalto), Chalmers University of Technology (Chalmers), Royal Institute of Technology (KTH), Norwegian University of Science and Technology (NTNU) and the Technical University of Denmark (DTU). The goal of the N5T alliance is to utilize shared and complementary strengths and create synergy within education, research and innovation.

Perspectives

These different fields of application forms a new joint subject area: planning and design for Sustainable Urban Transitions, where systems thinking, participative and scenario approaches, risk reduction, research by design and generative planning are key concepts. Within this subject area, the aims of the programme are to:

- Provide opportunities for joint learning and understanding of urban planning, design and management as highly complex transition processes, laden with both short-term and long-term uncertainties.
- Support integrated learning and capacity building targeting the variety of involved professionals.
- Show how sociotechnical systems theory, participative and scenario approaches, area-based planning and practice-based research are key concepts in sustainable urban transitions.
- Provide opportunities for learning in different contexts (North and South) and fields of application at the five participating universities, exploiting the strong complementary specialties of the N5T partners to foster highly qualified candidates for public administration, industry and research within sustainable urban transitions.
- The programme is active at four different levels of urban transitions: individual inhabitants/users, neighbourhoods, infrastructural systems, and urban regions. These levels are represented by the programme's five study tracks and the learning outcomes differ depending on study track. Details of the programme's learning outcomes are to be found in the study track descriptions.

Level

The NMP SUT is a two-year 120 ECTS Nordic double degree master programme coordinated by Chalmers and based on the particular expertise of the participating universities. In the double degree programme students study one year at two different universities following a Year one university/Year two university pattern:

- Year one university, 1st and 2nd semesters
- Year two university, 3rd and thesis semesters

The length of the study period in each university corresponds to 60 ECTS.

Relevance

Since continued urbanization will be a major trend globally in the coming decades (from today's three billion to the anticipated six billion urban inhabitants by 2050), future career opportunities for successful NMP SUT students cover a wide field of potential employers

and/or clients in both OECD and non-OECD countries. The five study tracks reflect different but equally valid ways to address critical challenges linked to urban transitions. Career opportunities will thus be found in the public sector (agencies for urban/regional planning, management, and governance), in development institutions (local and international), and in both NGOs and consultancy firms active in the field of urban transitions. As the NMP SUT is integrated into the research environments at the five participating universities it also provides a solid platform for pursuing an academic career.

2 Learning outcome (Urban Ecology)

After completing this study track, the candidate should have:

Knowledge

• Knowledge of two specific, underprivileged neighbourhoods (one in a developing country, the other in a Nordic country), their territorial strength in terms of organisation, resources, skills and access to land, but also their struggle, and changing livelihood conditions.

• Experience in how to address both non-planned and planned neighbourhoods in urban centres and fringe areas for the purpose of livelihood improvements, tenure security and urban upgrading in contexts of conflicts of objectives of equity, environmental sustainability and civil society interests.

• Understanding of specific cases of building strategic responsibility and action at higher levels of urban governance and management in terms of ‘scaling up’ local development initiatives.

• Knowledge of integrated action planning and integrated local planning processes building both on local defined priorities and local ownership and higher levels strategic action.

Reflection

• Competence in applying, examining and analyzing participative tools.

• Ability to use geographical information systems (GIS) as an important tool in urban mapping, planning and management.

Practice

• Awareness of the struggle of the urban poor in terms of entitlements to land, work, and participation in the civil society, and overall livelihood improvements.

• Understanding of what are contextual and general issues in local and higher level urban transition in both developing and Nordic countries as well as their localised and interrelated nature.

• Knowledge on the interface and the potential conflicts between targeted strategies addressing urban poverty and urban environmental strategies.

3 Target group

The programme is open to students with a bachelor in Architecture, Landscape Architecture, Planning (such as Physical Planning and Human Geography with a profile in planning), and Engineering. However, depending on their background (bachelor degree and professional experiences) students can only apply to certain study tracks and, hence, to certain universities (see diagram here). There are a limited and predefined number of student places in each study track and for each category of student (i.e. Architecture, Landscape Architecture, Planning, and Engineering).

Since continued urbanization will be a major trend globally in the coming decades (from today's three billion to the anticipated six billion urban inhabitants by 2050), future career opportunities for successful NMP SUT students cover a wide field of potential employers and/or clients in both OECD and non OECD countries. Career opportunities will thus be found in the public sector (agencies for urban/regional planning, management, and governance), in development institutions (local and international), and in both NGOs and consultancy firms active in the field of urban transitions. As the NMP SUT is integrated into the research environments at the five participating universities it also provides a solid platform for pursuing an academic career.

4 Staff competences

Will be based on the current staff at the Department of Urban Design and Planning with competence within:

- Process knowledge, urban governing, governance
- Urban fabric and infrastructure
- Transportation
- Urban design and land use planning
- GIS
- Planning theory
- Landscape architecture (lacking competence)

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Need competence from planning in developing countries within informal processes.

5 Education /learning

The programme will start autumn 2012. A group of 30 students will be distributed between the universities. NTNU will get 6-8 new students every year.

6 Funding

By the time there is no special funding for the programme.

7 Research

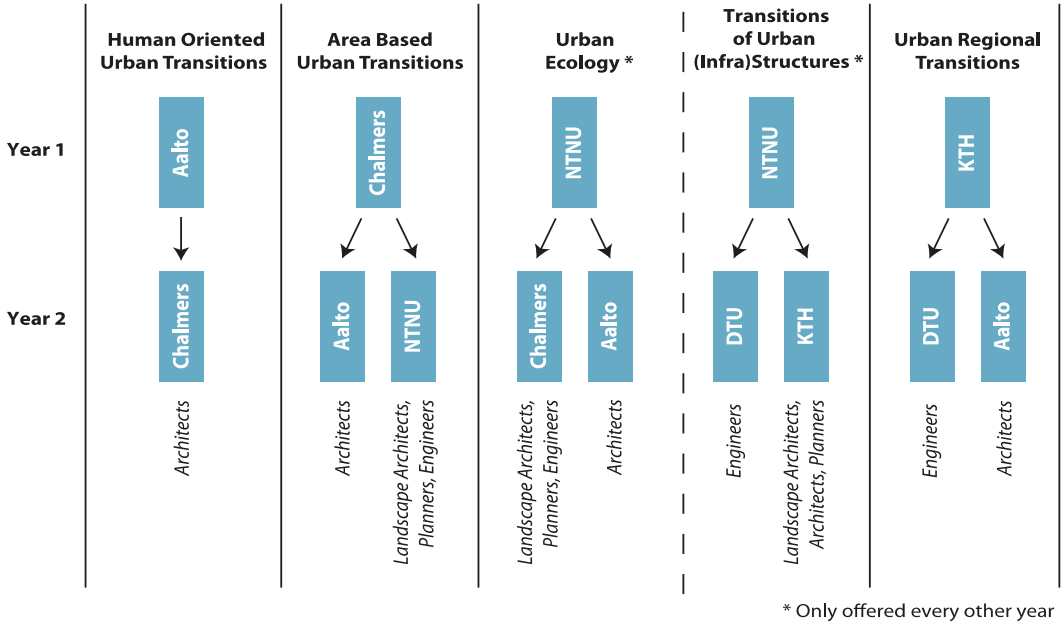
Both the topic, Sustainable Urban transitions, and the cooperation with the leading Nordic universities, make a excellent basis for research within the European research programmes, national programmes and others.

8 Location

Chalmers will coordinate the programme and the students will at NTNU be distributed at existing courses with MUEP, MFP and MA.

The programme will be an interesting basis for a broad, multidisciplinary research programme within Sustainable urban development.

Possible convergence: **Sustainable urban development and transition**



Study track: Sustainable urban structures (every other year)

Semester	Subject no.	Title	Autumn	Spring
1. emester	AAR4515	Sustainable urban design (Project)	15	
1. semester	AAR4944	Planning for Sustainability and Development	7,5	
1. semester	FP4350	Planning theory and planning process skills	7,5	
2. semester	AAR4225	Integrated land use and transportation planning		7,5
2. semester	AAR4936	Analytical methods in physical planning		7,5
2. semester	AAR5260	GIS in urban planning		7,5
2. semester	AAR5270	Globalisation and urban development		7,5
3. semester	AAR8320	Introduction to theories and methods of science	7,5	
3. semester	FP4350	Planning theory and process skills	7,5	
3. semester	AAR4944	Planning for sustainability and development	7,5	
3. semester	AAR4100	Introduction to Norwegian Built Environment	7,5	
4. semester		Master thesis		30

Study track: Urban Ecology (every other year)

Sem	Title	Autumn	Spring
University 1: NTNU			
1.	AAR4525 Urban Ecological Planning in Dev. Countries (project)	15	
1.	AAR4820 Urban Ecological Planning in Dev. Countries (theory)	7,5	
1.	AAR4816 Urban Ecological Planning in Dev. Countries (method)	7,5	
2.	AAR5305 Urban Ecological Planning in Diverse Cultures		7,5
2.	AAR5250 Field methods and research proposal writing		7,5
2.	AAR5260 GIS in urban planning		7,5
2.	Electives:		
2	AAR5270 Globalisation and Urban Development		7,5
2	Experts in Teamwork – Sustainable Architecture		7,5
University 2: Chalmers			
3.	Suburbs: Design and Future Challenges	21,5	
3.	Advanced theory and methodology – master's thesis preparation course	7.5	
University 2: Aalto			
3	Urban Laboratory	10	
	Electives		
3	A-36.3330 Urban Renewal, studio	10	
3	A-36.3504 City in Transition Theory	5	
3	Maa-20.3510 Strategic Urban and Regional Planning	4	
3	21 A00310 Introduction to Management	6	
3	21 E80000 Gender, organizations and management	6	
3	21 E10000 How to change the world: Innovation towards sustainability	6	
3	07124 Context / Upgrading a Neglected Space	12	
3	10157 Designing Services	12	
University 2 and 1:			
4.	Master thesis		30

MASTER OF SCIENCE IN BIOTECHNOLOGY

Programme code: MSBIOTECH

The 2-year biotechnology Master of Science study is interdisciplinary at several levels. First, the programme is a collaboration between the Department of Biology and the Department of Biotechnology. The courses within the programme reflect this interdisciplinary, as the development of knowledge and skills is focusing on thorough knowledge about basic biological processes, available technologies to study such processes, and knowledge-based approaches to modify or optimise processes in order to tackle major societal, environmental or sustainability problems.

Learning outcomes

The science programme in biotechnology is aimed towards the scientific research with focus on cell- and molecular biology, biochemistry and microbiology. One of the objectives is to give the students an in-depth understanding of the biological processes in bacteria, plants and animals and possible applications of these processes. During the course of the study it will be placed emphasis on practical skills in central courses such as cell- and molecular biology, biochemistry and microbiology in addition to research training. The latter includes statement of testable hypotheses, strategies for testing, collecting data, and interpretation of the results. Furthermore, it is the intention that the master study shall contain a theoretical and methodical dimension that can be translated to other scientific areas.

A candidate from this programme should be able to maintain, develop, and renew industrial processes and manage such enterprise. The science programme offers an in-depth study in fields of biology such as cell biology, molecular biology, microbiology and biochemistry.

The theses work will be linked to both basic research projects and projects aiming towards the global challenges such as energy, environment, health, food and water. Several projects will be in the intersection between technology, natural science and medicine.

Admission requirements

One of the following requirements has to be fulfilled to qualify for admission to the programme

- BSc in cell- and molecular biology,
- BSc from Norwegian university colleges within bioengineering (bioingeniørfag)
- BSc in food technology (matteknologi/næringsmiddelfag),
- an education which corresponds to 3 years of study at university level within the field of biotechnology or biochemistry.
- BSc in other related areas may be considered on an individual basis.

Study plan

There are two main components to the Master's programme:

- Master's thesis (60 ECTS credits)
- Theoretical and methodological courses, compulsory and optional courses (60 ECTS credits)

Semester	7,5 ECTS	7,5 ECTS	7,5 ECTS	7,5 ECTS
4. Spring	**BI3091/ BT3091 Special Syllabus**	Master thesis		
3. Autumn	**BI3016 Molecular Cell Biology**	Master thesis		
2. Spring	**Experts in Teamwork**	Optional course	Master thesis	
1. Autumn	**TBT4145 Molecular Genetics**	Optional course	Optional course	Optional course

Compulsory courses (30 ECTS credits):

- TBT 4145 Molecular Genetics
- Experts in Teamwork
- BI3016 Molecular Cell Biology
- BI3091/ BT3091 Special Syllabus

At least two of the following courses must to be selected from the following list:

Autumn:

BI 3013 Experimental Cell- and Molecular Biology	7,5 ECTS
BI3019 System biology; Resources, Standards, Tools	7,5 ECTS
TBT4135 Biopolymers	7,5 ECTS
TBT4505 Biotechnology Specialization Course	7,5 ECTS
FI3107 Biotechnology and Ethics	7,5 ECTS
MOL3005 Immunology	7,5 ECTS
MOL3014 Nanomedicine I: Bioanalysis	7,5 ECTS

Spring:

BI3017 Bio Visualisation	7,5 ECTS
BI3018 Patentation and Commercialization of Biotech and Medtech Invention,	7,5 ECTS
TBT4125 Food Chemistry	7,5 ECTS
TBT4130 Environmental Biotechnology	7,5 ECTS
TBT4165 Systems Biology and Biological Networks	7,5 ECTS
MOL3015 Nanomedicine II: Therapy	7,5 ECTS
MTEK3001 Applied Bioinformatics and Systems Biology	7,5 ECTS

The normal workload for a full-time student for one academic year is 60 ECTS credits.
The programme also offers the students the opportunity to study one semester abroad. We recommend that this is done in the 2nd semester. At least 3 of the courses taken during the master's degree have to be registrated as NTNU courses. At least 30 ECTS, in addition to the course Experts in Teamwork, should be covered by courses on a master level.
Deadline for handing in the Master thesis is the 15th of May, deadline for the exam is 15th of June in the 4th semester.

Master Thesis

The Department of Biology and the Department of Biotechnology will give the student opportunities to choose between wide varieties of master thesis, covering various aspects from human health to food chemistry. In this way the programme ensures that all students, despite various educational backgrounds, are given suitable master thesis that connect to and builds directly on their previous education.

Master's thesis can be linked to on-going research in Molecular Biology, Biopolymer chemistry, Microbiology and Molecular Genetics, Systems Biology, Bioinformatics, Microarray-based and other genomics data production technologies, knowledge gathering and modelling of biological processes, Food Chemistry, and Environmental Biotechnology.
The student will be part of active research groups working with research themes that include the analysis of basic developmental processes and biochemical processes in plants; characterization of marine algae to lay the foundation for biotech applications in the fields of energy production, CO_2 capture, materials and feed; the study of fundamental processes that link quality of food and human metabolic health; the exploitation of software tools and knowledge bases to integrate and simulate biological processes in the computer; the use of microbial communities for production of renewable energy and for water treatment; molecular genetics and biochemistry of antibiotic biosynthesis in marine bacteria and genome-based bioprospecting for new antibiotics; structure-functional characterization of bioactive molecules derived from bioprospecting studies; quality of food linked to the biochemical processes in the raw material and changes during storage and processing.

Career prospects

Graduates of the Masters programme will be internationally qualified for a wide range of positions both in industry and research related to bio- and medical technology, as well as for further doctoral studies. Other areas of employment are in the biotechnological and pharmaceutical industry, i.e. in connection with development of therapeutic products, methods of analysis and kits, along with improving products in agriculture and aquaculture.
A number of students, mainly former Bioengineers, have got leading positions in laboratories, or they are teachers in Medical technical teaching institutions. After graduating, all the students independent of their educational background, are qualified for a wide range of positions in public and government institutions, in research positions or research support in universities and private research institutes, hospitals and government institutions like Folkehelsa, Veterinærinstituttet and Næringsmiddeltilsynet, and they also have competence within the area of risk assessment (REACH).

Further information: http://www.ntnu.edu/studies/msbiotech

MASTER OF SCIENCE IN AQUATIC FOOD PRODUCTION – SAFETY AND QUALITY

Programme code: MSAQFOOD

The Nordic Master Programme in “Aquatic Food production – Safety and Quality” (AQFood) addresses the entire value chain through the interdisciplinary approach of this programme, and considers important aspects of economy, production management as well as environmental challenges. Students will obtain the necessary background and knowledge of the operation of the entire aquatic food production chain as well as safety and quality issues. The understanding of the role of the various academic fields that contribute to the efficiency and transparency of the aquatic food supply chain will be enhanced and field studies will ensure the necessary industrial focus.

The Nordic Master Programme AQFood is offered by a consortium of five leading universities in the Nordic countries, DTU- Denmark, NTNU- Norway, UMB- Norway, SLU-Sweden and HI- Iceland. The universities are working together to deliver a key education for the aquatic food sector. Marine and maritime research collaboration between NTNU, cooperating Nordic universities, industry and seafood industry will be safeguarded through excursions, projects and the master thesis.

Career prospects

After finishing the master programme, the candidates will be qualified for a wide range of different jobs in the aquatic sector, both in science and in the industry depending on the chosen specialisation. The master programme is designed for students who wish to pursue a career in the aquatic food production, whether they will be professionals in aquaculture production, industrial food production or natural resource management.

Learning outcomes

After following the core, students are expected to be able to:

- Explain the aquatic food value chain and understand the value chain elements
- Describe the aquatic food industry and the global trends in terms of resources and environmental impact
- Describe basic concepts of food quality and be familiar with biochemical and chemical reactions that are important to aquatic food quality
- Describe basic concepts of food safety and identify main health hazards (microorganisms, bacteria and virus) and recognize their importance in relation to fish/aquatic food
- Explain production systems i.e. aquaculture and fisheries available today with their weakness and their strength in relation to sustainability, food safety and quality
- Explain methods/systems for processing and packaging of aquatic food products to increase shelf-life and preserve perishable products and their strength in relation to sustainability, food safety and quality
- Describe and evaluate systems for transport/logistics of aquatic products and the role of supply chain management and information technologies to enhance transparency and ensure quality, safety, and traceability of products
- Analyse the challenges in terms of innovation and marketing for the aquatic fish/food sector

Natural Resources and supply chain management / Food Science

The students should be able to describe physiology, anatomy, health and welfare of fish and be able to relate this to fisheries, to analyse and evaluate different systems used in fisheries and understand the interactions between human activity, environmental conditions and aquatic exploitation. They should be able to evaluate the economical, technical, environmental and biological challenges of the aquatic food value chain from a management and sustainability perspective. The candidate should also be able to estimate the impact of laws and regulations that can have effect on revenue (HI/UoI specialization) or to evaluate the cause and effect of different production techniques strategies and handling process during the life of the fish, and final process quality of fish as food (DTU Specialization).

Aquatic Production

First year of study at UMB, second year of study at SLU or DTU, see the respective universities for learning outcome and study plan.

Industrial production

The students should have advanced knowledge of aquatic food processing combined with the ability to apply this knowledge to obtain products with optimal quality and safety. They should be able to evaluate environmental effects of specific aquatic food processing options and have knowledge of aquatic food quality and shelf-life together with the ability to evaluate quality attributes by relevant sensory, microbiological, biochemical and chemical methods. Further they should be able to document aquatic food processing, quality, safety and health effects taking into account national and EU-regulations.

Students should be able to estimate how ICT can influence supply chain management in aquatic food chains for optimization of processes and evaluate how supply chain management can improve the quality of safety related recalls HI (UoI) Ind. Eng. specialization).

Admission requirements

BSc/ BEng or equivalent degree in the fields of chemistry, biology, natural sciences, environment, health and production, or biotechnology will be required.

Programme structure and specialisations

There are two main components to the Master's programme:

- Theoretical and methodological courses, compulsory and optional courses (90 ECTS credits)
- Master's thesis (30 ECTS credits)

The AQFood Nordic Master Programme offers three specialisations:

- Natural Resources and Supply Management / Food Science (NTNU)
- Industrial Production (DTU)
- Aquatic Production (UMB)

All specialisations take the entire value chain as a unique starting point.

The first semester (30 ECTS) is given essentially as e-learning. The last two semester's students are required to move to one of the other 5 collaborating universities, depending on chosen specialisation.

Specialisation: Natural Resources and Supply Chain Management / Food Science (NTNU/DTU)

Semester	7,5 ECTS	7,5 ECTS	7,5 ECTS	7,5 ECTS
4th semester Spring – DTU	Master thesis			
3rd semester Autumn – DTU	**23501 Biological Quality - Pre-harvest Impact on Post-harvest Product Quality**	**23DT Aquatic Food Microbiology**	**23DT Food Quality - Preserving high quality throughout the production**	Optional courses
2nd semester Spring – NTNU	**TMR4137 Sustainable Utilization of Marine Resources**	**BI3061 Biological Oceanography**	Optional course	Optional course
1st semester Autumn -NTNU	**Intro Week BT2115 Safety and Human Health Effects of Aquatic Food**	**BT3115 Primary Production - Aquaculture and Fisheries**	**BT3110 Aquatic Food Processing & Technology**	**BT2110 Aquatic Food Supply Chain Management, Environment and Resources**

Optional courses 2nd semester:
TBT4125 Food chemistry (7,5 ECTS)
BT 8117 Marine lipids (7,5 ETCS)
TEP4265 Food technology (7,5 ECTS)
Xxxx xxx Experts in Teamwork
MOL3006 Molecular Mechanisms of Nutrition

Specialisation: Natural Resources and Supply Chain Management / Food Science (NTNU/UoI)

Semester	7,5 ECTS	7,5 ECTS	7,5 ECTS	7,5 ECTS
4th semester (spring)	Master thesis			
3rd semester autumn – UoI	**IÐN110F Production Planning**	**IÐN116F Supply Chain Management**	Optional course	Optional course
2nd semester spring - NTNU	**TMR4137 Sustainable Utilization of Marine Resources**	**BI3061 Biological Oceanography**	Optional course	Optional course
1st semester autumn -NTNU	**Intro Week BT2115 Safety and Human Health Effects of Aquatic Food**	**BT3115 Primary Production - Aquaculture and Fisheries**	**BT3110 Aquatic Food Processing & Technology**	**BT2110 Aquatic Food Supply Chain Management, Environment and Resources**

Specialisation Industrial Production and Food Chemistry (DTU/NTNU)

Semester	7,5 ECTS	7,5 ECTS	7,5 ECTS	7,5 ECTS
4th semester Spring – NTNU	Master thesis			
3rd semester Autumn - NTNU	**BT 8119 Food Chemistry Advanced**	**BT 8112 Salting of Fish**	Optional course	Optional course
2nd semester Spring – DTU	**23520 Food Process Design**	**23102 Food Safety in Production**	Optional courses	
1st semester Autumn - DTU	**Intro Week BT2115 Safety and Human Health Effects of Aquatic Food**	**BT3115 Primary Production - Aquaculture and Fisheries**	**BT3110 Aquatic Food Processing & Technology**	**BT2110 Aquatic Food Supply Chain Management, Environment and Resources**

Optional courses 3rd semester: Select one of the two first and one of the two last courses from the following list:
TBT4505 Biotechnology specialization course (7,5 ECTS)
KJ 3053 Analytical Methods for Industrial- and Environmental Monitoring (7,5 ECTS)
TBT5115 Risk Management in Projects (7,5 ECTS)
TEP4223 Life Cycle Assessment (7,5 ECTS)

Master Thesis

The students may choose from a wide variety of master thesis projects, covering various aspects from basic fish biochemistry/chemistry to applied, industry-related projects. In this way the programme ensures that all students, despite various educational backgrounds, are given suitable master thesis that connect to and builds directly on their previous education. Examples of master theses may be found at the home webpage for this master programme.

Contact information and counselling

Address: NTNU, Faculty for Natural Sciences and Technology, 7491 Trondheim, Norway
Telephone: 73 59 41 97
E-mail: studies-master@nt.ntnu.no
URL: http://www.ntnu.no/nt/english
http://www.ntnu.edu/studies/msaqfood

Student advisors

NN +47 73 59 33 13 Gerd Inger Sætrom / Ragnhild Inderberg Vestrum
NN +47 73 59 45 52 Siri Bremdal

MASTER OF SCIENCE IN NATURAL RESOURCES MANAGEMENT

Sustainable use of natural resources such as water, fossil energy, minerals and biological resources in land and water ecosystems are essential for the survival and development of mankind. However, the increasing needs and demands for these natural resources resulting from the growth of the human population combined with the decrease of the finite resources urgently calls for a sustainable management and conservation of these resources. Such management requires an interdisciplinary approach including in-depth knowledge about specific resources as well as a holistic perspective, including ecological, economic, social and cultural aspects, which are all central in an ecosystem services framework. Consequently there is increasing demand in society for scientists with interdisciplinary competence within natural resources management. The master program aims to enable students to combine interdisciplinary knowledge to solve problems related to environmental issues and the management of natural resources.

Learning outcomes

The interdisciplinary master program in Natural Resources Management, provides students with advanced knowledge, analytical skills and general knowledge at an advanced level aiming for work within the fields of research, public administration, governmental and non-governmental organizations, education and industry.

The Masters in Natural Resources Management offers specializations in the 4 disciplines: Biology, Chemistry, Resource Geology and Geography. The masters program includes 30ECTS elective courses that allows students to be interdisciplinary and flexible in the individual composition of their academic profile.

The program will provide a thorough insight into processes and mechanisms related to conflicting interests over the use of natural resources. In the masters thesis the student will obtain an advanced in-depth understanding in a topic that is relevant within the field of management of natural resources.

Knowledge

The MSc graduate in Natural Resources Management has:

- Substantial multidisciplinary knowledge about natural resources management related to the research within the specialization
- Substantial knowledge in a specific area based upon research experience from a masters project
- Substantial knowledge about various methodological and analytic approaches that are used within the specialization.

Proficiency/Skills

The MSc graduate in Natural Resources Management:

- Can independently carry out a complete scientific work process, including the theoretical background, hypotheses generation, collecting and analyzing data as along with the interpretation of results and their presentation
- Has high competence and multidisciplinary project experience within selected topics related to natural resources management and ability to contribute in a multidisciplinary team towards the management and sustainable use of natural resources
- Can critically evaluate methods and results within the field of specialization.

General Competence

The MSc graduate in Natural Resources Management:

- Can communicate research results in English, both in written and oral to both professionals and to a wider audience
- Can acquire and evaluate research information
- Can work on a project independently and in cooperation with others in interdisciplinary groups
- Can contribute to innovative thinking within the specialization in particular
- Has competence within Health- Environment and Safety in general, and within Health- Environment and Safety within the specialization in particular
- Is familiar with research ethics.

Specialization: Biology

With a specialization within biology the student holds an in-depth competence within the fields of conservation biology, ecology, evolution, systematics and/or physiology. The student with specialization within biology will through the work on the master project obtain an in-depth knowledge *in a biologically based research topic* which is related to the management of the biological resource in question.

The MSc graduate in Natural Resources Management with biology specialization will hold the following knowledge and skills:

Knowledge

The MSc graduate in Natural Resources Management has:

- A broad knowledge within the respective biological field (theoretical and experimental) and how this integrates with management of natural resources for sustainable use
- Knowledge about biological diversity, ecosystem services and other aspects of conservation biology and how this knowledge can be applied to find environmentally sound solutions
- A thorough understanding of evolutionary and ecological processes.

Proficiency/Skills

The MSc graduate in Natural Resources Management:

- Can apply the biological knowledge as well as the knowledge about management of natural resources within research, public administration, governmental and nongovernmental organizations
- Can evaluate and apply relevant theory, methods and analytic approaches within the respective field of biology, including statistical methods
- Can implement knowledge from several research fields and disciplines.

Specialization: Geography

A specialization within geography provides the student with in-depth competence within selected geographical concepts and theories, and skills for applying this competence to natural resource management issues. The students also attain an in-depth competence in relevant geographical research methods and understand their relevance for research on natural resource management issue. The student specializing in geography will through the master project acquire in-depth knowledge within a research topic directly or indirectly related to the natural resource management issue in question.

The MSc graduate in Natural Resources Management specializing in geography will hold the following knowledge and skills:

Knowledge

The MSc graduate in Natural Resources Management has:

- Acquired a deep understanding of general concepts and theories from the field of geography, and integrated this with an understanding of concepts and theories from the specific field of natural resource management
- Knowledge about research fields in geography such as environmental geography, political ecology, natural resource management or other relevant specialisations in geography, and understand how this knowledge can be applied on environmental issues.

Proficiency/Skills

The MSc graduate in Natural Resources Management:

- Can evaluate and apply relevant theory, methods and analytic approaches within the field of geography on natural recourse management issues
- Can implement knowledge from several research fields and disciplines
- Can apply geographical knowledge as well as knowledge about management of natural resources in public administration, governmental and non-governmental organisations.

Specialization: Chemistry

With a specialization within chemistry the student holds a broad competence within the fields of environmental chemistry and analytical chemistry. The student specializing in chemistry will through the master project acquire in-depth knowledge within a research topic related to the natural resource management issue in question. The MSc graduate in Natural Resources Management with chemistry specialization will hold the following knowledge and skills:

Knowledge

The MSc graduate in Natural Resources Management has:

- Broad knowledge of environmental and analytical chemistry required to monitor, understand, explain and predict consequences of natural changes and man-made influences on earth, air, water, and the living environments
- Broad knowledge of how environmental chemistry integrates with management and sustainable use of natural resources
- Basic knowledge of chemical speciation and the importance of speciation in dispersion of chemical environmental pollution and monitoring

Proficiency/Skills

The MSc graduate in Natural Resources Management:

- Can apply the knowledge in environmental and analytical chemistry as well as knowledge about management of natural resources within research, public administration, governmental and nongovernmental organizations
- Can evaluate and apply relevant theory, methods and analytic approaches within environmental and analytical chemistry, including relevant statistical methods.
- Can integrate knowledge from several research fields and disciplines.

Specialization: Resource Geology

Knowledge

The MSc graduate in Natural Resources Management has:

- A solid theoretical knowledge of mineral and ore-deposit forming processes
- Specialized knowledge on a specific type of geological deposits.
- specialized knowledge of several analytical methods relevant to in depth studies of geological deposits
- General knowledge of mining techniques and environmental as well as socio-cultural implications of economic exploitation of geological deposits

Proficiency/skills

The MSc graduate in Natural Resources Management

- Are able to partake in studies of geological deposits in collaboration with relevant experts
- Know where to find and how to retrieve and interpret relevant geological background information
- Know how to design and initiate sampling of geological data relevant for a given deposit type

Structure of the International Masterstudy in Natural Resources Management

Year	Semester						Total credits
2	4. semester Spring	**Special Syllabus for Master Degree* (7,5 credits)**				**RFEL 3080 Scientific Seminars in Natural Resources Management (7,5 credits)**	30
	3. semester Autumn	Master Thesis (60 credits)					30
1	2. semester Spring	**Elective course (7.5 credits)**	**Elective course (7.5 credits)**	**Elective course (7.5 credits)**			30
	1. semester Autumn	**Elective course (7.5 credits)**	**RFEL 3081 Natural Resources Management, Interdisciplinary Project (7.5 credits)**	**GEOG 3030 Natural Resources Management (7.5 credits)**			30
							120

Mandatory courses (30 credits)
Elective courses (30 credits)
Master thesis (60 credits)

* Course code for Special Syllabus for Master's Degree for each of the specialisations in the programme:
Biology: BI3091
Chemistry: KJ3091
Resource Geology: GEOL3093
Geography: GEOG3091

** Course code for Master's Thesis for each of the specialisations in the programme:
Biologi: NATRBI 3900
Chemistry: NATRKJ3900
Resource Geology: GEOL3090
Geography: GEOG3940

Elective courses -MSc Natural Resources Management

Study plan 2012-2013

KJ3053 Analytical methods for Industrial and Environmental Monitoring (7,5 credits) Autumn
KJ3072 Advanced Aquatic Chemistry (7,5 credits), Autumn
KJ 3071 Applied geochemistry (7,5 credits) Autumn
KJ3050 Marine Organic Environmental Chemistry , 7,5 credits, Autumn, (restricted admission)
KJ3059 Advanced Chromatography Advanced Chromatography, (7,5 sp), Autumn

BI2017 Genetics and Evolution I (7,5 credits) Spring *****
BI2043 Biodiversity and Conservation Biology I (7,5 credits)Autumn*
(7,5 credits) Autumn –
BI3003 Norwegian Vertebrates: ecology and management (7,5 credits) Autumn
BI3004 Behaviour and Conservation Biology (7,5 credits) Autumn
BI3005 Fish Behaviour and Ecology (7,5 credits) Spring – **teaching in 2013**
BI3010 Population Genetics (7,5 credits) Autumn
BI3032 Population Dynamics (7,5 credits) Spring
BI3051Evolutionary Analyses (7,5 credits) Spring
BI3072 Environmental Toxicology (7,5 credits) Autumn
BI3082 Biodiversity and Conservation Biology II (7,5 credits) Autumn
BI3083 Evolutionary and Ecological Genetics (7,5 credits)
BI2044 Ethology (7,5 credits) Spring
Behavioural Ecology - ny kode: BI3040 Behavioural Ecology, (7,5 credits) Spring
BI3041 Sexual Selection, (7,5 credits) Spring , **teaching in 2012/2014**
***BI2017 and BI2043 is mandatory in BSc Biology, NTNU and these students can't choose these elective courses.**

TGB4115 Mineral Deposit Geology (7,5 credits) Autumn
TGB4120 Prospecting and Formation of Selected Ore-Depotits (7,5 credits) Spring – **no teaching in 2012/2013**
TGB4135 Basin Analysis(7,5 credits) Spring
TGB4170 Diagenesis/Reservoir Quality(7,5 credits) Spring
TPG4177 Carbonate Reservoir Characterization(7,5 credits) Autumn

GEOG3003 Methodology and the Research Process(7,5 sp) Autumn
GEOG3005 Qualitative Methods (7,5 credits) Spring
GEOG3006 Quantitative Methods (7,5 credits) Spring
GEOG3505 Landscape and Planning (15 credits) Autumn

GEOG3515 Environment, Development and Changing Rural Livelihoods (7,5 credits) Autumn
GEOG3519 Geographical Information System I (7,5 credits) Autumn
GEOG3520 Geographical Information System II (7,5credits) Spring
GEOG3523 GIS data capture and mapping, (7,5 credits), Spring
SØK3524 Environmental and Resource Economics (15 credits) Autumn and Spring
POL3517 International development: The Effects of Politics, Institutions and International Economy (15 credits) Spring

FI5207 Multicultural Conflicts and Ethics 7,5 credits, Spring

The list of the following courses can be elected by all students attending the international master programme MSc Natural Resources Management if you have the knowledge demanded in the course description. It is also possible to choose other courses apart from this list according to spesific interest and in agreement with the supervisor and responsible Department.

MASTER OF SCIENCE IN ENVIRONMENTAL TOXICOLOGY AND CHEMISTRY

Programme code: MSENVITOX

Anthropogenic pollution is one of the most significant threats to the environment. Organic and inorganic environmental toxicants originating from human activities are distributed throughout the world via oceanic currents and atmospheric transport processes. This issue is of global importance. Consequently there is a high demand from both society and industry for scientists with competence within the interdisciplinary scientific area of environmental toxicology and chemistry.

Learning outcomes

The master programme in Environmental Toxicology and Chemistry provides students with knowledge, analytical skills and general knowledge at an advanced level, with the aim of working in research, manufacturing, consulting, education and public administration, or for the purpose of further education in a doctoral program.

The master programme aims to enable students to combine biological and chemical knowledge to solve problems related to environmental pollution.

The master programme is interdisciplinary and will provide students with specialization in issues related to pollution in the natural environment with an either chemical or biological main approach, but with a solid basis in both chemistry and biology. The programme will provide a thorough insight into the processes and mechanisms related to how environmental toxicants are absorbed by organisms, dispersal mechanisms locally and globally, how they are distributed and transported in ecosystems, how they can be monitored, and the effects that environmental toxicants have on cells, organs, organisms, populations and ecosystems. Depending on the main approach, the programme will also provide insight and practical experience in methodology and analytical techniques of relevance for working with issues within environmental chemistry and environmental toxicology. The study also focuses on the dissemination of research results to a wide audience.

Knowledge

After finishing the study programme, the candidate should have acquired

- wide academic and applied knowledge in biology and/or chemistry with specialization in the field of Environmental Toxicology and/or Environmental Chemistry.
- knowledge of chemical properties of different groups of compounds and biological effects and important cycles, as basis for a comprehensive understanding of climate/environment, pollution and toxicology.
- knowledge of the physicochemical and/or biophysical processes of importance to the natural environment.
- research experience in a speciality that requires advanced knowledge of biology and/or chemistry through a supervised master's project that extends over several semesters.
- knowledge of relevant methods and hypothesis testing, including experimental analysis (chemical and/or biological), statistical techniques and other tools used to analyze and solve biological and/or chemical issues in research, manufacturing, management and/or teaching.
- knowledge of international research in her/his speciality, knowledge of international research groups in the field, and the breadth of research being done in the fields of

"Environmental Toxicology" and "Environmental Chemistry".

Skills

After finishing the study programme, the candidate should

- have professional knowledge of and be able to utilize a variety of advanced quantitative and qualitative analysis methods, methodology in the field and the application of these to independently analyze and solve (modelling) toxicological and/or chemical problems.
- be able to collect and analyze environmental samples, perform statistical analysis of data and interpretation and presentation of research results.
- combine insights from several scientific disciplines.
- make critical and independent assessments of methods and results.
- continuously develop his/her professional competence.
- be able to communicate subject matter and scientific results both to specialists and to a wider audience and be able to formulate scientific reasoning/argumentation.
- have expertise in handling chemical substances and/or biological material and understand environmental issues, including EHS.

General competence

After finishing the study programme, the candidate is should

- know important aspects in environmental pollution, understand this discipline's role in society and be able to assess ethical issues within this field.
- be able to acquire, evaluate and adopt relevant and reliable new information.
- have the background to carry out/solve advanced tasks and projects, both independently and in teams, and have the ability to assess her/his own efforts in projects.
- have an international perspective on her/his scientific field.

Career prospects

Graduates of the Masters programme will be internationally qualified for a wide range of positions in public and government institutions, administrative environmental agencies, consultancy companies and industry (e.g. oil and energy companies and the chemical industry) both as researcher or adviser. Some examples are Statoil and other oil companies, Det Norske Veritas, SINTEF, and national environmental authorities. Furthermore, there is an increasing need for competence within the area of risk assessment (REACH).

Through this programme you will be part of a large international scientific and industrial network. The candidates in environmental toxicology can after five years of work experience apply to become a "European Registered Toxicologist".

Admission requirements

One of the following requirements has to be fulfilled to qualify for admission to the programme:

- To qualify for the specialisation in Environmental Toxicology: BSc in Biology (minimum of 80 ECTS credits biology courses) including pollution biology. In addition, applicants must have basic knowledge in chemistry.
- To qualify for the specialisation in Environmental Chemistry: BSc in Chemistry (minimum of 80 ECTS credits chemistry courses) including environmental and/or analytical chemistry.
- Bachelor degrees within other related areas may be considered on an individual basis.

The candidate's background should provide a biological and/or chemical relevant basis for the master study in Environmental Toxicology and Chemistry (e.g. courses listed below in the bachelor degrees at NTNU forming the basis for this master study).

In the following tables you will find the admission requirements for NTNU BSc students. Compulsory courses are written in bold.

BSc in Chemistry, Environmental and Analytical Chemistry:

Year	Semester				
3	6. Spring	KJ2022 Spectroscopic Methods in Organic Chemistry	TKJ4175 Chemometrics	**KJ2053 Chromatography**	**TBI4110 Ecotoxicology and Environmental Resources**
	5. Autumn	**KJ1041 Chemical Bonds, Spectroscopy and Kinetics**	**ST0103 Statistics with Applications**	BI1003 Evolutionary Biology, Ecology and Ethology	
2	4. Spring	**KJ1042 Basic Thermodynamics with Laboratory**	**KJ2072 Environmental Chemistry**	**KJ2073 Analytical Environmental Chemistry**	Elective course
	3. Autumn	**Perspective Course**	**KJ2050 Analytical Chemistry, Basic Course**	**KJ1030 Inorganic Chemistry**	
1	2. Spring	FY0001 Service course in physics	**MA0002 Mathematical Methods B**	**KJ1020 Organic Chemistry**	
	1. Autumn	**EXPH0001 Philosophy and Theory of Science**	**MA0001 Mathematical Methods A**	**KJ1000 General Chemistry**	
ECTS Credits:		7,5	7,5	7,5	7,5

BSc in Biology, Cell and Molecular Biology:

Year	Semester				
3	6 Spring	**BI2071 Pollution Biology I**		**ST2304 Statistical modelling for biologists/biotechnologists**	**KJ2072 Environmental Chemistry**
	5 Autumn	**BI2014 Molecular Biology**	**BI2015 Molecular Biology, Laboratory Course**	**Perspective Course**	KJ2050 Analytical Chemistry, Basic Course
2	4 Spring	**EXPH0001 Philosophy and Theory of Science**	**BI2012 Cell Biology**	**KJ1020 Organic Chemistry**	
	3 Autumn	**BI1004 Physiology**		**MA0001 Mathematical Methods A**	**ST0103 Statistics with Applications**
1	2 Spring	**BI1001 Cell and Molecular Biology**		**BI1002 Faunistics and Floristics in Norwegian Ecosystems**	
	1 Autumn	**BI1003 Evolutionary Biology, Ecology and Ethology**		**KJ1000 General Chemistry**	
ECTS Credits:		7,5	7,5	7,5	7,5

BSc in Biology, Physiology:

Year	Semester				
3	6 Spring	**BI2071 Pollution Biology I**		**ST2304 Statistical modelling for biologists/biotechnologists**	**KJ2072 Environmental Chemistry,**
	5 Autumn	**BI2020** Zoo-Physiology **or BI2021 Plant Ecophysiology or BI2022 Plant Growth and Development**		**Perspective Course**	BI2014 Molecular Biology/KJ2050 Analytical Chemistry, Basic Course
2	4 Spring	**EXPH0001 Philosophy and Theory of Science**	**BI2012 Cell Biology**	**KJ1020 Organic Chemistry**	
	3 Autumn	**BI1004 Physiology**		**MA0001 Mathematical Methods A**	**ST0103 Statistics with Applications**
1	2 Spring	**BI1001 Cell and Molecular Biology**		**BI1002 Faunistics and Floristics in Norwegian Ecosystems**	
	1 Autumn	**BI1003 Evolutionary Biology, Ecology and Ethology**		**KJ1000 General Chemistry**	
ECTS Credits:		7,5	7,5	7,5	7,5

Programme Structure and Specialisations

A diverse team of scientists is ready to offer you a two year international, interdisciplinary Master's programme in close collaboration with SINTEF and Statoil. You will work in a group incorporating both Norwegian and international students. All teaching is in English. The programme also offers you the opportunity to experience one semester in the University Centre in Svalbard (UNIS). Svalbard is an island archipelago situated in the heart of the Arctic.

The programme requires two years of full-time study, beginning with the autumn term (mid August). The normal workload for a full-time student for one academic year is 60 ECTS credits. There are two main components to the Masters programme:

Masters thesis (60 ECTS credits)

Theoretical and methodological courses, some compulsory and some elective (60 ECTS credits)

There are two areas of scientific specialisation in this Masters programme:

Environmental Chemistry

Environmental Toxicology

Below you will find tables and lists of courses that describe the programme structure for each of these specialisations. The final structure of the course will be individually selected by each student allowing you to create the study programme most suited to your interests and skills. Advice will be given by the course administrators if required, and all study plans must be approved by the respective department.

You will find the course descriptions at the following web sites:
NTNU courses: http://www.ntnu.no/studies/courses
UNIS courses: http://www.unis.no/10_STUDIES/1020_Courses/

Environmental Chemistry:

1) For students spending all semesters at NTNU:

Year	Semester				
2	4 Spring NTNU:	**KJ3091 (7,5 ECTS) Special syllabus for Master's degree**	Master thesis		
	3 Autumn NTNU:	**KJ3053**[3] **(7,5 (ETCS) Analytical methods for industrial- and environmental monitoring**	Master thesis		
1	2 Spring NTNU:	**Experts in Team Work (7,5 ECTS)**	Elective course (7,5 ECTS)	Master thesis	
	1 Autumn NTNU:	**KJ3050**[1] **(7,5 ECTS) Organic Marine Environmental Chemistry**	KJ3072 (7,5 ECTS) Advanced Aquatic Chemistry	Elective course	**RFEL3070**[2] **(7,5 ECTS) Scientific Seminars in Pollution**
ECTS Credits		7,5	7,5	7,5	7,5

[1] KJ3050 requires previous knowledge in general chemistry corresponding to KJ1000 and a basic course in analytical chemistry (e.g. KJ2050).
[2] The students have to follow the RFEL3070 course in all semesters at NTNU.
[3] TKJ4175 Chemometrics is recommended previous knowledge for KJ3053.

Compulsory courses (written in bold in the table):
KJ3050[1] Organic marine environmental chemistry (7,5) (Autumn)
REFEL3070 Scientific Seminars in Pollution (7,5) (All semesters)
Experts in team work (7,5) (Spring)
KJ3053 Analytical methods for industrial- and environmental monitoring (7,5) (Autumn)
KJ3091 Special syllabus for Master's degree (7,5) (Last semester)

Elective courses:
KJ2050[1] Analytical Chemistry, Basic Course (7,5) (Autumn)
KJ3059 Advanced Chromatography (7,5) (Autumn)
KJ3072 Advanced Aquatic Chemistry (7,5) (Autumn)
BI3071 Advanced Ecotoxicology (7,5) (Autumn)
BI3072 Environmental Toxicology (7,5) (Autumn)

2) For students spending the second semester at UNIS:

<table>
<tr><td>Year</td><td>Semester</td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">2</td><td>4 Spring
NTNU:</td><td>KJ3091/KJ3093
(7,5/10 ECTS)
Special syllabus for
Master’s degree</td><td colspan="3">Master thesis</td></tr>
<tr><td>3 Autumn
NTNU:</td><td>Elective course/
Master thesis</td><td colspan="3">Master thesis</td></tr>
<tr><td rowspan="2">1</td><td>2 Spring
UNIS:</td><td colspan="3">AT-324 (10 ECTS)
Techniques for the Detection of Organo-Chemical Pollutants in the Arctic Environment[3)]
and/or
AT-330 (10 ECTS)
Arctic Environmental Toxicology[3)]
and/or
AT-331 (10 ECTS)
Arctic Environmental Pollution: Atmospheric Distribution and Processes[3)]</td><td>Elective course/
Master thesis</td></tr>
<tr><td>1 Autumn
NTNU:</td><td>KJ3050[1)]
(7,5 ECTS)
Organic Marine Environmental Chemistry</td><td>KJ3072 (7,5 ECTS)
Advanced Aquatic Chemistry</td><td>Elective course/
Master thesis</td><td>RFEL3070[2)]
(7,5 ECTS)
Scientific Seminars in Pollution</td></tr>
<tr><td colspan="2">ECTS Credits</td><td>7,5</td><td>7,5</td><td>7,5</td><td>7,5</td></tr>
</table>

[1)] KJ3050 requires previous knowledge in general chemistry corresponding to KJ1000 and a basic course in analytical chemistry (e.g. KJ2050).
[2)] The students have to follow the RFEL3070 course in all semesters at NTNU.
[3)] Students spending the second semester at UNIS must take at least two of the three courses offered (AT-324, AT-330 and AT-331) to get exempted from Experts in Team Work at NTNU. For students also doing corresponding field work at Svalbard, special agreements can be made according to the rules for exception from EiT. The requirements are:

Compulsory courses (written in bold in the table):
KJ3050[1)] Organic marine environmental chemistry (7,5) (Autumn)
REFEL3070 Scientific Seminars in Pollution (7,5) (All semesters)

Two of the three following courses offered at UNIS (total of 20 ECTS):
AT-324 Techniques for detection of organo-chemical pollutants in the arctic environment (10) (Spring)
AT-330 Arctic Environmental Toxicology (10) (Spring)
AT-331 Arctic Environmental Pollution: Atmospheric Distribution and Processes (10) (Spring)

KJ3091 Special syllabus for Master’s degree (7,5) (last semester)
or
KJ3093 Special syllabus for Master’s degree (10) (last semester) only for those who follow 2 of the 3 courses at UNIS

Elective courses:
KJ2050[1)] Analytical Chemistry, Basic Course (7,5) (Autumn)
KJ3053 Analytical methods for industrial- and environmental monitoring (7,5) (Autumn)
(TKJ4175 Chemometrics (7,5) (Spring) is recommended previous knowledge for KJ3053).
KJ3059 Advanced Chromatography (7,5) (Autumn)
KJ3072 Advanced Aquatic Chemistry (7,5) (Autumn)
BI3071 Advanced Ecotoxicology (7,5) (Autumn)
BI3072 Environmental Toxicology (7,5) (Autumn)

Environmental toxicology:

1) For students spending all semesters at NTNU:

Year	Semester				
2	4 Spring NTNU:	**BI3091 (7,5 ECTS) Special syllabus for Master's degree**	Master thesis		
	3 Autumn NTNU:	**BI3075 (7,5 ECTS) Experimental Ecotoxicology**	Elective course (7,5 ECTS)	Master thesis	
	2 Spring NTNU:	**Experts in Team Work (7,5 ECTS)**	BI3073 (7,5 ECTS) Genetic Toxicology	Master thesis	
	1 Autumn NTNU:	**BI3071 (7,5 ECTS) Advanced Ecotoxicology**	**BI3072 (7,5 ECTS) Environmental Toxicology**	**RFEL3070[1)] (7,5 ECTS) Scientific Seminars in Pollution**	Master thesis
ECTS Credits		7,5	7,5	7,5	7,5

[1)] The students have to follow the RFEL3070 course in all semesters at NTNU.

Compulsory courses:
RFEL3070 Scientific Seminars in Pollution (7,5) (All semesters)
BI3071 Advanced Ecotoxicology (7,5) (Autumn)
BI3072 Environmental Toxicology (7,5) (Autumn)
Experts in Team Work (7,5) (Spring)
BI3075 Experimental Ecotoxicology (7,5) (Autumn)
BI3091 Special syllabus for Master's degree (7,5) (last semester)

Elective courses:
BI3073 Genetic Toxicology (7,5) (Spring)
KJ2050 Analytical Chemistry, Basic Course (7,5) (Autumn)
KJ3050 Organic marine environmental chemistry (7,5) (Autumn)
(KJ3050 requires previous knowledge in general chemistry corresponding to KJ1000 and a basic course in analytical chemistry (e.g. KJ2050)

2) For students spending the second semester at UNIS:

<table>
<tr><td>Year</td><td>Semester</td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">2</td><td>4 Spring NTNU:</td><td>BI3091/BI3093 (7,5/10 ECTS) Special syllabus for Master’s degree</td><td colspan="3">Master thesis</td></tr>
<tr><td>3 Autumn NTNU:</td><td>BI3075 (7,5 ECTS) Experimental Ecotoxicology</td><td colspan="3">Master thesis</td></tr>
<tr><td rowspan="2">1</td><td>2 Spring UNIS:</td><td colspan="3">AT-324 (10 ECTS) Techniques for the Detection of Organo-Chemical Pollutants in the Arctic Environment[2)]
and/or
AT-330 (10 ECTS) Arctic Environmental Toxicology[2)]
and/or
AT-331 (10 ECTS) Arctic Environmental Pollution: Atmospheric Distribution and Processes[2)]</td><td>Master thesis</td></tr>
<tr><td>1 Autumn NTNU:</td><td>BI3071 (7,5 ECTS) Advanced Ecotoxicology</td><td>BI3072 (7,5 ECTS) Environmental Toxicology</td><td>RFEL3070[1)] (7,5 ECTS) Scientific Seminars in Pollution</td><td>Master thesis</td></tr>
<tr><td colspan="2">ECTS Credits</td><td>7,5</td><td>7,5</td><td>7,5</td><td>7,5</td></tr>
</table>

[1)] The students have to follow the RFEL3070 course in all semesters at NTNU.
[2)] Students spending the second semester at UNIS must take at least two courses at UNIS (20 ECTS) to get exempted from Experts in team work at NTNU. For students also doing corresponding field work at Svalbard, special agreements can be made according to the rules for exception from EiT. The requirements are:

Compulsory courses:
RFEL3070 Scientific Seminars in Pollution (All semesters)
BI3071 Advanced Ecotoxicology (Autumn)
BI3072 Environmental Toxicology (Autumn)
BI3075 Experimental Ecotoxicology (Autumn)

Two of these courses offered at UNIS (total of at least 20 ECTS):
AB-203 Arctic Environmental Management (15) (Spring)
AB-323 Light, Climate and Primary Production in the Arctic (10) (Spring)
AT-324 Techniques for Detection of Organo-chemical Pollutants in the Arctic Environment (10) (Spring)
AT-330 Arctic Environmental Toxicology (10) (Spring)
AT-331 Arctic Environmental Pollution: Atmospheric Distribution and Processes (10) (Spring)

BI3091 Special syllabus for Master’s degree (7,5)
or

BI3093 Special syllabus for Master's degree (10) only for those who follow 2 of the 3 courses at UNIS

Examples of Master Theses

- Developing and establishing analytical methods and tools for use in environmental monitoring of marine and coastal areas, including quality assurance of these methods.
- Impacts of oil and gas activities on the marine environment, including biomonitoring and studies of harmful effects on invertebrates and fish.
- Distribution of brominated flame retardants in nature, including their bioaccumulation and toxicological effects in different organisms.
- Long-range atmospheric transport, deposition and effects of trace metals (e.g. lead, mercury, cadmium) in air, snow, soil, water, and ecosystems. An example of this is the chemistry of mercury in the Arctic after polar sunrise.
- Occurrence of environmental pollutants in complex mixtures. To increase the understanding of their interaction, in vitro studies are carried out, in which cells are exposed to individual toxicants and mixtures of known environmental pollutants (e.g. PAHs, PCBs, trace metals)
- Fate and effects of crude oil in the marine environment following accidental and chronic releases. The behaviour of spilled oil in the environment and the use of analytical chemical methods for oil spill identification and monitoring.

Contact information and counselling

Address: NTNU, Faculty for Natural Sciences and Technology, 7491 Trondheim, Norway
Telephone: 73 59 41 97
E-mail: studies-master@nt.ntnu.no
URL: http://www.ntnu.no/nt/english
http://www.ntnu.edu/studies/msenvitox

Student advisors:

Siri Bremdal +47 73 59 45 52
Helge Dyrendal Rø +47 73 59 63 10
Thea Berg Fines +47 73 55 13 40

MASTER OF SCIENCE IN CONDENSED MATTER PHYSICS

Outline of the programme

The Master of Science programme (MSc) in Condensed Matter Physics at NTNU is designed to train the student in fields of experimental and/or theoretical condensed matter physics, and in scientific work and research. The programme is relevant for the strategic area Materials at NTNU. The Department of Physics has strong research groups in condensed matter physics.

Learning outcome

The 2 years master's degree programme in Condensed Matter Physics gives a specialization within condensed matter physics and materials physics. The goal of the programme is to educate physicists to be capable of working independently with physics on a high level and to take on the many challenges in society and industry. Through advanced courses, with lectures, assignments and laboratory work, and the master's thesis, the students will acquire knowledge in relevant working methods for research, industry, administration and teaching.

The master candidate has basic competence in physics and materials science, and in-depth knowledge in condensed matter physics. Specifically, the candidate has:

- wide knowledge in physics, mathematics and technological applications of physics.
- basic competence in data processing, for example in computations, data analysis and numerical simulations.
- knowledge about generalizations and mathematical argumentation, and can use mathematical formalism in problems within condensed matter physics.
- an overall range of subjects providing theoretical insight to apply a variety of methods and techniques.
- insight in ethical problems related to research in the subject area.
- knowledge in planning and performing research projects in materials science.
- ability to work with advanced scientific problems, both independently and in teams.
- skills to give well-structured presentations for different audiences by the use of modern presentation tools.
- the skills to write scientific reports and contributions to scientific publications.
- competence to perform risk assessments and be familiar with safety instructions in his/her subject area.
- the skills to bring his/her own competence up to date through lifelong learning.

The MSc programme consists of two years corresponding to 120 credits (ECTS credits) including a thesis of 60 credits. The rest of the programme is scheduled courses of 7.5 credits. The courses should be chosen in topics which are related to the specialization in the thesis work and in collaboration with the supervisor.

<table>
<tr><th>Year</th><th>Semester</th><th>7.5 credits</th><th>7.5 credits</th><th>7.5 credits</th><th>7.5 credits</th></tr>
<tr><td rowspan="2">2nd</td><td>Spring</td><td>Self Study
or
Elective</td><td colspan="3" rowspan="2">Master’s Thesis</td></tr>
<tr><td>Autumn</td><td>Elective</td></tr>
<tr><td rowspan="2">1st</td><td>Spring</td><td>TFY4245 Solid State Physics, Advanced Course</td><td>Experts in Teamwork</td><td>Elective</td><td rowspan="2">Master’s Thesis</td></tr>
<tr><td>Autumn</td><td>FY3114 Functional Materials</td><td>Elective</td><td>Elective</td></tr>
</table>

Elective courses are listed below and should be chosen with help from the supervisor.

Examination: The courses may have different examination forms, but most often an examination, oral or written, will be arranged at the end of the semester in which the course is offered. However, the exam in one of the courses or in a specially selected curriculum (self study) from scientific articles or books relevant for the thesis work must be taken as an oral exam as part of the final examination. The thesis must be submitted at least one month before this final examination, in which the candidate will also be questioned on the content of the thesis. The set of courses for the master’s degree and the topic for the thesis will be approved by the Department of Physics.

For all examinations, and also for the thesis, the scale of grading is from A (highest) to E (lowest), or F (fail).

Master’s Thesis

The Master’s thesis corresponds to a total of 60 credits and the work is done continually over the four semesters. Already in the first semester the work on the thesis is corresponding to 7.5 credits, and it is therefore important that the planning of the thesis work can begin as early as possible. With help from the Coordinator of the MSc programme an academic supervisor will be appointed to each student.

The topic of the thesis’ work must be within the research areas of the Department of Physics’ research divisions.

Topics offered in the programme

The activities in condensed matter physics cover both experimental and theoretical topics. Experimental activities are focused on physical properties of different materials, such as polymers, molecular crystals, functional oxides, magnetic materials, metals, semiconductors, complex materials, using a variety of experimental techniques. The activities also include experimental studies of structural, electronic, mechanical and optical properties of surfaces. Applied activities exist within solar energy–and environmental physics, and optical

measurement techniques are developed. Theoretical studies are performed in different subjects such as soft condensed matter physics, superconductors, self-consistent equations of state, liquid crystals and solid–solid transitions, as well as on the theory of strongly correlated fermion systems, in particular low-dimensional ones. Fermi liquids, heavy fermion systems, quantum magnets, non-fermi liquids, gauge-field theories of strongly correlated systems, novel phase transitions and quantum phase transitions are also studied.

PLAN OF STUDY

1st year, autumn
Compulsory:
FY3114 Functional Materials

Elective:
TFY4205 Quantum Mechanics II
TFY4300 Energy and Environmental Physics
FY3006 Sensors and Transducers

1st year, spring
Compulsory:
TFY4245 Solid State Physics, Advanced Course
Experts in Teamwork, Interdisciplinary Project

Elective:
TFY4190 Instrumentation
TFY4195 Optics
TFY4200 Optics, Advanced Course
TFY4210 Quantum Theory of Many-Particle Systems
TFY4235 Computational Physics
TFY4275 Classical Transport Theory
TFY4280 Signal Processing
TFY4340 Mesoscopic Physics
FY3201 Atmospheric Physics and Climate Change
FY3402 Subatomic Physics
FY3464 Quantum Field Theory I

2nd year, autumn
Elective:
TFY4255 Materials Physics
TFY4292 Quantum Optics
TFY4515 Physics, Specialization Course
FY3403 Particle Physics
FY3466 Quantum Field Theory II
FY8302 Quantum Theory of Solids
Courses listed under 1st year autumn can also be chosen.

2nd year, spring
One elective course, or a self study course to be agreed upon with the academic supervisor.

MASTER OF SCIENCE 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, and knowledge 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

<u>Knowledge</u>

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 that extends over one or two semesters
- 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.

<u>Skills</u>

The candidate

- My 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 through both teamwork and independent in their 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
- Have knowledge of the marine sector's role in society and is the basis for assessing the ethical issues
- Expertise in handling of 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.

1. **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

2. **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

3. **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 shall study two subjects in common, that is 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 takes 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 takes the 30 credit thesis, starting in their 4.th semester. Students at Department of Biotechnology takes either a 30 or a 60 credits thesis.

Thesis – 60 credits

Spring semester as the 4 th semester: Deadline for handing in the Master's thesis is the 15th of May, deadline for the exams is the 15th of June.

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				
	BI3064	FEED ORGANISMS IN MARINE FRY PROD	1,d	7,5	O	O	O
	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
	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
	TBT4175	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
	TMR4295	DESIGN OF MECHANICAL SYSTEMS	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
	TVM4162	INDUSTRIAL ECOLOGY		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				
	BI3065	EARLY LIFE HISTORY OF FISH	1,d	7,5	O	O	O
	BI3005	FISH BEHAVIOR AND ECOLOGY	1,2,3	7,5	O	O	O
	TEP4265	FOOD ENGINEERING	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				
	BI3032	POPULATION DYNAMICS	3	7,5			O
	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		
	TTT4195	MARINE OBSERVATION TECHNOLOGY	1,3	7,5	O	O	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: BI3064, BI3060, TMR4115 Spring: BI3065, BI3005, TMR4140
Marine Aquaculture Systems
Autumn: BI3064, TMR4115 Spring: BI3065, BI3005, TMR4140, TTK4170, TTT4195

2) Marine Harvesting
The following courses are recommended in specialization
Processing of Marine Resources
Autumn: BI3063, TMR4115, TMR4130, TMR4135, TMR4215, TMR4295 Spring: TBT4125, TEP4265, TMR4120,TMR4230

3) Marine biology and Biotechnology:
The following courses are recommended in specialization
Marine Biology and Ecology
Autumn: BI3060, BI3063, TBT4135, TBT4145 Spring: BI3005, BI3032, TBT4125, TTT4195
Marine Biochemistry and Biotechnology
Autumn: BI3060, BI3063, TBT4135, TBT4145, Spring: BI3005, TBT4125, TEP4265, 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

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				
	BI3064	FEED ORGANISMS IN MARINE FRY PRODUCTIONS	1,d	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
	TIØ4120	OPERATION RESEARCH, INTRO		7,5		O	
	TMR4215	SEA LOADS	2	7,5	O	O	O
	TMR4295	DESIGN OF MECHANICAL SYSTEMS	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
	TVM4162	INDUSTRIAL ECOLOGY		7,5	O	O	O
2nd sem		**Compulsory courses**					
spring		EXPERTS IN TEAMWORK		7,5	C	C	C
		Optional courses A-list	a				
	BI3005	FISH BEHAVIOR AND ECOLOGY	1,2,3,d	7,5			O
	TEP4265	FOOD ENGINEERING	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				
	BI3065	EARLY LIFE HISTORY OF FISH	1,d	7,5	O	O	O
	BI3032	POPULATION DYNAMICS	3	7,5			O
	BI3073	GENETICS TOXICOLOGY	1,d	7,5	O		O
	SØK2004	INDUSTRIAL ECONOMICS		7,5		O	
	TBT4125	FOOD CHEMISTRY	2,3	7,5	O	O	
	TMR4240	MARINE CONTROL SYSTEMS		7,5		O	
	TTT4195	MARINE OBSERVATION TECHNOLOGY	1,3	7,5		O	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					
	TBT4500	BIOTECHNOLOGY, SPEC PROJ	3	7,5	C	C	C
	TMR4570	FISHERIES AND MARINE RESOURCES, SPEC PROJ	2	7,5	C	C	C
		Optional courses					
	BI3064	FEED ORGANISMS IN MARINE FRY PRODUCTIONS	1	7,5	O	O	O
	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	MARINE PHYSICAL ENVIRONMENT		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
	BT3110	AQUATIC FOOD PROCESSING AND TECHNOLOGY	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
	TMR4295	DESIGN OF MECHANICAL SYSTEMS		7,5	O	O	
	TTT4175	MARINE ACOUSTICS		7,5	O	O	
	TVM4162	INDUSTRIAL ECOLOGY		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
	TMR4905	MARINE SYSTEMS, 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, BI3005, TMR4140, TTK4170, TTT4195
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: BI3005, TBT4125, TBT4135, TMR4215
Sustainable Marine Harvesting
Autumn: TEP4265, TMR4115, TMR4130, TMR4135 Spring: TBT4125, TMR4190, TMR4215, TMR4120, TMR4230, TMR4295

3) Marine biology and Biotechnology:
The following courses are recommended in specialization:
Marine Biochemistry and Biotechnology
Autumn: BI3060, BI3063, TBT4135, TBT4145 Spring: BI3005, TBT4125, TTT4195

d) This course is taught intensivly
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

MASTER OF SCIENCE IN MATHEMATICS

Degree Program

The degree program for the Master of Science in Mathematics for international students at NTNU is stipulated to take two years. One year of full studies corresponds to 60 credit points, i.e. in total 120 credit points are needed. The degree consists of two parts. The program starts with course work corresponding to 75 credit points and concludes with writing a thesis corresponding to 45 credit points.

Admission requirements

To be accepted as a student to this program one has to have:

- Bachelor's degree consisting of at least three years of university studies.

- Studied mathematics at a university for at least 1½ years.
  .

- For the study directions in **algebra**, **analysis** and **topology**: Reached the level and covered material equivalent to

  - MA1101 Basis calculus I,
  - MA1102 Basis calculus II,
  - MA1201 Linear algebra and geometry,
  - MA1202 Linear algebra with applications,
  - MA1103 Vector calculus,
  - MA1301 Number theory,
  - MA2201 Algebra,
  - TMA4120 Calculus 4K.

- For the study direction in **numerical analysis**: Reached the level and covered material equivalent to

  - MA1101 Basic calculus,
  - MA1102 Basic calculus II,
  - MA1201 Linear algebra and geometry,
  - MA1202 Linear algebra with applications,
  - MA1103 Vector calculus,
  - ST1101 Probability,
  - ST1201 Statistical methods.

- For the study direction in **statistics**: Reached the level and covered material equivalent to

  - MA1101 Basic calculus,
  - MA1102 Basic calculus II,
  - MA1201 Linear algebra and geometry,
  - MA1202 Linear algebra with applications,
  - MA1103 Vector calculus,
  - ST1101 Probability,
  - ST1201 Statistical methods
    and at least two statistic courses on the level of ST2101 or TMA4250 or higher.

(All codes for these courses refer to the 2012/2013-course catalogue).

Applications for this program are filed through the http://www.ntnu.no/intersek/ Office of International Relations. For further information and requirements see the homepage mentioned above.

Description of the degree

All students are required to take the course “Interdisciplinary Teamwork, (Eksperter i Team)” (EiT). This should be done the second semester.

The Department of Mathematical Sciences offers various courses at graduate level in addition to more specialized graduate seminars. Currently we offer five directions of study, algebra, analysis (functional analysis and complex and harmonic analysis, differential equations), numerical analysis, statistics and topology.

Algebra, analysis and topology: All students must take at least 30 credit points amongst the courses

- MA3201 Rings and modules,
- MA3202 Galois theory,
- TMA4145 Linear methods,
- TMA4225 Foundations of analysis,
- TMA4190 Manifolds,
- MA3402 Analysis on manifolds

(unless the material has been covered in previous courses).

For the **algebra** direction, which builds upon MA3201 Rings and modules, MA3202 Galois theory, the courses MA3203 Ring theory and MA3204 Homological algebra should be taken. Some possible areas for topics for the thesis in algebra are presently representation theory of finite dimensional algebras, homological algebra and higher dimensional rings and orders.

For the **analysis** direction, which builds upon TMA4145 Linear methods, TMA4225 Foundations of analysis, the courses TMA4230 Functional analysis and TMA4175 Complex analysis should be taken. Some possible areas for topics for the thesis in analysis are presently geometric function theory, function spaces, harmonic analysis, continued fractions, dynamical systems, operator theory, topological measure theory and partial differential equations.

For the **topology** direction, which builds upon TMA4190 Manifolds, MA3402 Analysis on manifolds, the course MA3403 Algebraic topology I should be taken, and at least one more topology course. Some possible areas for the thesis in topology are homotopy theory, K-

theory, generalized cohomology theories, category theory, non-linear dynamics, Lie-groups and differential geometry.

Numerical analysis: If the admission background does not cover TMA4215 Numerical Mathematics and TMA4212 Numerical Solution of Differential Equations these should be taken. In addition TMA4220 Numerical Solution of Partial Differential Equations Using Element Methods and TMA4205 Numerical Linear Algebra should be taken. Some possible areas for the thesis in numerical analysis are numerical solution of ordinary and partial differential equations, numerical linear algebra and topics within computational sciences.

Statistics: For the statistics direction the courses TMA4295 Statistical inference and TMA4300 Computer intensive statistical methods should be taken. If the admission background does not cover TMA4265 Stochastic processes and TMA4267 Linear statistical models, the courses must be taken as part of the master program. Some possible areas for the thesis in statistics are biomodelling, computational statistics, design of experiments, functional genomics, life time analysis and spatial statistics.

As mentioned above, the coursework will take 2½ semesters (75/30 semester). All the courses in the degree must be approved by the Department of Mathematical Sciences, NTNU.

The Thesis

The thesis could contain some independent research, but could also be of purely expository nature. The student may be required to follow seminars on the topic of the thesis. These seminars will in addition to the courses help the student to obtain the necessary background needed for writing the thesis. The work with the thesis should correspond to a workload of 45 credit points.

Exams

The exam in each of the courses is either a written exam or an oral exam normally at the end of the semester when the course is taught.

EXAMINATION REGULATIONS AT THE NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY (NTNU)

Adopted by the Board of NTNU on 7 December 2005 in accordance with the Act of 1 April 2005 relating to Universities and University Colleges, subsections 3-3, 3-4, 3-5, 3-9, 3-10 and 5-3. Revised by the Board on 24 January 2006, 12 October 2006, 22 May 2008, 30 March 2011 and on 12 October 2011.

Chapter 1 Scope, Purpose and Definitions

§1 Scope and Purpose

1. The regulations are valid for all studies at the Norwegian University of Science and Technology (NTNU).

2. The regulations contain rules about the organization of studies, examinations and assessment, requirements for the award of degrees, and regulations concerning the rights and obligations of the University and students at NTNU. The regulations are to ensure that studies and examinations at NTNU are carried out properly

§2 Definitions

Final examination	A type of assessment that normally follows at the end of the semester under conditions that can be controlled. The final examination generally is the concluding assessment of the student in a course or a group of courses.
Course	The smallest unit in which the student can receive an assessment and course grade. The extent of the course is measured in credits. The course involves activities that form the basis for assessment. The activities may be compulsory.
Subject	A collection of courses in one group in a curriculum.
Main profile	Courses in a curriculum which are defined as belonging to the same discipline which can supplement each other and build on foundation course level in a programme of study. In case a Master's degree is based on a completed Bachelor's degree, the main profile contains the academic qualifications required for admission to the Master's degree.
Final grade	The grade given after a course or group of courses. It is based on the assessments that count during that course. The weighting of the grades in assessments during the course is stated in the course description.
Credits	Measure of the study workload. The normal workload in one academic year is 60 credits.
Programme of study	A group of courses that forms one academic entity that students can apply for admission to, receive the right to study, and leads to a degree.
Field of study	A specialization within a programme of study, which is described in the curriculum for that programme of study.
Assessment	The evaluations a student receives on the basis of his/her performance in a course, or a group of courses and that lead to a grade.
One-year programme	A structured group of courses totalling 60 credits and having separate admission.

These regulations refer to the Act relating to Universities and University Colleges of 1 April 2005, no. 15.

Chapter 2 Admission and individual education plan

§3 Admission

The valid admission regulations are the relevant regulations adopted by the Ministry of Education and Research and NTNU's own admission regulations.

§4 Admission to study and progress in studies

1. Admission involves the right to take the courses in the programme of study, a one-year programme or separate courses which the student has gained admission to. Admission provides the opportunity to take the courses specified in the individual education plan or in accordance with the progress in studies approved by the Faculty. Admission to study is valid from the day NTNU receives confirmation of the student's acceptance of his/her admission.
2. The right to take the programme of study which the student has been admitted to ceases when
   - the student fulfils the criteria allowing him/her to receive a certificate after completing the programme of study
   - the student has completed the one-year programme
   - the student's progress in studies is insufficient, according to the definition given in Section 4, subsection 3
   - the student himself/herself confirms that he/she has withdrawn from the programme of study before it is completed
   - the student has not paid the semester fee by the stipulated deadline, see Section 6.
3. In programmes of study that are divided into year courses/ years, a student cannot take the next year if he/she has an outstanding deficit of more than 22.5 credits from the two previous years. Students who want to take the 4th year cannot have any unfinished courses from the 1st year. Students who want to take the 5th year cannot have any unfinished courses from the 1st and 2nd years, and students who want to take the 6th year cannot have any unfinished courses from the 1st, 2nd, and 3rd years.
   The student loses the right to study a programme of study if he/she has an outstanding deficit of more than 22.5 credits. No student is permitted to use more than 2 academic years to take the same year in a programme of study. The time spent in each year should be adjusted according to any leave that has been granted, and any possible reductions in the study progress (part-time studies) that have been approved in the individual education plan, ref. Sections 5, 7, and 8.
   It is to be evident from the curriculum whether the programme of study is divided into years, ref. Section 14, subsection 1.
   Students that apply for re-admission to the same programme of study will, if applicable, be given recognition of previous studies in the year the student is admitted to. The same is true when there is great degree of similarity between a programme of study a student has applied for admission to and another programme of study a student has or had been admitted to. Exemption to this regulation can be made when more than three years have elapsed since the student was admitted to the other programme of study. Rector is to decide the matter.
4. The Faculty is to decide whether the right to study should be terminated in accordance with the above regulations. The Faculty may grant exemptions from the regulations in Section 4, subsection 3 in cases of illness, serious family problems, when the main part of the studies has already been completed, extraordinary conditions related to the subject (taking the next year) or other reasons found to warrant special treatment.
5. A student who is not covered the regulations in Section 4, subsection 3 has admission withdrawn if he/she has not earned any credits during one academic year in the programme of study or one-year programme that the student is admitted to. This does not apply if the student has registered for and been present at one or more examinations and when it is agreed in the individual education plan that the student is not to earn any credits. The Faculty is to decide in matters of withdrawal of admission.

6. A student who has gained admission to a programme of study and has had normal progress (without adjustment for leave or reduced progress in studies), is not to be affected by changes in the disciplinary objectives, level and structure of the programme while completing his/her work on the programme. The student nevertheless has to accept that there may be changes in the courses and the structure of the programme of study that will not cause a delay in his/her progress.
7. A student who has gained admission to a programme of study, one-year programme or individual courses at NTNU, has the right to follow other courses he/she is qualified to take and receive assessment of his/her performance in these courses. The student also has the right to follow lectures in courses outside the programme of study or one-year programme if there are no restrictions on the admission to the courses. The student maintains these rights also after having completed the programme of study.

§5 Individual education plan

The Faculty together with students who have gained admission to study for 60 credits or more are to agree on an individual education plan before the end of the first semester. The individual education plan can be amended in agreement with the Faculty. The individual education plan is a mutual agreement between the student and NTNU concerning the duties and responsibilities of each party for progress in studies as well as the duties and responsibilities of each student towards his/her fellow students. The individual education plan gives the content and progress of the planned studies, cf. Section 6, subsection 2.

§6 Registration

1. Students who have been admitted to NTNU have to register and pay the semester fee at NTNU each semester by the deadline set by the Rector. The deadline is given in the curriculum and on NTNU's Internet pages. Students who do not pay the semester fee by the stipulated deadline will have their admission withdrawn in accordance with the regulations relating to Student Welfare Organizations of 12 February 2001, Section 10. The Faculty is to decide in matters of withdrawal of admission due to non-payment of the semester fee.
2. For students who have agreed to an individual education plan, this registration is to determine and confirm the information in the plan for the current semester concerning
   - which courses the student will attend
   - which courses the student is to be given assessment in
   - other possible activities determined in the programme of study which the student follows
   - other information where adjustments are possible and which is relevant for the student's progress in his/her studies.
3. Students who are not obliged to agree on an individual education plan or who have not yet entered into an individual education plan also have the duty to register. This registration is to indicate which courses the student will attend and receive assessment in.
4. The registration gives access to the resources offered by NTNU in order to enable the student to complete his/her courses that semester.

7 Leave of absence

1. The Faculty is to handle applications for leave of absence. Such leave from study is primarily given for one academic year. For shorter periods, leave can be given until the end on the semester. A student must have completed more than 30 credits in the courses included in the programme of study in order to apply for leave of absence without stating a reason.
2. The Faculty may accept an application for leave for more than one academic year if there are special circumstances or pressing reasons, such as illness, extensive demands for child-care etc., military service or civilian service.
3. The student must accept that there may be changes in the programme of study during a period when he/she has a leave of absence.

§8 Part-time studies
Studies at NTNU may be taken on a part-time basis following agreement with the Faculty. The percentage of the nominal progress in studies is to be included in the individual education plan.

§9 Students without the right to study
1. Those who have not been granted admission have the right to receive assessment in a course in accordance with the Act relating to Universities and University Colleges, Section 3-10. The Faculty decides whether the requirements for registration have been fulfilled and may specify further regulations concerning assessment in the absence of normal admission.
2. The Rector may decide upon a special deadline for registration for this type of assessment. The Rector can also decide that those who have not been admitted as students should pay an examination fee in order to cover the extra cost of carrying out such assessments.

§10 Teaching – delegation of authority in accordance with the Act relating to Universities and University Colleges, Section 3-8
1. The Faculty has the authority to reserve certain lectures just for the students of the University or specified groups of students if the nature of the lectures makes this necessary, cf. the Act relating to Universities and University Colleges Section 3-8, subsection 2.
2. The Faculty has the authority to allow people who are not following normal courses to attend lectures and participate in exercises whenever there is sufficient space.

§11 Suspension, exclusion – delegation of authority in accordance with the Act relating to Universitiesand University Colleges, Section 4-8, subsection 1
1. In cases where a student behaves in a way that seriously disturbs the work of fellow students or the general activities of the University, the Faculty has the authority to give a written warning stating that if such behaviour is continued a recommendation concerning suspension will be presented to the Board. In cases that are not specifically related to an individual Faculty, this authority rests with the Rector.
2. The Faculty has the authority to give a written warning to a student that an exclusion recommendation will be presented to the Board unless the suspension decision made by the Board is respected. In cases that are not specifically related to an individual Faculty, this authority rests with the Rector.
3. Complaints about decisions involving a written warning should be sent to the Appeals Committee at NTNU.

Chapter 3 Organization of studies

§12 The academic year
1. The academic year consists of 40 weeks and is divided into two semesters. The autumn semester extends over 19 weeks and finishes before the end of the year. The spring semester lasts 21 weeks.
2. The Board of NTNU may approve that a programme of study at NTNU deviates from the ordinary structure described in Section12, subsection 1 if the duration of the programme is more than 40 weeks and has teaching and/or studies which can be pursued independently of the other studies at NTNU.

§13 Programmes of study
1. Programmes of study at NTNU are organized according to the following models, they can
   - lead to a Bachelor's degree which subsequently forms the basis for a Master's degree.
   - be an integrated study which leads to a Master's degree or a professional degree
   - lead to a Master's degree which is based on a completed Bachelor's degree or equivalent education.

The Board establishes and terminates each programme of study at NTNU. When the Board creates a new programme of study, it should simultaneously decide which Faculty is to administer the programme.

2. Each programme of study has a main profile, which gives disciplinary specialization of at least 80 credits. All programmes of study involving 5-year integrated Master's degrees should also satisfy the requirements of the Bachelor's degree.
3. Each programme of studies consists of different courses. The courses offered should each be of 7.5 credits or a multiple of that. The courses given in the programme of study are either compulsory or optional. The Faculty establishes new courses and terminates old ones. For the Master of Science in Engineering programmes, the Rector has this authority. For courses in the 5-Year Teacher Education programmes, the Faculty exercises this authority in consultation with Rector. The Board at NTNU is to approve the establishment of courses where it is assumed that this will increase the basic disbursement in the State appropriation model.
4. All programmes of study leading to a lower degree as well as integrated programmes of study leading to a higher degree or a professional degree are to contain three introductory courses:
   a) Ex. phil. of 7.5 credits. 2/3 of the Ex. phil. is to be common for all students at NTNU. Ex. phil. should be suited to the disciplinary area but the variations are up to 1/3 of the content. The curriculum is to indicate the specific variety.
   b) Ex. fac. of 7.5 credits is specific for the relevant Faculty. It should be part of the main profile is and is to be taken in the first year.
   c) Perspective course of 7.5 credits that is to represent a different field of study from that included in the student's programme of study.
   Rector is to decide the detailed regulations for the introductory courses considering the recommendations from the Education Committee.
   Rector's authority to decide when the regulations in point a) are implemented is in accordance with S-sak 23/10 (Board item 23/10). Changes in point c) apply from the start of the academic year 2010/2011).

§13a One-year programmes

The Rector is to establish and terminate each one-year programme at NTNU following a recommendation from the Education Committee. The rector is also to decide which Faculty is to administer each one-year programme.

§14 Curriculum and course description

Each programme of study is to be described in a curriculum. The Faculty administering the programme of study is to approve the curriculum. Rector is to approve the curricula for the Master of Science in Engineering programmes and the 5-Year Teacher Education programmes.
The curriculum should contain information about possible admission requirements and ranking regulations for the programme of study. The curriculum should stipulate:
- the learning outcomes and professional objectives of the programme of study
- any required previous knowledge for the programme of study
- which Faculty is to administer the programme of study
- which courses are included in the programme of study
- the scope of the programme of study in terms of credits
- what course combination meets the required main profile
- the structure of the programme of study, whether the programme of study has been divided into years, the fields of study, which are the common courses, which are compulsory and optional courses, and the sequence of the courses
- the possibilities for student exchanges abroad
- other issues which affect the implementation and quality assurance
- transitional arrangements as a result of changes in the curriculum.

All courses are to be presented in a course description. Each Faculty is to provide a description of its own subject areas. Each course description should include:
- learning outcomes

- the qualifications necessary to gain admission to the course
- the content of the course
- teaching methods
- how many credits the course is worth
- the extent of the education
- possible compulsory education
- which activities are included, their extent and which of them are compulsory, for instance courses in methodology, exercises, work experience, field courses, excursions, laboratory work, group exercises, semester papers and other written exercises, artistic performances
- the requirements for receiving assessment
- activities that will be subject to on-going assessment and which of them will count in the course grade
- the organization of a possible final examination (how often, when in the semester, date and similar information)
- what examination support material can be used
- the form of assessment and grading scale for the assessments during the course
- the weighting of assessments during the course that are to count in the course grade

§15 Recognition of external studies/practical experience

1. The Faculty is to handle applications concerning recognition of external studies or practical experience in accordance with the Act relating to Universities and University Colleges, Section 3-5. A condition is that the external education has been approved as education at university or university college level.
2. The Faculty is to handle applications concerning the approval of an equivalent degree or education in accordance with the Act relating to Universities and University Colleges, Section 3-5.

§16 Exemption from assessment

1. The Faculty is to grant exemption from the final examination, test or other assessment in cases where the student can document that similar assessment has already been done by NTNU or another institution. The Faculty may also grant exemption on basis of other recognized examinations, tests or other kinds of assessment, or on basis of documented practical experience, in accordance with the Act relating to Universities and University Colleges, Section 3-5. When processing such applications for exemption, the Faculty should take both a student's previous education into account, as well as the assessment in terms of level, scope and content.
2. The student is to send such an application to the Faculty that administers the programme of study in which he/she has the right to study.

§17 Reduction of credits

If a student receives assessment in courses where the content wholly or partially overlaps, the total of credits for these courses should be reduced accordingly. The Faculty decides the extent of the reduction in each separate case. If some of the courses to which the student has gained admission to are compulsory, the reduction should take place in the optional courses. The reduction should be done in a way that provides the student with the best grade that has been awarded. The basis for the reduction should be evident from the transcript or certificate.

Chapter 4 Degrees

§18 Awarding degrees

The Faculties award degrees with their respective titles in accordance with their delegated responsibility from the Board when the latter approves a new programme of studies.

§19 Bachelor's degree

1. The Faculty awards the Bachelor's degree on basis of a completed programme of study or a free selection of courses in cases where the student has completed a total of 180 credits. The 180 credits should include:
   - a main profile of at least 80 credits, where the curriculum defines the requirements of the main profile
   - introductory courses of 22.5 credits, ref. Section 13, subsection 4.
2. If the Bachelor's degree is not based on an established programme of study, the Faculty that awards the degree is to cover the area where the major part of the disciplinary content belongs. If the student has a degree where more than one major parts are is included, the student can decide which of the relevant faculties should award the degree.

§20 Master's degree

1. In order to gain admission to a Master's programme which is based on a lower degree, the student must
   - have been awarded a Bachelor's degree or its equivalent
   - have received a passing degree in courses corresponding to 80 credits in the subject area of the relevant Master's degree, as specified in the curriculum for the relevant Master's programme
   - have fulfilled the other requirements for admission, as specified in the curriculum for the Master's programme.

   When admission to a Master's programme is based on experience, the second point is not valid.

   Instead, at least 2 years of relevant professional experience is demanded.
2. In order to receive a Master's degree, the student must
   - either satisfy the admission criteria of the Master's programme and in addition have passes in relevant studies corresponding to 120 credits, where the curriculum allows 30 credits to be replaced by relevant practical experience
   - or have completed a course of studies corresponding to 300 credits, where the requirements of the Bachelor's degree are included.
3. In the Master's programme described in Section 20, subsection 2, a Master's thesis corresponding to at least 30 credits, but no more than 60 credits, should be included.
4. In order to receive a Master's degree corresponding to less than 90 credits, the specified requirements relevant for such a degree programme must have been met.

§21 Candidata/candidatus medicinae

In a programme of studies leading to the degree candidata/candidatus medicinae, introductory courses as defined in Section 13, subsection 4 are included. The degree is based on a coherent course of study corresponding to 360 credits. The Faculty of Medicine will decide the content of the programme of study as well as additional criteria for awarding the degree.

§22 Candidata/candidatus psychologiae

In a programme of studies leading to the degree candidata/candidatus psychologiae, introductory courses as defined in Section 13, subsection 4 are included. The degree is based on a coherent professional study corresponding to 360 credits. The Faculty of Social Sciences and Technology Management will decide the content of the programme of study as well as additional criteria for awarding the degree.

Chapter 5 Assessment

§23 Assessment

1. In all courses or groups of courses included in a programme of study, the possibility for assessment and subsequent grading of the knowledge and skills of the students should be available each academic year. The assessment should be given as a final evaluation, or

possibly an evaluation based on different types of on-going assessments described in the curriculum.

2. In order to receive assessment, the student must have registered that same semester, and also meet the academic requirements for assessment given in the course description.
3. A student who has handed in a paper in an assessment cannot prevent the assessment from being done. The student cannot block an assessment if the examination began with an oral test.

§24 Examination periods

Final examinations take place at the end of each semester. The Rector decides the time of the examination periods. The dates are given in the curriculum. The Rector may decide to organize the examinations outside the regular examination periods, if practical considerations related to the courses or other things make this necessary.

§25 Final examination

The course description states whether the course is to be concluded with a final examination and what requirements the student has to satisfy in order to sit the final examination. A grade is always awarded at the final examination.

§26 Instructions at final examination

The Rector can issue general instructions for
- students who are allowed to sit a final examination
- invigilators
- the presence of teaching staff during a written final examination.

These instructions are found in the curriculum.

§27 Legitimate leave of absence at final examination

1. If a student is unable to sit a final examination due to illness or other pressing reasons, an application for approved absence has to be submitted to the Division of Student and Academic Affairs. The application, which has to be submitted at the latest one week after the first final examination to which the absence applies, has to contain information about which final examinations the application concerns. Documentation should be included in the application. The period of absence is to be indicated on the medical certificate.
2. A student who is taken ill during a final examination should notify the principal invigilator in the examination hall or the external examiner/internal examiner at oral examinations. The student subsequently has to see a doctor quickly and submit a medical certificate, as stated in the regulations in Section 27, subsection 1.

§28 Re-sit examination

1. In a course where the final examination is to be held only once in the academic year, a re-sit examination is to be arranged before the next normal examination. Students with an approved absence may take the re-sit examination. This also applies to students who have not passed the initial examination.
2. Students must register for the re-sit examination within the deadline stated by the Faculty or in the supplementary regulations.
3. The Faculty can in agreement with the Rector decide to organize the re-sit examination during the same period as the normal examination, in the next examination period or at a later time outside the examination period. For certain programmes of study, the time of the re-sit examination will be a standard arrangement that can be stated in the supplementary regulations.
4. During a re-sit examination, the quality of the assessment should correspond to the one given at the normal final examination. Alternative forms of assessment at re-sit examination should be stated in the course description.

§29 Approved absence from other types of assessment than final examination
The Faculty should, if practically possible, ensure that students with approved absence from other types of assessment than in the final examination can be assessed during the semester and before any possible final examination in the course.

§30 Re-examination
1. A student who has failed to pass the examination in a course has the right to repeat the examination and receive a new assessment. The course description or the supplementary regulations determine what areas have to be repeated after a student has failed to pass an examination.
2. The student has the right to complete a second period of practical work experience if he/she failed to pass the first period of practical work experience.
3. If the student has passed, he/she only has the right to re-take an examination once more in each course in order to improve his/her grade. If the student is registered for an examination and has not withdrawn his/her examination registration by the deadline decided by the Director of the Student and Academic Division, this is regarded as one attempt. The highest grade obtained is the one that counts. When the grade for a course is based on two or more assessments or tests, all of these have to be re-taken.

§31 New assessment of Master's thesis
A student may submit a new or revised Master's thesis once in cases where the thesis has not been awarded a passing grade. If the thesis has been given a passing grade, there is no opportunity for a new assessment in the same programme of study.

§32 Syllabus at new assessment/re-sit examinations
In case of new assessment and re-sit examinations, the syllabus of the course at the time of the new assessment or the re-sit examination is to be valid. In cases of changes in the national framework plans, the Ministry may decide upon special arrangements. If there are significant changes in the syllabus, there is to be a possibility to be assessed according to the former syllabus for at least one year, but no more than two years after the introduction of the changes.

§33 Adjusted forms of assessment
1. In order to give all students approximately the same working conditions when receiving assessment, students with particular requirements that have been sufficiently documented may apply for an adjusted form of assessment. Such an assessment does not imply any reduction in the general degree requirements.
2. The adjusted forms of assessment may be practically oriented in order to allow the use of special aids or extended time. In particular cases, types of assessment that differ from the normal one may also be accepted.
3. If the requirements of the student are permanent, the use of special aids may be allowed throughout his/her studies.
4. An application, including documentation, should be sent to the Division of Student and Academic Affairs before the registration deadline. The application is to be decided by the Rector. Applications for different forms of assessment from the one given in the course description are to be decided by the Rector in consultation with the Faculty.
5. Students with sudden acute requirements should as far as possible be given the same rights with regard to assessment as described above. An application containing sufficient documentation should be sent to the Division of Student and Academic Affairs as soon as possible after the acute situation has arisen.

§34 Form of language/language by written assessment
1. Arrangements with regard to the form of language used in examination papers are given in

Regulations concerning forms of language in examination papers of 7 July 1987. The regulations are in accordance with the Act of 11 April 1980 no. 5 concerning the use of Forms of Language in the Public Services.

2. Examination papers written in Norwegian should contain a version in the other form of the Norwegian language (*bokmål* and *nynorsk*). The exception is examination papers in the subject Norwegian. In case all the students prefer the same form of language, the examination papers may only be written in this form. The students choose their form of language as they register for an examination.
3. If the lectures are given in a non-Scandinavian language, the examination paper should also include a version in the language that has been used in the lectures. Applications requesting the examination paper to be in a language different from Norwegian or that used in teaching are to be decided by the Faculty.
4. In examinations at higher degree level, the Faculty may decide that the text in the examination paper is in a non-Scandinavian language even though there is no requirement that the examination answer paper is to be written in that language. Higher degree level means master's programmes or the 4th, 5th or 6th years in integrated programmes of study. The decision concerning this is to be indicated in the course description.
5. If a significant portion of the curriculum of the course is written in a language that is different from the one used in lectures, the Faculty may decide that the examination paper should contain a version in this language as well.
6. Assessment papers and Master's theses can be written in Norwegian, Danish, Swedish or English unless stipulated otherwise in the course description or in description of the programme of study.
7. If another foreign language than English is part of the characteristics of the course, its learning objectives or curriculum, the Faculty is to determine which language the candidate is to use in his/her assessment paper.
8. The Master's thesis is to be written in the language that is most relevant to the content of the topic and the practical conditions of each individual master's student. The Faculty is to determine which languages can be approved within this framework. Master's theses that are written in Norwegian are to have a summary in English or another relevant language. Master's theses written in a non-Scandinavian language are to have a short summary in Norwegian. The Faculty may waive this provision if the candidate is an international student and does not speak one of the Scandinavian languages (Norwegian, Swedish or Danish).

§35 Oral examinations behind closed doors

At the request of the student, the Faculty may decide against making an oral examination public in cases where there are pressing reasons, ref. the Act relating to Universities and University Colleges, Section 3-9, subsection 3. The Faculty should ensure that the assessment in these cases also satisfies the normal academic level in the programme of study.

§36 Academic misconduct or an examination offence/attempted academic misconduct or an examination offence

1. In cases of academic misconduct or an examination offence/attempted academic misconduct or an examination offence, the University Appeals Committee may cancel the assessment in accordance with the Act relating to Universities and University Colleges, Section 4-7. The same applies to the recognition of courses, credits or education, as well as exemption from assessment.
2. In accordance with the Act relating to Universities and University Colleges, Section 4-8, subsection 3, the University Appeals Committee may expel a student who has behaved contrary to the regulations for up to one year. The student may also lose his/her right to sit for examinations within institutions affected by the ruling for up to one year.
3. More detailed information about reactions to academic misconduct or an examination offence is given in Guidelines for reactions to academic misconduct or examination offences/attempts at academic misconduct or examination offences at NTNU of 30 May 2001.

Chapter 6 Determination of grades

§37 Examiners

1. The Faculty appoints the examiners, ref. the Act relating to Universities and University Colleges, Section 3-9, subsection 2. For inter-faculty courses such as "Experts in Team" that are not administered by one faculty, the rector is to appoint the external examiner(s). If there is an appeal, the Faculty is to appoint the external examiner(s). The examiners are appointed for 3 years at a time.
2. At least two examiners are to be present at oral examinations and assessment of vocational training or other activities of a type that cannot be subsequently checked. At least two examiners, of whom at least one should be external, should be present at the assessment of Master's theses, ref. the Act relating to Universities and University Colleges, Section 3-9, subsection 2.
3. The Faculty determines the guidelines regarding external participation at the assessment, whether general or a specific programme of study. This could be done by external participation in each separate assessment or through an external evaluation of the assessment procedures.

§38 Deadlines for determination of grades

In accordance with the Act relating to Universities and University Colleges, Section 3-9, subsection 4, the deadline for determination of grades is 3 weeks following the examination, unless special reasons make it necessary to use more time. When special reasons occur, a new deadline should be announced. The deadline for assessment of the Master's thesis is 3 months after the thesis has been handed in.

Chapter 7 Grades

§39 Grading scales

Assessment is given on basis of grading, either through a scale ranging from A to F or on the basis of Passed/Not Passed. Grade A is the highest pass grade, while Grade E is the lowest pass grade. The grading scale is based on the following descriptions and general qualitative descriptions:
symbol description General, qualitative description of valuation criteria

Symbol	Description	General, qualitative description of valuation criteria
A	Excellent	An excellent performance, clearly outstanding. The candidate demonstrates excellent judgement and a high degree of independent thinking.
B	Very good	A very good performance. The candidate demonstrates sound judgement and a very good degree of independent thinking.
C	Good	A good performance in most areas. The candidate demonstrates a reasonable degree of judgement and independent thinking in the most important areas.
D	Satisfactory	A satisfactory performance, but with significant shortcomings. The candidate demonstrates a limited degree of judgement and independent thinking.
E	Sufficient	A performance that meets the minimum criteria, but no more. The candidate demonstrates a very limited degree of judgement and independent thinking.
F	Fail	A performance that does not meet the minimum academic criteria. The candidate demonstrates an absence of both judgement and independent thinking.

Passed/Not Passed is used where assessment is not required.
The Faculty is to provide descriptions of the assessment criteria that are specific for each subject.

§40 Grade Point Average

The Grade Point Average can be estimated as long as letter grades have been given for at least 75% of the credits. When estimating the Grade Point Average, all grades in each separate course should be included.

The Grade Point Average is determined as follows:

1. Each letter grade is replaced by its equivalent number, A=5, B=4, C=3, D=2, E=1.
2. The numerical equivalent is multiplied by the number of credits in the course, and the separate sums of credits and numerical equivalents are added up for all courses that are included.
3. This total is subsequently divided by the total number of credits included in all the courses.
4. The quotient is calculated to one decimal place.
5. The Grade Point Average is the letter degree which represents the equivalent of the full number of the quotient after the normal rounding-up rule has been applied.

§41 Final grade

1. Whether or not a final grade is to be given is decided by supplementary regulations.
2. The final grade means the overall grade for the entire programme of study at the award of degree. The grade is a weighted average based on the letter grades in the courses included in the degree. In order to get a final grade the student must have a pass mark in courses at NTNU corresponding to at least 120 credits, and at least 75% of these must have been given a letter grade. The method for calculating the final grade is the same as that described for the Grade Point Average in Section 40.

§42 Explanations and appeals

1. Cases involving the explanation of grades and complaints about them are to be handled in accordance with the Act relating to Universities and University Colleges, Section 5-3. Requests for an explanation of grades and complaints should be forwarded to the Faculty. If written guidelines for determining grades have been issued, these are to be made available for students after the grade has been decided, ref. the Act relating to Universities and University Colleges, Section 5-3, subsection 3.
2. If there is a new assessment of a grade, at least two new examiners, including at least one external, are to be involved, ref. the Act relating to Universities and University Colleges, Section 3-9, subsection 5. The new examiners should not have any information about the initial grade, the explanation for it or the basis of the student's complaint.
   If the examiner(s) in the first assessment find passages that are copied without citing the sources, but situation is not considered serious enough to be termed academic misconduct, the department may be notified by the examiner(s). If the student lodges a complaint about the grade he/she has received, the department is allowed to inform the new examiners about the lack of source citation. The department is to inform the student that the new examiners will be informed about the lack of source citation.
3. When on-going assessment is used, the student cannot lodge a complaint until he/she has received the grade in the relevant course or group of courses. Although the student cannot lodge a complaint following each separate assessment, he/she has the right to an explanation of the grading for each separate assessment.
4. Complaints against procedural errors can be submitted in accordance with the Act relating to Universities and University Colleges, Section 5-2. The complaint is to be sent to the Faculty. In accordance with Section 5-2 of the Act relating to Universities and University Colleges, complaints can only be made about on-going assessments which will be included in the certificate or that count as part of the final grade.
5. Complaints about the grading of group work, where a common grade is given, all participating students must agree and sign the complaint. The same applies to complaints about procedural errors in these cases.

Chapter 8 Certificates and transcripts

§43 Certificates

1. Certificates are issued after the completion of a degree or an educational programme. A certificate is normally issued only once for the same degree/education. The certificate is to contain information about the programme of study the degree is based on. The certificate should show the semester and year the degree/educational programme was completed. The final grade (if applicable) is to be given on the certificate. Diploma supplements form a part of the certificate. A transcript of grades showing the courses the student has passed should be attached to the certificate.
2. In order to receive a certificate for a completed degree at NTNU, at least 60 of the credits to be included in the basis of calculation of the degree have to been taken at NTNU.
3. For the degrees that are awarded in cooperation with other Norwegian or foreign institutions (joint degrees) at least 30 credits have to be be taken at NTNU.
4. When recognition is given for education that has previously been used in the basis of calculation of a degree or as part of a degree or professional training, a student must also have completed at least 60 new credits before he/she can be awarded a new degree. The Faculty may decide requirements for up to 90 new credits for certain programmes. Rector has the authority to adopt requirements for up to 90 new credits for the Master of Science in Engineering programmes and the 5-Year Teacher Education programmes.

§44 Transcript

Upon request, students are to receive a transcript confirming their passing grades. The transcript should show the grades given in each course, the year and semester in which the grades were obtained, as well as the title and number of credits for the courses.

Chapter 9 Supplementary regulations and implementation

§45 Supplementary regulations

The Faculty has the authority to add supplementary regulations to these regulations. For inter-Faculty programmes of study, the supplementary regulations are to be accepted by all faculties involved. For the Master of Science in Engineering programmes and the 5-Year Teacher Education programmes, Rector has the authority to add supplementary regulations.

§46 Implementation

The regulations are to come into force immediately.

EXTRACTS FROM ACT OF 1 APRIL 2005 RELATING TO UNIVERSITIES AND UNIVERSITY COLLEGES

Chapter 3 Academic decisions - accreditation

§ 3-9. Examinations and marking

1. Universities and university colleges shall ensure that students' knowledge and skills are tested and assessed in a manner that is impartial and academically sound. Assessment shall also safeguard the academic standards of the course of study in question. An external evaluation shall be made of the assessment or assessment arrangements.
2. The board shall appoint examiners for examinations, tests, assessments of assignments or other assessments the results of which are entered on the diploma or included in the mark given for the course of study in question. When assessing candidates' independent work in higher degree courses, each candidate shall be assessed by at least two examiners, of whom at least one shall be external.
3. The oral parts of examinations and tests shall be public unless regard for the examination or test arrangements indicates otherwise. The board may make exceptions to the rule concerning public examinations in particular cases at the request of the examination candidate concerned when particularly weighty reasons so indicate.
4. Marks shall be made known within three weeks unless for special reasons more time is required. The board may itself make exceptions in respect of specific examinations and may in temporary regulations pursuant to the seventh paragraph set a longer time limit when it is not possible to provide the number of qualified examiners required to complete the marking within three weeks. The board may itself in a regulation pursuant to the seventh paragraph set a longer time limit for dissertations and similar large written works.
5. Re-marking pursuant to sections 5-2 and 5-3 shall be carried out by at least two new examiners, of whom at least one shall be external. Marks may be changed in the appellant's favour and disfavour. If the final mark is set on the basis of both a written and an oral test and an appeal against a mark for the written part of the examination is upheld, a new oral test shall be held to determine the final mark.
6. The mark awarded following an examination, test, assessment of an assignment or other assessment shall either be pass/fail or be based on a graded scale of six marks from A to F, where A to E indicate a pass and F indicates a fail.
7. The board itself issues regulations governing the taking and arrangement of examinations and tests, including the conditions for resitting an examination or test and for permission to retake a practice period, and provisions concerning registration and the conditions for registration for examinations. In the case of courses for which national curriculum regulations have been established pursuant to section 3-2, second paragraph, the regulations must be based on any general provisions concerning examinations and assessment contained in the curriculum regulations. The board may delegate the issue of supplementary provisions concerning special circumstances relating to particular examinations to a faculty or department.

Chapter 4 The students' rights and obligations

§ 4-7. Annulment of examinations or tests

1. The board itself or the board's appeals committee, cf. section 5-1, may annul an examination or test or recognition of a course if the student
   a) by using a false diploma or by other dishonest means, has gained admission to the examination or test or to attend the course concerned, or
   b) has attempted to cheat or wilfully or through gross negligence has cheated in the course of or prior to the final assessment of the examination or test concerned, or while taking the course in question.
2. The board itself or the institution's appeals committee, cf. section 5-1, may annul credit for or recognition of a course or exemption from an examination or test if the student obtained it by using a false diploma or by other dishonest means.
3. Annulment decisions pursuant to the first and second paragraph may be appealed to the Ministry or to a special appeals body appointed by the Ministry, cf. section 5-1, seventh paragraph.
4. The right to annulment has no time limit.
5. An annulment decision entails an obligation to return any diplomas or mark transcripts to the institution. If such diploma or mark transcript is not returned to the institution at the proper time, the institution may obtain the assistance of an enforcement officer (namsmann) to secure its return, pursuant to the provisions laid down in Chapter 13 of the Enforcement Act.
6. If the diploma can form the basis of authorization for the exercise of a profession or trade, the institution shall notify the authority concerned of the annulment.

7. Other institutions under the present Act may be informed of the annulment of an examination or test. The Ministry issues specific provisions concerning information routines, etc.

§ 4-8. Exclusion

1. A student who despite written warning by the board repeatedly behaves in a manner which seriously disturbs the work of fellow students or other activities at the institution may be excluded by the board itself or the institution's appeals committee, cf. section 5-1, from specific parts of the institution for up to one year. If a student after receiving a written warning from the board continues not to respect such exclusion, the board itself or the institution's appeals committee, cf. section 5-1, may exclude him or her from attending courses for up to one year.
2. A student who has behaved in such a seriously censurable manner as to endanger the life or health of patients, clients, children attending a day care institution, pupils or others with whom the student comes into contact in connection with clinical or practical training or who in relation to such persons commits serious breaches of the obligation to observe secrecy or behaves with gross indecency, may, if the board itself or the institution's appeals committee, cf. section 5-1, so decides, be excluded from attending courses for up to three years. The institution shall inform the Norwegian Directorate for Health and Social Welfare of any exclusion pursuant to this provision of students attending courses that may result in a right of authorization pursuant to section 48, first paragraph, of the Health Personnel Act.
3. A student who has behaved as described in section 4-7, first or second paragraph, if the board itself or the institution's appeals committee so decides, cf. section 5-1, may be excluded from the institution and deprived of the right to sit examinations at institutions under this Act for up to one year. The Ministry issues specific provisions concerning information routines, etc.
4. A decision to exclude a student requires a majority of at least two-thirds. The student may appeal against such a decision pursuant to the provisions laid down in the Public Administration Act. The Ministry or a special appeals body appointed by the Ministry is the appeals body.
5. The student is entitled to seek the assistance of a lawyer or other spokesman from the date the question of exclusion is raised or from the date of any written warning pursuant to the first paragraph. The cost of such assistance shall be met by the institution.

Chapter 5 Appeals

§ 5-2. Complaints against procedural errors in connection with examinations

1. A candidate who has taken an examination or test may complain of procedural errors within three weeks of the date when he or she became or should have become aware of the circumstance on which the complaint is based. Such complaints are ruled on by the board itself or the institution's appeals committee. 1 April 2005
2. If an error was committed which may have affected the student's performance or its assessment, the mark shall be rescinded. If the error can be corrected by remarking the papers submitted, they shall be re-marked. Otherwise a new examination or test shall be held with new examiners. The mark awarded in a second assessment pursuant to the present section may be appealed against pursuant to the provisions laid down in section 5-3.
3. If a request for explanation of or an appeal against a mark has been submitted, the time limit for an appeal pursuant to this section is reckoned from the date when the student receives the explanation or when the appeal is finally ruled on.
4. If the board or the board's appeals committee finds that formal errors were committed and that this can reasonably be supposed to have affected the performance of one or more candidates or the assessment of that performance, the decision may be taken to carry out a new assessment or to hold a new examination or test.

§ 5-3. Complaints regarding marks awarded - right to explanation

1. A student is entitled to an explanation of the marks awarded for his or her performance. At oral examinations or assessments of practical skills, a request for such an explanation must be made immediately on notification of the mark. Requests for explanations of other assessments must be submitted within one week after the candidate learns of the mark, but never more than three weeks after the announcement of the mark.
2. Explanations shall normally be given within two weeks after the candidate requests them. They shall state the general principles on which the assessment was based and explain the assessment of the candidate's performance. Explanations may be given orally or in writing at the examiner's discretion.
3. If written guidelines for assessments have been issued, they shall be available to students after the marks have been decided.
4. A student may appeal in writing against a mark awarded for his or her performance within three weeks of the announcement of the examination results. The performance shall then be reassessed. In the event of a request for an explanation of a mark or a complaint of procedural errors in the question-setting, the examination procedure or the assessment procedure, the time limit for appeals pursuant to this section is reckoned from the date when the student receives the explanation or when the appeal is finally ruled on. In connection with the use of

continuous assessment, the institution may decide whether the student shall submit an appeal following the assessment of a separate examination, assignment or other assessment or whether an appeal shall be submitted on announcement of the result of assessment of the study programme, discipline, or module.

5. Appeals may not be lodged against marks awarded for oral performance and assessment of practical training or the like which, owing to the nature of the test cannot be reviewed. The results of preliminary examinations (forprøver) may only be appealed against when the examination is failed.
6. Marks awarded following re-marking pursuant to this section may not be appealed against.

INFORMATION ABOUT CHEATING AND ACADEMIC MISCONDUCT IN HOME EXAMINATIONS, SEMESTER ASSIGNMENTS AND OTHER EXAMINATIONS AT NTNU

On 12 October 2006, the Board of NTNU passed Guidelines concerning the action to be taken in cases of students cheating or attempting to cheat at examinations at NTNU. This extract from these Guidelines is written to give students important information about this matter.NTNU regards cheating as a serious matter with grave consequences when a student is even suspected of cheating. Failing to respect the work of others by not citing sources can lead to an examination being failed and even expulsion from NTNU and all higher education in Norway for up to one year.

NTNU defines cheating as actions that are in conflict with the examination regulations that lead to the results being more favourably judged than would otherwise be the case. This is a broad definition that includes gross negligence. The following examples clarify what NTNU can regard as cheating:

- An examination answer paper with all or some of the text from the Internet that is presented as the student's own work
- An examination answer paper with all or some of the text used by someone else at a previous examination
- An examination answer paper with all or some of the text used by the student at a previous examination
- An examination answer paper with all or some of the text written by someone else
- Work that is handed in as the student's own work that is written, designed or composed by someone else
- Quotes from textbooks, other sources, or the Internet that are not presented with their sources and are not clearly marked as quotations (plagiarism)
- Using examination support material that is not permitted

Ask your professors, Student Service or student advisers at NTNU if you are unsure about the rules relating to cheating. It is the student's own responsibility to find out about the rules relating to the use of other people's work - plagiarism - which is against Norwegian law (see below). In an examination, each student must find out what examination support material is permitted.

Plagiarism detection
NTNU has acquired a system for plagiarism detection. This system is designed to detect plagiarism in examination answer papers submitted in connection with teaching at NTNU. This means that texts submitted by students in courses at NTNU can be checked for plagiarism.

What Norwegian law says about cheating

The Act of 1 April 2005 relating to Universities and University Colleges Section 4-7, Subsection 1, b. states that the University Appeals Committee can annul an examination or test or approval of a course if the student has

attempted to cheat or on purpose or with gross negligence has cheated in the course of or prior to the final assessment of the examination or test concerned, or while taking the course in question.

Annulment of the examination (The above Law, Section 4-7, Subsection 1, b)
The least severe reaction is annulment of the examination. Annulment alone is used in the least serious cases of cheating. An attempt to cheat includes gross negligence. The matter is decided by the University Appeals Committee.

Suspension from further studies (The above Law, Section 4-8, Subsection 3)
In the graver cases of cheating the student may be excluded from NTNU and may lose the right to take examinations at other institutions covered by the Act relating to Universities and University Colleges for a period of one year. The matters is decided by the University Appeals Committee and requires two-thirds majority, see Act of 1 April 2005 relating to Universities and University Colleges Section 4-8, Subsection 4.

NTNU's Examination Regulations can be found on http://www.ntnu.no/studier/reglement. See Examination Regulations at the Norwegian University of Science and Technology (NTNU) (pdf).